80-M3126PA100M7-K828F70

datasheet

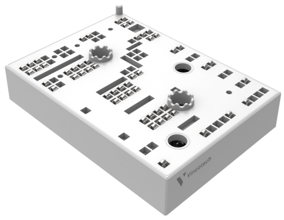
Vincotech

MiniSKiiP® PACK 3 **1200 V / 100 A**

Features

- IGBT Mitsubishi gen 7 technology with low VCEsat and improved EMC behavior
- Extended current range up to 200 A
- Solder-free spring contact technology

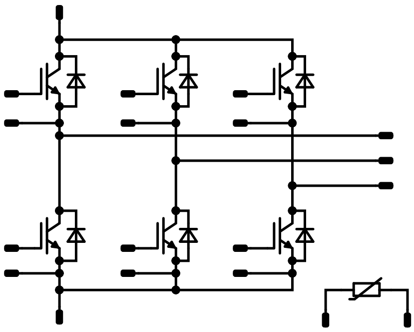
MiniSKiiP® 3 16 mm housing



Target applications

- Industrial Drives

Schematic



Types

- 80-M3126PA100M7-K828F70

Maximum Ratings

T_j = 25 °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 °C	121	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	240	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 800 V T_j = 150 °C	9,5	µs
Maximum junction temperature	T_{jmax}		175	°C
Inverter Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ T_s = 80 °C	81	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	149	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	5500	V
Isolation voltage	V_{isol}	AC Voltage t_p = 1 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

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 Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$			10	0,01	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		100	25 125 150		1,53 1,71 1,75	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			0,5	µA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}		0	10		25		21000		pF
Output capacitance	C_{oes}							700		pF
Reverse transfer capacitance	C_{res}							280		pF
Gate charge	Q_g	V_{CC} = 600 V	15		100	25		700		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 2,5 W/mK (HPTP)						0,4		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	600	100	25 125 150		118,2 118,2 117,6		ns
Rise time	t_r					25 125 150		10,2 12,4 13,4		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		173,6 200,4 205,6		ns
Fall time	t_f					25 125 150		82,85 96,38 106,77		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=11,6 µC Q_{rFWD}=17,27 µC Q_{rFWD}=19,18 µC				25 125 150		3,26 4,87 5,37		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		6,6 8,77 9,49		mWs

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(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25			40	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 2,5 W/mK (HPTP)						0,64		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=9387 A/µs d*i*/d*t*=7872 A/µs d*i*/d*t*=8350 A/µs	±15	600	100	25 125 150		178,25 165,9 164,61		A
Reverse recovery time	t_{rr}					25 125 150		149,24 311,54 339,17		ns
Recovered charge	Q_r					25 125 150		11,6 17,27 19,18		µC
Reverse recovered energy	E_{rec}					25 125 150		5,14 7,75 8,59		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		4044 2649 2147		A/µs

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	
Thermistor										
Static										
Rated resistance	R					25		1		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1670 Ω				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	

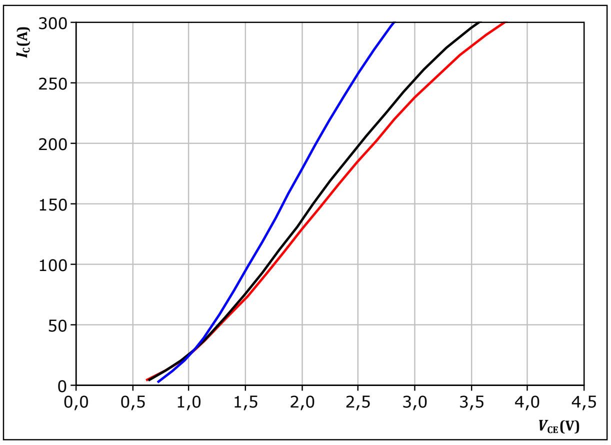
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

