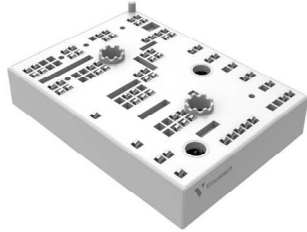
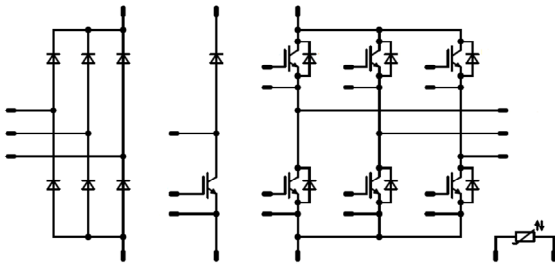




Vincotech

MiniSkiiP® PIM 3		1200 V / 75 A
Features • IGBT M7 with low V_{CEsat} and improved EMC behavior • Solder-free spring contact technology • Built-in PTC		MiniSkiiP® 3 housing 
Target applications • Industrial Drives		Schematic 
Types • 80-M312PMA075M7-K429A70		

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Inverter / Brake Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C		75	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	196	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum junction temperature	T_{jmax}		175	°C



Vincotech

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Inverter / Brake Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	83	A
Repetitive peak forward current	I_{FRM}		200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	149	W
Maximum junction temperature	T_{jmax}		175	°C

Rectifier Diode

Peak Repetitive Reverse Voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F		50	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	490	A
Surge current capability	I^2t		1200	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	93	W
Maximum Junction Temperature	T_{jmax}		150	°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* $t_p = 2\text{ s}$	5500	V
		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		> 200	

*100 % tested in production



Vincotech

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 / Brake Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0075	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		75	25 125 150		1,55 1,70 1,75	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							4		Ω
Input capacitance	C_{ies}		0	10		25		16000		pF
Output capacitance	C_{oes}							480		
Reverse transfer capacitance	C_{res}							190		
Gate charge	Q_g		15	600	75	25		490		nC

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5 \text{ W/mK}$ (HPTP)						0,49		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{goff} = 2 \Omega$ $R_{gon} = 2 \Omega$	± 15	600	75	25 125 150		197 208 212		ns
Rise time	t_r					25 125 150		29 38 39		
Turn-off delay time	$t_{d(off)}$					25 125 150		203 233 242		
Fall time	t_f					25 125 150		86 113 111		
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 8,5 \mu\text{C}$ $Q_{tFWD} = 13,4 \mu\text{C}$ $Q_{tFWD} = 15,3 \mu\text{C}$				25 125 150		5,56 7,82 8,50		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		5,08 6,80 7,29		



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datasheet

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 / Brake 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	$R_{th(j-s)}$	$\lambda_{paste} = 2,5 \text{ W/mK}$ (HPTP)						0,64		K/W
-------------------------------------	---------------	--	--	--	--	--	--	------	--	-----

Dynamic

Peak recovery current	I_{RRM}	$di/dt = 2268 \text{ A/}\mu\text{s}$ $di/dt = 1969 \text{ A/}\mu\text{s}$ $di/dt = 1970 \text{ A/}\mu\text{s}$	± 15	600	75	25 125 150		75 77 78		A
Reverse recovery time	t_{rr}					25 125 150		278 432 459		ns
Recovered charge	Q_r					25 125 150		8,54 13,39 15,31		μC
Reverse recovered energy	E_{rec}					25 125 150		3,20 5,19 6,00		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		802 614 544		A/ μs

Rectifier Diode

Static

Forward voltage	V_F				50	25 125 150		1,14 1,08 1,07	1,8	V
Reverse leakage current	I_r			1600		25 145			50 1100	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5 \text{ W/mK}$ (HPTP)						0,75		K/W
-------------------------------------	---------------	--	--	--	--	--	--	------	--	-----

