



MiniSKiiP® PACK 3

1200 V / 200 A

Topology features

- Inverter
- Kelvin Emitter for improved switching performance
- Temperature sensor

Component features

- Easy paralleling
- Low turn-off losses
- Low collector emitter saturation voltage
- Positive temperature coefficient
- Short tail current
- Switching optimized for EMC

Housing features

- Base isolation: Al₂O₃
- Easy assembly in one mounting step
- Flexible PCB design w/o pin holes
- Rugged solderless spring contacts

Extra features

- New pin-out for optimized power losses

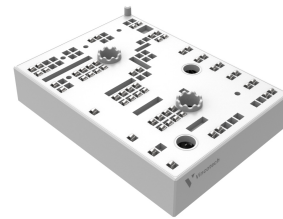
Target applications

- Industrial Drives

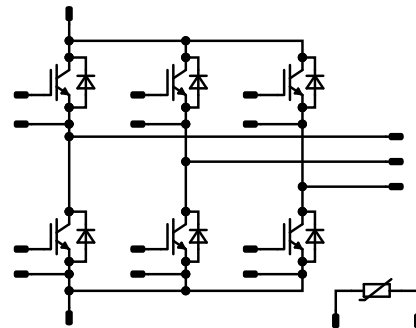
Types

- 80-M3126PB200M7-K810F70

MiniSKiiP® 3 16 mm housing



Schematic





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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	198	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	400	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	392	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	9,5	μs
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

Inverter Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	141	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	400	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	245	W
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

Module Properties

Thermal Properties

Storage temperature	T_{stg}		-40...+125	$^{\circ}\text{C}$
Operation temperature under switching condition	T_{jop}		-40...+($T_{jmax} - 25$)	$^{\circ}\text{C}$

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage* $t_p = 2\text{ s}$	5500	V
Isolation voltage	V'_{isol}	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance		With std lid For more informations see handling instructions	6,3	mm
Clearance		With std lid For more informations see handling instructions	6,3	mm
Comparative Tracking Index	CTI		≥ 600	

*100 % tested in production



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Characteristic Values

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

Inverter Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$			10	0,02	25	5,4	6	6,6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		200	25 125 150		1,69 1,88 1,93	1,85 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			100	μA
Gate-emitter leakage current	I_{GES}		20	0		25			500	nA
Internal gate resistance	r_g							2		Ω
Input capacitance	C_{ies}							37000		pF
Output capacitance	C_{oes}		0	10		25		1100		pF
Reverse transfer capacitance	C_{res}							420		pF
Gate charge	Q_g	$V_{CC} = 600$ V	15		200	25		1200		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 2,5$ W/mK (HPTP)						0,24		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$					25 125 150		461 472,8 474,4		ns
Rise time	t_r					25 125 150		78,4 92 98,6		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		321,6 355 365,6		ns
Fall time	t_f					25 125 150		77,33 91,16 100,75		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 19,95$ μC $Q_{tFWD} = 30,14$ μC $Q_{tFWD} = 33,51$ μC				25 125 150		23,88 31,95 34,37		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		13,44 17,92 19,34		mWs



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Characteristic Values

Parameter	Symbol	Conditions					Values			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 Diode										
Static										
Forward voltage	V_F				200	25 125 150		1,86 1,99 1,98	2,1 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1200$ V				25			40	μA
Thermal										
Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 2,5$ W/mK (HPTP)						0,39		K/W
Dynamic										
Peak recovery current	I_{RRM}					25 125 150		112,58 113,54 116,43		A
Reverse recovery time	t_{rr}					25 125 150		379,9 532,94 580,11		ns
Recovered charge	Q_r	$di/dt=2545$ A/μs $di/dt=1765$ A/μs $di/dt=1647$ A/μs	±15	600	200	25 125 150		19,95 30,14 33,51		μC
Reverse recovered energy	E_{rec}					25 125 150		6,76 10,66 11,85		mWs
Peak rate of fall of recovery current	$(di_r/dt)_{max}$					25 125 150		398,86 320,76 350		A/μs



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Characteristic Values

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

Thermistor

Static

Rated resistance	R					25		1		kΩ
Deviation of R_{100}	$A_{R/R}$	$R_{100} = 1670 \Omega$				100	-2		2	%
Maximum Current	I_{max}							3		mA
Power dissipation constant	d					25		0,76		mW/K
A-value	A							$7,635 \times 10^{-3}$		1/K
B-value	B							$1,73 \times 10^{-5}$		1/K ²
Vincotech Thermistor Reference									E	

⁽¹⁾ Value at chip level

⁽²⁾ Only valid with pre-applied Vincotech thermal interface material.



Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics
 $I_C = f(V_{CE})$

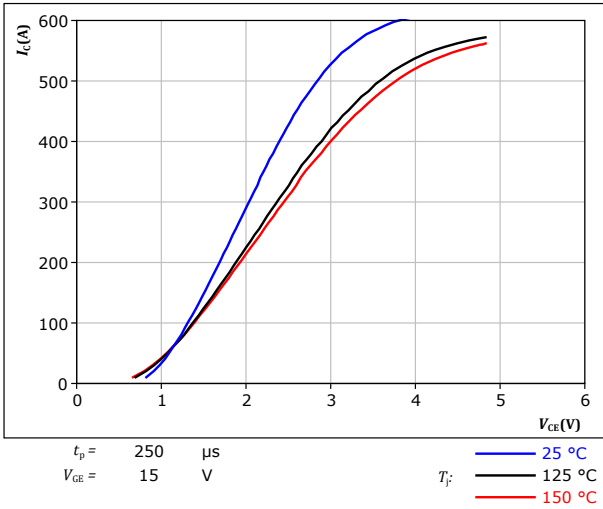


figure 2. IGBT

Typical output characteristics
 $I_C = f(V_{CE})$

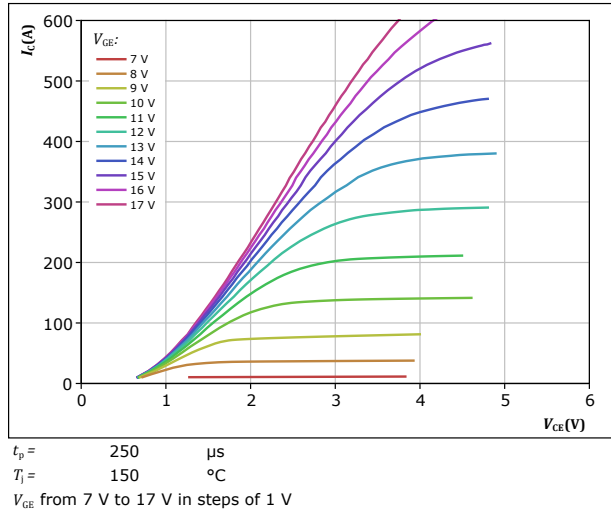


figure 3. IGBT

Typical transfer characteristics
 $I_C = f(V_{GE})$

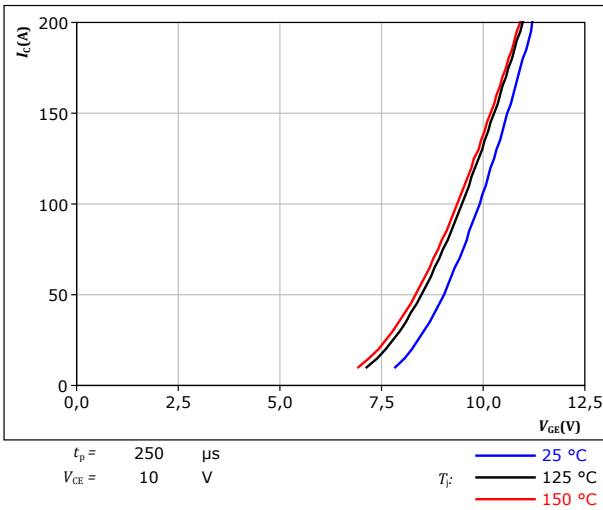
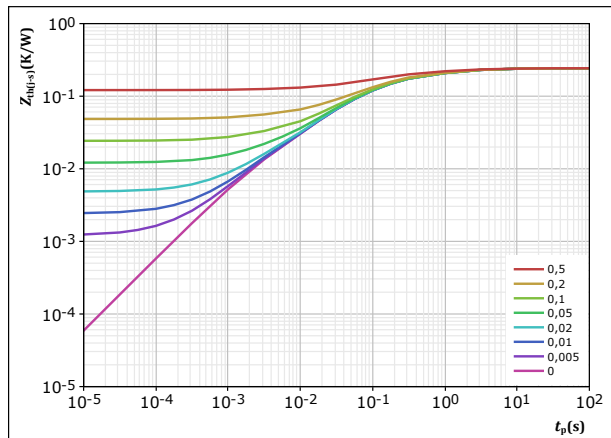


figure 4. IGBT

Transient thermal impedance as a function of pulse width
 $Z_{th(j-s)} = f(t_p)$



$D = t_p / T$
 $R_{th(j-s)} = 0,243 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
1,22E-02	8,07E+00
5,19E-02	1,24E+00
1,10E-01	1,65E-01
6,11E-02	3,27E-02
7,54E-03	2,30E-03

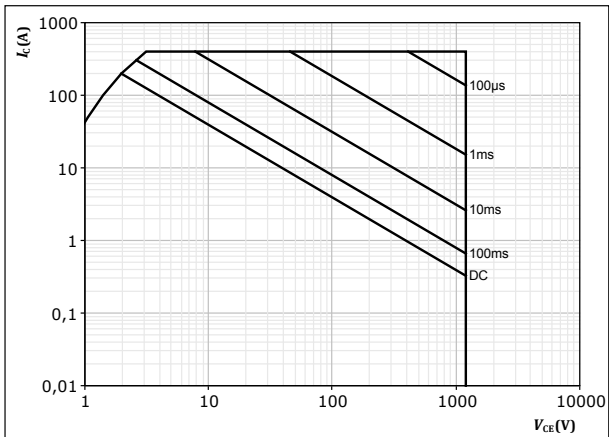


Inverter Switch Characteristics

figure 5. IGBT

Safe operating area

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



$D =$ single pulse
 $T_s = 80 \text{ } ^\circ\text{C}$
 $V_{GE} = 15 \text{ V}$
 $T_j = T_{jmax}$