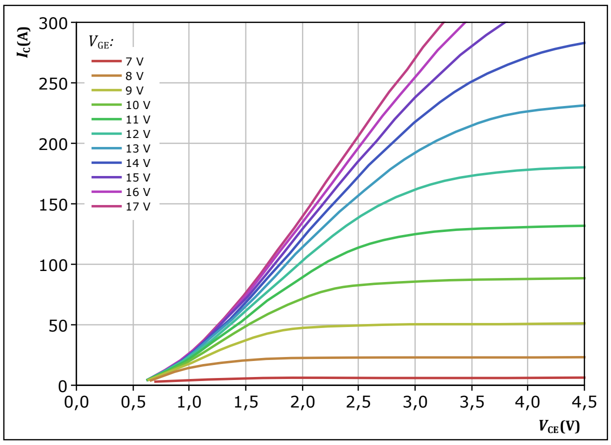


t_p =	250	μs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



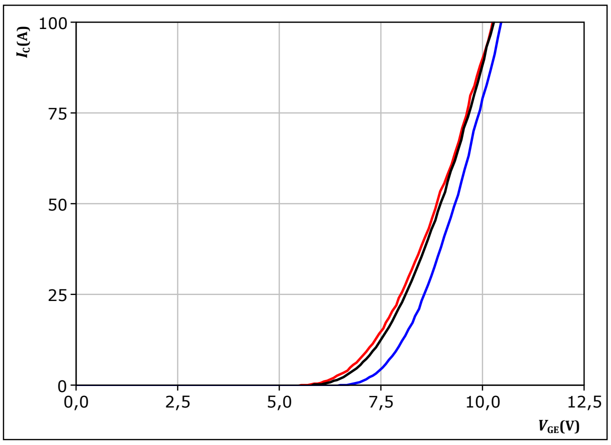
t_p =	250	μs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

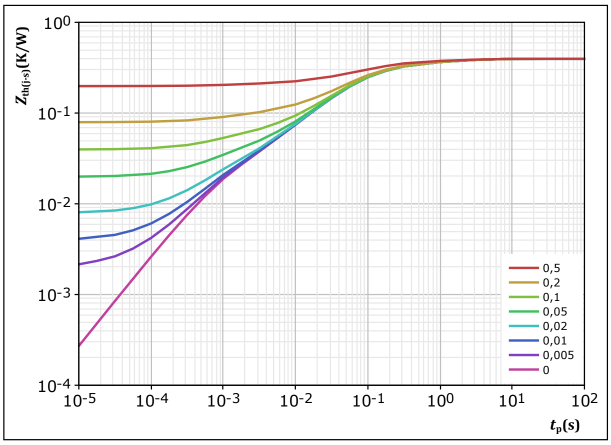


t_p =	250	μs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,396	K/W

IGBT thermal model values

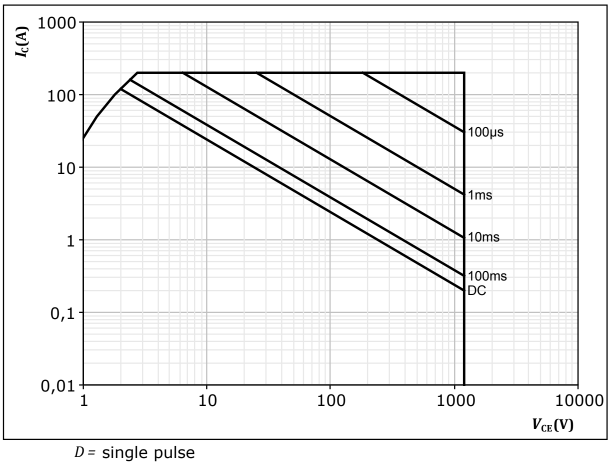
R (K/W)	τ (s)
3,71E-02	2,37E+00
7,39E-02	4,13E-01
2,19E-01	7,15E-02
4,88E-02	1,27E-02
1,74E-02	8,65E-04

Inverter Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})

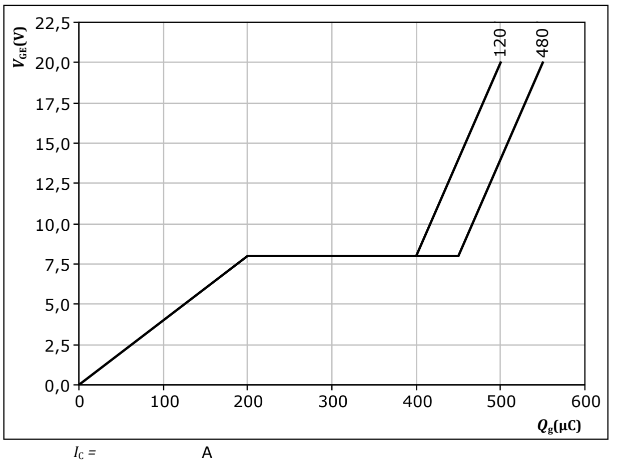


D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

figure 6. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



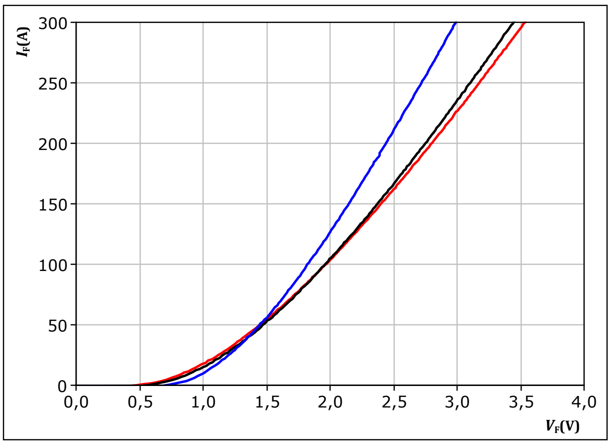
I_C =		A
T_j =	25	°C

Inverter Diode Characteristics

figure 7. FWD

Typical forward characteristics

I_F = f(V_F)



