Vincotech

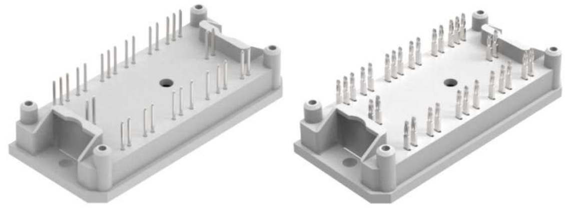
10-F1126PA100M7-L820F09
10-P1126PA100M7-L820F09Y
datasheet

flow PACK 1 — 1200 V / 100 A

Features

- IGBT Mitsubishi gen 7 technology with low V_{CEsat} and improved EMC behavior
- Compact and low inductive design
- Built-in NTC

flow 1 17mm housing

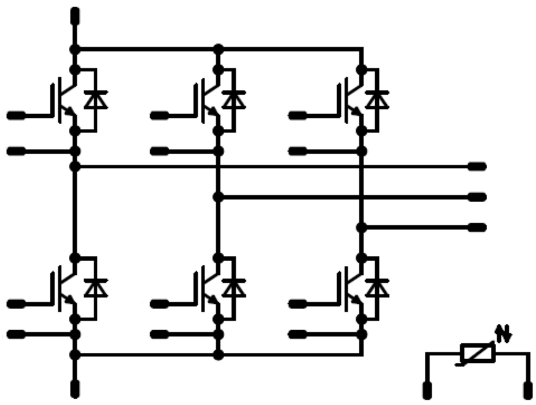


solder pin — Press-fit pin

Target applications

- Industrial Drives
- UPS

Schematic



Types

- 10-F1126PA100M7-L820F09
- 10-P1126PA100M7-L820F09Y

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	86	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	160	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	66	A
Repetitive peak forward current	I_{FRM}			200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	106	W
Maximum junction temperature	T_{jmax}			175	°C
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC Test Voltage	t_p = 2 s	4000	V
Creepage distance				min. 12,7	mm
Clearance		solder pins / Press-fit pins		12,64 / min. 12,7	mm
Comparative Tracking Index	CTI			> 200	

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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	
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,01	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		100	25 125 150		1,61 1,82 1,91	2,05	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			110	µA
Gate-emitter leakage current	I_{GES}		20	0		25			500	nA
Internal gate resistance	r_{g}							none		Ω
Input capacitance	C_{ies}							21000		
Output capacitance	C_{oes}		0	10		25		700		pF
Reverse transfer capacitance	C_{res}							280		
Gate charge	Q_{g}		15	600	100	25		650		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,59		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$					25 125 150		118 118 118		
Rise time	t_{r}	R_{goff} = 2 Ω R_{gon} = 2 Ω				25 125 150		10 12 13		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		174 200 206		
Fall time	t_{f}		±15	600	100	25 125 150		83 96 107		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 11,6 µC Q_{rFWD} = 17,3 µC Q_{rFWD} = 19,2 µC				25 125 150		3,255 4,868 5,368		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		6,605 8,774 9,490		

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10-F1126PA100M7-L820F09
10-P1126PA100M7-L820F09Y
datasheet

Characteristic Values

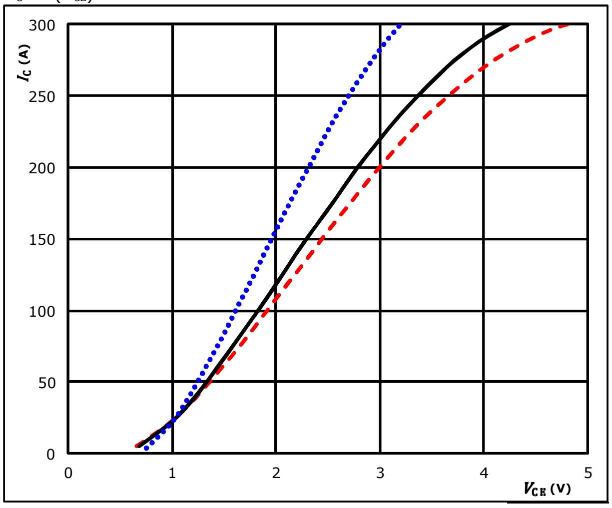
Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Inverter Diode										
Static										
Forward voltage	V_F				100	25 125 150		1,82 1,96 1,97	2,1	V
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,90		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 9387 A/μs di/dt = 7872 A/μs di/dt = 8350 A/μs	±15	600	100	25 125 150		178 166 165		A
Reverse recovery time	t_{rr}					25 125 150		149 312 339		ns
Recovered charge	Q_r					25 125 150		11,601 17,270 19,181		μC
Reverse recovered energy	E_{rec}					25 125 150		5,138 7,753 8,588		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		4044 2649 2147		A/μs
Thermistor										
Rated resistance	R					25		4,7		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 426 Ω				100	-12		+11	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$					25		3500		K
B-value	$B_{(25/100)}$					25		3560		K
Vincotech NTC Reference									G	

