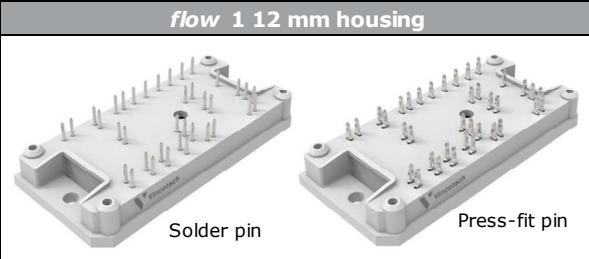
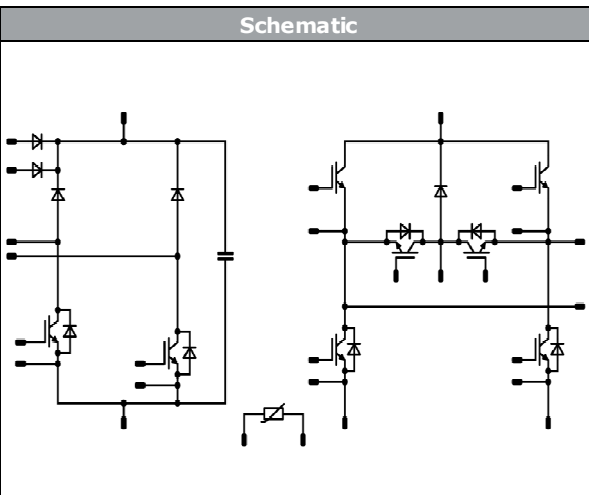




Vincotech

<i>flow SOL 1 BI (TL)</i>	650 V / 75 A
<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;">Features</p> <ul style="list-style-type: none"> Dual Booster with bypass diode + H6.5 Bridge S5 IGBT Chipset for higher efficiency Kelvin emitter for improved switching Integrated DC Link capacitor Integrated NTC Low inductive design </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;">Target applications</p> <ul style="list-style-type: none"> Solar Inverters </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;">Types</p> <ul style="list-style-type: none"> 10-FY07BVA075S5-LF45E18 10-PY07BVA075S5-LF45E18Y </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><i>flow 1 12 mm housing</i></p>  <p style="text-align: center; margin: 0;">Solder pin Press-fit pin</p> </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;">Schematic</p>  </div>

Maximum Ratings

$T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Low Buck Switch / High Buck Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ }^\circ\text{C}$	58	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	225	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ }^\circ\text{C}$	86	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum junction temperature	T_{jmax}		175	$^\circ\text{C}$



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Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Buck Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	47	A
Repetitive peak forward current	I_{FRM}		100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	63	W
Maximum junction temperature	T_{jmax}		175	°C
Boost Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	58	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	225	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	86	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C
Low Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	47	A
Repetitive peak forward current	I_{FRM}		100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	63	W
Maximum junction temperature	T_{jmax}		175	°C
High Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	47	A
Repetitive peak forward current	I_{FRM}		100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	63	W
Maximum junction temperature	T_{jmax}		175	°C



Vincotech

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Input Boost Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	58	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	225	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	86	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C
Input Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	55	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	71	W
Maximum junction temperature	T_{jmax}		175	°C
ByPass Diode				
Peak repetitive reverse voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F		75	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	95	W
Maximum junction temperature	T_{jmax}		150	°C
Input Boost Sw. Protection Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F		10	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	33	W
Maximum junction temperature	T_{jmax}		175	°C
Capacitor (DC)				
Maximum DC voltage	V_{MAX}		630	V
Operation Temperature	T_{op}		-55...+125	°C



Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
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Module Properties

Thermal Properties

Storage temperature	T_{stg}		-40...+125	°C
Operation temperature under switching condition	T_{top}		-40...(T _{max} - 25)	°C

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage* $t_p = 2\text{ s}$	6000	V
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			min. 12,7	mm
Clearance		Solder pins / Press-fit pins	8,16 / 7,93	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production



Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	

Low Buck Switch / High Buck Switch

Static

Parameter	Symbol	$V_{GE} = V_{CE}$	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$					0,00075	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CESat}		15			75	25 125 150		1,56 1,56 1,59	1,75	V
Collector-emitter cut-off current	I_{CES}		0	650			25			50	μA
Gate-emitter leakage current	I_{GES}		20	0			25			100	nA
Internal gate resistance	r_g								none		Ω
Input capacitance	C_{ies}								4500		pF
Output capacitance	C_{oes}	$f = 1$ Mhz	0	25		25			130		
Reverse transfer capacitance	C_{res}								17		
Gate charge	Q_g		15	520	75	25			164		nC

Thermal

Parameter	Symbol	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)	K/W

Dynamic

Parameter	Symbol	$R_{gon} = 4$ Ω $R_{goff} = 4$ Ω	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$						25 125 150		31 31 31		ns
Rise time	t_r						25 125 150		10 10 11		
Turn-off delay time	$t_{d(off)}$						25 125 150		110 126 132		
Fall time	t_f						25 125 150		10 25 32		
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 2,2$ μC $Q_{tFWD} = 4$ μC $Q_{tFWD} = 4,7$ μC					25 125 150		0,450 0,701 0,758		mWs
Turn-off energy (per pulse)	E_{off}						25 125 150		0,457 0,875 1,02		



Vincotech

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 datasheet

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		

Buck Diode

Static

Parameter	Symbol	V_{GS} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F			50	25 125 150		1,50 1,44 1,42	1,92	V
Reverse leakage current	I_R		650		25			2,65	μA

Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)	1,50	K/W

Dynamic

Parameter	Symbol	di/dt	V_{GS}	V_{DS}	I_C	T_j	Min	Typ	Max	Unit
Peak recovery current	I_{RRM}					25 125 150		86 110 117		A
Reverse recovery time	t_{rr}					25 125 150		55 87 101		ns
Recovered charge	Q_r	$di/dt = 5329$ A/μs $di/dt = 8023$ A/μs $di/dt = 7260$ A/μs	-5 / 15	350	75	25 125 150		2,18 4,04 4,70		μC
Reverse recovered energy	E_{rec}					25 125 150		0,381 0,839 1,02		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		5984 4040 4174		A/μs



Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	

Boost Switch

Static

Parameter	Symbol	$V_{GE} = V_{CE}$	V_{GS} [V]	V_{CE} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$				0,00075	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CESat}		15		75	25 125 150		1,56 1,56 1,59	1,75	V
Collector-emitter cut-off current	I_{CES}		0	650		25			50	μA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}							4500		pF
Output capacitance	C_{oes}	$f = 1 \text{ Mhz}$	0	25		25		130		
Reverse transfer capacitance	C_{res}							17		
Gate charge	Q_g		15	520	75	25		164		nC

Thermal

Parameter	Symbol	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)	K/W

Dynamic (T21,D12)

Parameter	Symbol	$R_{goff} = 4 \Omega$ $R_{gon} = 4 \Omega$	V_{GS} [V]	V_{CE} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$		±15	350	76	25 125 150		60		ns
Rise time	t_r						25 125 150	11 10 11		
Turn-off delay time	$t_{d(off)}$						25 125 150	88 106 109		
Fall time	t_f						25 125 150	12 17 22		
Turn-on energy (per pulse)	E_{on}						$Q_{iFWD} = 2,2 \mu\text{C}$ $Q_{iFWD} = 4,1 \mu\text{C}$ $Q_{iFWD} = 4,7 \mu\text{C}$	25 125 150	0,661 0,904 0,986	
Turn-off energy (per pulse)	E_{off}		25 125 150	0,604 1,04 1,11						



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 datasheet

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		

Low Boost Diode

Static

Parameter	Symbol	V_{GS} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F			50	25 125 150		1,50 1,44 1,42	1,92	V
Reverse leakage current	I_R		650		25			2,65	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					1,50		K/W
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Dynamic

Parameter	Symbol	dI/dt	V_{GS} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Peak recovery current	I_{RRM}				76	25 125 150		83 93 94		A
Reverse recovery time	t_{rr}				76	25 125 150		59 100 117		ns
Recovered charge	Q_r	$dI/dt = 6510$ A/μs $dI/dt = 4900$ A/μs $dI/dt = 6125$ A/μs	±15	350	76	25 125 150		2,18 4,08 4,73		μC
Reverse recovered energy	E_{rec}				76	25 125 150		0,470 0,935 1,10		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$				76	25 125 150		5969 1181 1324		A/μs



Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max		

Boost Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{CE}$			0,00075	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CEsat}		15		75	25 125 150		1,56 1,56 1,59	1,75	V
Collector-emitter cut-off current	I_{CES}		0	650		25			50	μA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}							4500		pF
Output capacitance	C_{oes}	$f = 1 \text{ Mhz}$	0	25		25		130		
Reverse transfer capacitance	C_{res}							17		
Gate charge	Q_g		15	520	75	25		164		nC

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,10		K/W
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Dynamic (T21,D20)

Turn-on delay time	$t_{d(on)}$	$R_{goff} = 4 \Omega$ $R_{gon} = 4 \Omega$	±15	350	76	25		65		ns
Rise time	t_r					125		64		
						150		66		
						25		12		
Turn-off delay time	$t_{d(off)}$					125		11		
						150		13		
						25		87		
Fall time	t_f	125		105						
		150		110						
		25		14						
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 2,1 \mu\text{C}$ $Q_{tFWD} = 4 \mu\text{C}$ $Q_{tFWD} = 4,5 \mu\text{C}$				25		0,527		mWs
						125		0,873		
						150		0,855		
Turn-off energy (per pulse)	E_{off}					25		0,733		
						125		1,04		
						150		1,29		



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 datasheet

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		

High Boost Diode

Static

Parameter	Symbol	V_{GS} [V]	V_{DS} [V]	I_D [A]	I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F			50		25 125 150		1,50 1,44 1,42	1,92	V
Reverse leakage current	I_R		650			25			2,65	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)							1,50		K/W
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Dynamic

Parameter	Symbol	λ_{paste} [W/mK]	V_{GS} [V]	V_{DS} [V]	I_D [A]	I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Peak recovery current	I_{RRM}	± 15	350	76		76	25		71		A
							125		92		
							150		92		
Reverse recovery time	t_{rr}						25		57		
							125		105		
							150		113		
Recovered charge	Q_r	$di/dt = 6622$ A/μs					25		2,14		μC
		$di/dt = 6272$ A/μs					125		4,02		
		$di/dt = 6687$ A/μs					150		4,51		
Reverse recovered energy	E_{rec}						25		0,629		mWs
							125		1,05		
							150		1,27		
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$						25		1089		A/μs
							125		1422		
							150		1342		



Vincotech

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10-PY07BVA075S5-LF45E18Y
 datasheet

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	

Input Boost Switch

Static

Parameter	Symbol	$V_{GE} = V_{CE}$	V_{GS} [V]	V_{CE} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$				0,00075	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CESat}		15		75	25 125 150		1,56 1,56 1,59	1,75	V
Collector-emitter cut-off current	I_{CES}		0	650		25			50	μA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}							4500		pF
Output capacitance	C_{oes}	$f = 1$ Mhz	0	25		25		130		
Reverse transfer capacitance	C_{res}							17		
Gate charge	Q_g		15	520	75	25		164		nC

Thermal

Parameter	Symbol	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)	K/W

Dynamic

Parameter	Symbol	$R_{gon} = 4$ Ω $R_{goff} = 4$ Ω	I_D [A]	V_{CE} [V]	T_j [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$		0 / 15	350	75	25		24	ns
Rise time	t_r					125		24	
						150		24	
						25		11	
Turn-off delay time	$t_{d(off)}$					125		12	
						150		12	
						25		127	
Fall time	t_f					125		145	
						150		150	
		25		22					
Turn-on energy (per pulse)	E_{on}	$Q_{rFWD} = 2,5$ μC $Q_{rFWD} = 4,7$ μC $Q_{rFWD} = 5,4$ μC				25		0,379	mWs
						125		0,605	
						150		0,681	
Turn-off energy (per pulse)	E_{off}					25		0,854	
						125		1,24	
						150		1,36	



Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		

Input Boost Diode

Static

Parameter	Symbol	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F			75	25 125 150		1,53 1,49 1,47	1,92	V
Reverse leakage current	I_R		650		25			3,8	μA

Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)	1,34	K/W

Dynamic

Parameter	Symbol	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Peak recovery current	I_{RRM}				25 125 150		92 116 123		A
Reverse recovery time	t_{rr}				25 125 150		53 84 94		ns
Recovered charge	Q_r	$di/dt = 8536$ A/μs $di/dt = 6881$ A/μs $di/dt = 6458$ A/μs	0 / 15	350	75	25 125 150	2,49 4,66 5,38		μC
Reverse recovered energy	E_{rec}				25 125 150		0,672 1,27 1,46		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$				25 125 150		2911 2634 2713		A/μs

ByPass Diode

Static

Parameter	Symbol	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F			75	25 125		1,10 1,04		V
Reverse leakage current	I_R		1600		25			50	μA

Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)	0,74	K/W



Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		

Input Boost Sw. Protection Diode

Static

Parameter	Symbol	V_{GS} [V]	V_{DS} [V]	I_D [A]	I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F			10		25 125		1,67 1,56	1,87	V
Reverse leakage current	I_R		650			25			0,14	µA

Thermal

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)		2,87		K/W

Capacitor (DC)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Capacitance	C			100		nF
Tolerance			-10		+10	%
Dissipation factor				2,5		%

Thermistor

Parameter	Symbol	Conditions	T_j [°C]	Min	Typ	Max	Unit
Rated resistance	R		25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$	100	-5		5	%
Power dissipation	P		25		5		mW
Power dissipation constant			25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ± 1 %	25		3962		K
B-value	$B_{(25/100)}$	Tol. ± 1 %	25		4000		K
Vincotech NTC Reference						I	

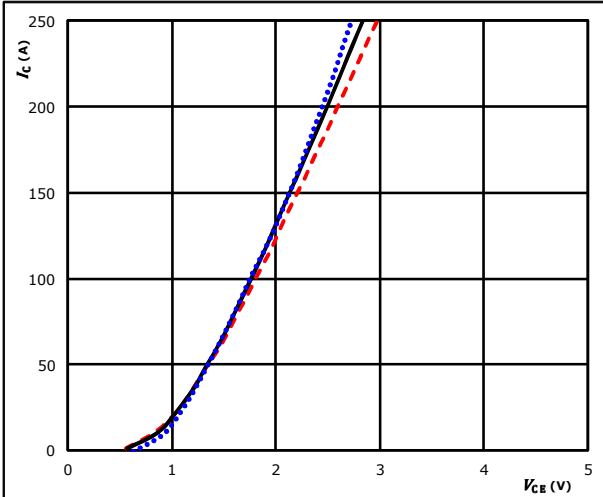


Low Buck Switch / High Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

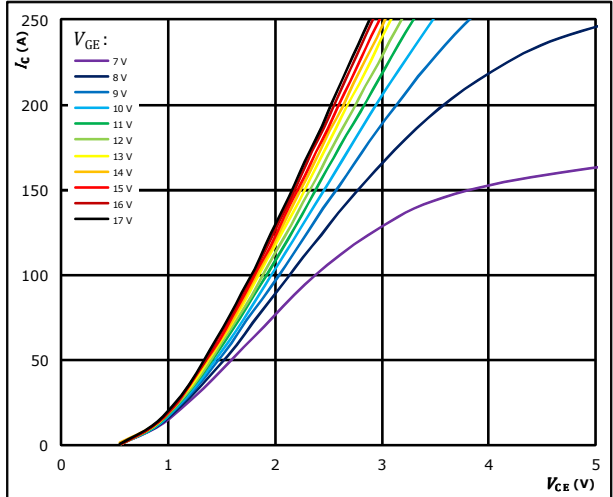


$t_p = 250 \mu\text{s}$
 $V_{GE} = 15 \text{ V}$
 $T_j: 25 \text{ }^\circ\text{C}$ (dotted blue)
 $125 \text{ }^\circ\text{C}$ (solid black)
 $150 \text{ }^\circ\text{C}$ (dashed red)

figure 2. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

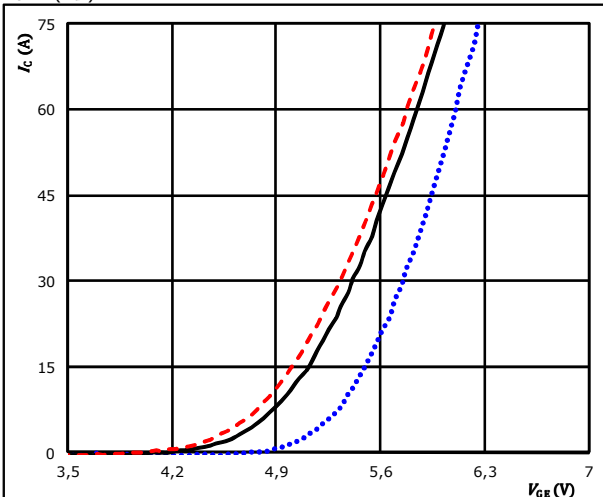


$t_p = 250 \mu\text{s}$
 $T_j = 150 \text{ }^\circ\text{C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

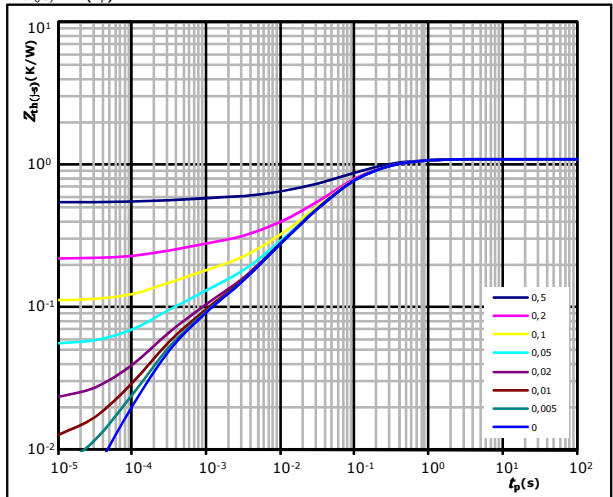


$t_p = 100 \mu\text{s}$
 $V_{CE} = 10 \text{ V}$
 $T_j: 25 \text{ }^\circ\text{C}$ (dotted blue)
 $125 \text{ }^\circ\text{C}$ (solid black)
 $150 \text{ }^\circ\text{C}$ (dashed red)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

$$Z_{th(\theta-s)} = f(t_p)$$



$D = t_p / T$
 $R_{th(\theta-s)} = 1,10 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
2,16E-01	4,05E-01
6,30E-01	6,87E-02
1,62E-01	1,13E-02
3,68E-02	2,51E-03
6,02E-02	3,09E-04