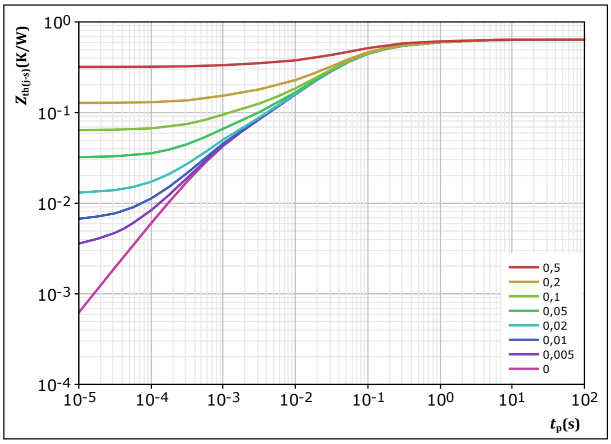
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 8. FWD

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,638 K/W

FWD thermal model values

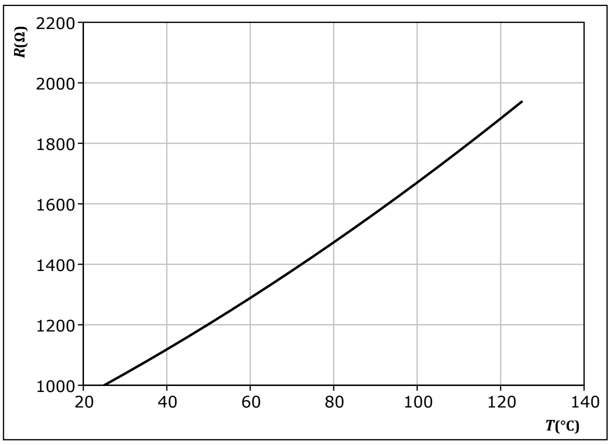
R (K/W)	τ (s)
5,42E-02	2,43E+00
9,66E-02	3,63E-01
3,34E-01	6,24E-02
1,12E-01	1,13E-02
4,07E-02	8,67E-04

Thermistor Characteristics

figure 9.	Thermistor

Typical PTC characteristic as function of temperature

$R_T = f(T)$

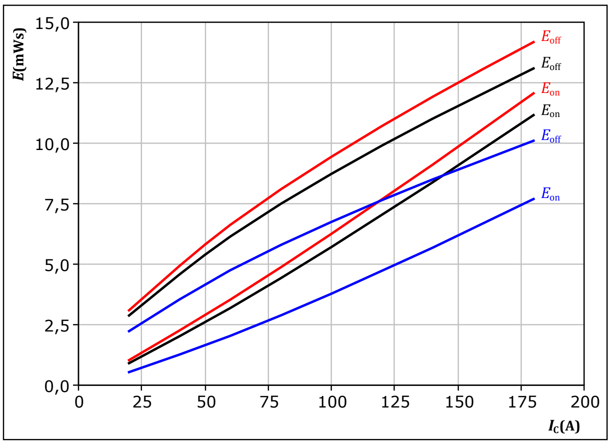


Inverter Switching Characteristics

figure 10. **IGBT**

Typical switching energy losses as a function of collector current

E = f(I_C)



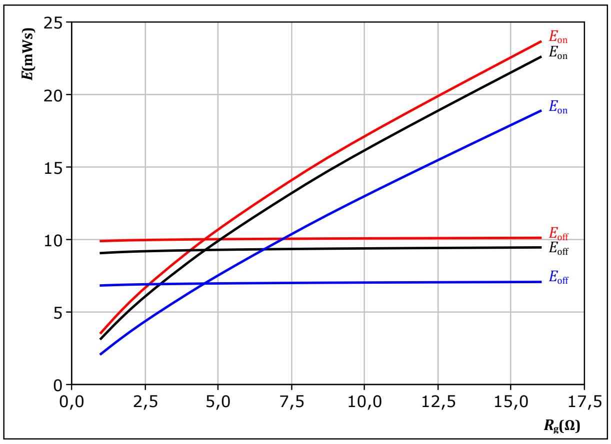
With an inductive load at

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 11. **IGBT**

Typical switching energy losses as a function of gate resistor

E = f(R_g)