Thermistor

Rated resistance	R					25		1		k Ω
Deviation of R_{100}	$\Delta R/R$	$R_{100} = 1670 \Omega$				100	-2		+2	%
R_{100}	R					100		1670		Ω
Power dissipation constant						25		0,76		mW/K
A-value	$A_{(25/50)}$					25		$7,635 \cdot 10^{-3}$		1/K
B-value	$B_{(25/100)}$					25		$1,731 \cdot 10^{-5}$		1/K ²
Vincotech PTC Reference									E	



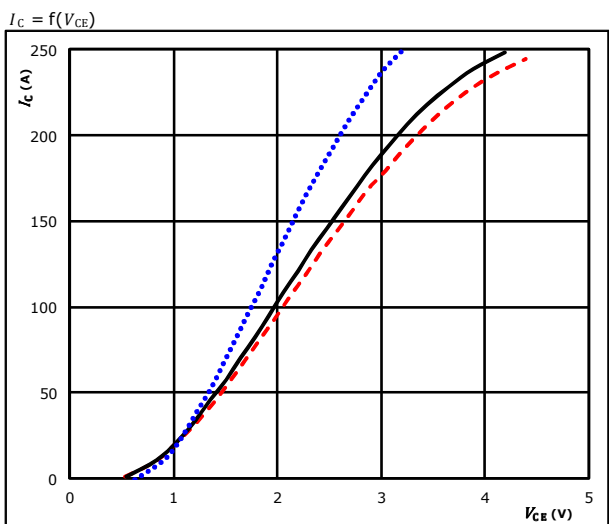
Vincotech

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Inverter / Brake Switch Characteristics