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

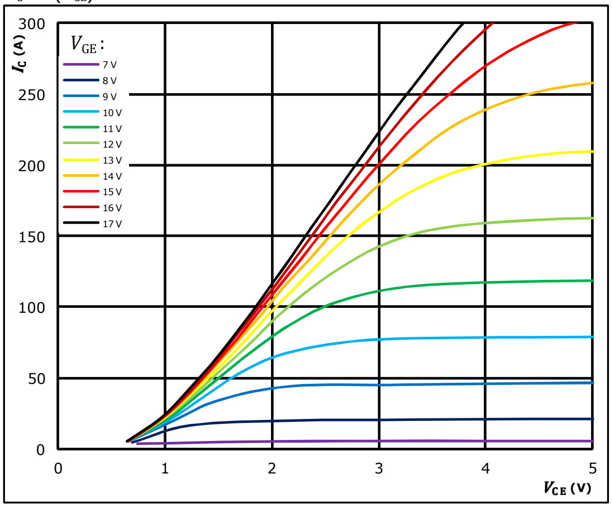


t_p =	250	µs		25	°C
V_{GE} =	15	V	T_j:	125	°C
				150	°C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 µs

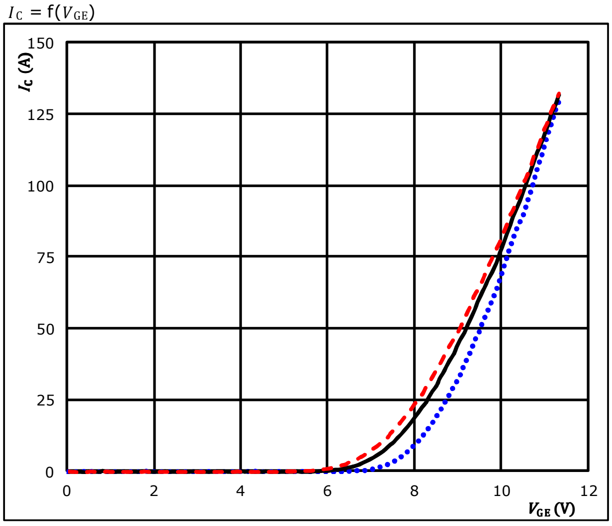
T_j = 150 °C

V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

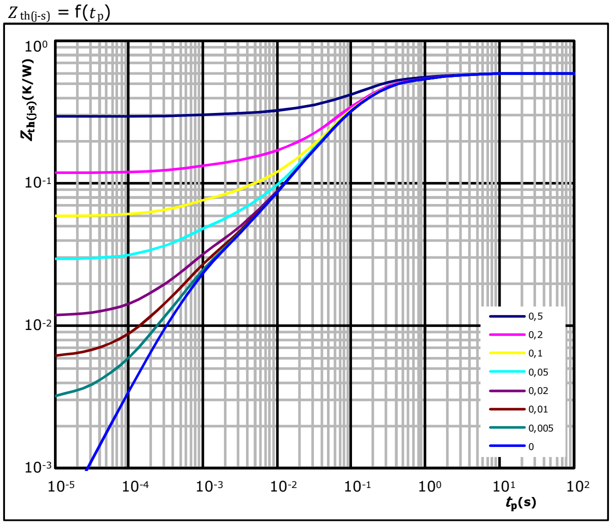


t_p =	100	µs		25	°C
V_{CE} =	10	V	T_j:	125	°C
				150	°C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j-s)}$ = 0,59 K/W

IGBT thermal model values

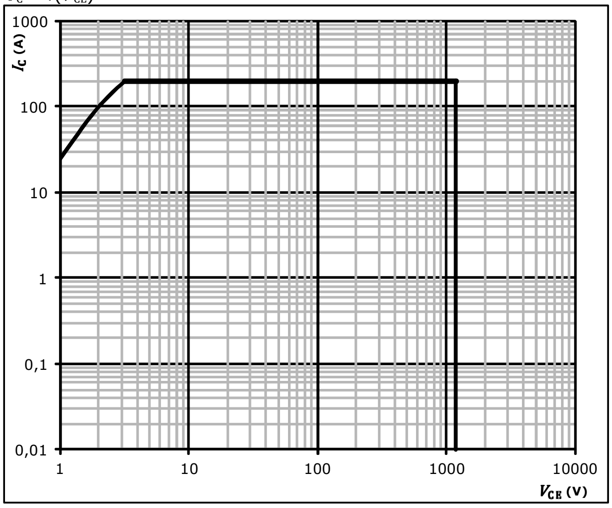
R (K/W)	τ (s)
6,07E-02	2,10E+00
9,70E-02	4,43E-01
3,35E-01	1,06E-01
5,92E-02	3,01E-02
2,26E-02	6,03E-03
1,97E-02	6,99E-04

Inverter Switch Characteristics

figure 6.	IGBT

Safe operating area

$I_C = f(V_{CE})$



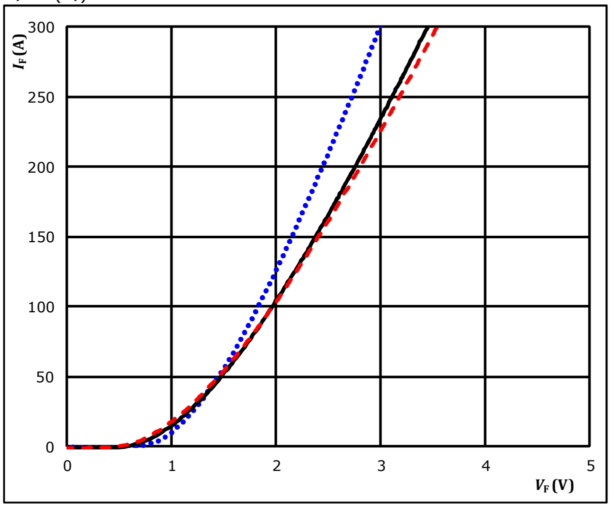
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	ºC