Inverter Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

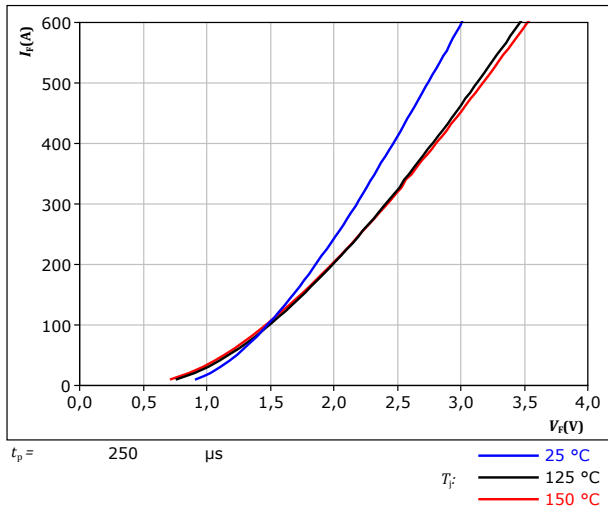
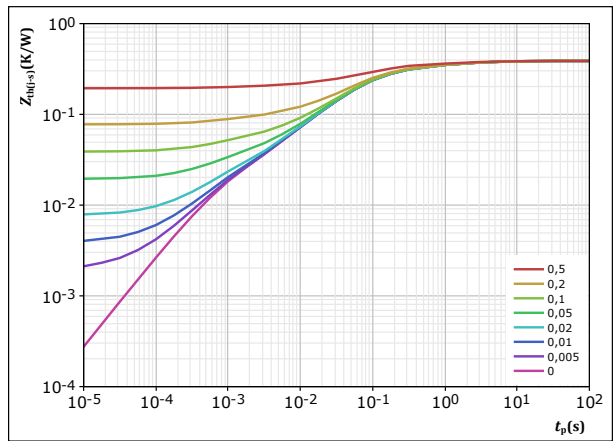


figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D = \frac{t_p}{T}$
 $R_{th(j-s)} = 0,388 \text{ K/W}$
 FWD thermal model values

R (K/W)	τ (s)
2,83E-02	4,37E+00
7,64E-02	6,12E-01
2,20E-01	7,43E-02
4,78E-02	1,15E-02
1,54E-02	7,56E-04

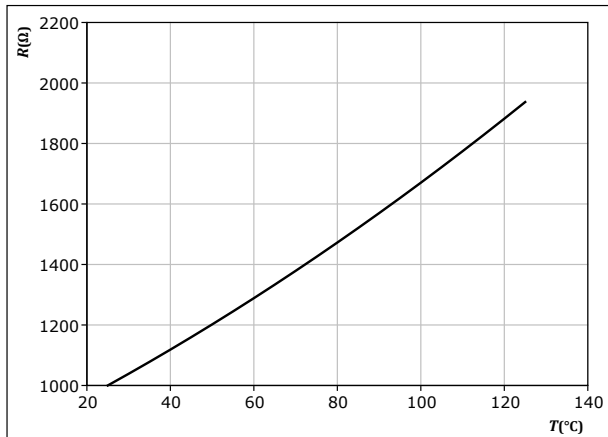


Thermistor Characteristics

figure 8. Thermistor

Typical PTC characteristic as function of temperature

$$R_T = f(T)$$

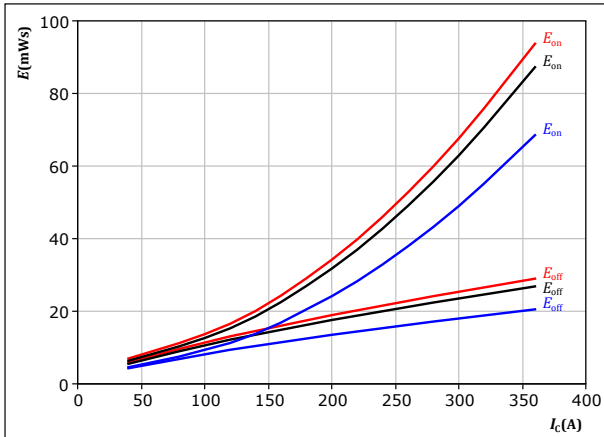




Inverter Switching Characteristics

figure 9. IGBT

Typical switching energy losses as a function of collector current
 $E = f(I_c)$

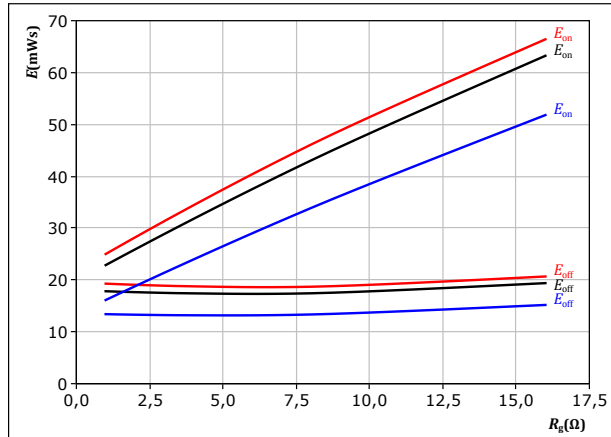


With an inductive load at

$V_{CE} =$	600	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{g(on)} =$	4	Ω		150 °C
$R_{g(off)} =$	4	Ω		

figure 10. IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor
 $E = f(R_g)$