figure 1. IGBT

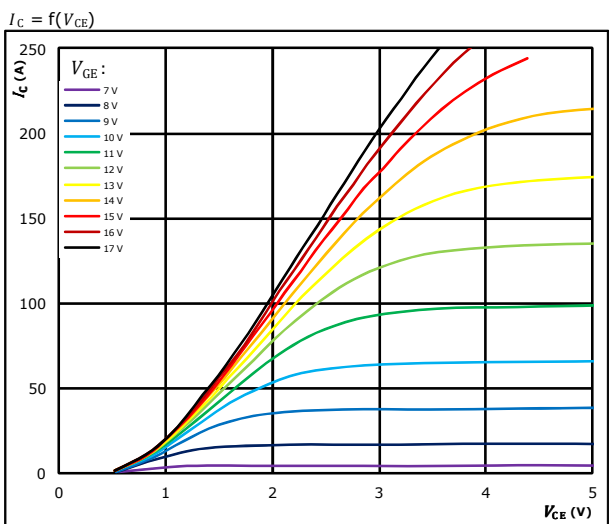
Typical output characteristics



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

figure 2. IGBT

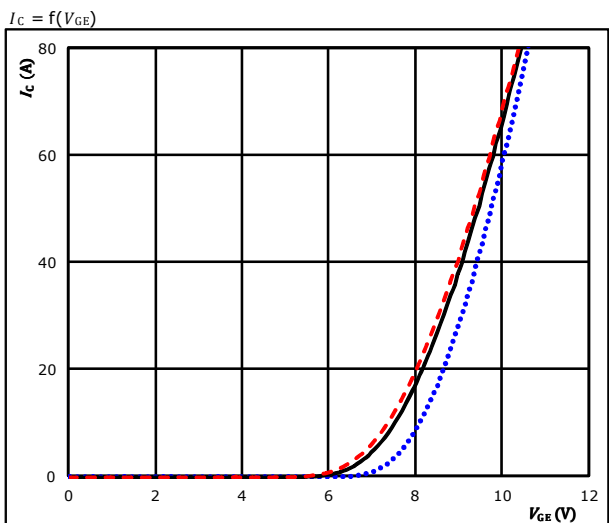
Typical output characteristics



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

figure 3. IGBT

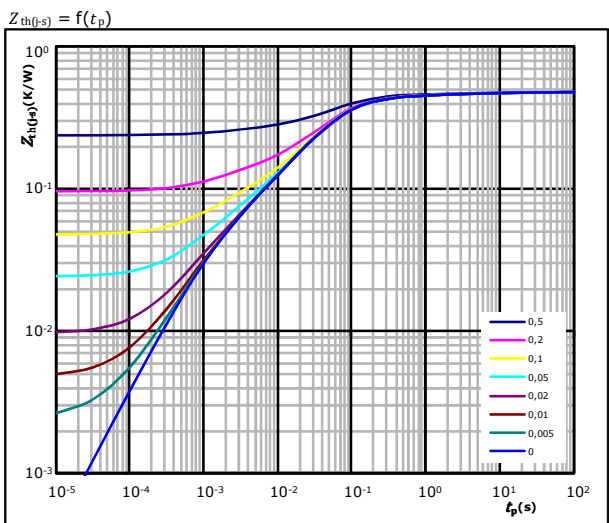
Typical transfer characteristics



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

figure 4. IGBT

Transient thermal impedance as function of pulse duration



$D = t_p / T$
 $R_{th(j-s)} = 0,49 \text{ K/W}$
IGBT thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
1,81E-02	3,62E+00
3,38E-02	3,08E-01
8,98E-02	5,50E-02
2,60E-01	1,84E-02
4,85E-02	3,57E-03
3,25E-02	5,49E-04
2,24E-03	2,65E-04



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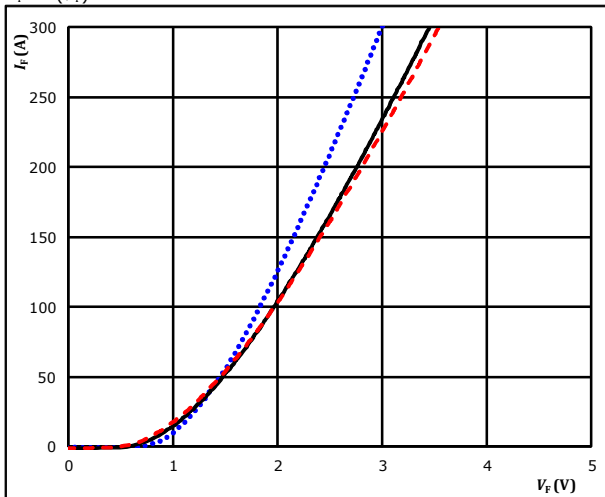
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Inverter / Brake Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

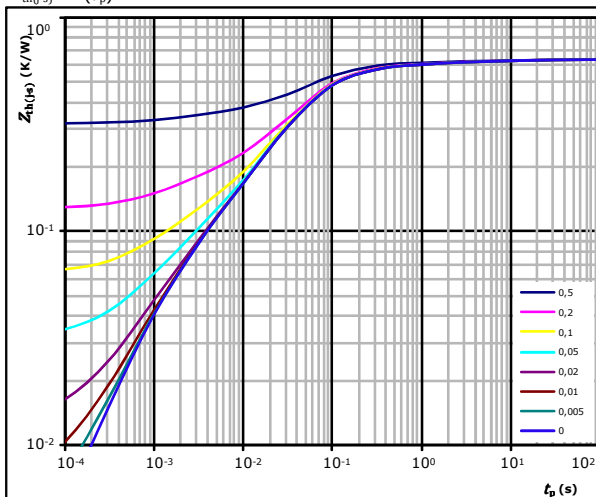


$t_p = 250 \mu s$
 T_j : 25 °C (blue dotted line)
 125 °C (black solid line)
 150 °C (red dashed line)

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,64 \text{ K/W}$

FWD thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
2,37E-02	4,76E+00
4,45E-02	4,05E-01
1,18E-01	7,23E-02
3,42E-01	2,42E-02
6,37E-02	4,70E-03
4,28E-02	7,22E-04
2,95E-03	3,48E-04