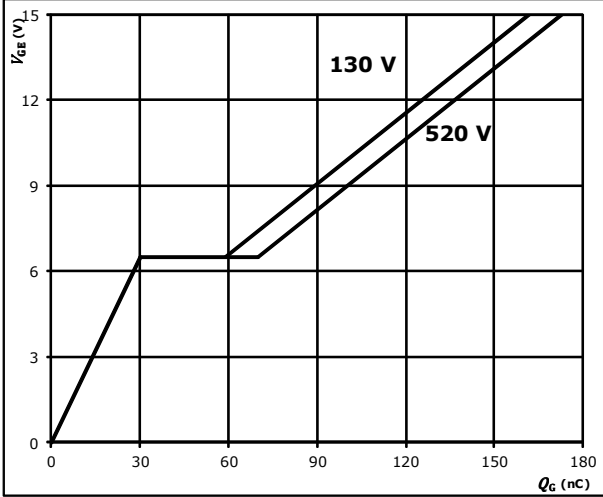


Low Buck Switch / High Buck Switch Characteristics

figure 5. IGBT

Gate voltage vs gate charge

$$V_{GE} = f(Q_G)$$

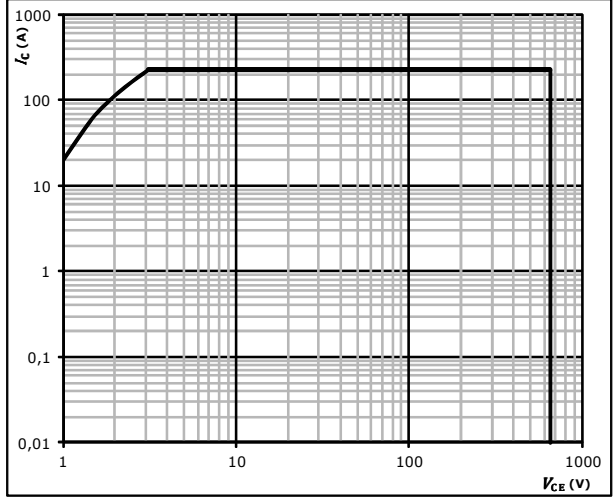


$I_C = 75$ A

figure 6. IGBT

Safe operating area

$$I_C = f(V_{CE})$$



$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = \pm 15$ V
 $T_j = T_{jmax}$

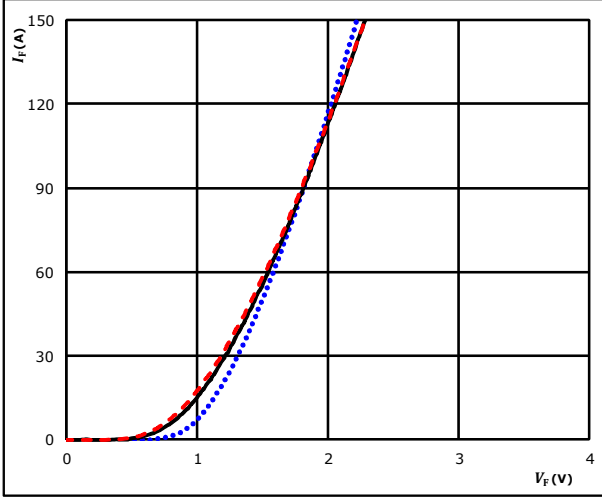


Buck Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

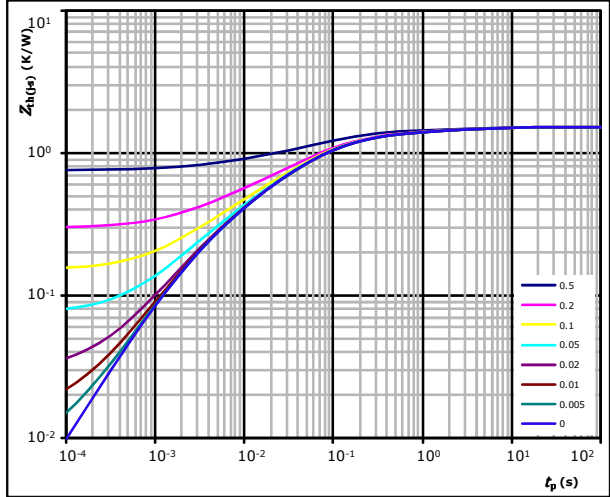


$t_p = 250 \mu s$
 T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T$
 $R_{th(j-s)} = 1,50 \text{ K/W}$
 FWD thermal model values

R (K/W)	τ (s)
1,03E-01	4,73E+00
2,05E-01	5,53E-01
6,39E-01	8,31E-02
3,39E-01	2,02E-02
1,71E-01	4,42E-03
4,45E-02	1,30E-03

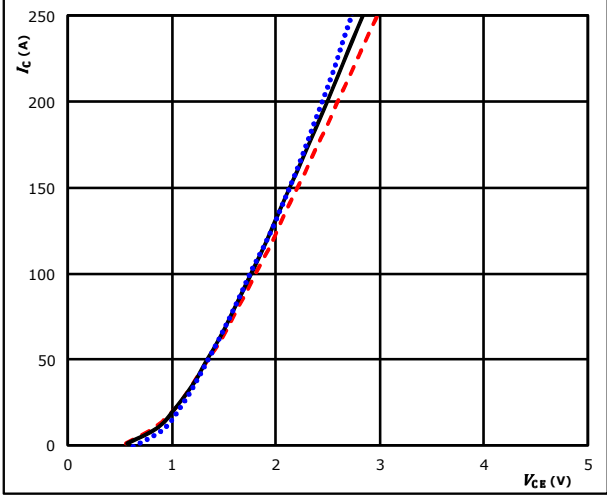


Boost Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

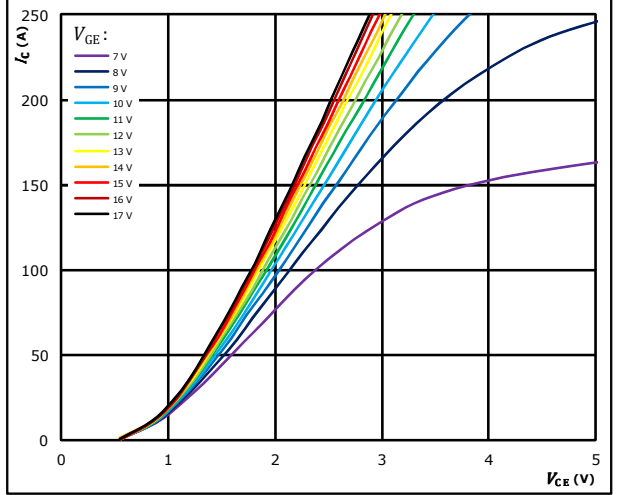


$t_p = 250 \mu s$ $T_j: 25 \text{ } ^\circ C$ (dotted blue line)
 $V_{GE} = 15 \text{ V}$ $T_j: 125 \text{ } ^\circ C$ (solid black line)
 $T_j: 150 \text{ } ^\circ C$ (dashed red line)

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

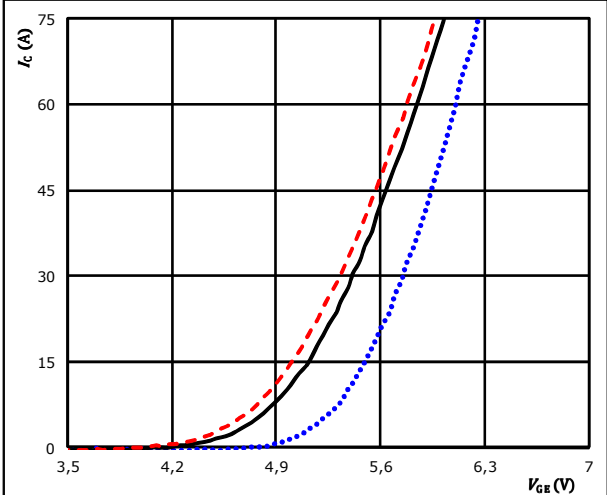


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

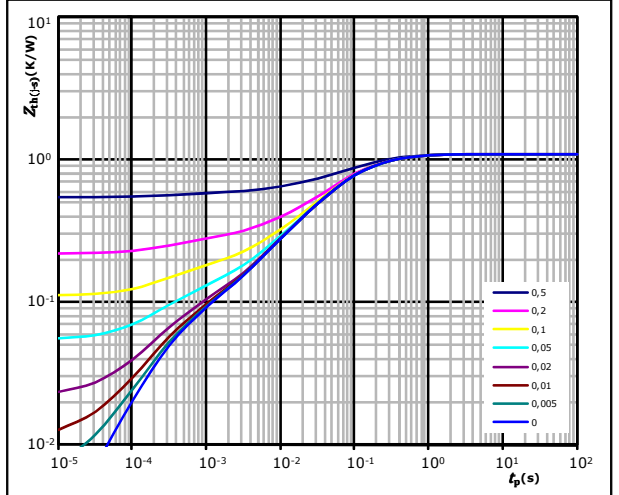


$t_p = 100 \mu s$ $T_j: 25 \text{ } ^\circ C$ (dotted blue line)
 $V_{CE} = 10 \text{ V}$ $T_j: 125 \text{ } ^\circ C$ (solid black line)
 $T_j: 150 \text{ } ^\circ C$ (dashed red line)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

$Z_{th(\theta-s)} = f(t_p)$



$D = t_p / T$
 $R_{th(\theta-s)} = 1,10 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
2,16E-01	4,05E-01
6,30E-01	6,87E-02
1,62E-01	1,13E-02
3,68E-02	2,51E-03
6,02E-02	3,09E-04

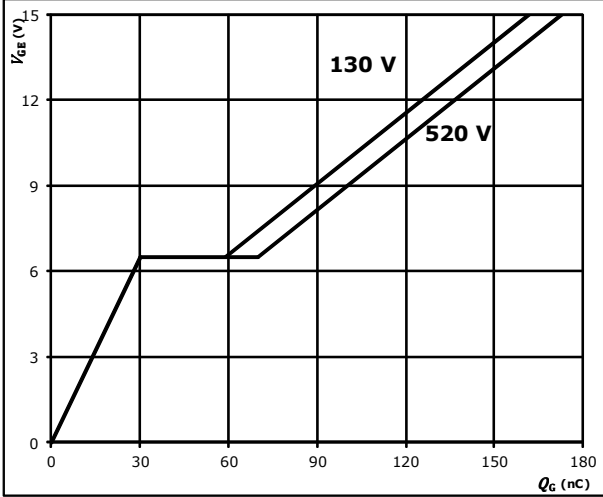


Boost Switch Characteristics

figure 5. IGBT

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

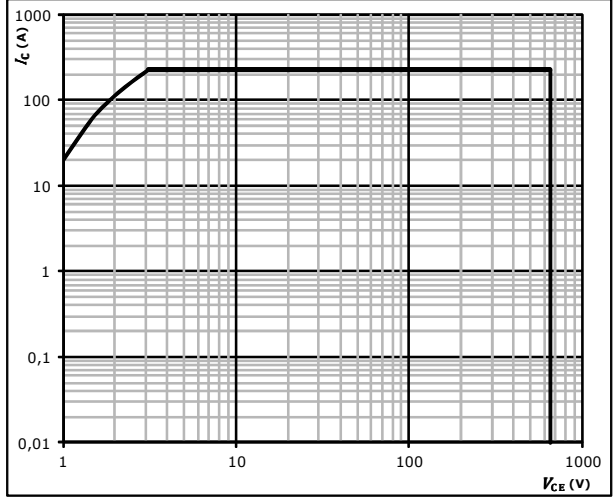


$I_C = 75$ A

figure 6. IGBT

Safe operating area

$I_C = f(V_{CE})$



$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = \pm 15$ V
 $T_j = T_{jmax}$

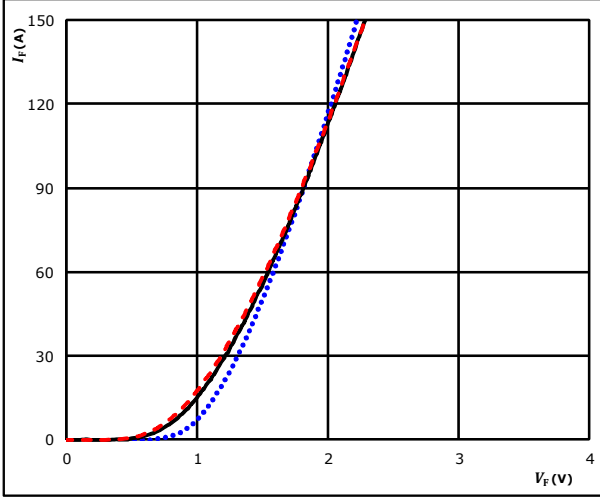


Low Boost Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

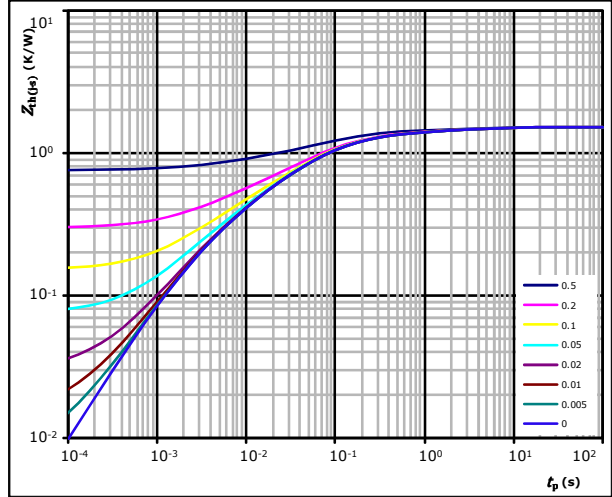


$t_p = 250 \mu s$
 T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T$
 $R_{th(j-s)} = 1,50 \text{ K/W}$
 FWD thermal model values

R (K/W)	τ (s)
1,03E-01	4,73E+00
2,05E-01	5,53E-01
6,39E-01	8,31E-02
3,39E-01	2,02E-02
1,71E-01	4,42E-03
4,45E-02	1,30E-03

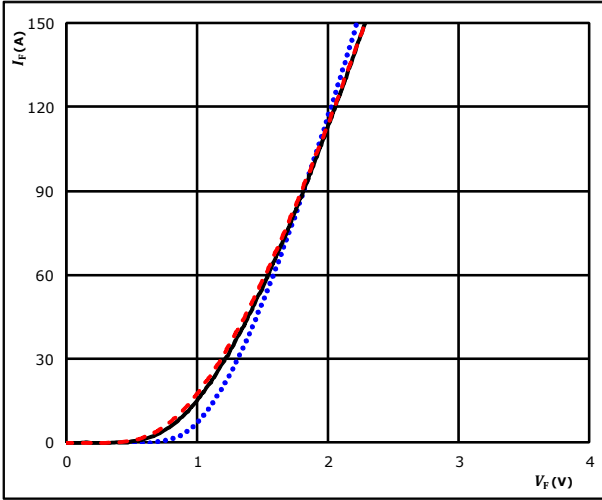


High Boost Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

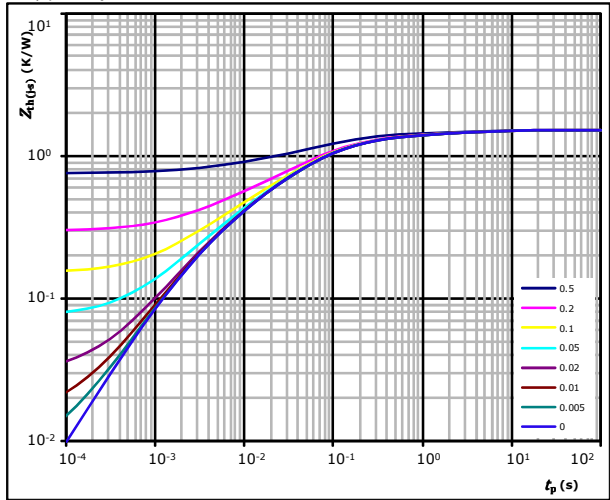


$t_p = 250 \mu s$
 T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T$
 $R_{th(j-s)} = 1,50 \text{ K/W}$
 FWD thermal model values

R (K/W)	τ (s)
1,03E-01	4,73E+00
2,05E-01	5,53E-01
6,39E-01	8,31E-02
3,39E-01	2,02E-02
1,71E-01	4,42E-03
4,45E-02	1,30E-03

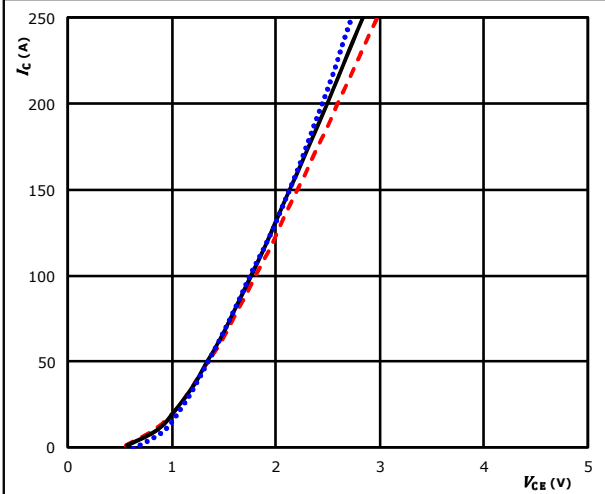


Input Boost Switch Characteristics

figure 1. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

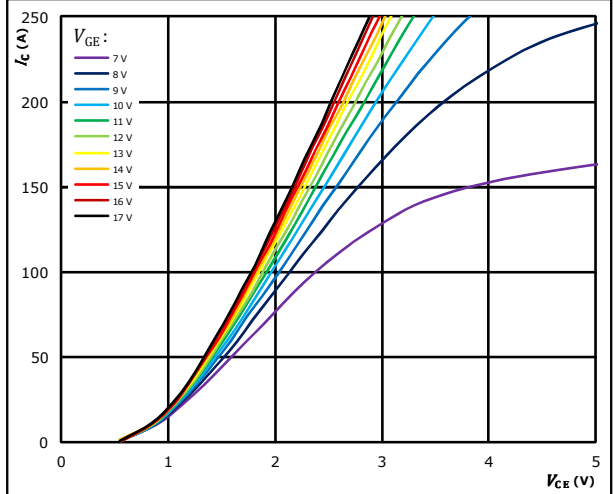


$t_p = 250 \mu\text{s}$ $T_j: 25 \text{ }^\circ\text{C}$ (dotted blue line)
 $V_{GE} = 15 \text{ V}$ $T_j: 125 \text{ }^\circ\text{C}$ (solid black line)
 $T_j: 150 \text{ }^\circ\text{C}$ (dashed red line)

figure 2. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

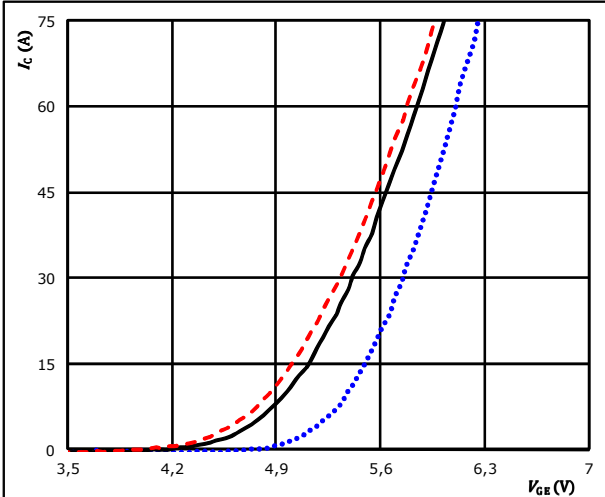


$t_p = 250 \mu\text{s}$
 $T_j = 150 \text{ }^\circ\text{C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