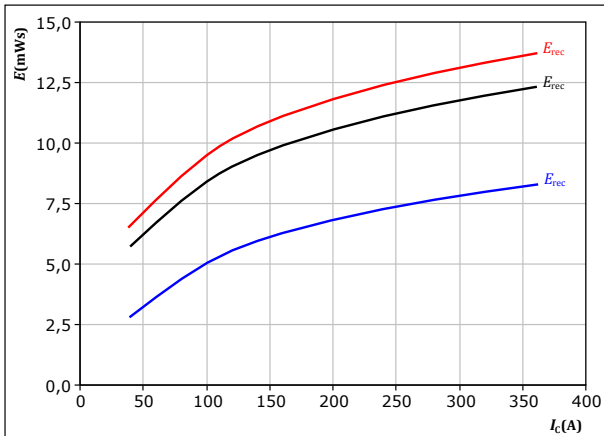


With an inductive load at

$V_{CE} =$	600	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_c =$	200	A		150 °C

figure 11. FWD

Typical reverse recovered energy loss as a function of collector current
 $E_{rec} = f(I_c)$

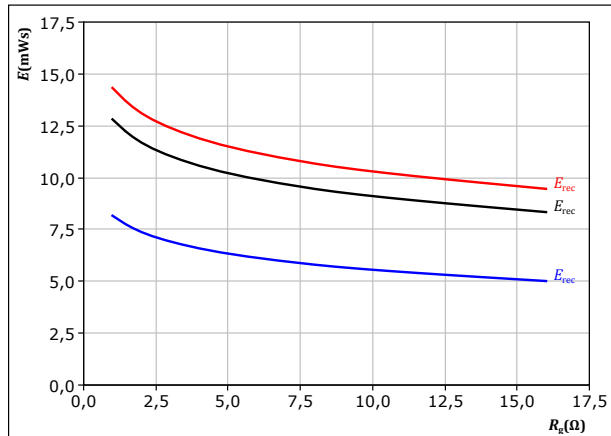


With an inductive load at

$V_{CE} =$	600	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{g(on)} =$	4	Ω		150 °C

figure 12. FWD

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor
 $E_{rec} = f(R_g)$



With an inductive load at

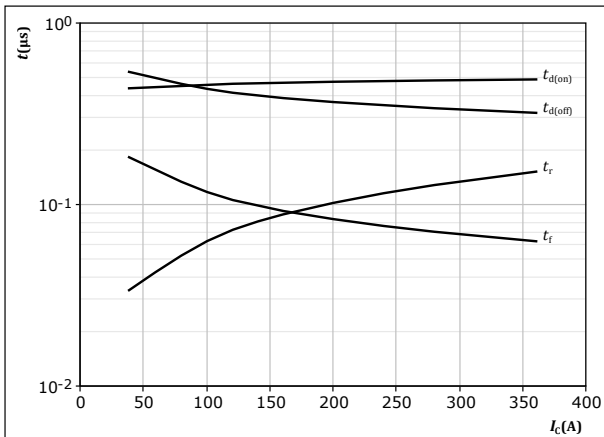
$V_{CE} =$	600	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_c =$	200	A		150 °C



Inverter Switching Characteristics

figure 13. IGBT

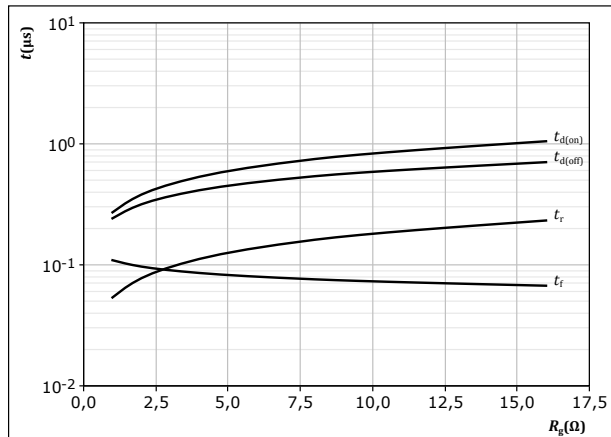
Typical switching times as a function of collector current
 $t = f(I_c)$



With an inductive load at
 $T_j = 150$ °C
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω

figure 14. IGBT

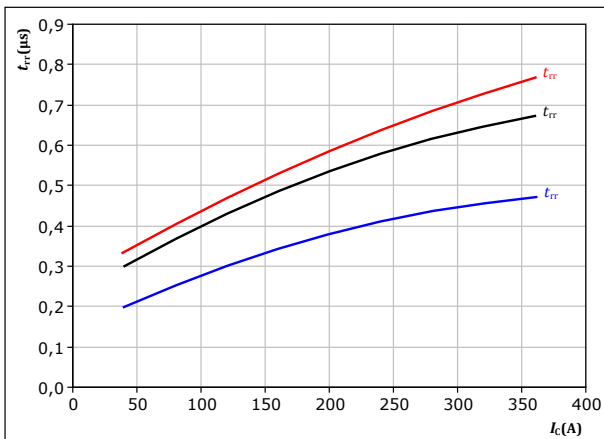
Typical switching times as a function of IGBT turn on gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150$ °C
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 200$ A

figure 15. FWD

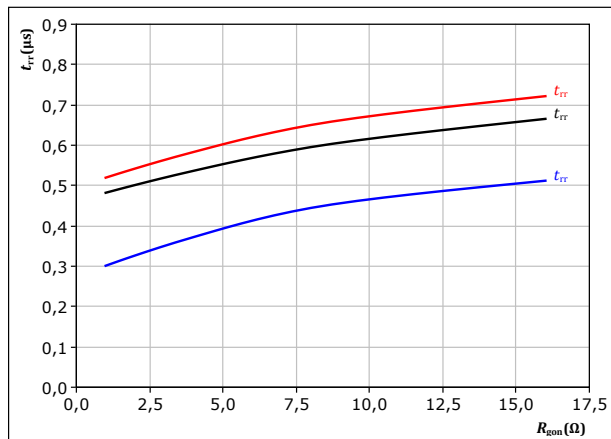
Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_c)$