Inverter Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



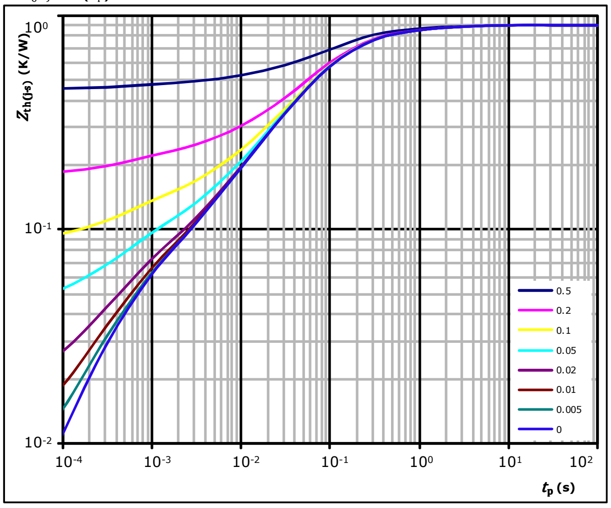
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,90 K/W

FWD thermal model values

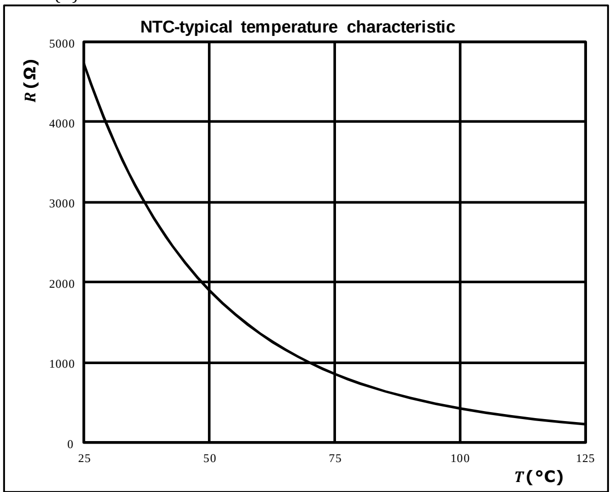
R (K/W)	τ (s)
6,37E-02	2,06E+00
1,71E-01	3,35E-01
4,76E-01	7,87E-02
1,11E-01	1,45E-02
3,47E-02	2,99E-03
4,20E-02	4,52E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

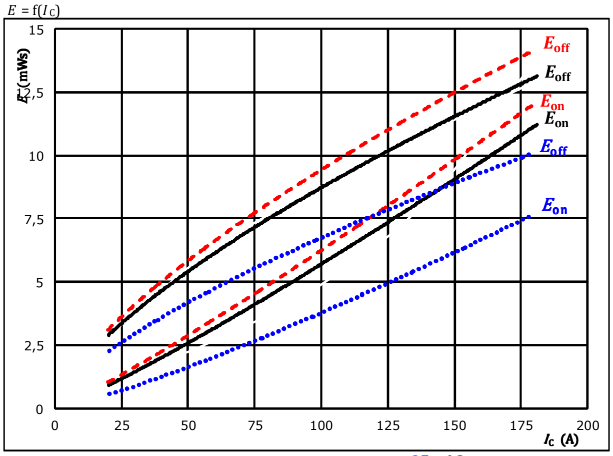


Inverter Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



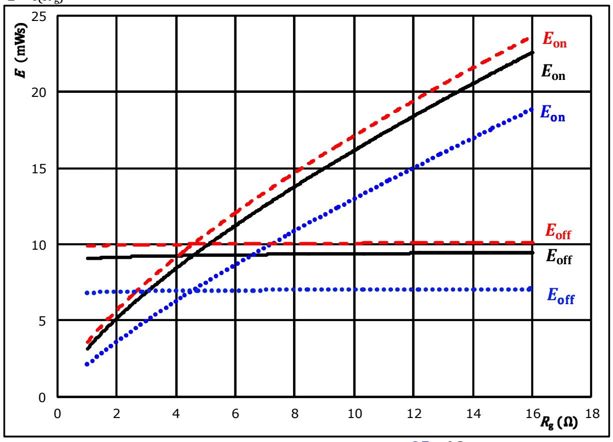
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	··········
V_{GE} =	±15	V		125 °C	———
R_{gon} =	2	Ω		150 °C	– – –
R_{goff} =	2	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



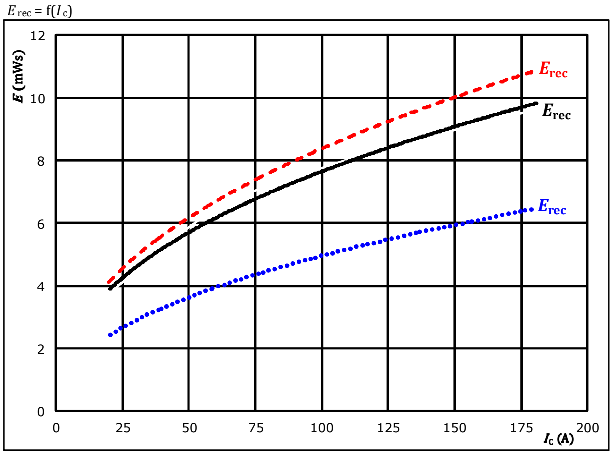
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	··········
V_{GE} =	±15	V		125 °C	———
I_C =	100	A		150 °C	– – –