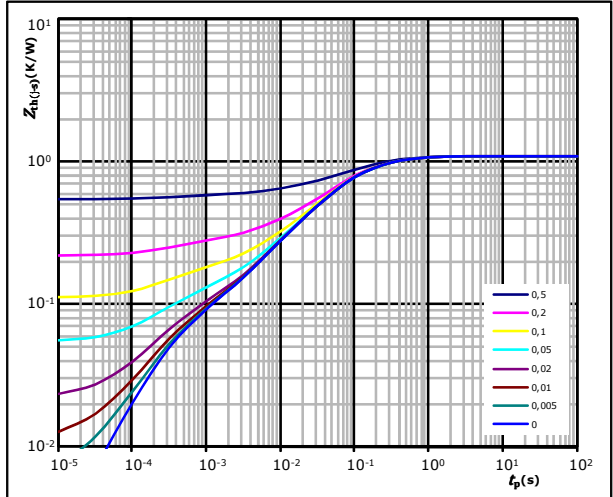


$t_p = 100 \mu\text{s}$ $T_j: 25 \text{ }^\circ\text{C}$ (dotted blue line)
 $V_{CE} = 10 \text{ V}$ $T_j: 125 \text{ }^\circ\text{C}$ (solid black line)
 $T_j: 150 \text{ }^\circ\text{C}$ (dashed red line)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T$
 $R_{th(j-s)} = 1,10 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
2,16E-01	4,05E-01
6,30E-01	6,87E-02
1,62E-01	1,13E-02
3,68E-02	2,51E-03
6,02E-02	3,09E-04

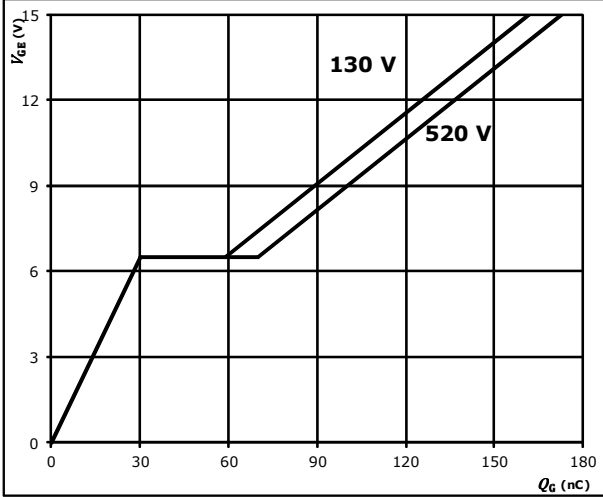


Input Boost Switch Characteristics

figure 5. IGBT

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

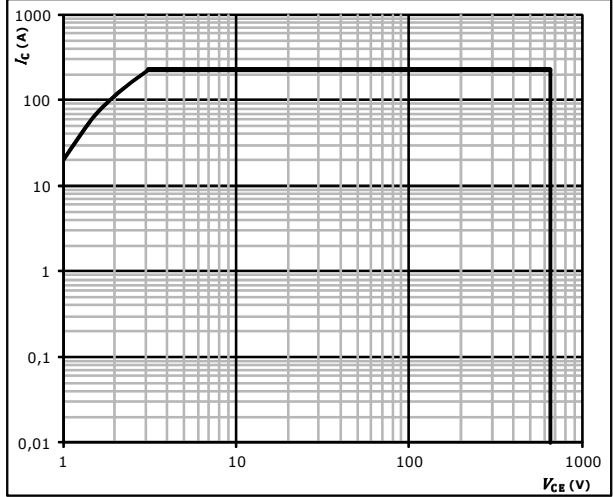


$I_C = 75$ A

figure 6. IGBT

Safe operating area

$I_C = f(V_{CE})$



$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = \pm 15$ V
 $T_j = T_{jmax}$

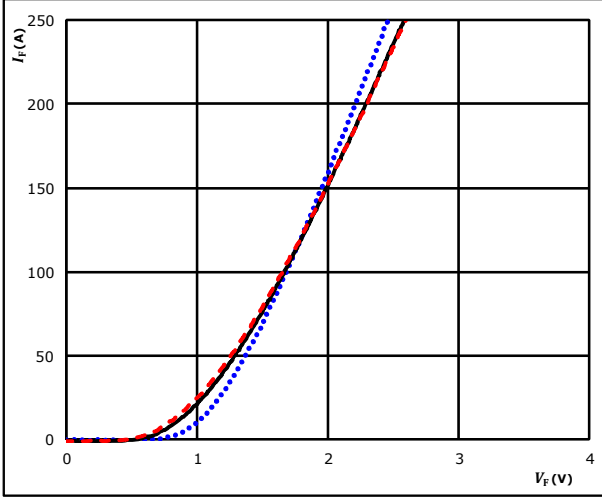


Input Boost Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

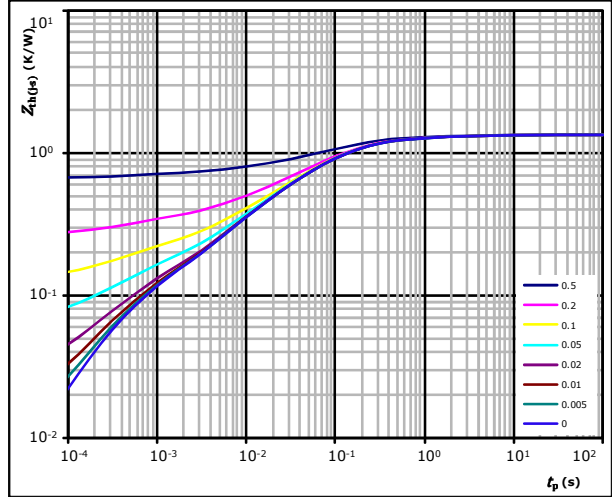


$t_p =$ 250 μ s
 T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D =$ t_p / T
 $R_{th(j-s)} =$ 1,34 K/W

FWD thermal model values

R (K/W)	τ (s)
5,84E-02	3,64E+00
1,57E-01	5,25E-01
5,86E-01	1,06E-01
3,27E-01	2,57E-02
1,27E-01	4,84E-03
8,12E-02	4,11E-04

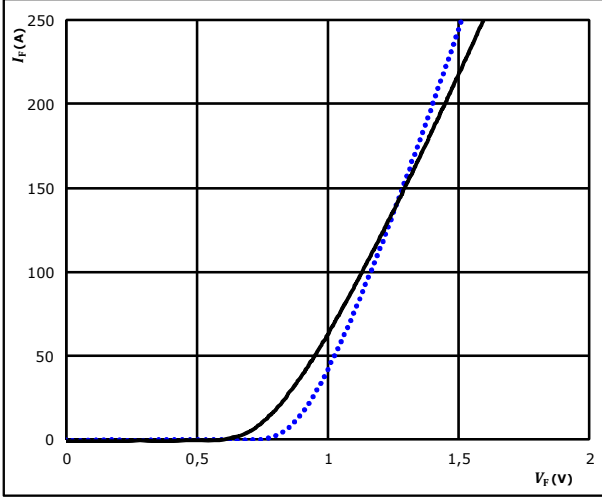


ByPass Diode Characteristics

figure 1. Bypass diode

Typical forward characteristics

$$I_F = f(V_F)$$

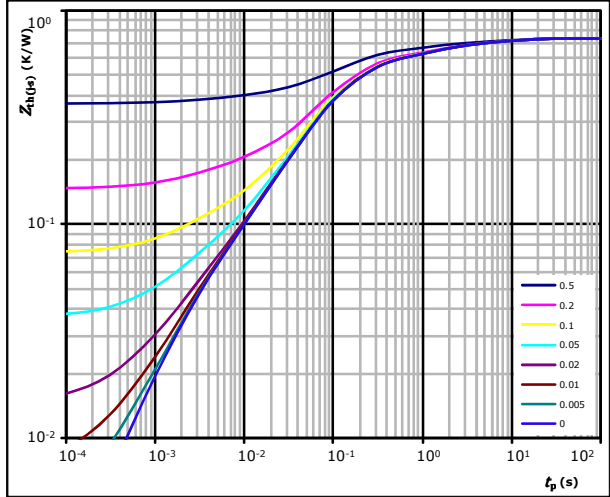


$t_p = 250 \mu s$
 $T_j: 25 \text{ }^\circ\text{C}$ (dotted blue line)
 $125 \text{ }^\circ\text{C}$ (solid black line)

figure 2. Bypass diode

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T$
 $R_{th(j-s)} = 0,74 \text{ K/W}$

Diode thermal model values

R (K/W)	τ (s)
6,95E-02	7,08E+00
1,21E-01	1,15E+00
2,75E-01	1,52E-01
2,24E-01	5,48E-02
3,60E-02	4,07E-03
1,01E-02	1,33E-03

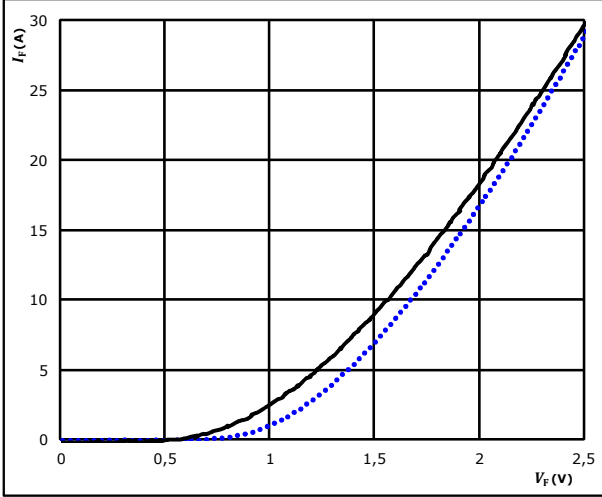


Input Boost Sw. Protection Diode Characteristics

figure 1. Prot. Diode

Typical forward characteristics

$$I_F = f(V_F)$$

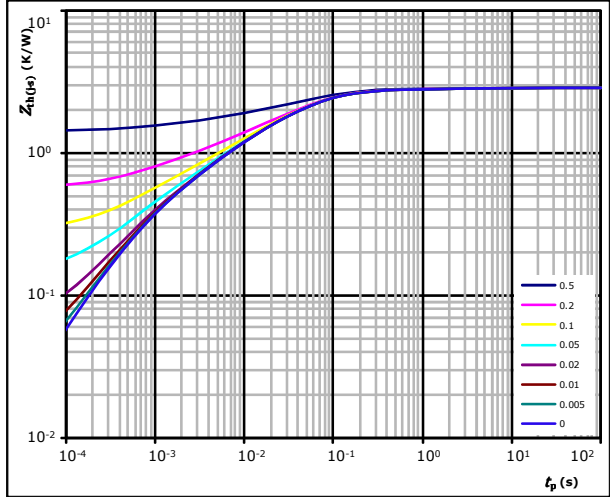


$t_p = 250 \mu s$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue line)
 $125 \text{ } ^\circ C$ (solid black line)

figure 2. Prot. Diode

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$$D = t_p / T$$

$$R_{th(j-s)} = 2,87 \text{ K/W}$$

Prot. Diode thermal model values

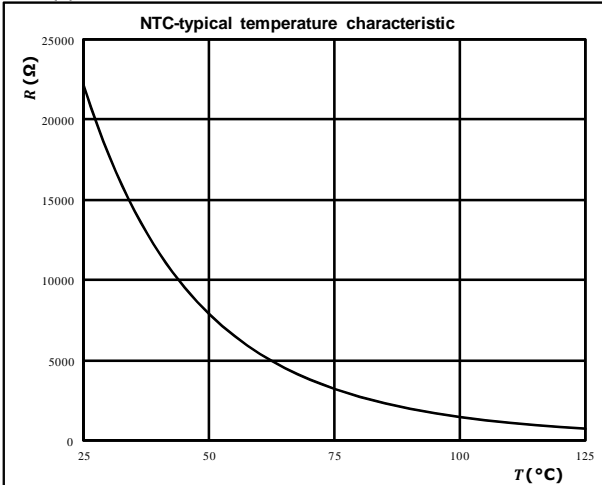
R (K/W)	τ (s)
6,53E-02	3,94E+00
1,48E-01	4,48E-01
1,31E+00	5,96E-02
7,32E-01	1,36E-02
4,04E-01	2,79E-03
2,11E-01	5,37E-04

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic as a function of temperature

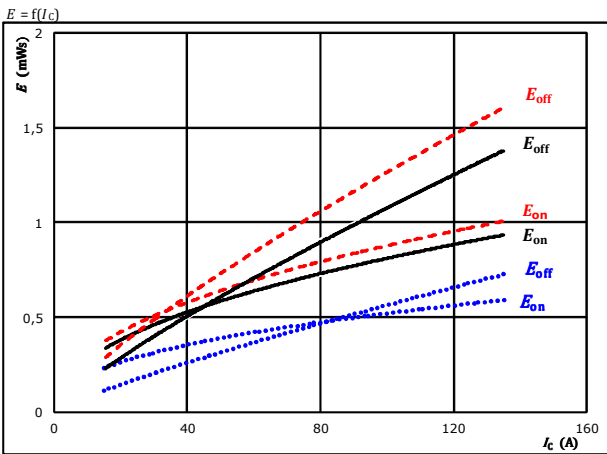
$$R = f(T)$$





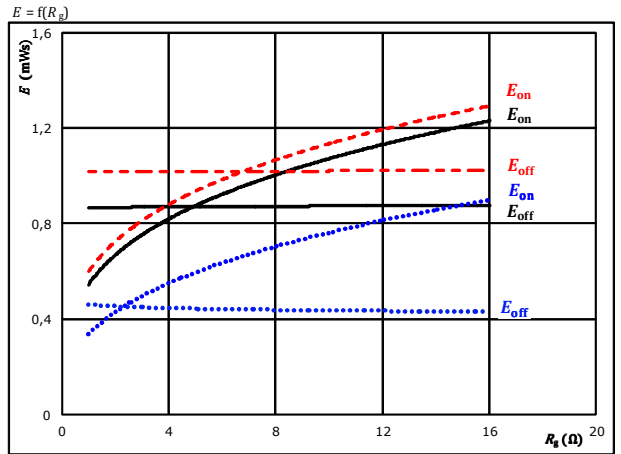
Buck Switching Characteristics

figure 1. IGBT
 Typical switching energy losses as a function of collector current



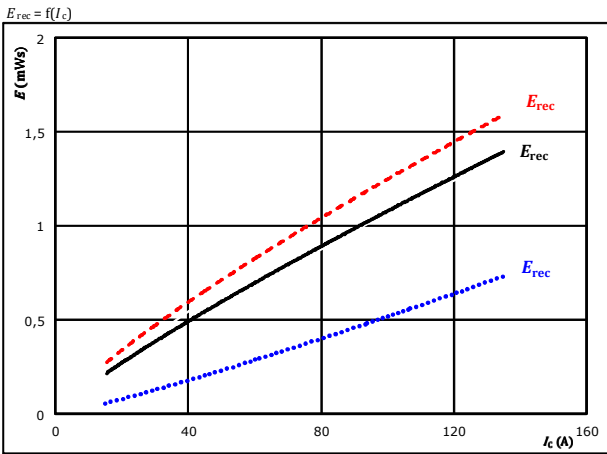
With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = -5 / 15$ V
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω
 $T_j: 25$ °C
 125 °C
 150 °C

figure 2. IGBT
 Typical switching energy losses as a function of gate resistor



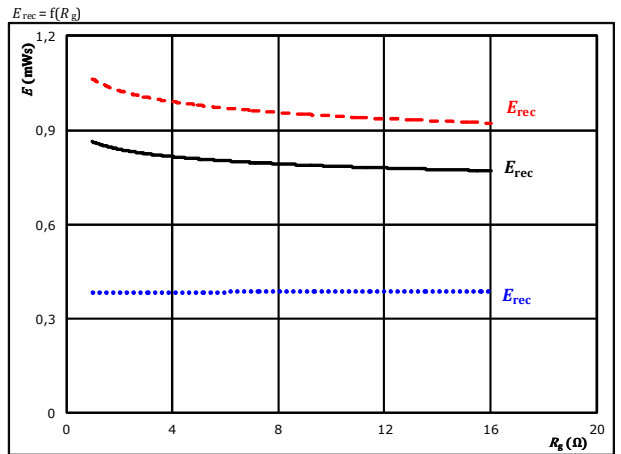
With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = -5 / 15$ V
 $I_C = 75$ A
 $T_j: 25$ °C
 125 °C
 150 °C

figure 3. FWD
 Typical reverse recovered energy loss as a function of collector current



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = -5 / 15$ V
 $R_{gon} = 4$ Ω
 $T_j: 25$ °C
 125 °C
 150 °C

figure 4. FWD
 Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = -5 / 15$ V
 $I_C = 75$ A
 $T_j: 25$ °C
 125 °C
 150 °C

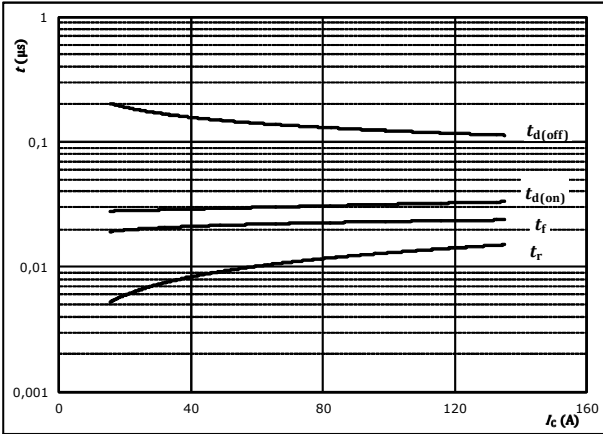


Buck Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



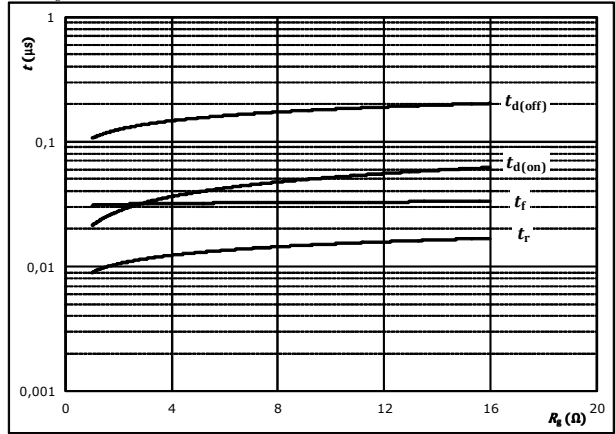
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	350	V
$V_{GE} =$	-5 / 15	V
$R_{gon} =$	4	Ω
$R_{goff} =$	4	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



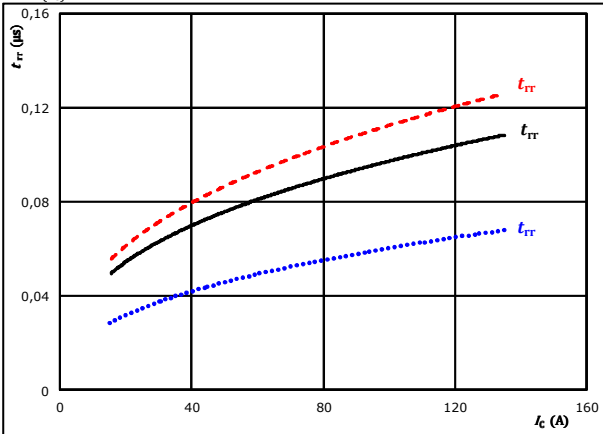
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	350	V
$V_{GE} =$	-5 / 15	V
$I_C =$	75	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_C)$$