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 16. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor
 $t_{rr} = f(R_{gon})$



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 200$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

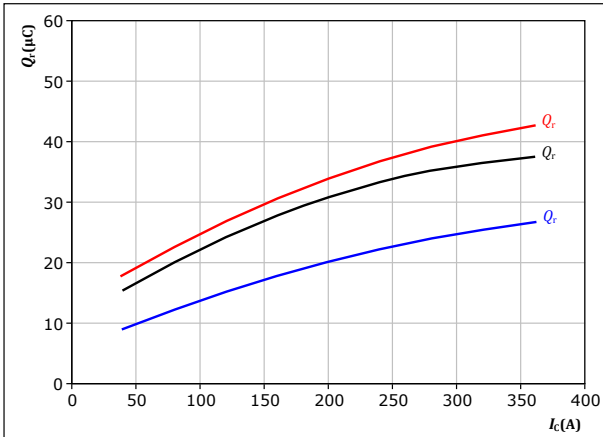


Inverter Switching Characteristics

figure 17. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

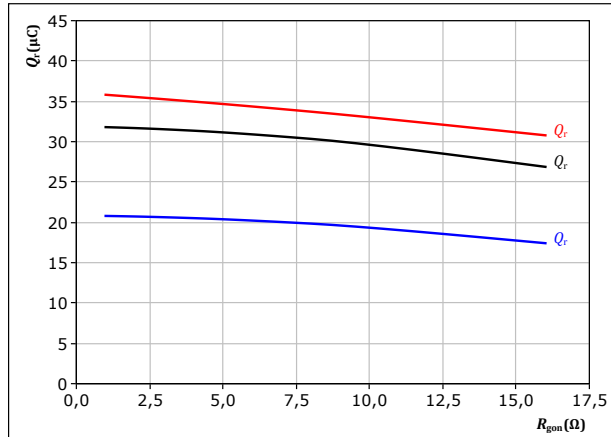
$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 4 \text{ } \Omega$

T_j : $25 \text{ } ^\circ\text{C}$ (blue)
 $125 \text{ } ^\circ\text{C}$ (black)
 $150 \text{ } ^\circ\text{C}$ (red)

figure 18. FWD

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

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



With an inductive load at

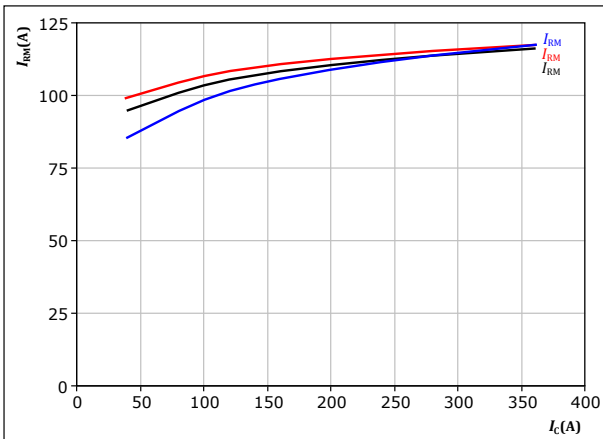
$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 200 \text{ A}$

T_j : $25 \text{ } ^\circ\text{C}$ (blue)
 $125 \text{ } ^\circ\text{C}$ (black)
 $150 \text{ } ^\circ\text{C}$ (red)

figure 19. FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

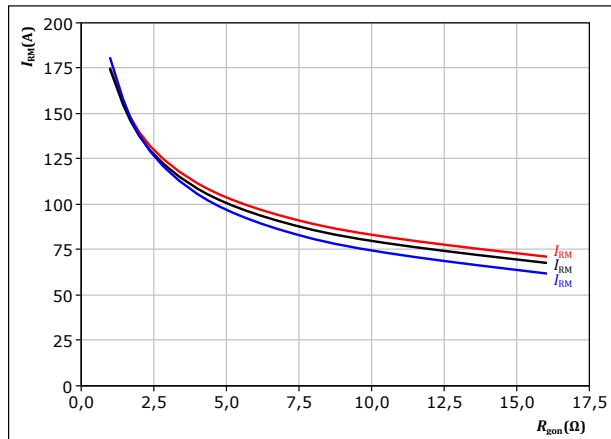
$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 4 \text{ } \Omega$

T_j : $25 \text{ } ^\circ\text{C}$ (blue)
 $125 \text{ } ^\circ\text{C}$ (black)
 $150 \text{ } ^\circ\text{C}$ (red)

figure 20. FWD

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

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



With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 200 \text{ A}$

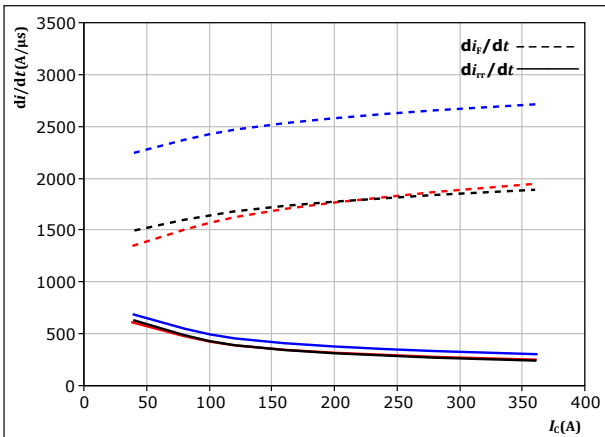
T_j : $25 \text{ } ^\circ\text{C}$ (blue)
 $125 \text{ } ^\circ\text{C}$ (black)
 $150 \text{ } ^\circ\text{C}$ (red)