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



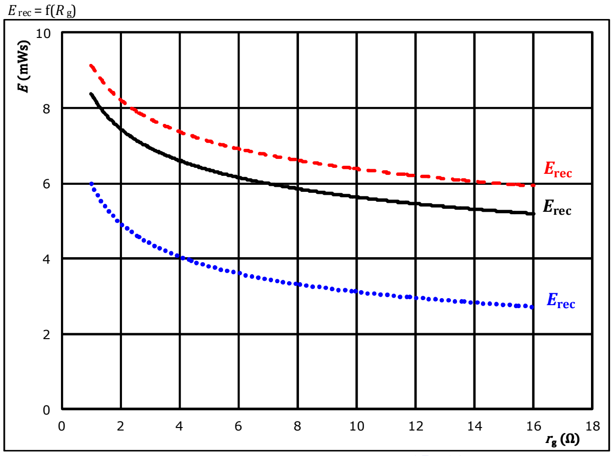
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	··········
V_{GE} =	±15	V		125 °C	———
R_{gon} =	2	Ω		150 °C	– – –

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

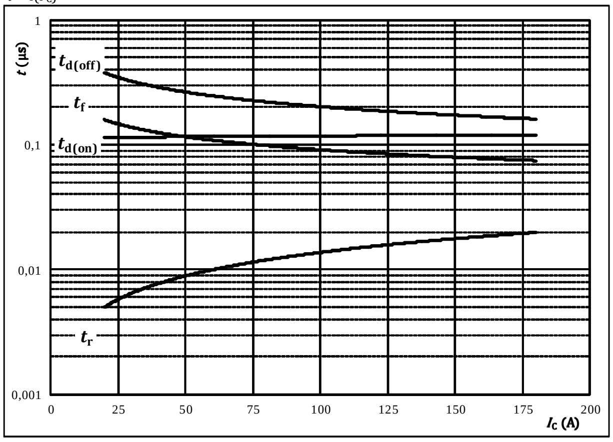
V_{CE} =	600	V	T_j:	25 °C	··········
V_{GE} =	±15	V		125 °C	———
I_C =	100	A		150 °C	– – –

Inverter Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



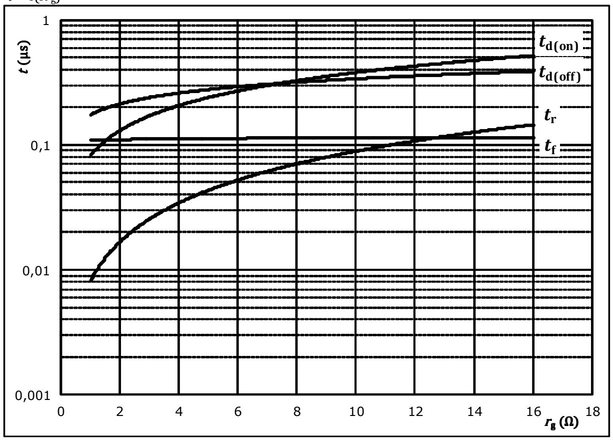
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



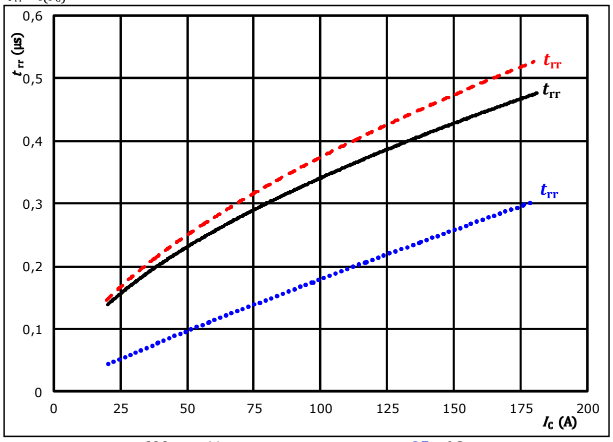
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	100	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

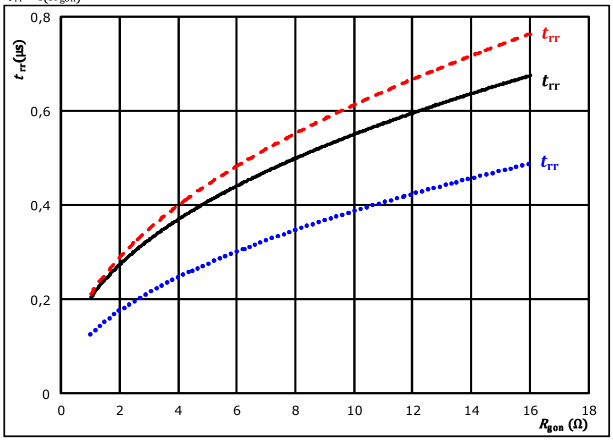


At						
V_{CE} =	600	V		25	°C	
V_{GE} =	±15	V	T_j:	125	°C	
R_{gon} =	2	Ω		150	°C	

figure 8. **FWD**

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

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



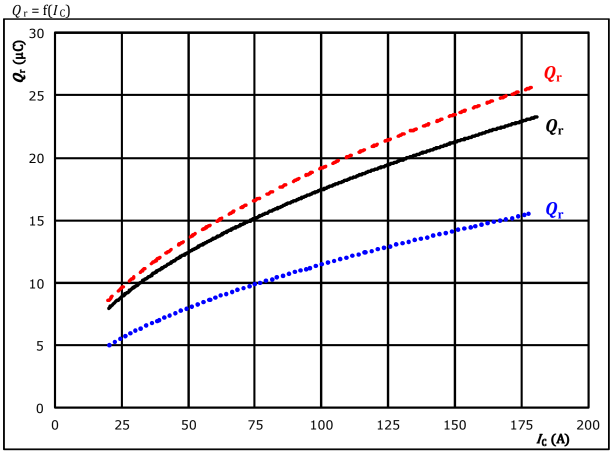
At						
V_{CE} =	600	V		25	°C	
V_{GE} =	±15	V	T_j:	125	°C	
I_C =	100	A		150	°C	