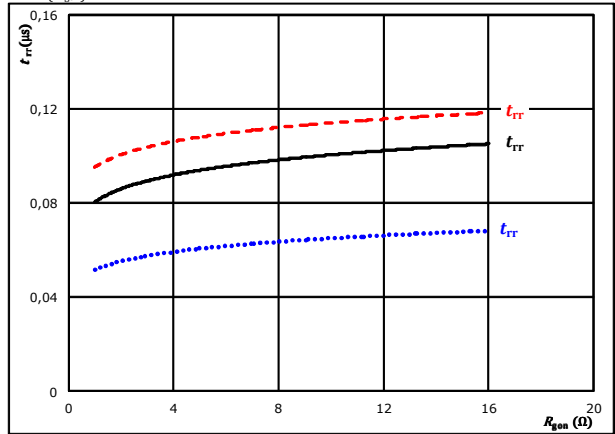


At	$V_{CE} =$	350	V	$T_j:$	25 °C	.....
	$V_{GE} =$	-5 / 15	V		125 °C	————
	$R_{gon} =$	4	Ω		150 °C	-----

figure 8. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

$$t_{rr} = f(R_{gon})$$



At	$V_{CE} =$	350	V	$T_j:$	25 °C	.....
	$V_{GE} =$	-5 / 15	V		125 °C	————
	$I_C =$	75	A		150 °C	-----

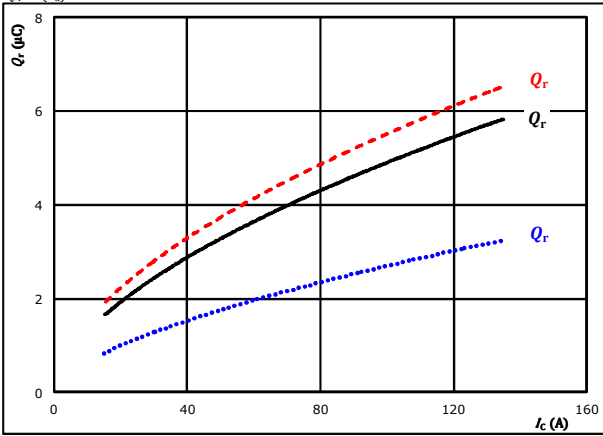


Buck Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

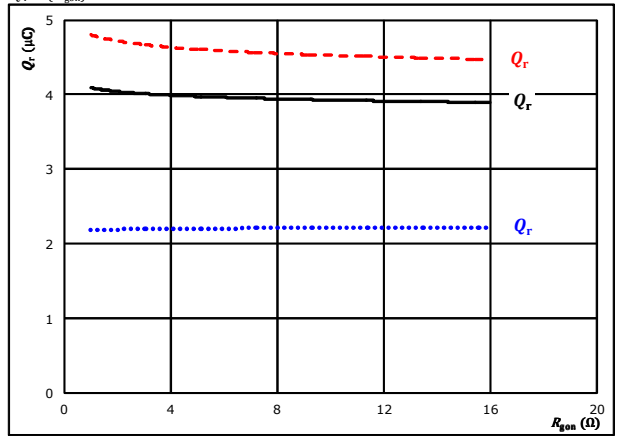


At $V_{CE} = 350$ V $T_j = 25$ °C $V_{GE} = -5 / 15$ V $T_j = 125$ °C $R_{gdn} = 4$ Ω $T_j = 150$ °C

figure 10. FWD

Typical recovered charge as a function of IGBT turn on gate resistor

$$Q_r = f(R_{gdn})$$

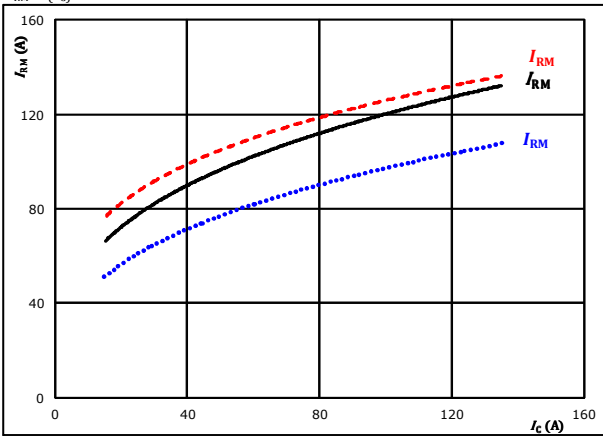


At $V_{CE} = 350$ V $T_j = 25$ °C $V_{GE} = -5 / 15$ V $T_j = 125$ °C $I_c = 75$ A $T_j = 150$ °C

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

$$I_{RM} = f(I_c)$$

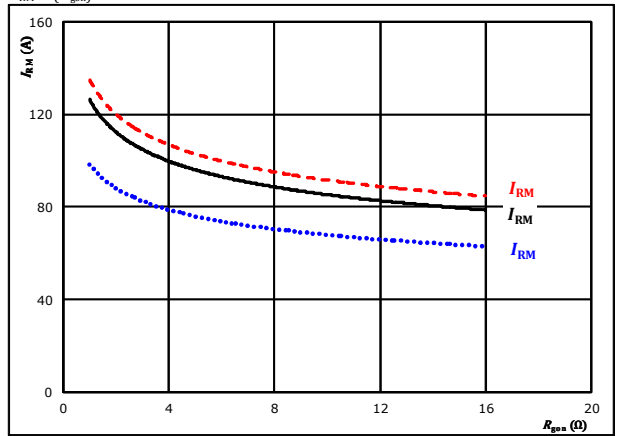


At $V_{CE} = 350$ V $T_j = 25$ °C $V_{GE} = -5 / 15$ V $T_j = 125$ °C $R_{gdn} = 4$ Ω $T_j = 150$ °C

figure 12. FWD

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

$$I_{RM} = f(R_{gdn})$$



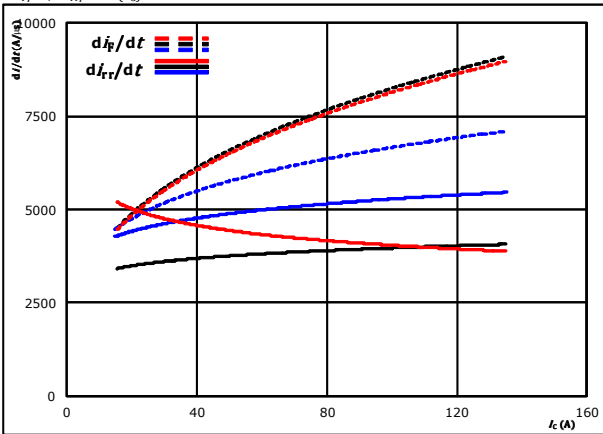
At $V_{CE} = 350$ V $T_j = 25$ °C $V_{GE} = -5 / 15$ V $T_j = 125$ °C $I_c = 75$ A $T_j = 150$ °C



Buck Switching Characteristics

figure 13. FWD

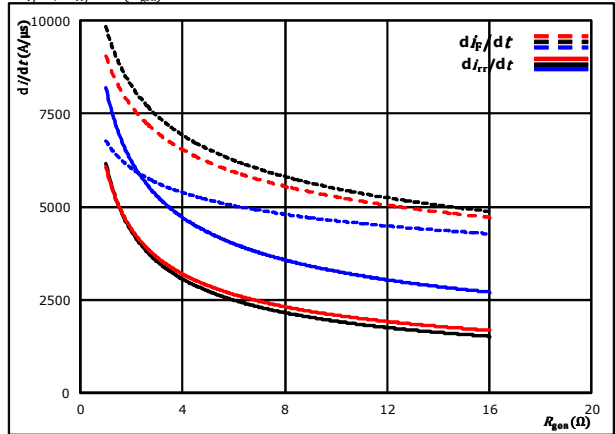
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = -5 / 15$ V $T_j = 125$ °C
 $R_{g(on)} = 4$ Ω $T_j = 150$ °C

figure 14. FWD

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{g(on)})$

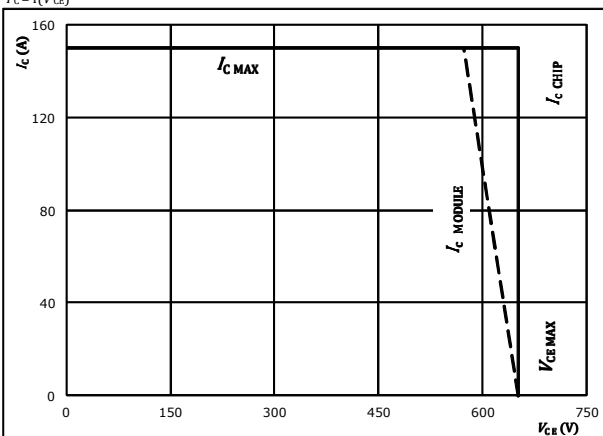


At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = -5 / 15$ V $T_j = 125$ °C
 $I_c = 75$ A $T_j = 150$ °C

Buck Switching Characteristics

figure 15. IGBT

Reverse bias safe operating area
 $I_c = f(V_{CE})$



At $T_j = 175$ °C
 $R_{g(on)} = 4$ Ω
 $R_{g(off)} = 4$ Ω

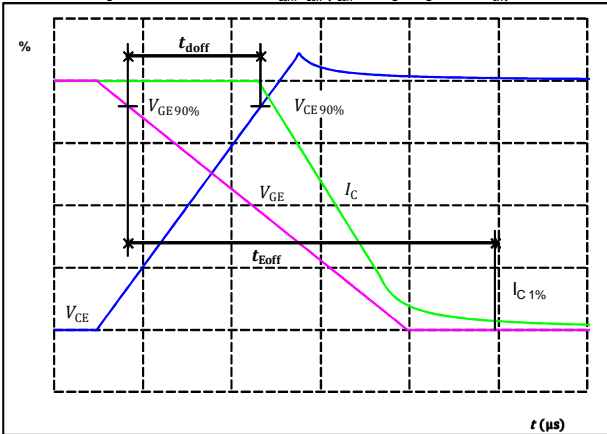


Buck Switching Definitions

General conditions		
T_j	=	125 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

figure 1. IGBT

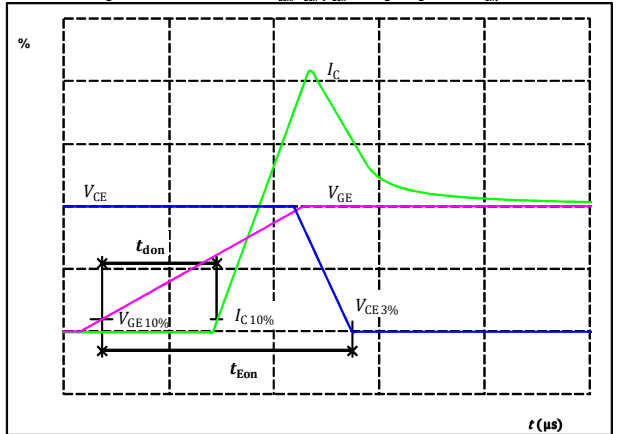
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%) =$	-5	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	75	A
$t_{doff} =$	126	ns

figure 2. IGBT

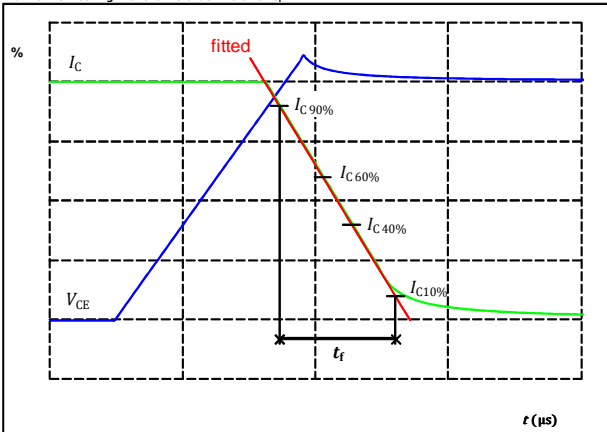
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%) =$	-5	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	75	A
$t_{don} =$	31	ns

figure 3. IGBT

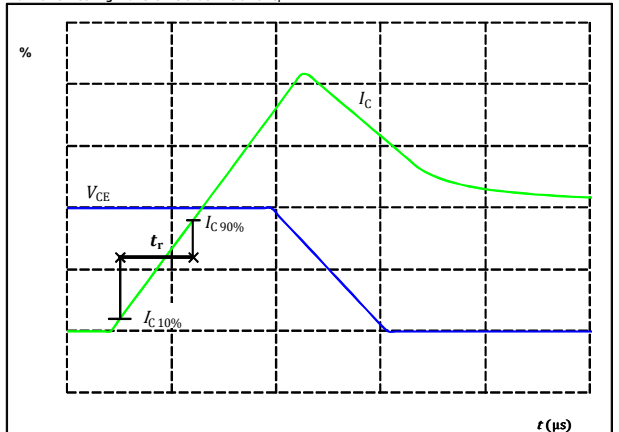
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	350	V
$I_C(100\%) =$	75	A
$t_f =$	25	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

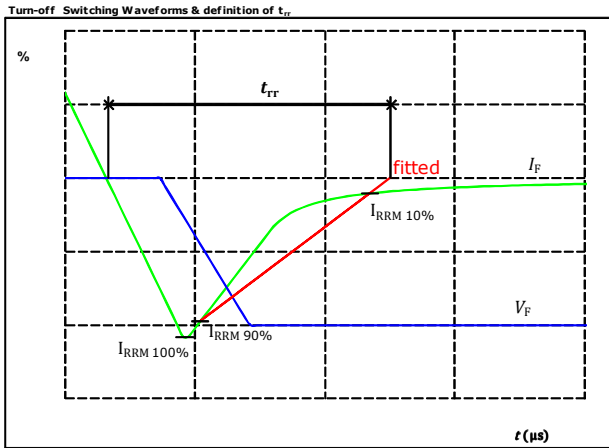


$V_C(100\%) =$	350	V
$I_C(100\%) =$	75	A
$t_r =$	10	ns



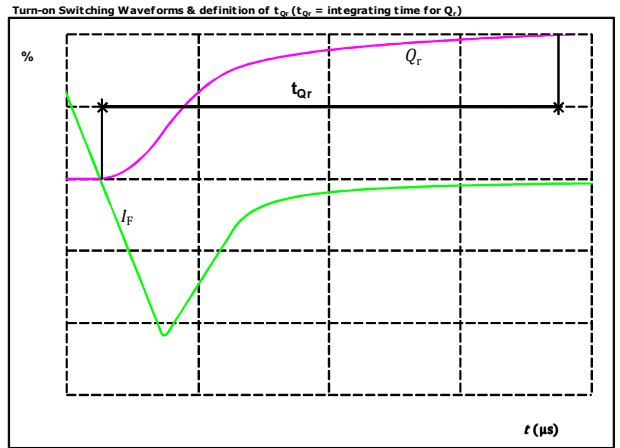
Buck Switching Characteristics

figure 5. FWD



$V_F(100\%) =$	350	V
$I_F(100\%) =$	75	A
$I_{RRM}(100\%) =$	110	A
$t_{rr} =$	87	ns

figure 6. FWD

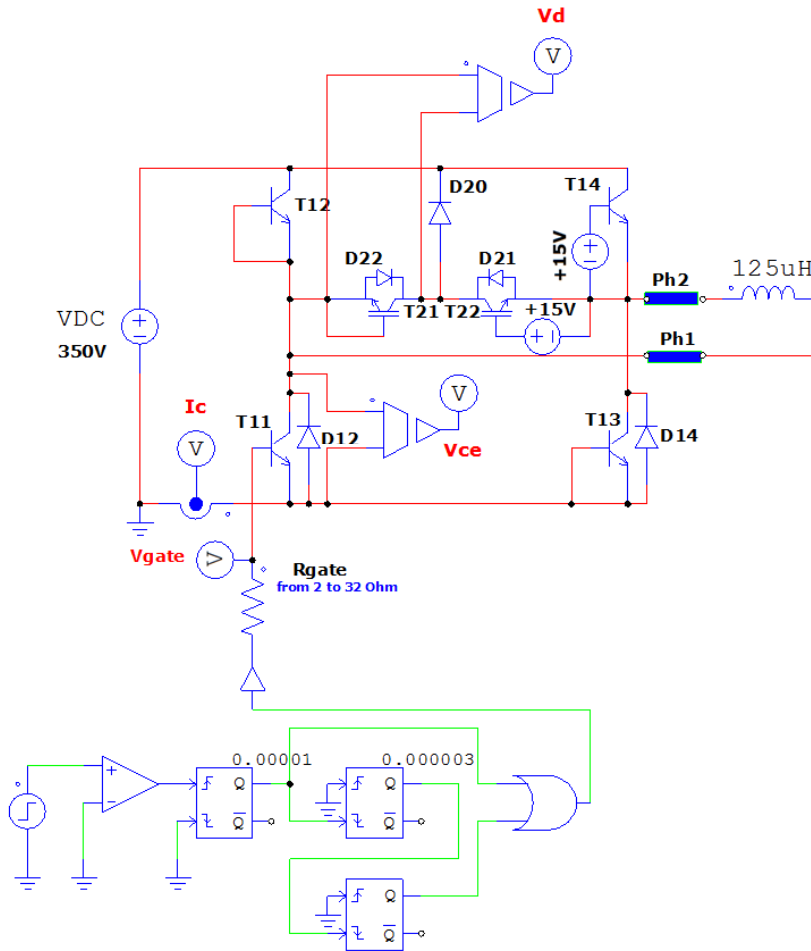


$I_F(100\%) =$	75	A
$Q_r(100\%) =$	4,04	μC



Buck Switching measurement circuit

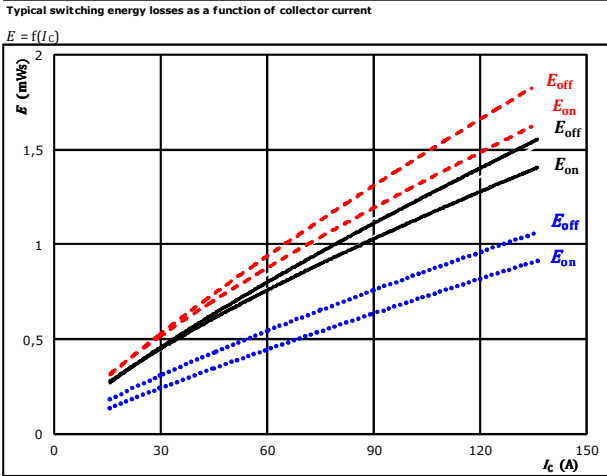
figure 1.