Inverter Switching Characteristics

figure 21. FWD

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

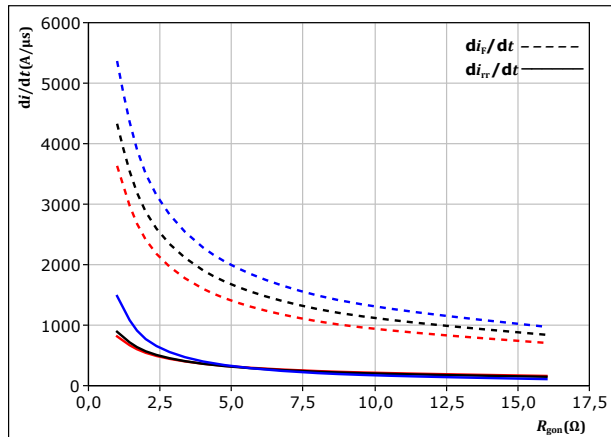


With an inductive load at

$V_{CE} =$	600	V	$T_j =$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{gon} =$	4	Ω		150 °C

figure 22. FWD

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



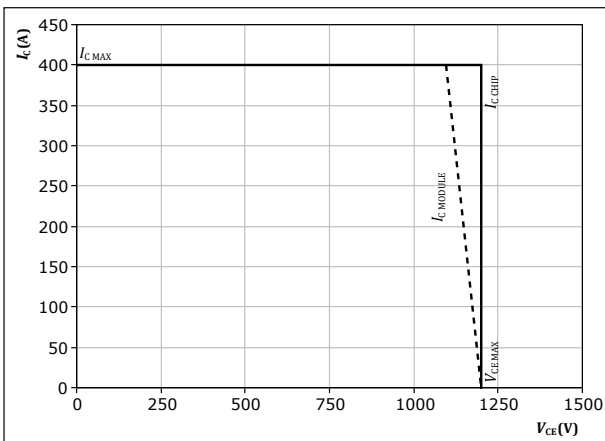
With an inductive load at

$V_{CE} =$	600	V	$T_j =$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_c =$	200	A		150 °C

figure 23. IGBT

Reverse bias safe operating area

$I_c = f(V_{CE})$



At $T_j = 150$ °C
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω



Inverter Switching Definitions

figure 24. IGBT
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})

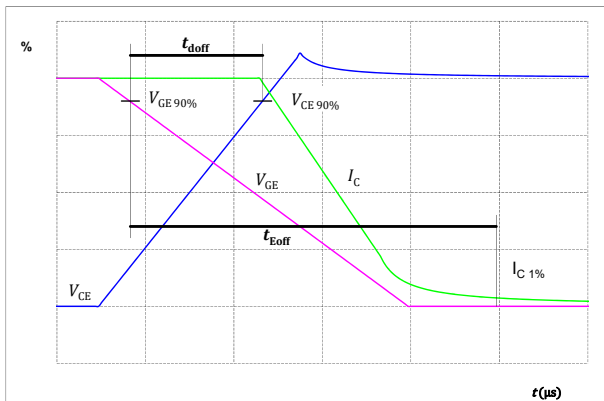


figure 25. IGBT
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})

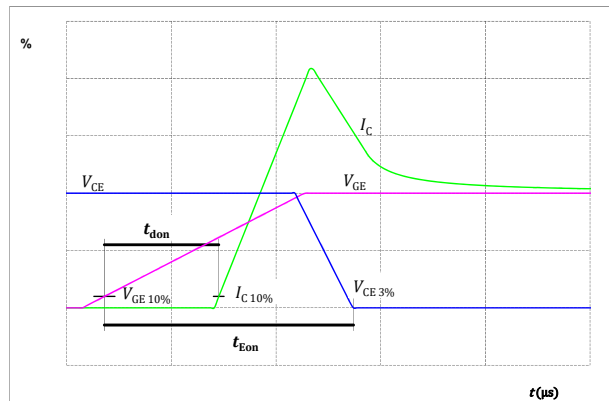


figure 26. IGBT
Turn-off Switching Waveforms & definition of t_f

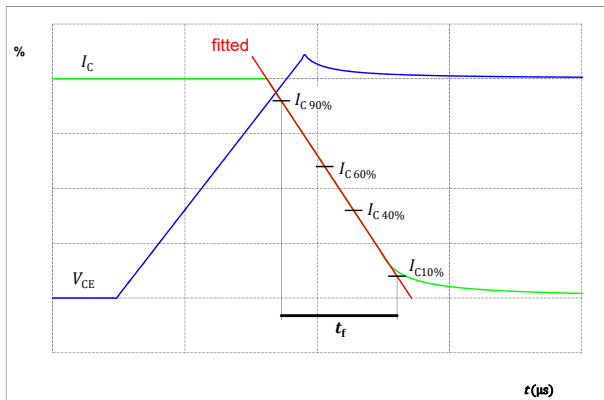
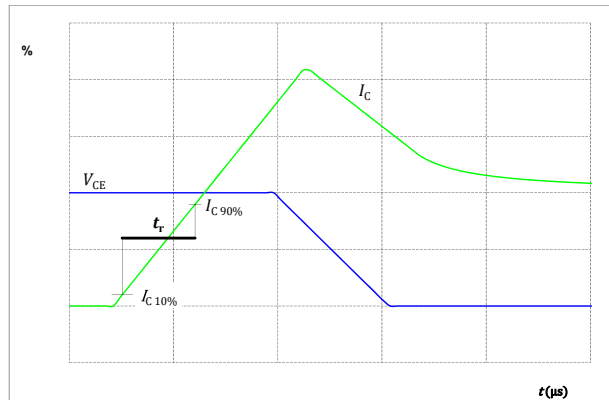