Inverter Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

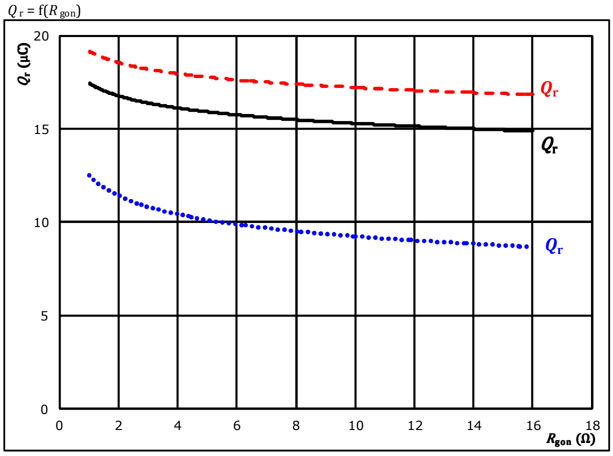


At	V_{CE} =	600	V		25 °C	··············
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	2	Ω		150 °C	– – –

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

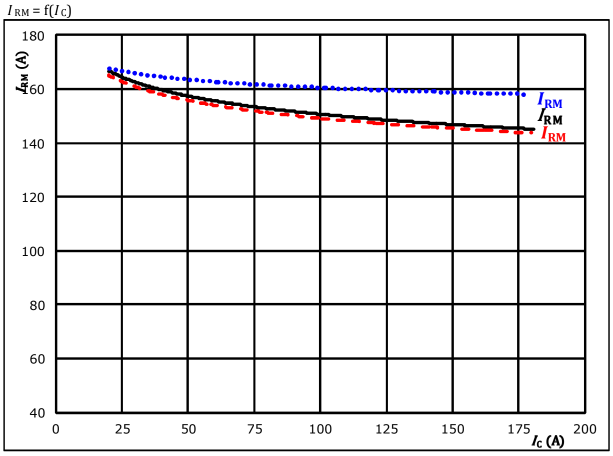


At	V_{CE}=	600	V		25 °C	··············
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C=	100	A		150 °C	– – –

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

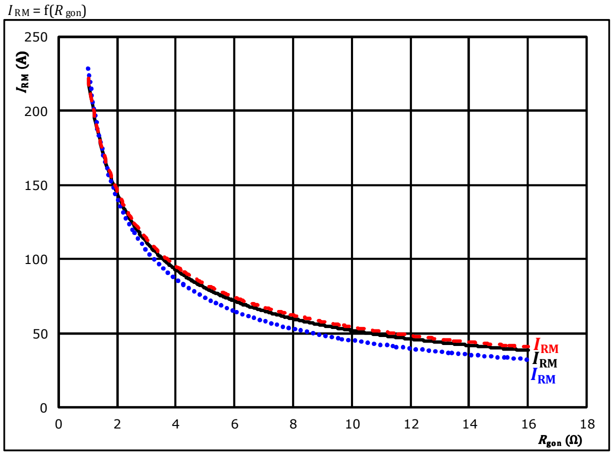


At	V_{CE}:	600	V		25 °C	··············
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	2	Ω		150 °C	– – –

figure 12. **FWD**

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

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



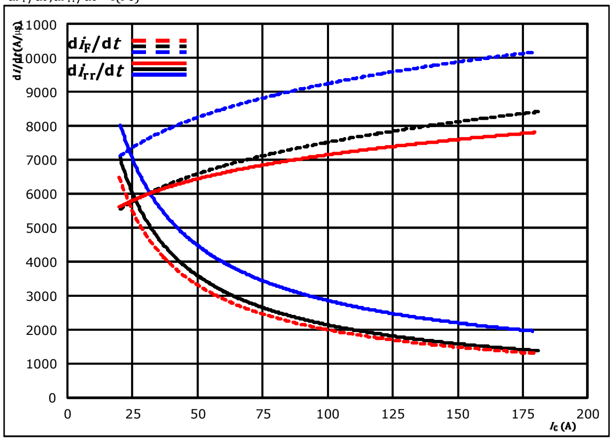
At	V_{CE} =	600	V		25 °C	··············
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C =	100	A		150 °C	– – –

Inverter Switching Characteristics

figure 13. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of collector current