Low Boost Switching Characteristics

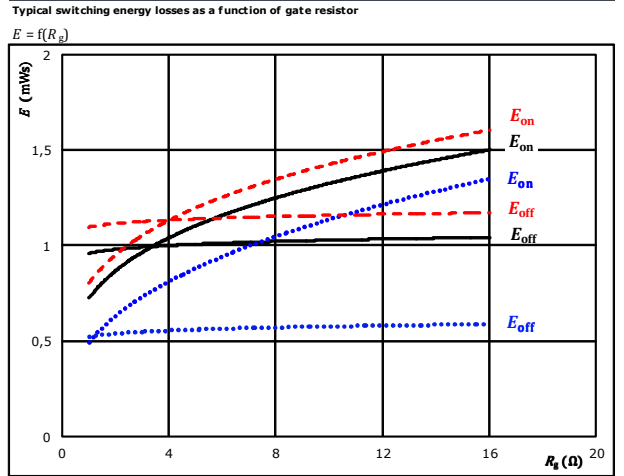
figure 1. IGBT
Typical switching energy losses as a function of collector current



With an inductive load at

$V_{CE} = 350$ V	$T_j: 25$ °C	.....
$V_{GE} = \pm 15$ V	125 °C	————
$R_{g(on)} = 4$ Ω	150 °C	- - - -
$R_{g(off)} = 4$ Ω		

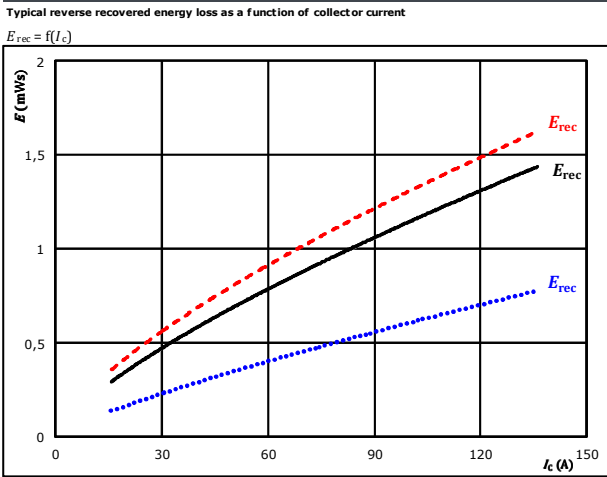
figure 2. IGBT
Typical switching energy losses as a function of gate resistor



With an inductive load at

$V_{CE} = 350$ V	$T_j: 25$ °C	.....
$V_{GE} = \pm 15$ V	125 °C	————
$I_C = 76$ A	150 °C	- - - -

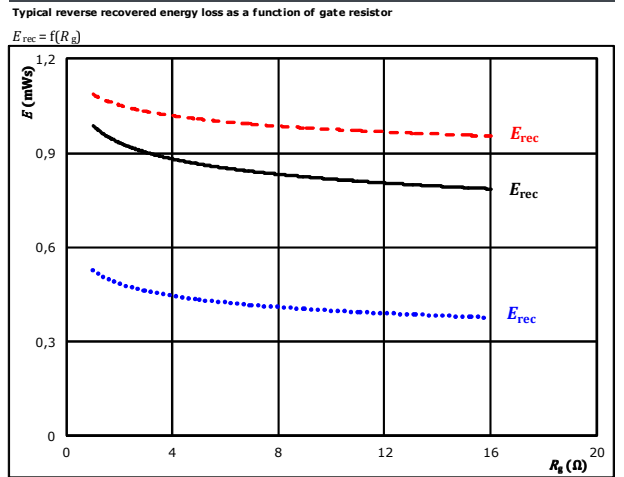
figure 3. FWD
Typical reverse recovered energy loss as a function of collector current



With an inductive load at

$V_{CE} = 350$ V	$T_j: 25$ °C	.....
$V_{GE} = \pm 15$ V	125 °C	————
$R_{g(on)} = 4$ Ω	150 °C	- - - -

figure 4. FWD
Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at

$V_{CE} = 350$ V	$T_j: 25$ °C	.....
$V_{GE} = \pm 15$ V	125 °C	————
$I_C = 76$ A	150 °C	- - - -

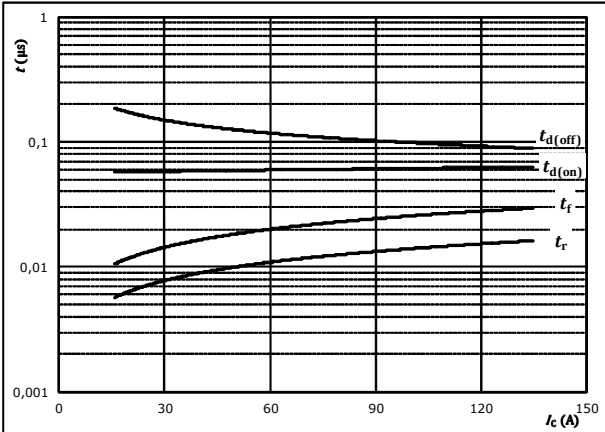


Low Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



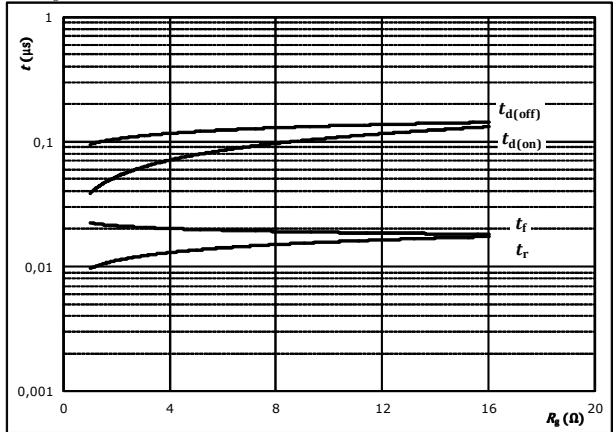
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$R_{g(on)} =$	4	Ω
$R_{g(off)} =$	4	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



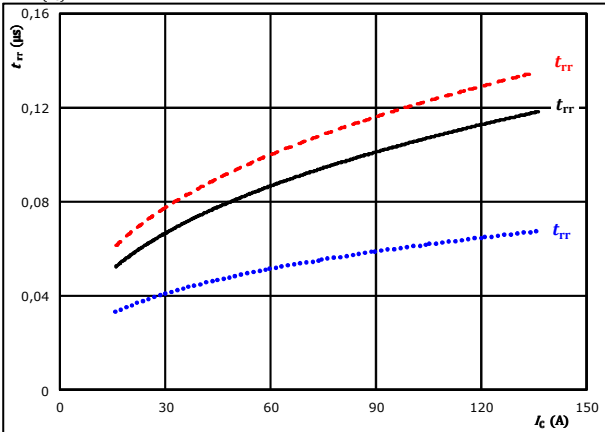
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$I_c =$	76	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_c)$$

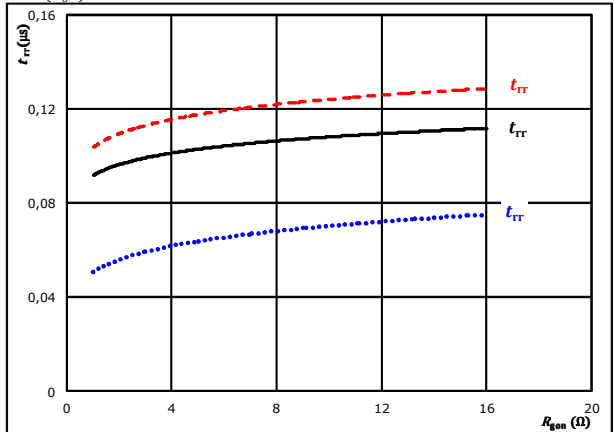


At	$V_{CE} =$	350	V	$T_j:$	25 °C	.....
	$V_{GE} =$	±15	V		125 °C	————
	$R_{g(on)} =$	4	Ω		150 °C	- - - -

figure 8. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

$$t_{rr} = f(R_{g(on)})$$



At	$V_{CE} =$	350	V	$T_j:$	25 °C	.....
	$V_{GE} =$	±15	V		125 °C	————
	$I_c =$	76	A		150 °C	- - - -

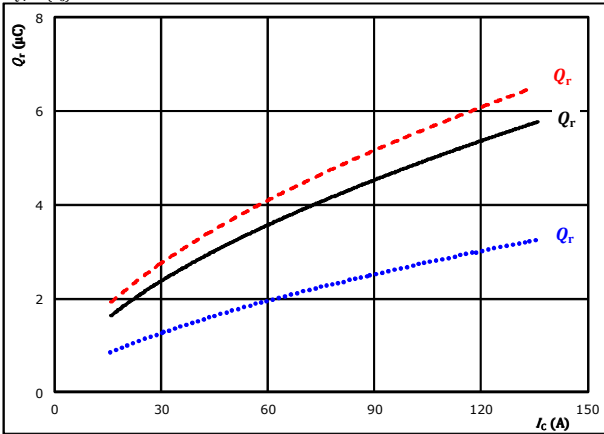


Low Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

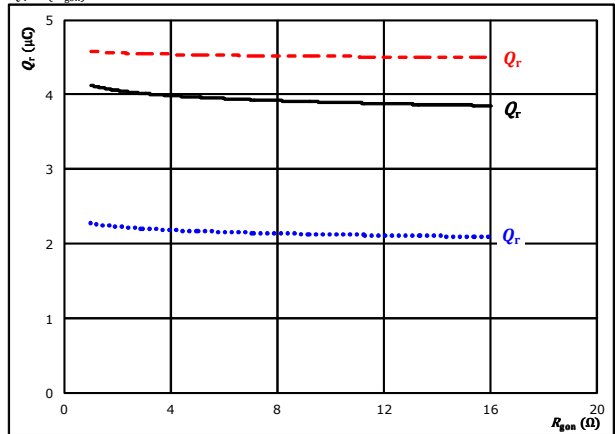


At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $R_{gdn} = 4$ Ω $T_j = 150$ °C - - - - -

figure 10. FWD

Typical recovered charge as a function of IGBT turn on gate resistor

$$Q_r = f(R_{gdn})$$

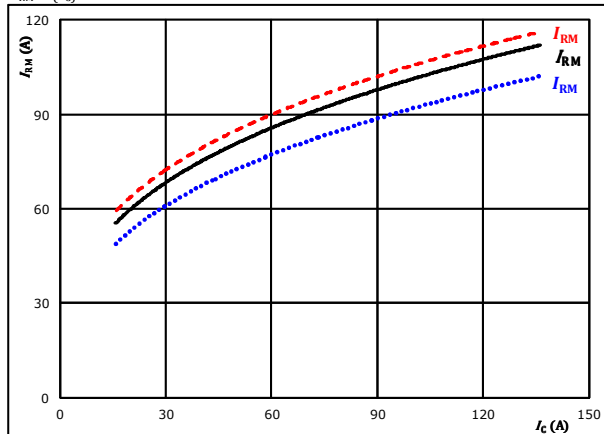


At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $I_c = 76$ A $T_j = 150$ °C - - - - -

figure 11. FWD

Typical peak reverse recovery current current as a function of collector current

$$I_{RM} = f(I_c)$$

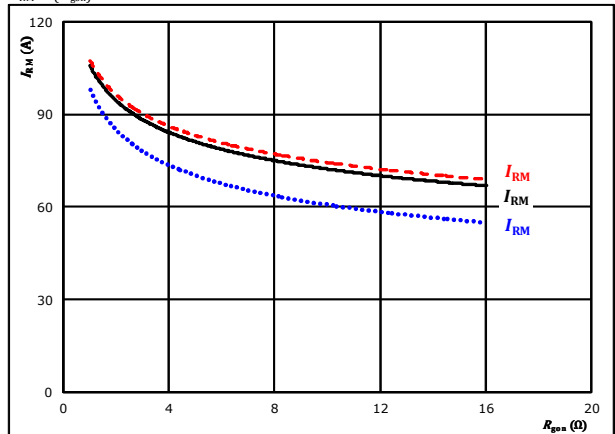


At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $R_{gdn} = 4$ Ω $T_j = 150$ °C - - - - -

figure 12. FWD

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

$$I_{RM} = f(R_{gdn})$$



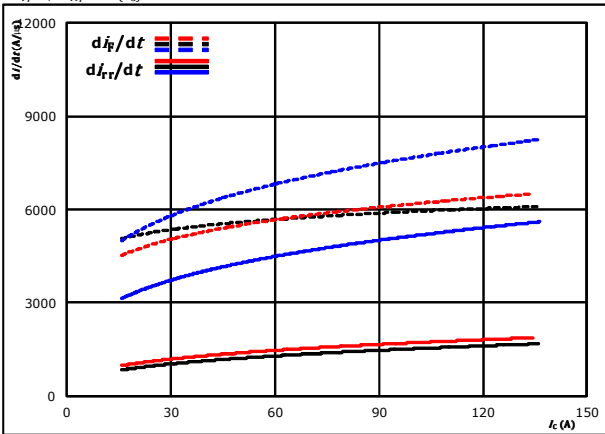
At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $I_c = 76$ A $T_j = 150$ °C - - - - -



Low Boost Switching Characteristics

figure 13. FWD

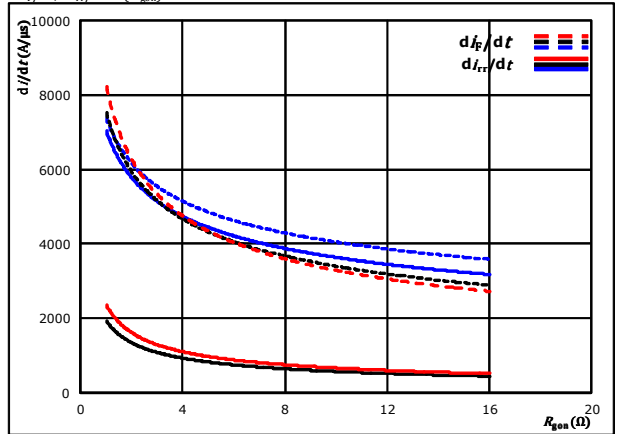
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 350$ V $T_j = 25$ °C (dotted blue line)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (solid black line)
 $R_{gon} = 4$ Ω $T_j = 150$ °C (dashed red line)

figure 14. FWD

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{gon})$



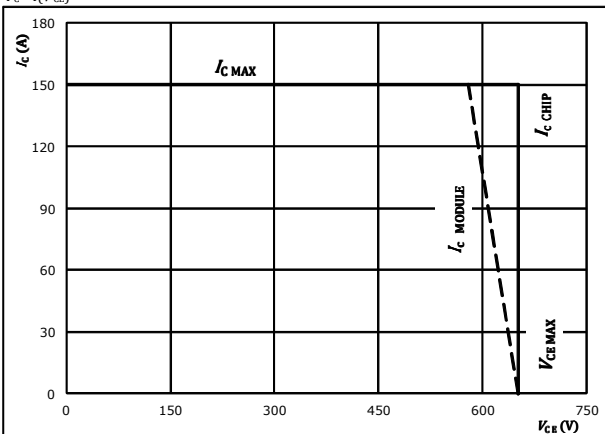
At $V_{CE} = 350$ V $T_j = 25$ °C (dotted blue line)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (solid black line)
 $I_c = 76$ A $T_j = 150$ °C (dashed red line)

Boost Switching Characteristics

figure 15. IGBT

Reverse bias safe operating area

$I_c = f(V_{CE})$



At $T_j = 175$ °C
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω



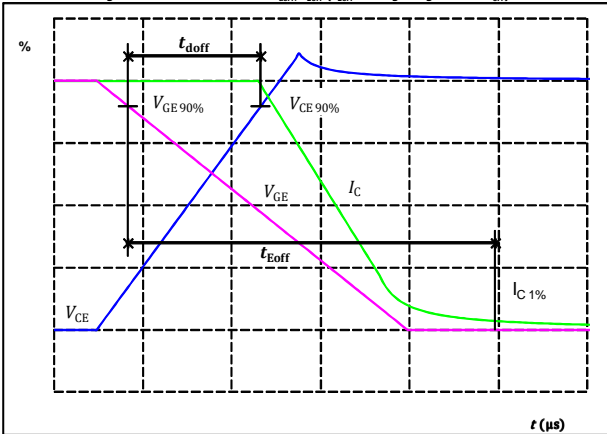
Low Boost Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

figure 1. IGBT

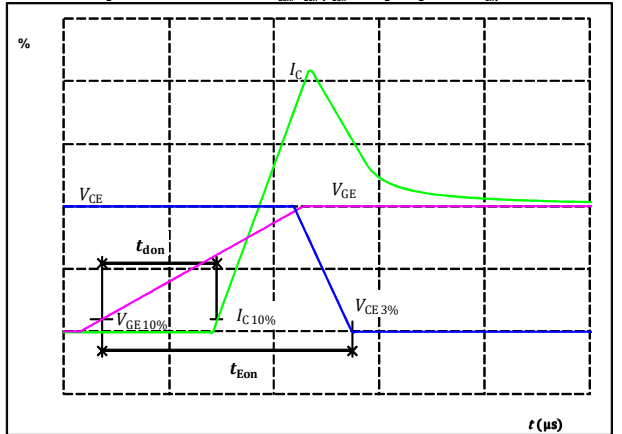
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	76	A
$t_{doff} =$	106	ns

figure 2. IGBT

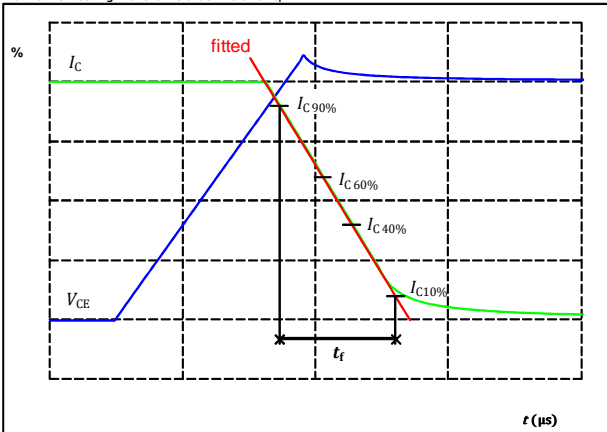
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	76	A
$t_{don} =$	62	ns

figure 3. IGBT

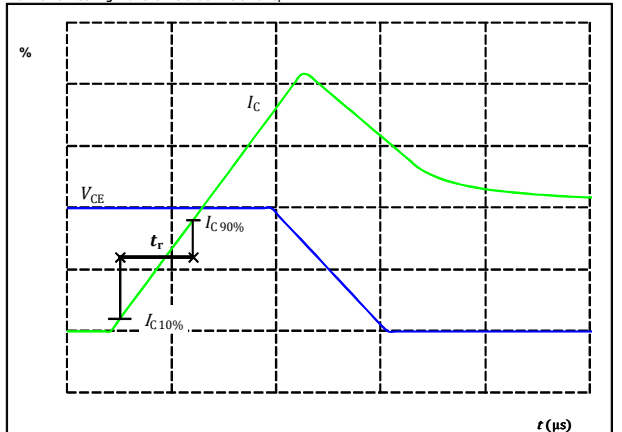
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	350	V
$I_C(100\%) =$	76	A
$t_f =$	17	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



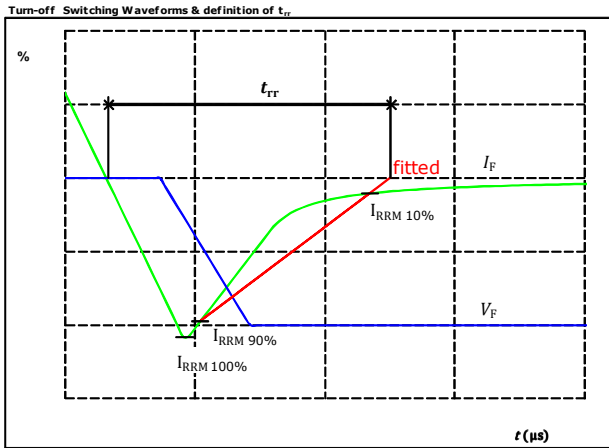
$V_C(100\%) =$	350	V
$I_C(100\%) =$	76	A
$t_r =$	10	ns