figure 27. IGBT
Turn-on Switching Waveforms & definition of t_r





Inverter Switching Definitions

figure 28. FWD

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

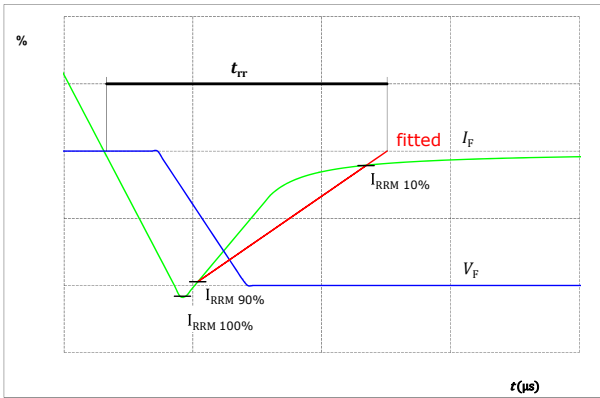
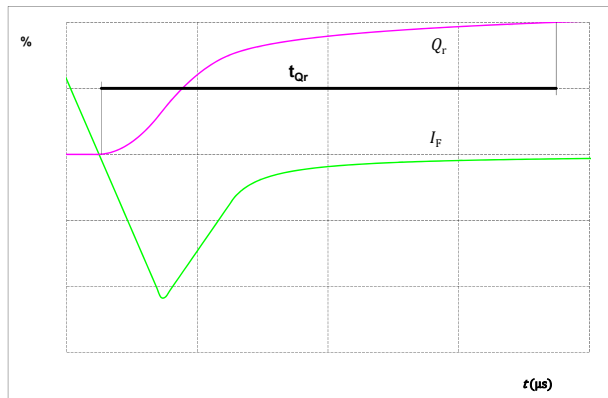


figure 29. FWD


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



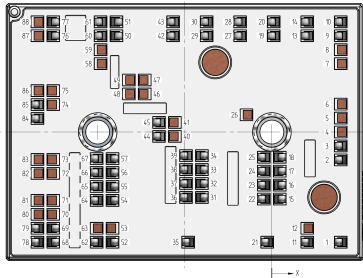


Vincotech

Ordering Code	
Version	Ordering Code
With std lid (6.5mm height) + no thermal grease	80-M3126PB200M7-K810F70-/0A/
With thin lid (2.8mm height) + no thermal grease	80-M3126PB200M7-K810F70-/0B/
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)	80-M3126PB200M7-K810F70-/1A/
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)	80-M3126PB200M7-K810F70-/1B/
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)	80-M3126PB200M7-K810F70-/4A/
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)	80-M3126PB200M7-K810F70-/4B/
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)	80-M3126PB200M7-K810F70-/5A/
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)	80-M3126PB200M7-K810F70-/5B/