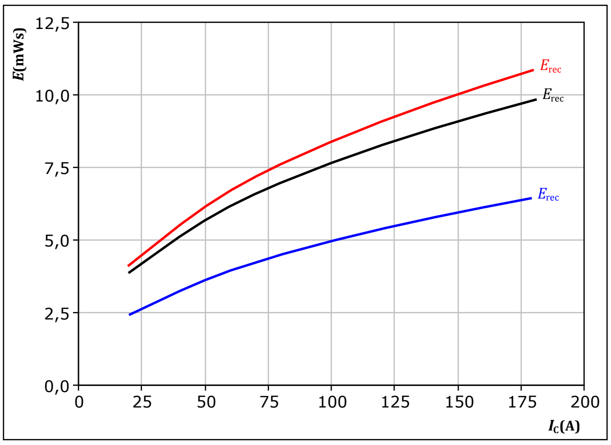
With an inductive load at

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

figure 12. **FWD**

Typical reverse recovered energy loss as a function of collector current

E_{rec} = f(I_C)



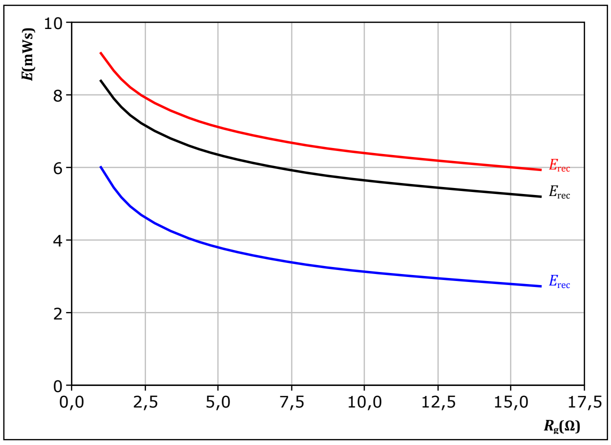
With an inductive load at

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

figure 13. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

E_{rec} = f(R_g)



With an inductive load at

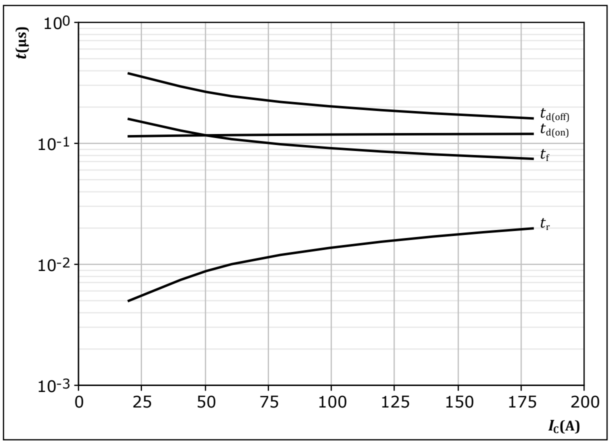
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	100	A		150 °C

Inverter Switching Characteristics

figure 14.	IGBT

Typical switching times as a function of collector current

t = f(I_C)



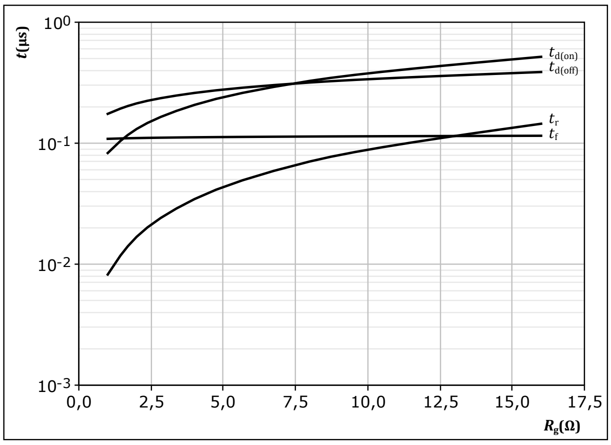
With an inductive load at

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

figure 15.	IGBT

Typical switching times as a function of gate resistor

t = f(R_g)