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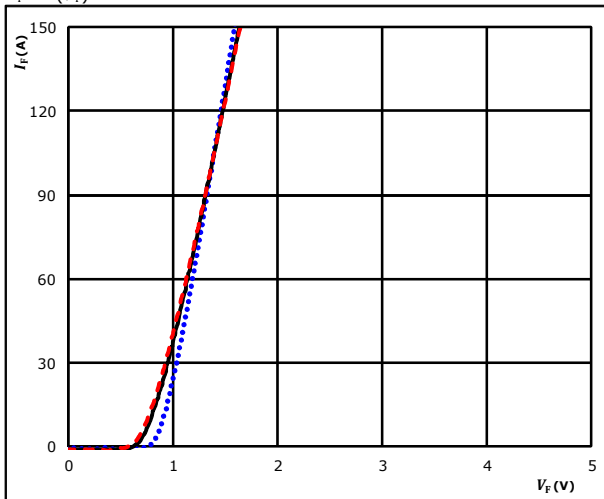
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Rectifier Diode Characteristics

figure 1. Rectifier

Typical forward characteristics

$$I_F = f(V_F)$$

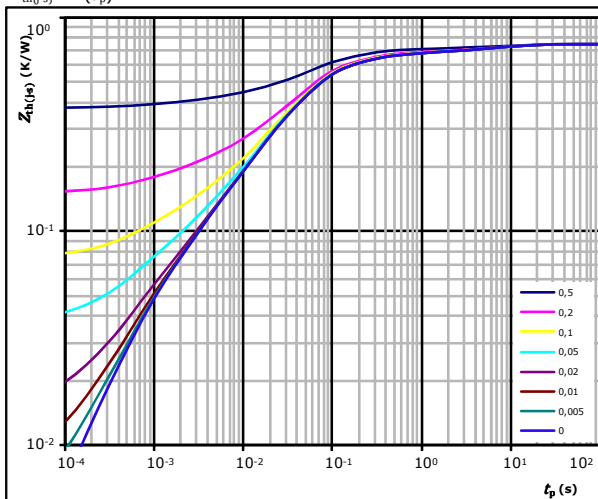


$t_p =$ 250 μ s
 T_j : 25 °C
125 °C ———
150 °C - - - -

figure 2. Rectifier

Transient thermal impedance as a function of pulse width

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



$$D = \frac{t_p}{T}$$

$$R_{th(j-s)} = 0,75 \text{ K/W}$$

Rectifier thermal model values

R (K/W)	τ (s)
6,99E-02	4,80E+00
7,97E-02	2,69E-01
3,54E-01	4,00E-02
1,62E-01	1,46E-02
5,21E-02	2,38E-03
3,21E-02	4,72E-04