$di_F/dt, di_{rr}/dt = f(I_C)$



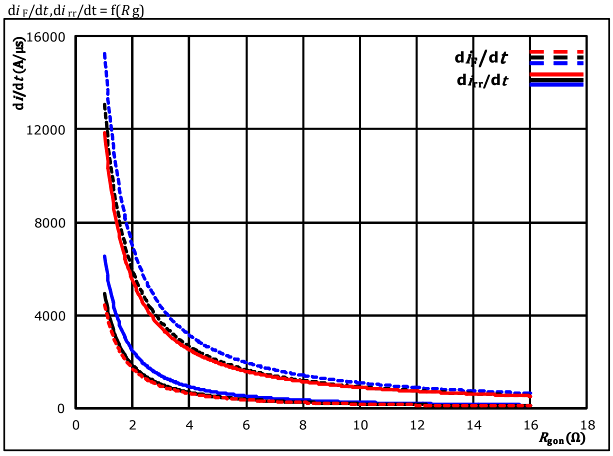
At

V_{CE} =	600	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
R_{gon} =	2	Ω		150 °C	dashed

figure 14. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

$di_F/dt, di_{rr}/dt = f(R_g)$



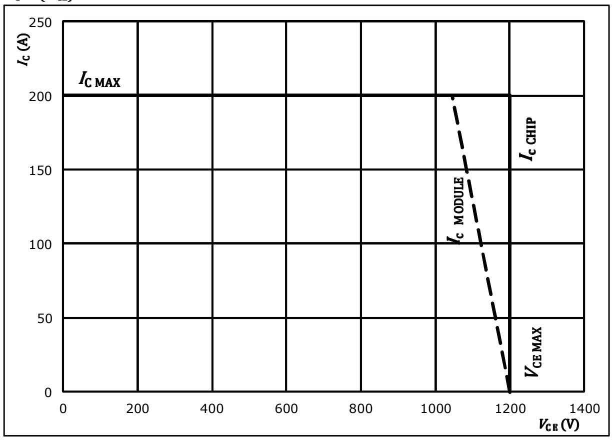
At

V_{CE} =	600	V		25 °C	dotted
V_{GE} =	±15	V	T_j:	125 °C	solid
I_C =	100	A		150 °C	dashed

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	175	°C
R_{gon} =	2	Ω
R_{goff} =	2	Ω

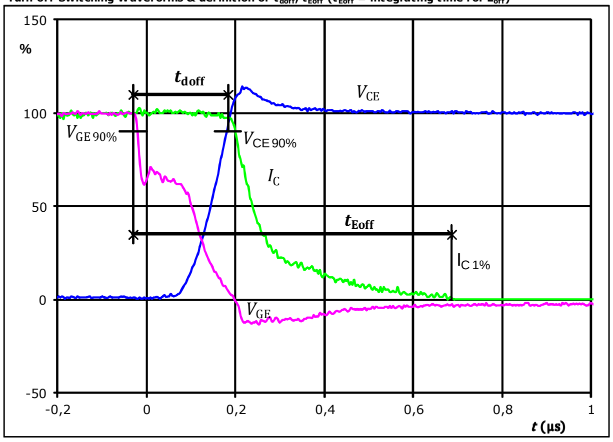
Inverter Switching Characteristics

General conditions

T_j	=	125 °C
R_{gon}	=	2 Ω
R_{goff}	=	2 Ω

figure 1. IGBT

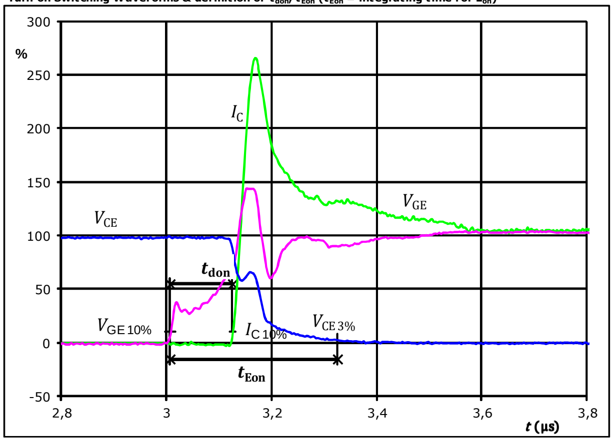
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	100	A
t_{doff} =	0,200	µs
t_{Eoff} =	0,717	µs

figure 2. IGBT

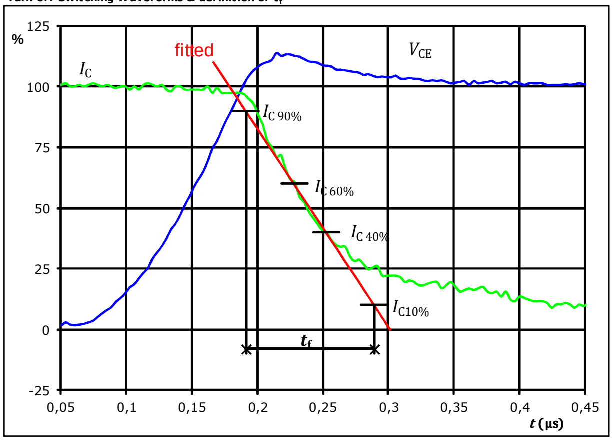
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	100	A
t_{don} =	0,118	µs
t_{Eon} =	0,318	µs

figure 3. IGBT

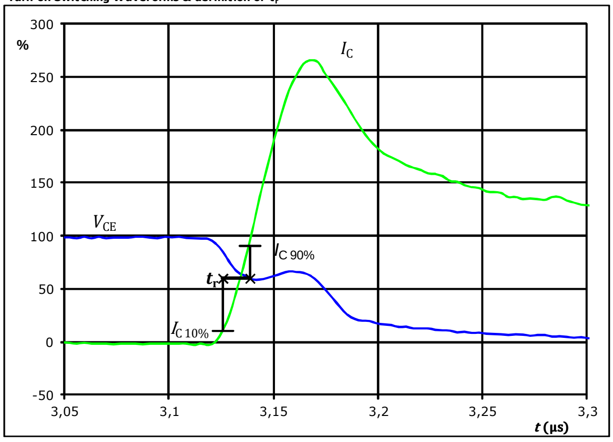
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	100	A
t_f =	0,096	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