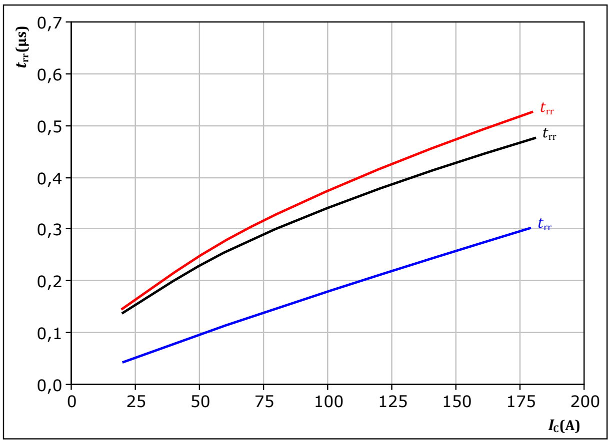
With an inductive load at

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

figure 16.	FWD

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

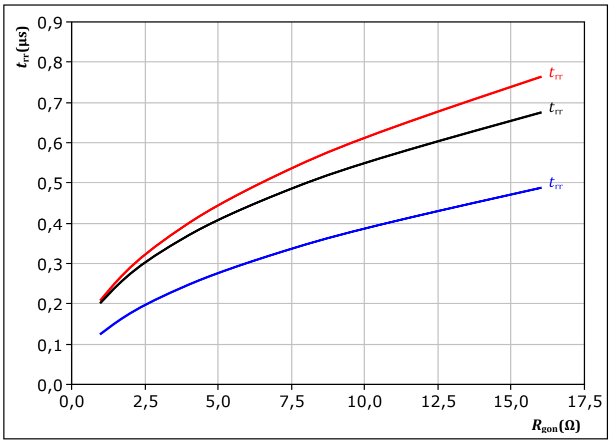
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 17.	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} =	±15	V
I_C =	100	A

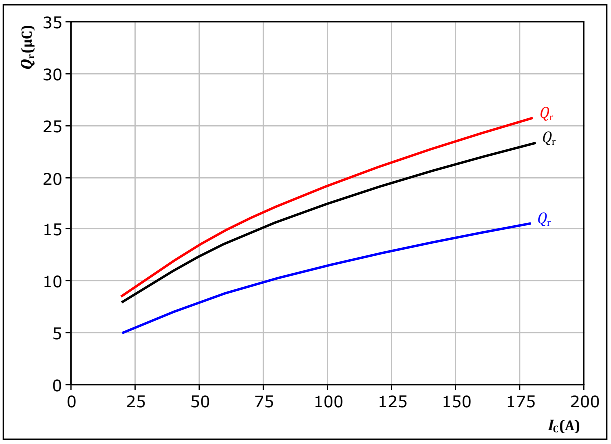
T_j: 25 °C, 125 °C, 150 °C

Inverter Switching Characteristics

figure 18. FWD

Typical recovered charge as a function of collector current

Q_r = f(I_C)



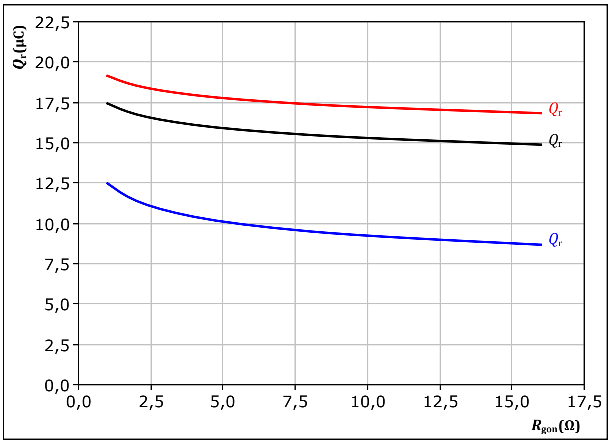
With an inductive load at

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

figure 19. FWD

Typical recovered charge as a function of turn on gate resistor

Q_r = f(R_{gon})