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

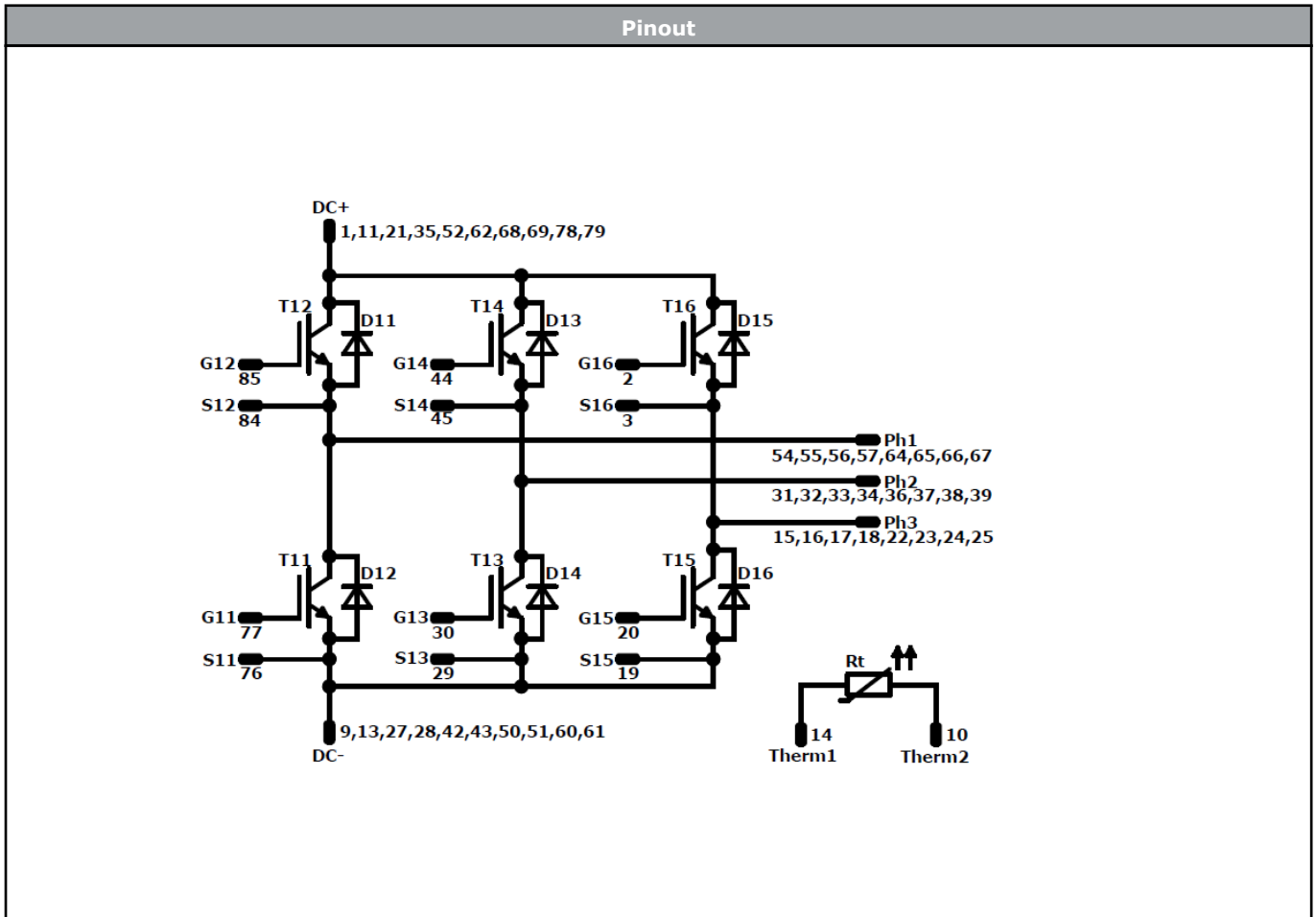
Outline							
Pin table [mm]							
Pin	X	Y	Function	45	-25,9	2,2	S14
1	15,83	-25,3	DC+	46	not assembled		
2	15,83	-6,4	G16	47	not assembled		
3	15,83	-3,2	S16	48	not assembled		
4	not assembled			49	not assembled		
5	not assembled			50	-35,68	22,1	DC-
6	not assembled			51	-35,68	25,3	DC-
7	not assembled			52	-36,58	-25,3	DC+
8	not assembled			53	not assembled		
9	15,83	22,1	DC-	54	-36,58	-15,7	Ph1
10	15,83	25,3	Therm2	55	-36,58	-12,5	Ph1
11	8,13	-25,3	DC+	56	-36,58	-9,3	Ph1
12	not assembled			57	-36,58	-6,1	Ph1
13	8,13	22,1	DC-	58	not assembled		
14	8,13	25,3	Therm1	59	not assembled		
15	1,82	-15,38	Ph3	60	-39,32	22,1	DC-
16	1,82	-12,18	Ph3	61	-39,32	25,3	DC-
17	1,82	-8,98	Ph3	62	-40,22	-25,3	DC+
18	1,82	-5,79	Ph3	63	not assembled		
19	0,43	22,1	S15	64	-40,22	-15,7	Ph1
20	0,43	25,3	G15	65	-40,22	-12,5	Ph1
21	-1,07	-25,3	DC+	66	-40,22	-9,3	Ph1
22	-1,82	-15,38	Ph3	67	-40,22	-6,09	Ph1
23	-1,82	-12,18	Ph3	68	-50,18	-25,3	DC+
24	-1,82	-8,98	Ph3	69	-50,18	-22,1	DC+
25	-1,82	-5,79	Ph3	70	not assembled		
26	not assembled			71	not assembled		
27	-7,27	22,1	DC-	72	not assembled		
28	-7,27	25,3	DC-	73	not assembled		
29	-14,97	22,1	S13	74	not assembled		
30	-14,97	25,3	G13	75	not assembled		
31	-16,05	-15,02	Ph2	76	-50,18	22,1	S11
32	-16,05	-11,82	Ph2	77	-50,18	25,3	G11
33	-16,05	-8,63	Ph2	78	-53,82	-25,3	DC+
34	-16,05	-5,42	Ph2	79	-53,82	-22,1	DC+
35	-19,22	-25,3	DC+	80	not assembled		
36	-19,7	-15,02	Ph2	81	not assembled		
37	-19,7	-11,82	Ph2	82	not assembled		
38	-19,7	-8,62	Ph2	83	not assembled		
39	-19,7	-5,42	Ph2	84	-53,82	3,1	S12
40	not assembled			85	-53,82	6,3	G12
41	not assembled			86	not assembled		
42	-22,67	22,1	DC-	87	not assembled		
43	-22,67	25,3	DC-	88	not assembled		
44	-25,9	-1	G14				



Pad positions refers to center point. For more informations on pad design please see package data



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Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	1200 V	200 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	200 A	Inverter Diode	
Rt	Thermistor			Thermistor	




Packaging instruction				
Standard packaging quantity (SPQ) 48	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for MiniSKiiP® 3 packages see vincotech.com website.

Package data
Package data for MiniSKiiP® 3 packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at 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
80-M3126PB200M7-K810F70-D7-14	4 Feb. 2022	Correct Pin table	

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