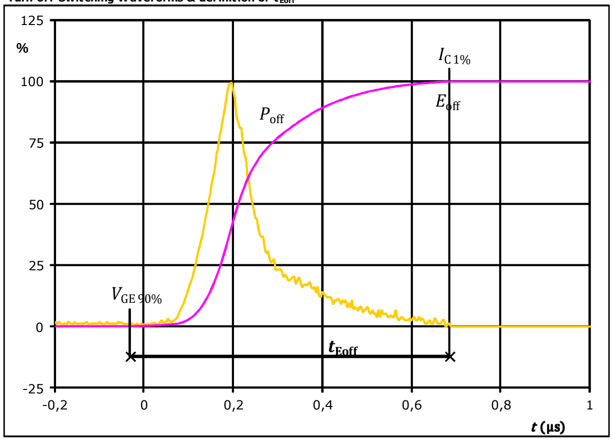


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	100	A
t_r =	0,012	µs

Inverter Switching Characteristics

figure 5. **IGBT**

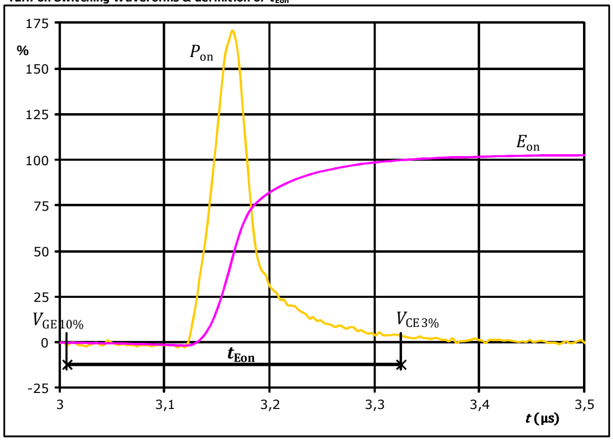
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	59,87	kW
E_{off} (100%) =	8,77	mJ
t_{Eoff} =	0,72	µs

figure 6. **IGBT**

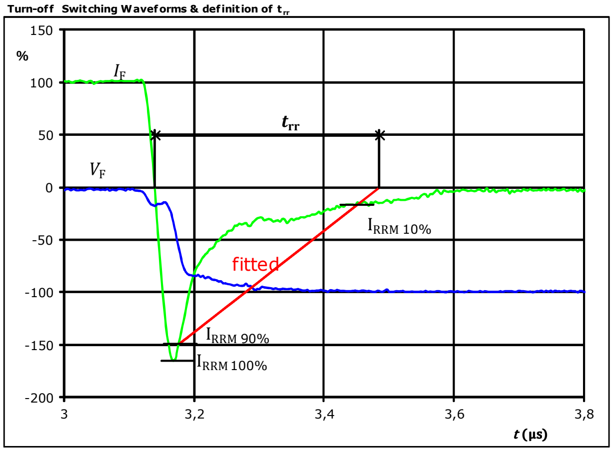
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	59,87	kW
E_{on} (100%) =	4,87	mJ
t_{Eon} =	0,32	µs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of t_{rr}

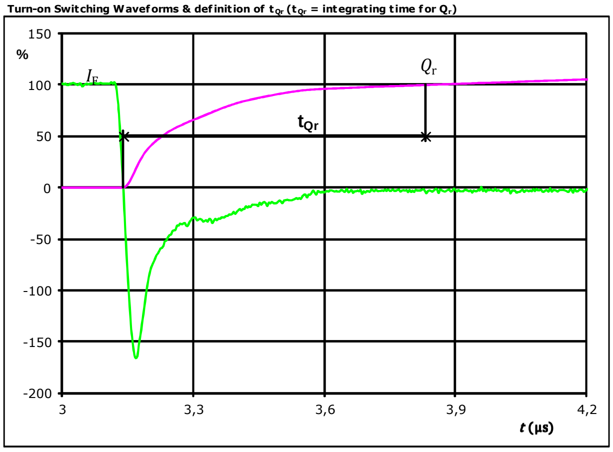


V_F (100%) =	600	V
I_F (100%) =	100	A
I_{RRM} (100%) =	-166	A
t_{rr} =	0,312	µs

Inverter Switching Characteristics

figure 8. **FWD**

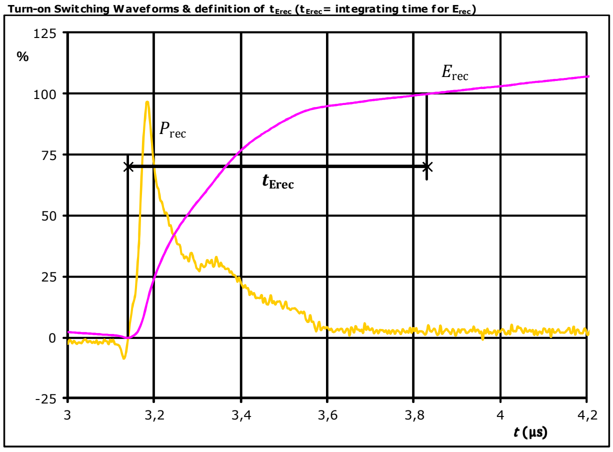
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	100	A
Q_r (100%) =	17,27	µC
t_{Qr} =	0,69	µs

figure 9. **FWD**

Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec}= integrating time for E_{rec})