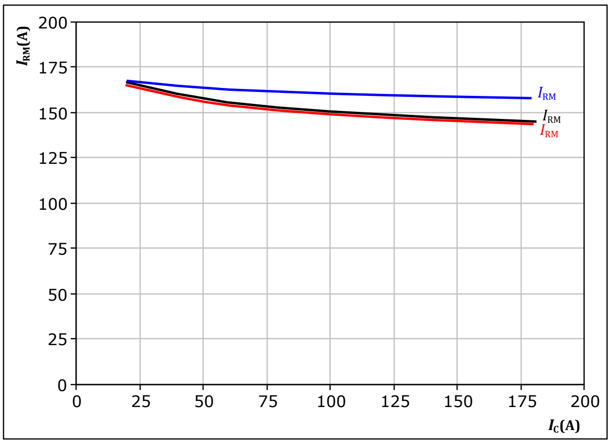
With an inductive load at

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

figure 20. FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



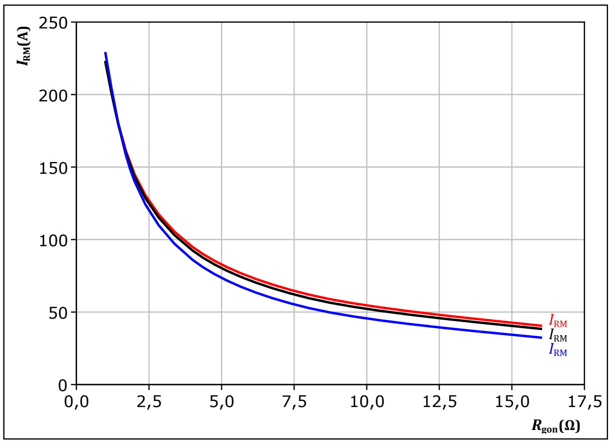
With an inductive load at

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

figure 21. FWD

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

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



With an inductive load at

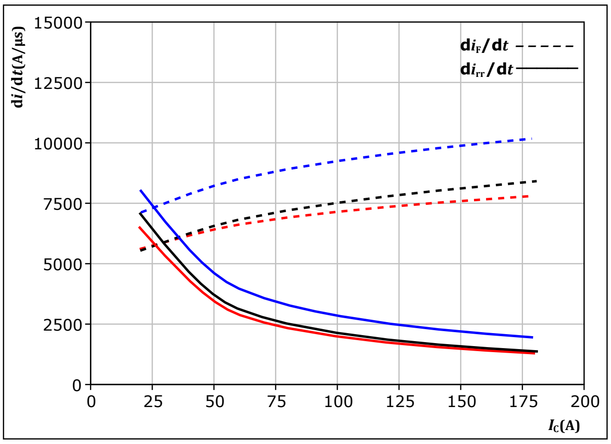
V_{CE} =	600	V	T_j:	25 °C / 125 °C / 150 °C
V_{GE} =	±15	V		
I_C =	100	A		

Inverter Switching Characteristics

figure 22. **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)



With an inductive load at

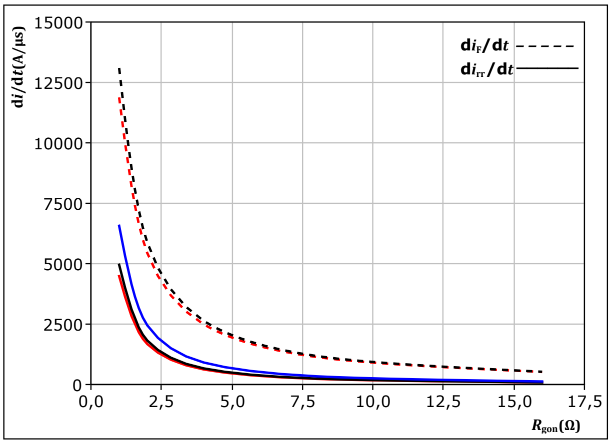
V_{CE} =	600	V	
V_{GE} =	±15	V	
R_{gon} =	2	Ω	

T_j: 25 °C, 125 °C, 150 °C

figure 23. **FWD**

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

di_F/dt, di_{rr}/dt = f(R_{gon})



With an inductive load at

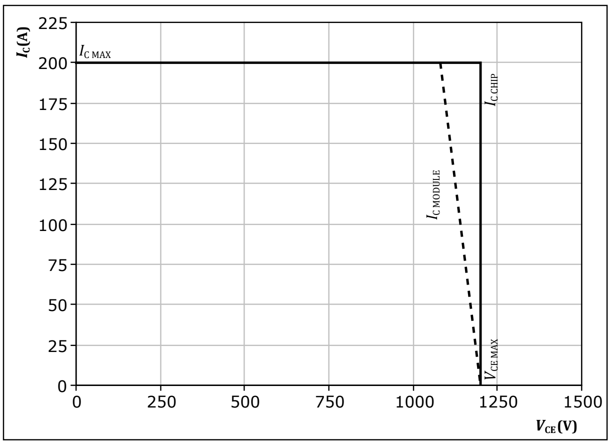
V_{CE} =	600	V	
V_{GE} =	±15	V	
I_C =	100	A	

T_j: 25 °C, 125 °C, 150 °C

figure 24. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At			
	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