Vincotech

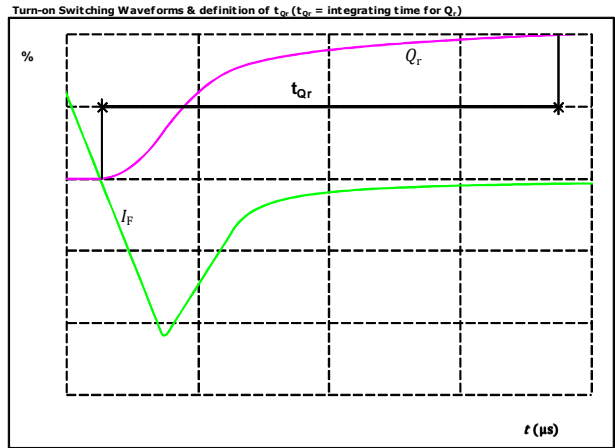
Low Boost Switching Characteristics

figure 5. FWD



$V_F(100\%) =$	350	V
$I_F(100\%) =$	76	A
$I_{RRM}(100\%) =$	93	A
$t_{rr} =$	100	ns

figure 6. FWD

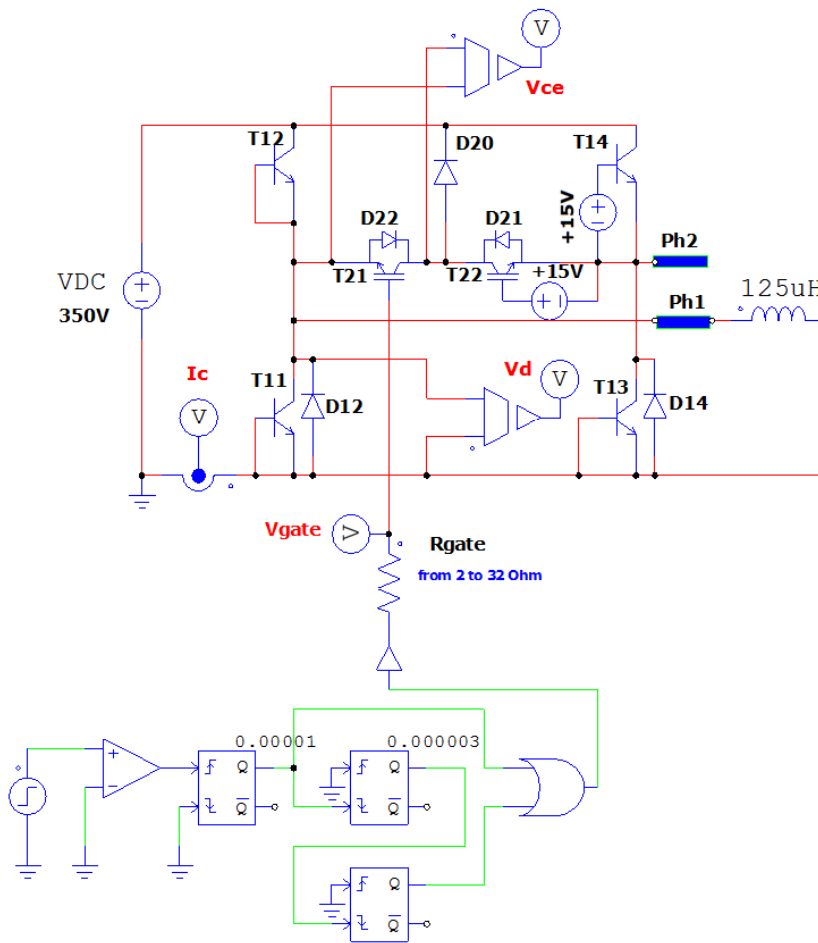


$I_F(100\%) =$	76	A
$Q_r(100\%) =$	4,08	μC



Low Boost Switching measurement circuit

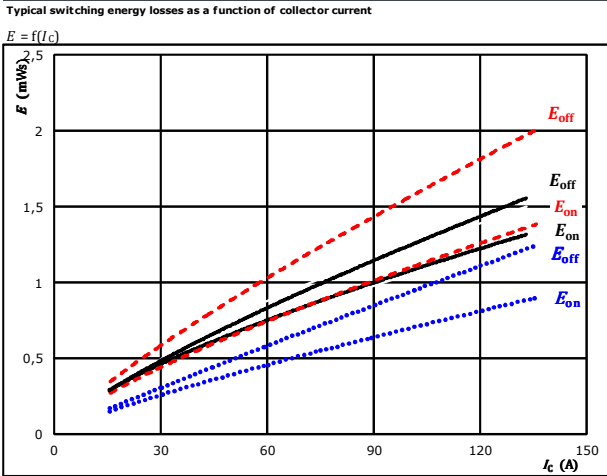
figure 1.





High Boost Switching Characteristics

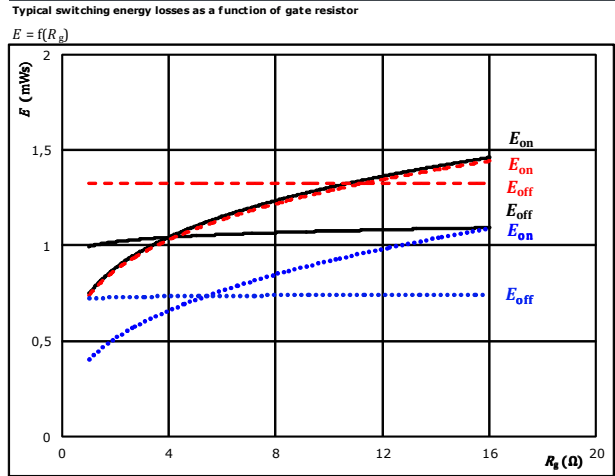
figure 1. IGBT
Typical switching energy losses as a function of collector current



With an inductive load at

$V_{CE} = 350$ V	$T_j: 25$ °C	.....
$V_{GE} = \pm 15$ V	125 °C	————
$R_{gon} = 4$ Ω	150 °C	- - - -
$R_{goff} = 4$ Ω		

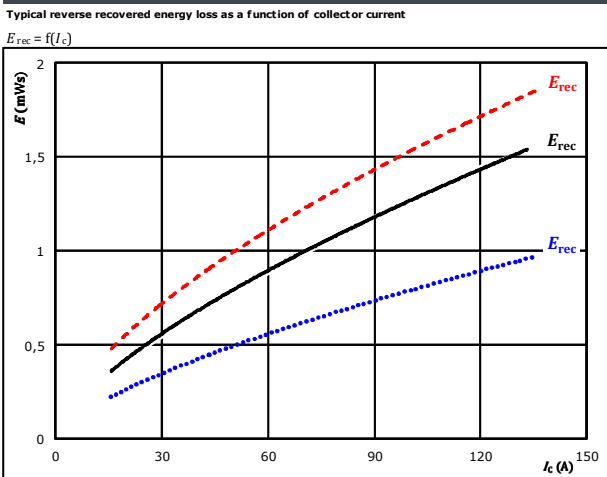
figure 2. IGBT
Typical switching energy losses as a function of gate resistor



With an inductive load at

$V_{CE} = 350$ V	$T_j: 25$ °C	.....
$V_{GE} = \pm 15$ V	125 °C	————
$I_c = 76$ A	150 °C	- - - -

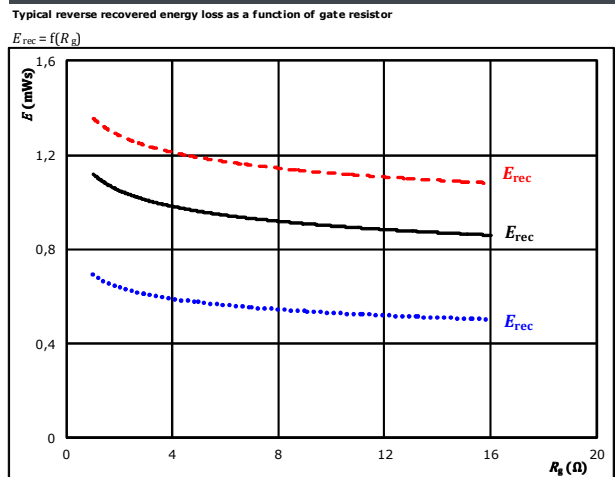
figure 3. FWD
Typical reverse recovered energy loss as a function of collector current



With an inductive load at

$V_{CE} = 350$ V	$T_j: 25$ °C	.....
$V_{GE} = \pm 15$ V	125 °C	————
$R_{gon} = 4$ Ω	150 °C	- - - -

figure 4. FWD
Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at

$V_{CE} = 350$ V	$T_j: 25$ °C	.....
$V_{GE} = \pm 15$ V	125 °C	————
$I_c = 76$ A	150 °C	- - - -

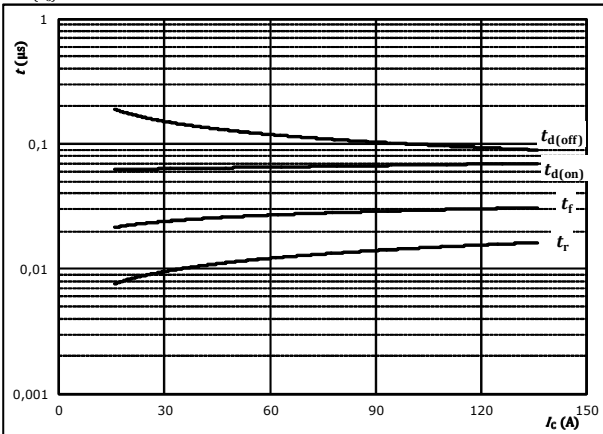


High Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



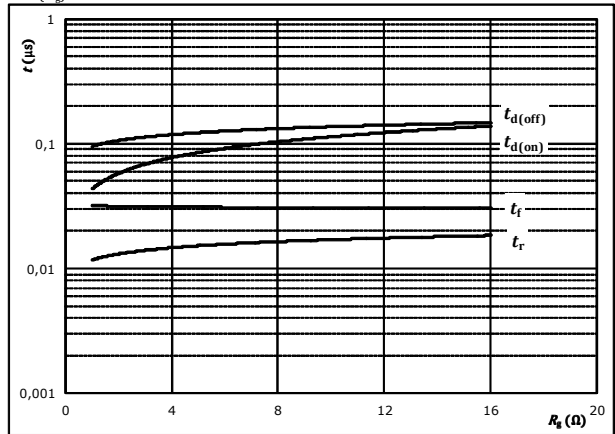
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$R_{gon} =$	4	Ω
$R_{goff} =$	4	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



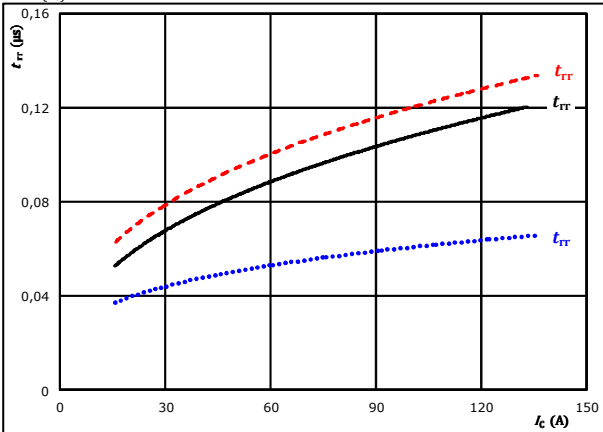
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$I_C =$	76	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_C)$$

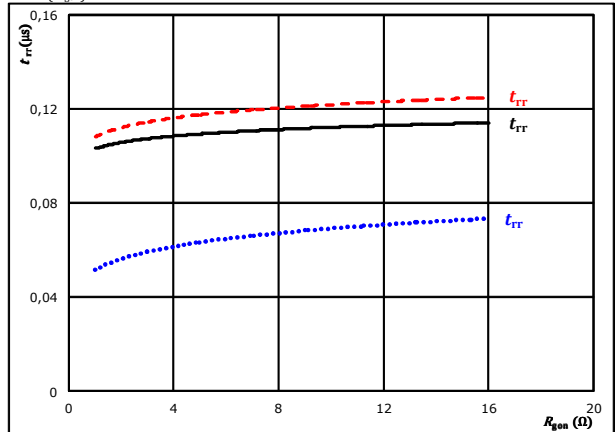


At	$V_{CE} =$	350	V	$T_j:$	25 °C	.....
	$V_{GE} =$	±15	V		125 °C	————
	$R_{gon} =$	4	Ω		150 °C	-----

figure 8. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

$$t_{rr} = f(R_{gon})$$



At	$V_{CE} =$	350	V	$T_j:$	25 °C	.....
	$V_{GE} =$	±15	V		125 °C	————
	$I_C =$	76	A		150 °C	-----



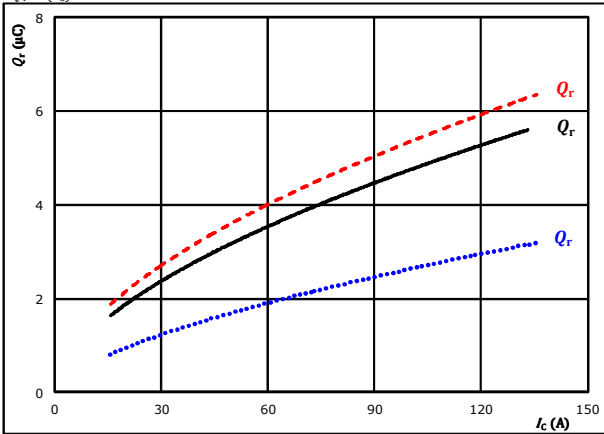
Vincotech

High Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

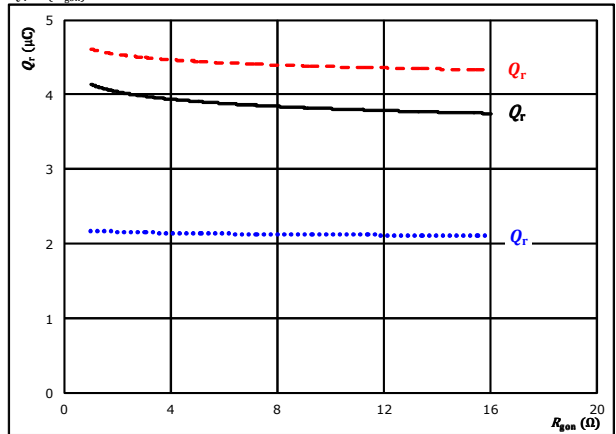


At $V_{CE} = 350$ V $T_j = 25$ °C (dotted blue)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (solid black)
 $R_{gdn} = 4$ Ω $T_j = 150$ °C (dashed red)

figure 10. FWD

Typical recovered charge as a function of IGBT turn on gate resistor

$$Q_r = f(R_{gdn})$$

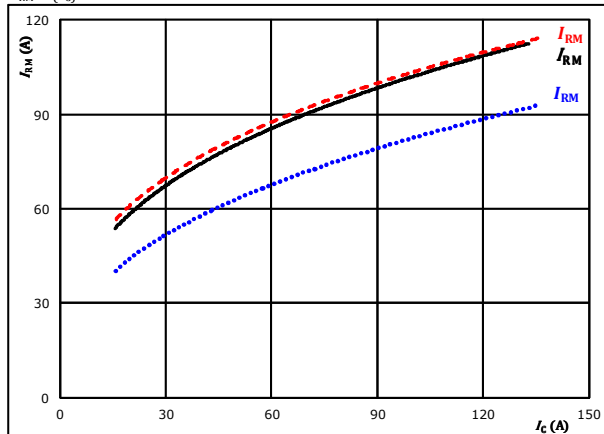


At $V_{CE} = 350$ V $T_j = 25$ °C (dotted blue)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (solid black)
 $I_c = 76$ A $T_j = 150$ °C (dashed red)

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

$$I_{RM} = f(I_c)$$

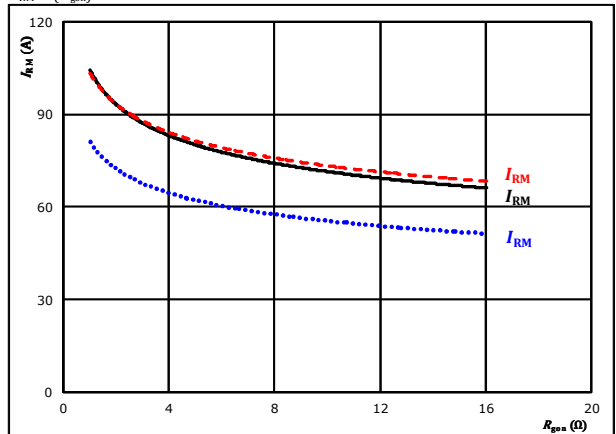


At $V_{CE} = 350$ V $T_j = 25$ °C (dotted blue)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (solid black)
 $R_{gdn} = 4$ Ω $T_j = 150$ °C (dashed red)

figure 12. FWD

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

$$I_{RM} = f(R_{gdn})$$



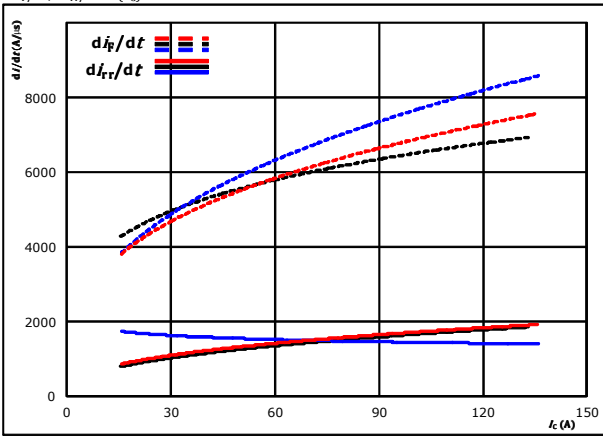
At $V_{CE} = 350$ V $T_j = 25$ °C (dotted blue)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (solid black)
 $I_c = 76$ A $T_j = 150$ °C (dashed red)



High Boost Switching Characteristics

figure 13. FWD

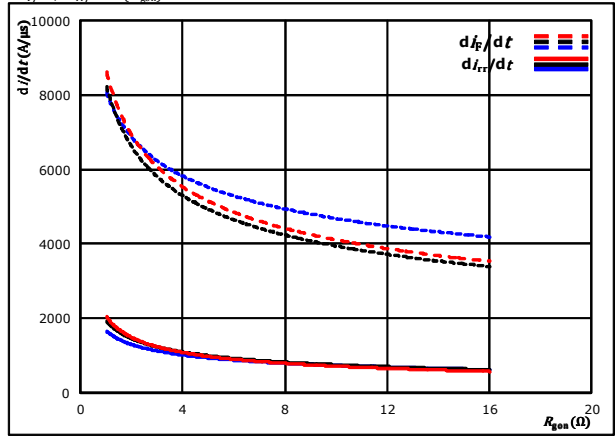
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 350$ V $T_j = 25$ °C (dotted blue)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (solid black)
 $R_{gon} = 4$ Ω $T_j = 150$ °C (dashed red)

figure 14. FWD

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{gon})$

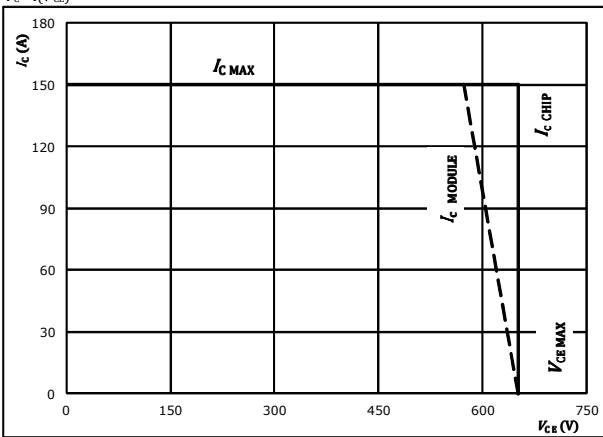


At $V_{CE} = 350$ V $T_j = 25$ °C (dotted blue)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (solid black)
 $I_c = 76$ A $T_j = 150$ °C (dashed red)