P_{rec} (100%) =	59,87	kW
E_{rec} (100%) =	7,75	mJ
t_{Erec} =	0,69	µs

Ordering Code & Marking

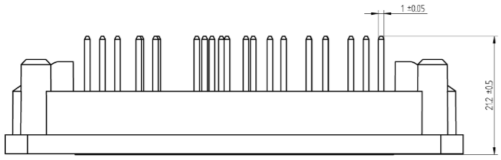
Version	Ordering Code
without thermal paste 17mm housing with solder pins	10-F1126PA100M7-L820F09
without thermal paste 17mm housing with Press-fit pins	10-P1126PA100M7-L820F09Y

	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

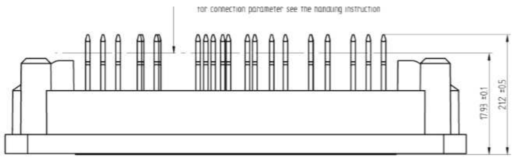
Outline

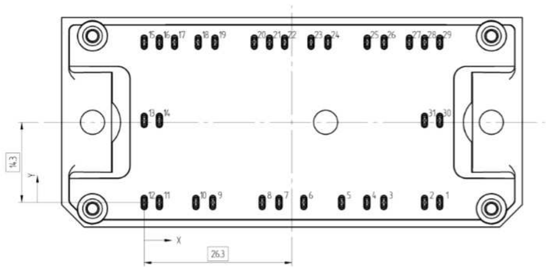
Pin table [mm]				Pin table [mm]			
Pin	X	Y	Function	Pin	X	Y	Function
1	52,6	0	DC-123	30	52,6	14,65	DC+123
2	49,9	0	DC-123	31	49,9	14,65	DC+123
3	42,65	0	G15				
4	39,65	0	S15				
5	35,15	0	Therm1				
6	28,4	0	Therm2				
7	24	0	G13				
8	21	0	S13				
9	12,2	0	G11				
10	9,2	0	S11				
11	2,7	0	DC-123				
12	0	0	DC-123				
13	0	14,65	DC+123				
14	2,7	14,65	DC+123				
15	0	28,6	Ph1				
16	2,7	28,6	Ph1				
17	5,4	28,6	Ph1				
18	9,6	28,6	S12				
19	12,6	28,6	G12				
20	19,6	28,6	Ph2				
21	22,3	28,6	Ph2				
22	25	28,6	Ph2				
23	29,7	28,6	S14				
24	32,7	28,6	G14				
25	39,7	28,6	S16				
26	42,7	28,6	G16				
27	47,2	28,6	Ph3				
28	49,9	28,6	Ph3				
29	52,6	28,6	Ph3				

solder pins



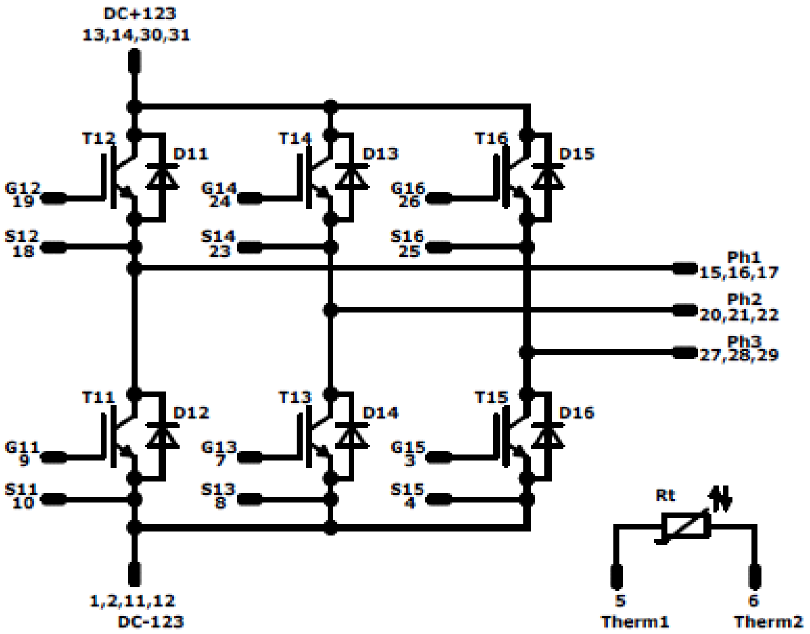
Press-fit pins





Tolerance of pinpositions ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11,T12,T13 T14,T15,T16	IGBT	1200 V	100 A	Inverter Switch	
D11,D12,D13 D14,D15,D16	FWD	1200 V	100 A	Inverter Diode	
Rt	Thermistor			Thermistor	

Vincotech

10-F1126PA100M7-L820F09
10-P1126PA100M7-L820F09Y
datasheet

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

Handling instruction
Handling instructions for *flow* 1 packages see vincotech.com website.

Package data
Package data for *flow* 1 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-x1126PA100M7-L820F09x-D2-14	03 Apr. 2017		