Inverter Switching Definitions

figure 25. **IGBT**

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

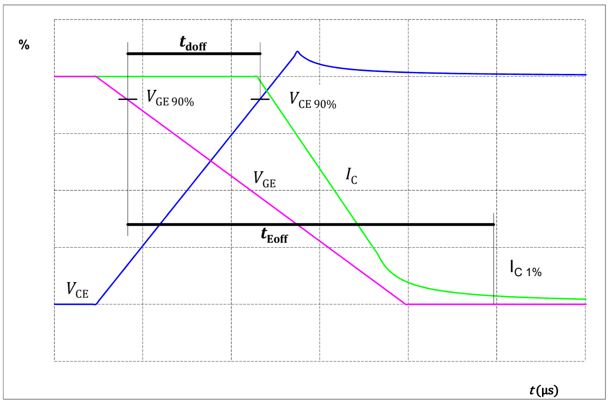


figure 26. **IGBT**

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

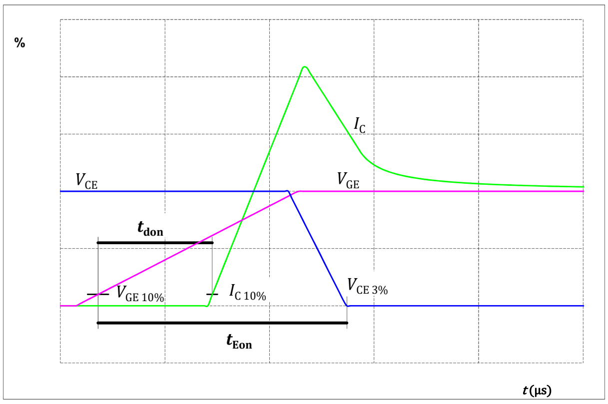


figure 27. **IGBT**

Turn-off Switching Waveforms & definition of t_f

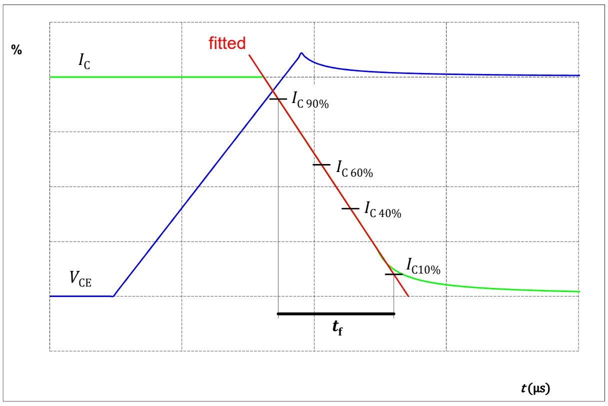
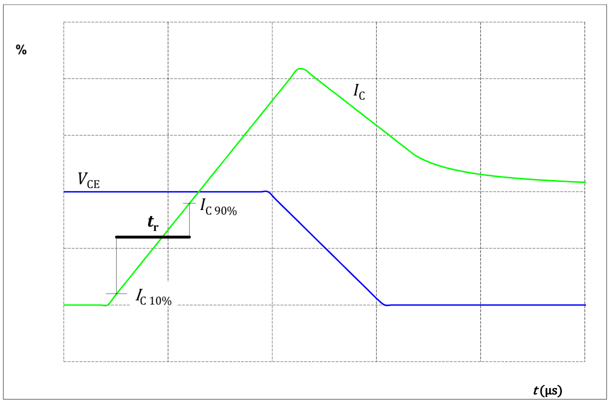


figure 28. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Inverter Switching Definitions

figure 29. **FWD**

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

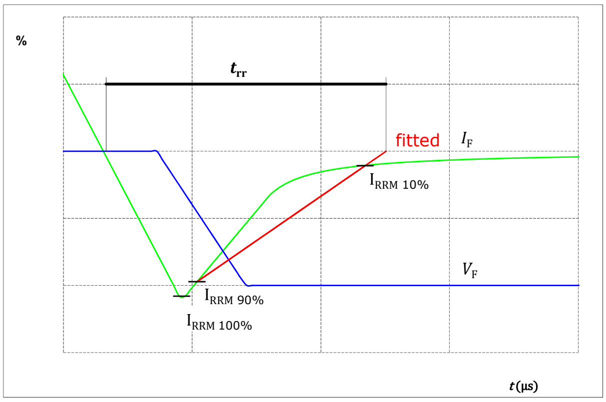
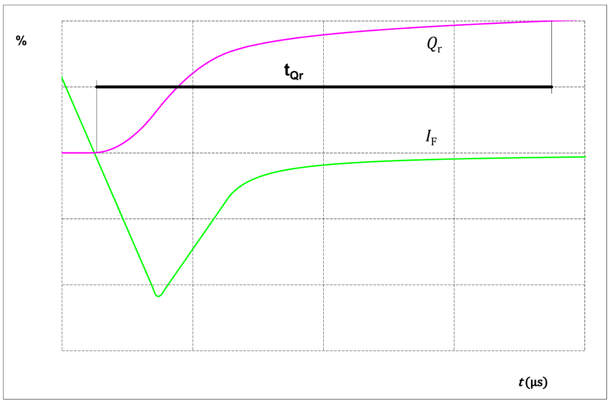