Boost Switching Characteristics

figure 15. IGBT

Reverse bias safe operating area
 $I_c = f(V_{CE})$



At $T_j = 175$ °C
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω



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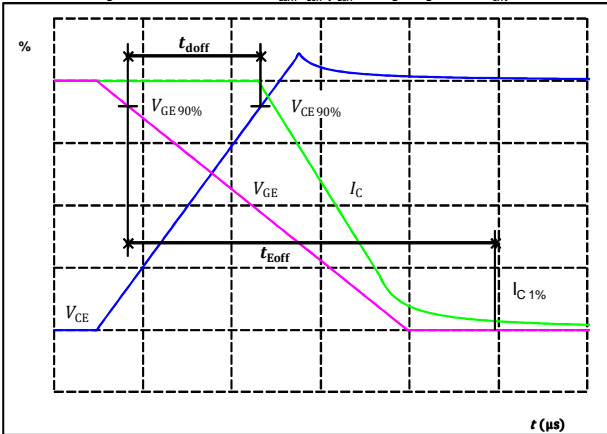
High Boost Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

figure 1. IGBT

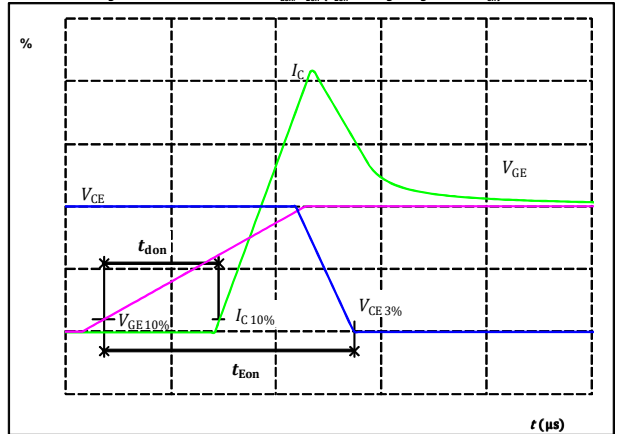
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	76	A
$t_{doff} =$	105	ns

figure 2. IGBT

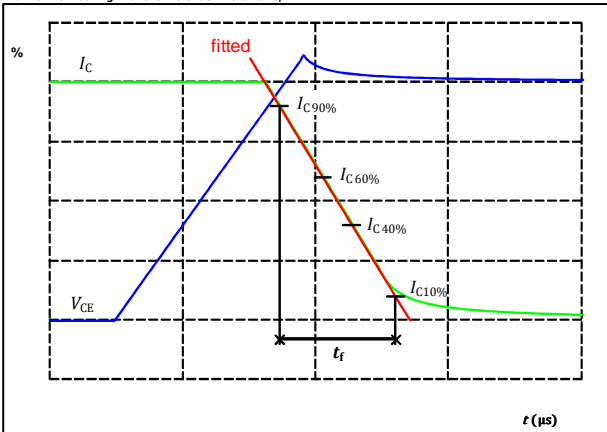
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	76	A
$t_{don} =$	64	ns

figure 3. IGBT

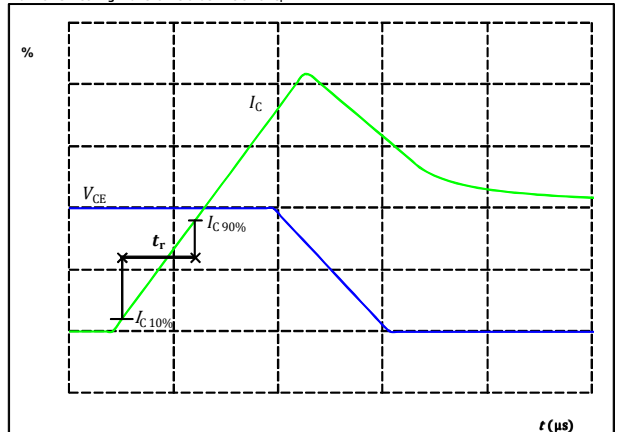
Turn-off Switching Waveforms & definition of t_r



$V_C(100\%) =$	350	V
$I_C(100\%) =$	76	A
$t_r =$	21	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



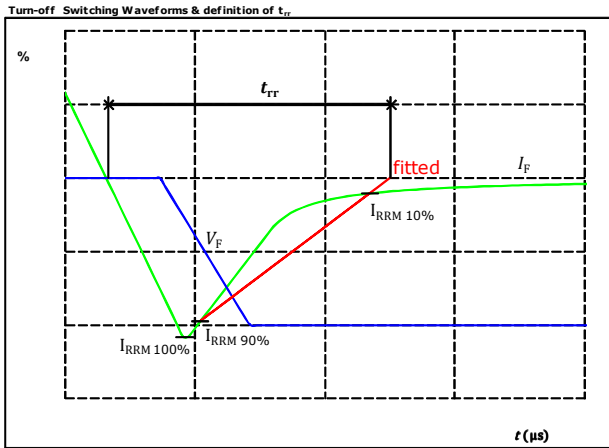
$V_C(100\%) =$	350	V
$I_C(100\%) =$	76	A
$t_r =$	11	ns



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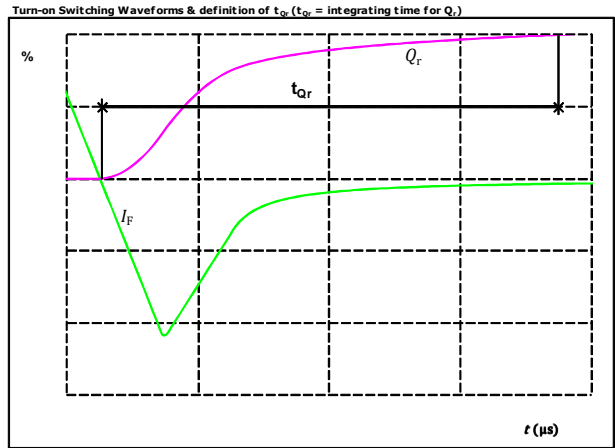
High Boost Switching Characteristics

figure 5. FWD



V_F (100%) =	350	V
I_F (100%) =	76	A
I_{RRM} (100%) =	92	A
t_{rr} =	105	ns

figure 6. FWD

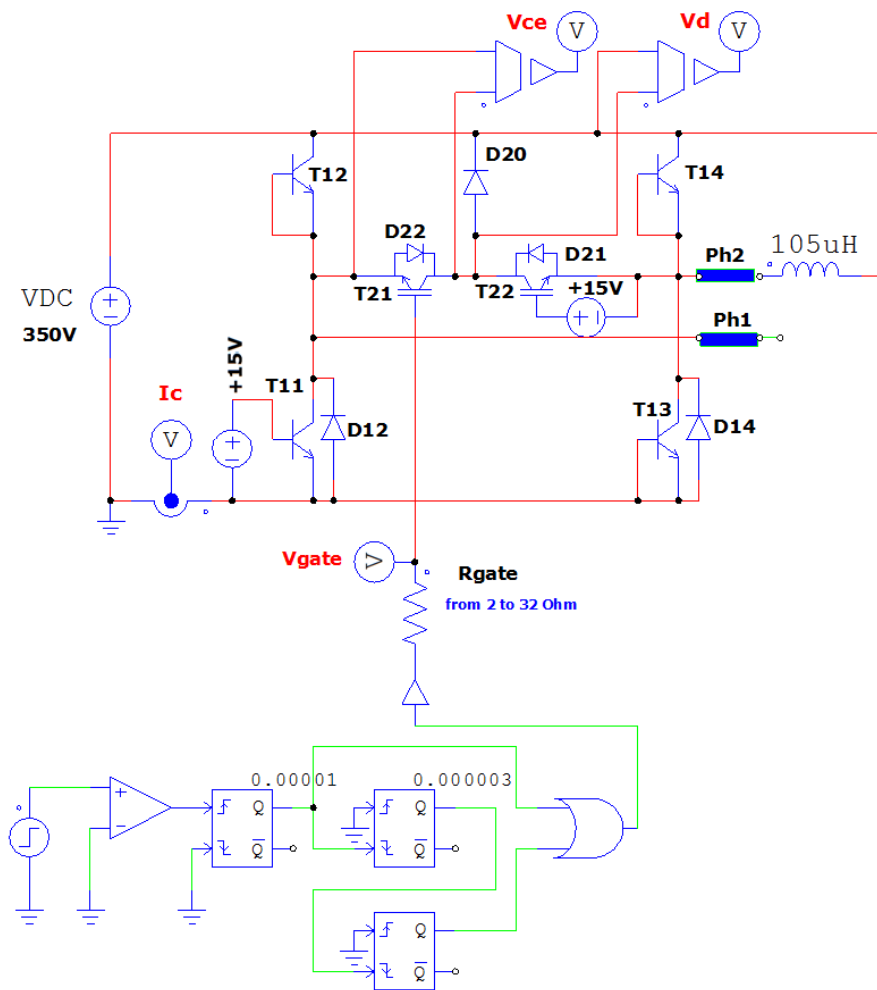


I_F (100%) =	76	A
Q_r (100%) =	4,02	μ C



High Boost Switching measurement circuit

figure 1.

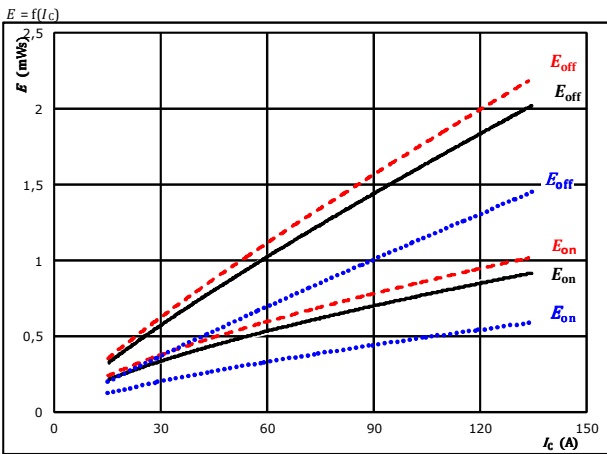




Input Boost Switching Characteristics

figure 1. IGBT

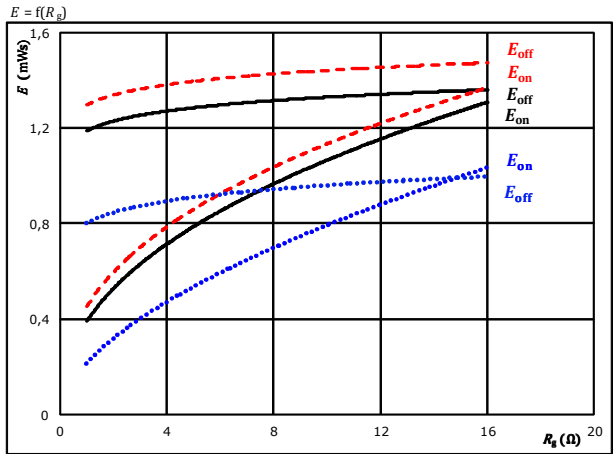
Typical switching energy losses as a function of collector current



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = 0 / 15$ V
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω
 T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

figure 2. IGBT

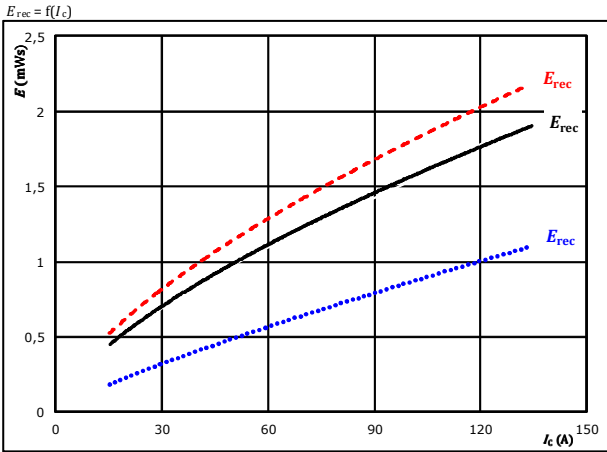
Typical switching energy losses as a function of gate resistor



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = 0 / 15$ V
 $I_C = 75$ A
 T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

figure 3. FWD

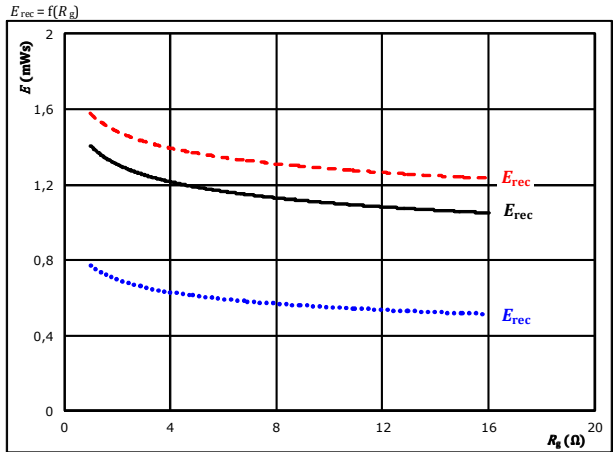
Typical reverse recovered energy loss as a function of collector current



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = 0 / 15$ V
 $R_{gon} = 4$ Ω
 T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = 0 / 15$ V
 $I_C = 75$ A
 T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)



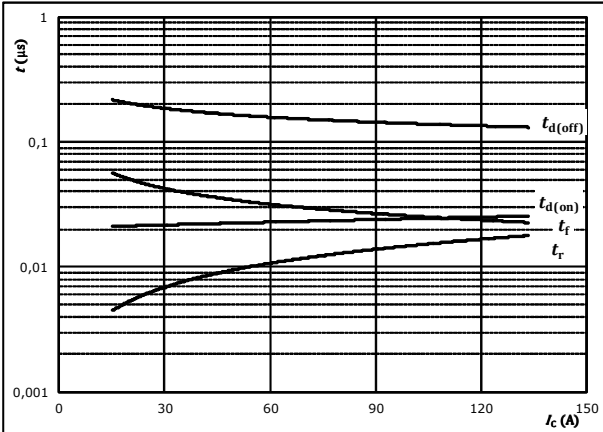
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Input Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



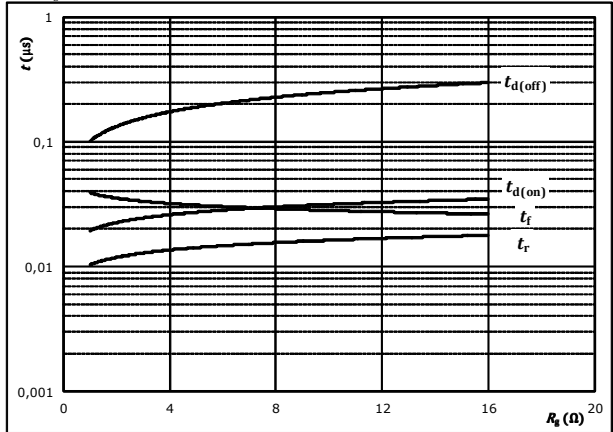
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	350	V
$V_{GE} =$	0 / 15	V
$R_{g(on)} =$	4	Ω
$R_{g(off)} =$	4	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



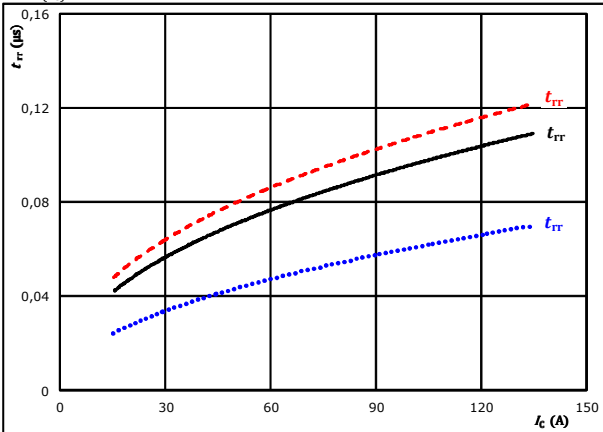
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	350	V
$V_{GE} =$	0 / 15	V
$I_c =$	75	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_c)$$