figure 30. **FWD**

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



Vincotech

80-M3126PA100M7-K828F70
datasheet

Ordering Code

Version	Ordering Code
With std lid (6.5mm height) + no thermal grease	80-M3126PA100M7-K828F70-/0A/
With thin lid (2.8mm height) + no thermal grease	80-M3126PA100M7-K828F70-/0B/
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)	80-M3126PA100M7-K828F70-/1A/
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)	80-M3126PA100M7-K828F70-/1B/
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)	80-M3126PA100M7-K828F70-/4A/
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)	80-M3126PA100M7-K828F70-/4B/
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)	80-M3126PA100M7-K828F70-/5A/
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)	80-M3126PA100M7-K828F70-/5B/

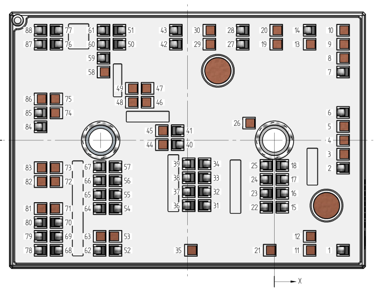
Marking

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

Outline

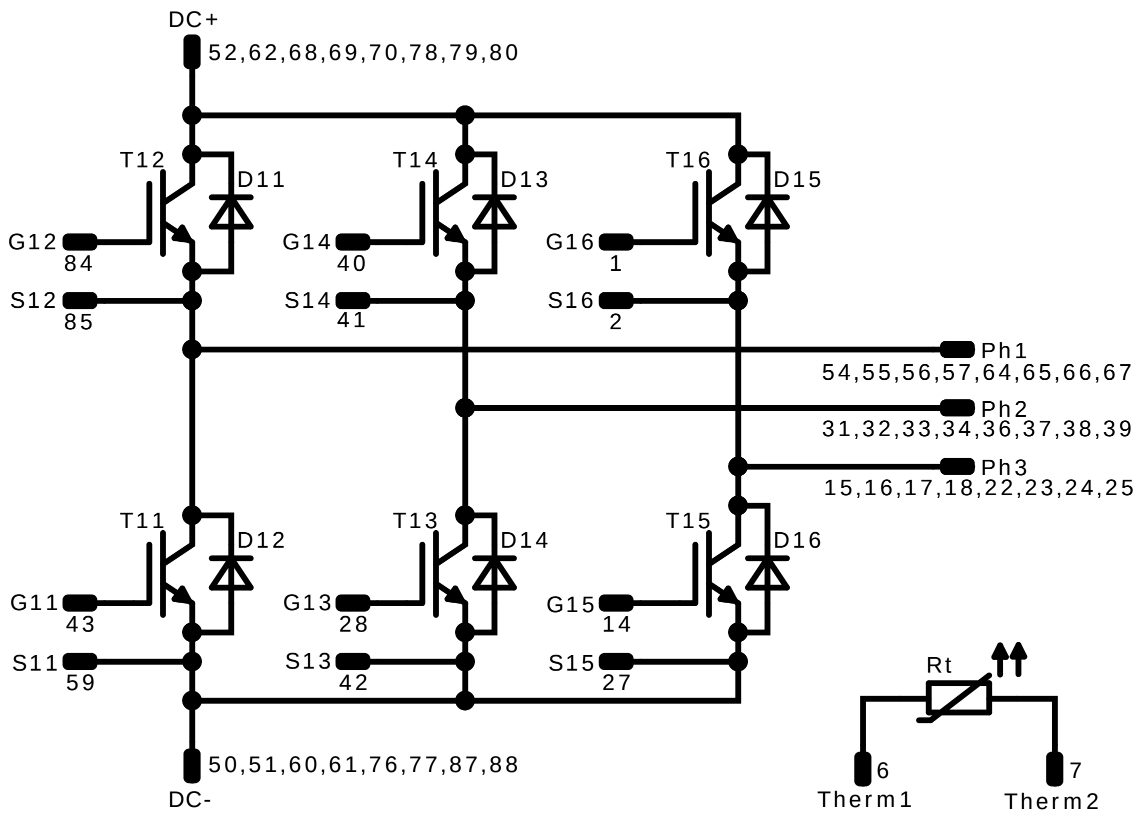
Pin table [mm]

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



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

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	PTC			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-M3126PA100M7-K828F70-D5-14	8 Mar. 2021	Update of pin table	