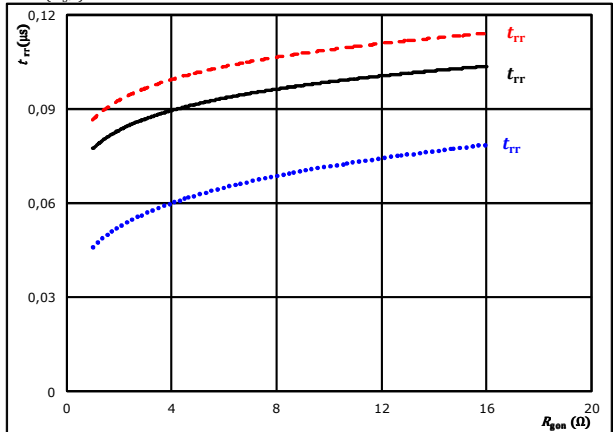


At	$V_{CE} =$	350	V	$T_j:$	25 °C	.....
	$V_{GE} =$	0 / 15	V		125 °C	————
	$R_{g(on)} =$	4	Ω		150 °C	-----

figure 8. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

$$t_{rr} = f(R_{g(on)})$$



At	$V_{CE} =$	350	V	$T_j:$	25 °C	.....
	$V_{GE} =$	0 / 15	V		125 °C	————
	$I_c =$	75	A		150 °C	-----

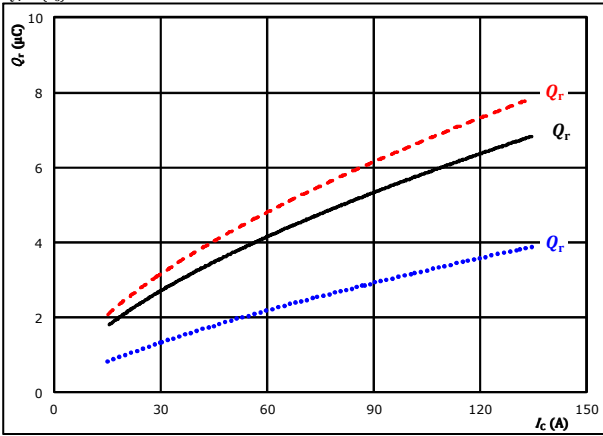


Input Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

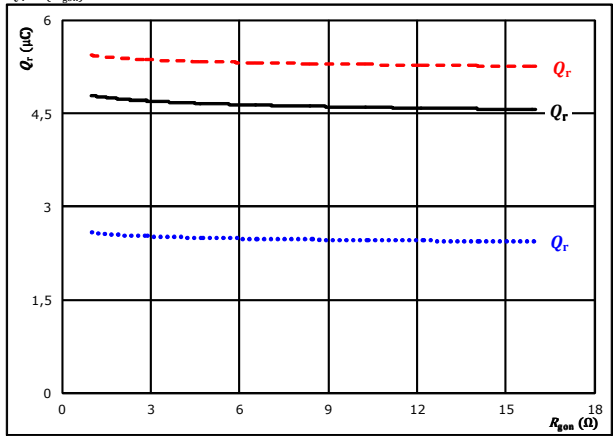


At $V_{CE} = 350$ V $T_j = 25$ °C $V_{GE} = 0 / 15$ V $T_j = 125$ °C $R_{gdn} = 4$ Ω $T_j = 150$ °C

figure 10. FWD

Typical recovered charge as a function of IGBT turn on gate resistor

$$Q_r = f(R_{gdn})$$

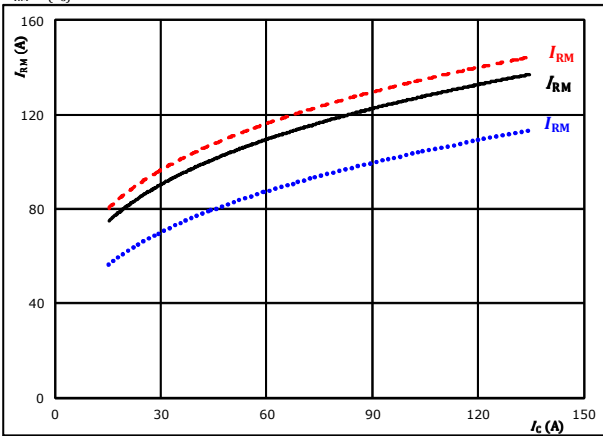


At $V_{CE} = 350$ V $T_j = 25$ °C $V_{GE} = 0 / 15$ V $T_j = 125$ °C $I_c = 75$ A $T_j = 150$ °C

figure 11. FWD

Typical peak reverse recovery current current as a function of collector current

$$I_{RM} = f(I_c)$$

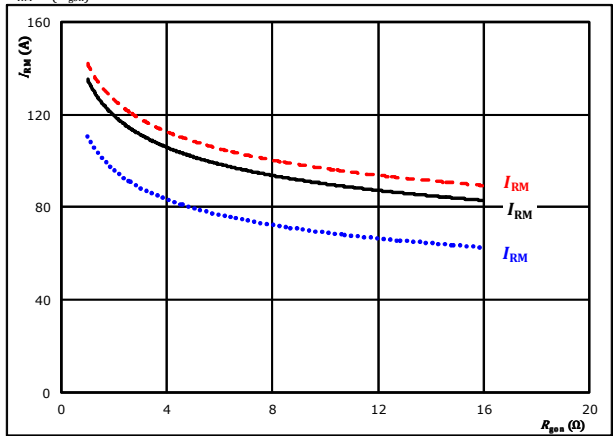


At $V_{CE} = 350$ V $T_j = 25$ °C $V_{GE} = 0 / 15$ V $T_j = 125$ °C $R_{gdn} = 4$ Ω $T_j = 150$ °C

figure 12. FWD

Typical peak reverse recovery current current as a function of IGBT turn on gate resistor

$$I_{RM} = f(R_{gdn})$$



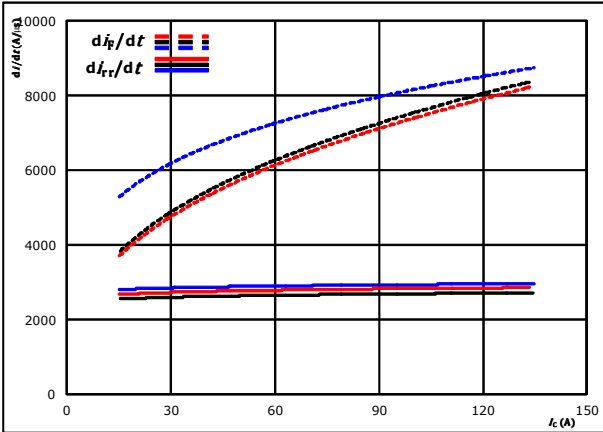
At $V_{CE} = 350$ V $T_j = 25$ °C $V_{GE} = 0 / 15$ V $T_j = 125$ °C $I_c = 75$ A $T_j = 150$ °C



Input Boost Switching Characteristics

figure 13. FWD

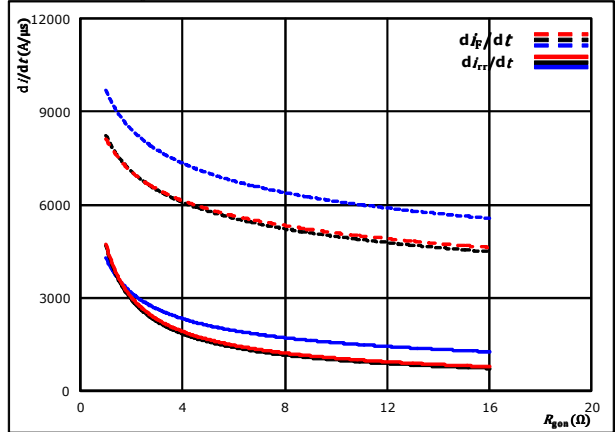
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = 0 / 15$ V $T_j = 125$ °C
 $R_{g(on)} = 4$ Ω $T_j = 150$ °C

figure 14. FWD

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{g(on)})$

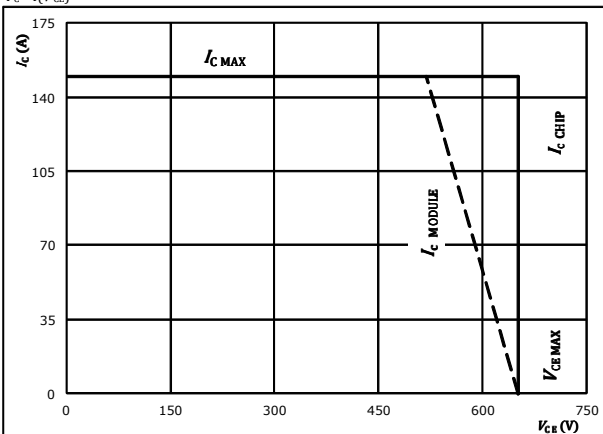


At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = 0 / 15$ V $T_j = 125$ °C
 $I_c = 75$ A $T_j = 150$ °C

Input Boost Switching Characteristics

figure 15. IGBT

Reverse bias safe operating area
 $I_c = f(V_{CE})$



At $T_j = 175$ °C
 $R_{g(on)} = 4$ Ω
 $R_{g(off)} = 4$ Ω



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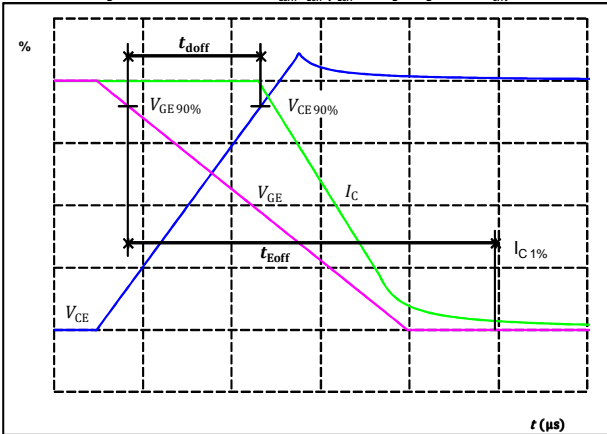
Input Boost Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

figure 1. IGBT

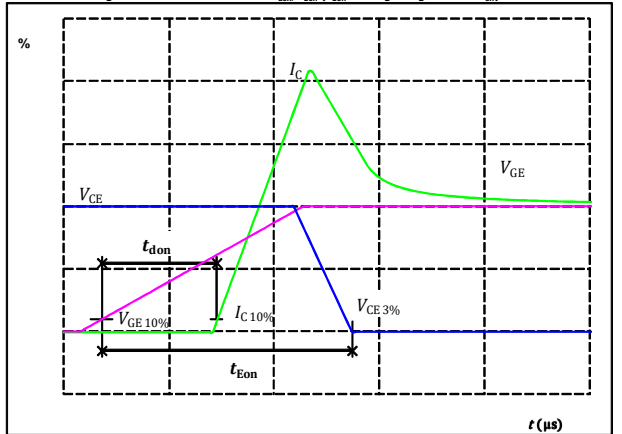
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%) =$	0	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	75	A
$t_{doff} =$	145	ns

figure 2. IGBT

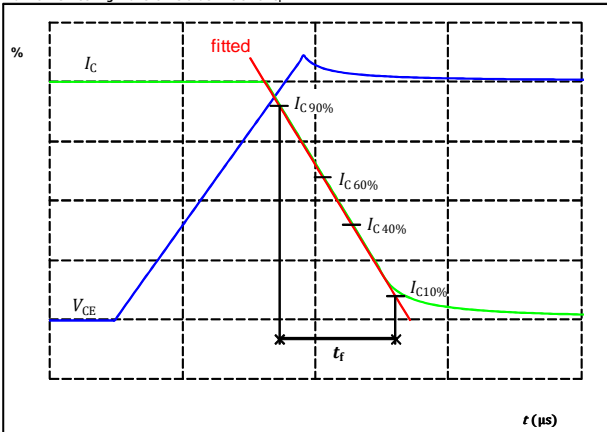
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%) =$	0	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	75	A
$t_{don} =$	24	ns

figure 3. IGBT

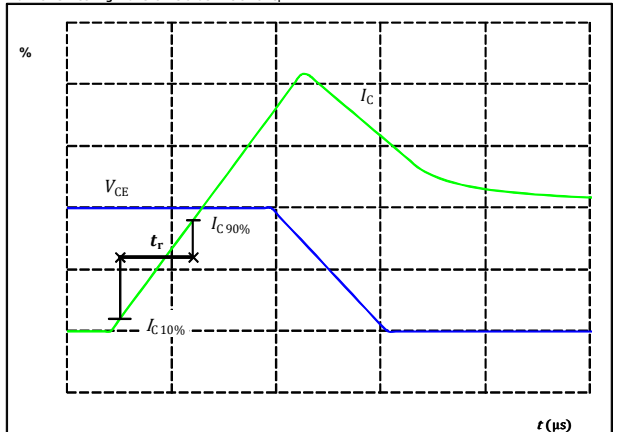
Turn-off Switching Waveforms & definition of t_r



$V_C(100\%) =$	350	V
$I_C(100\%) =$	75	A
$t_r =$	30	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



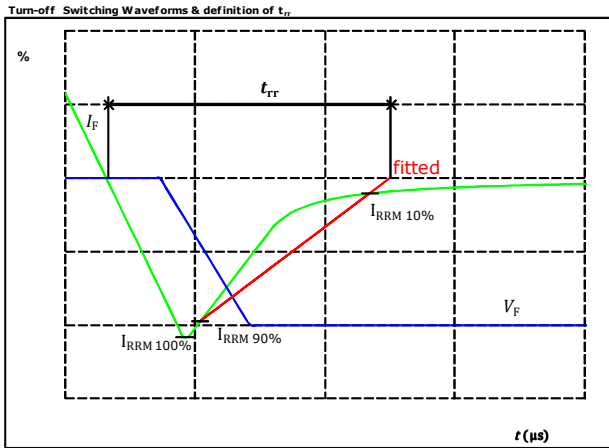
$V_C(100\%) =$	350	V
$I_C(100\%) =$	75	A
$t_r =$	12	ns



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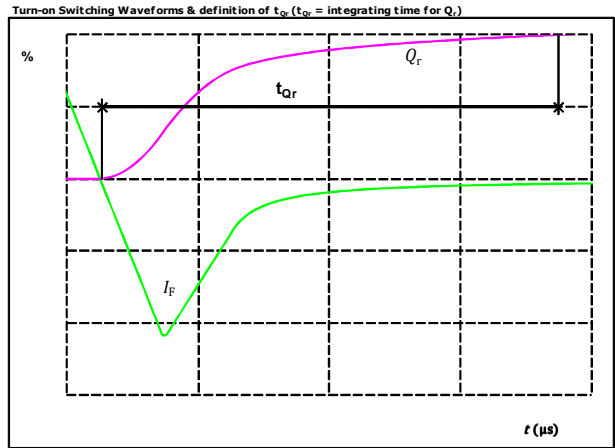
Input Boost Switching Characteristics

figure 5. FWD



$V_F(100\%) =$	350	V
$I_F(100\%) =$	75	A
$I_{RRM}(100\%) =$	116	A
$t_{rr} =$	84	ns

figure 6. FWD



$I_F(100\%) =$	75	A
$Q_r(100\%) =$	4,66	μC



10-FY07BVA075S5-LF45E18
10-PY07BVA075S5-LF45E18Y
 datasheet

Vincotech

Ordering Code & Marking						
Version			Ordering Code			
without thermal paste 12 mm housing with solder pins			10-FY07BVA075S5-LF45E18			
without thermal paste 12 mm housing with press-fit pins			10-PY07BVA075S5-LF45E18Y			
NN-NNNNNNNNNNNNNN TTTTIVV WYYY UL VIN LLLLL SSSS						
Text	Name		Date code	UL & VIN	Lot	Serial
	NN-NNNNNNNNNNNNNN-TTTTIVV		WYYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTIVV	LLLLL	SSSS	WYYY		

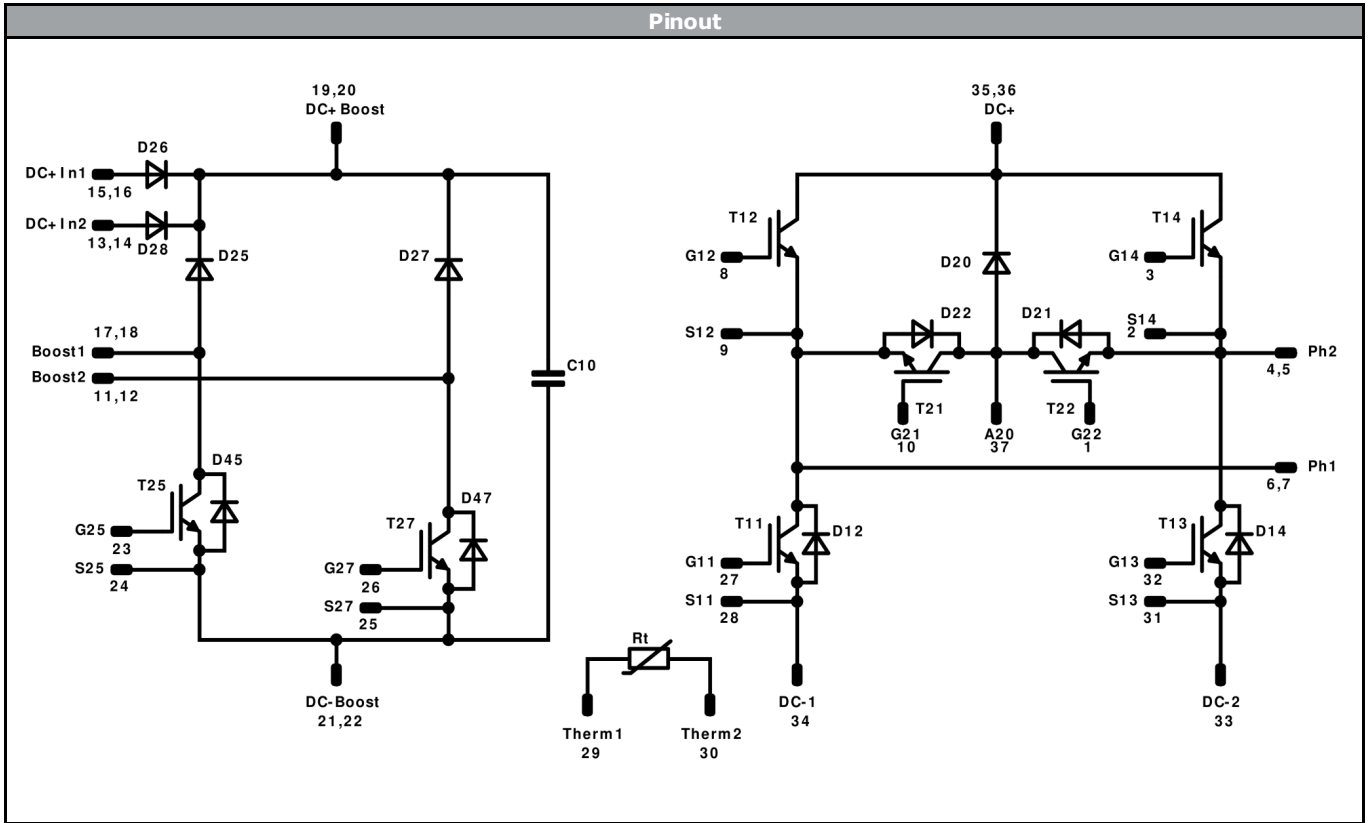
Pin table			
Pin	X	Y	Function
1	52,3	9	G22
2	52,3	6	S14
3	52,3	3	G14
4	49,3	0	Ph2
5	46,8	0	Ph2
6	30,75	0	Ph1
7	28,25	0	Ph1
8	25,25	3	G12
9	25,25	6	S12
10	25,25	9	G21
11	19,75	0	Boost2
12	19,75	2,5	Boost2
13	12,6	0	DC+In2
14	12,6	2,5	DC+In2
15	7,1	0	DC+In1
16	7,1	2,5	DC+In1
17	0	0	Boost1
18	0	2,5	Boost1
19	11,1	15,1	DC+Boost
20	11,1	17,6	DC+Boost
21	11,1	26	DC-Boost
22	11,1	28,3	DC-Boost
23	0	28,3	G25
24	3	28,3	S25
25	19,2	28,3	S27
26	22,2	28,3	G27
27	26,4	28,3	G11
28	31,3	28,3	S11
29	36,8	28,3	Therm1
30	41,9	28,3	Therm2
31	47,4	28,3	S13
32	52,3	28,3	G13
33	40,85	17,7	DC-2
34	37,85	17,7	DC-1
35	39,35	11,2	DC+
36	39,35	8,7	DC+
37	52,3	17,3	A20

Outline

Tolerance of pinpositions: $\pm 0,5\text{mm}$ at the end of pins
 Dimension of coordinate axis is only offset without tolerance



Vincotech



Identification					
ID	Component	Voltage	Current	Function	Comment
T13, T14	IGBT	650 V	75 A	Low Buck Switch	
T12, T14	IGBT	650 V	75 A	High Buck Switch	
D21, D22	FWD	650 V	50 A	Buck Diode	
T21, T22	IGBT	650 V	75 A	Boost Switch	
D12, D14	FWD	650 V	50 A	Low Boost Diode	
D20	FWD	650 V	50 A	High Boost Diode	
T25, T27	IGBT	650 V	75 A	Input Boost Switch	
D25, D27	FWD	650 V	75 A	Input Boost Diode	
D26, D28	Rectifier	650 V	75 A	ByPass Diode	
D45, D47	Prot. Diode	1600 V	10 A	Input Boost Sw. Protection Diode	
C10	Capacitor	630 V		Capacitor (DC)	
Rt	NTC			Thermistor	




Vincotech

10-FY07BVA075S5-LF45E18
10-PY07BVA075S5-LF45E18Y
datasheet

Packaging instruction			
Standard packaging quantity (SPQ) 100	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for <i>flow 1</i> packages see vincotech.com website.

Package data
Package data for <i>flow 1</i> packages see vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website. 

Document No.:	Date:	Modification:	Pages
10-xY07BVA075S5-LF45E18x-D2-14	04 May. 2018		

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.