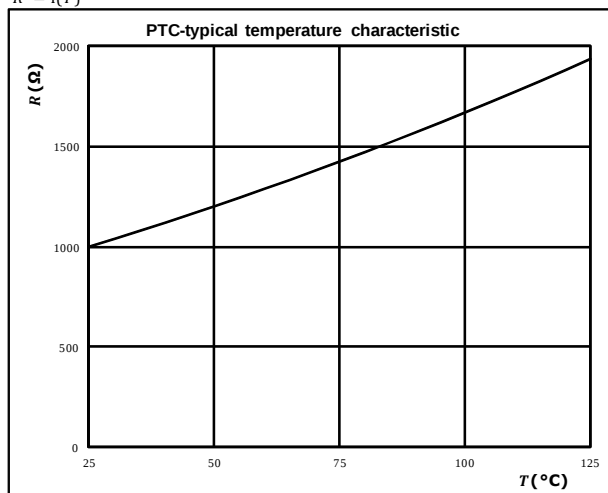


Thermistor Characteristics

figure 1. Thermistor

**Typical PTC characteristic
as a function of temperature**

$$R = f(T)$$





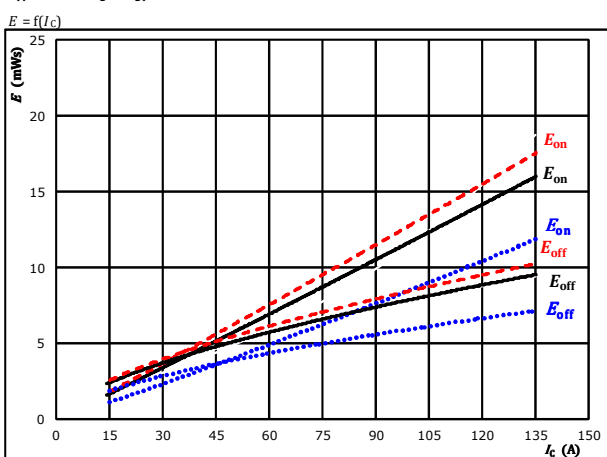
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datasheet

Inverter / Brake Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current



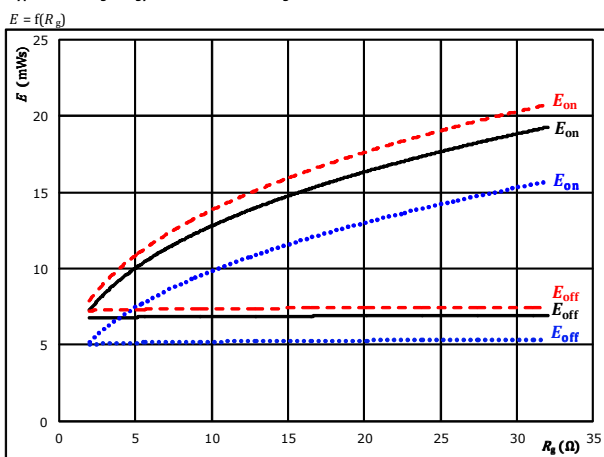
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ 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



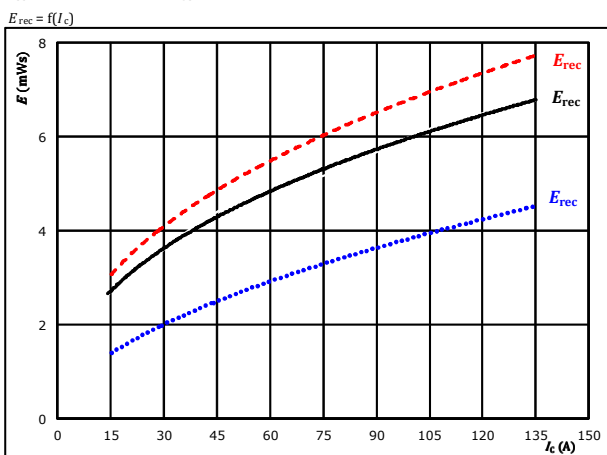
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ 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



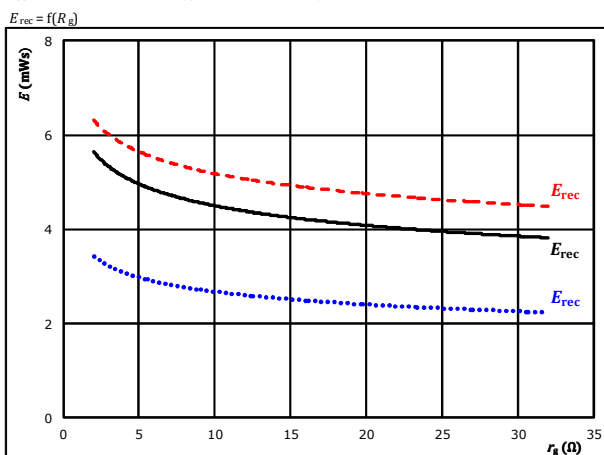
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ 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

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 75$ A

T_J : 25 °C (blue dotted)
125 °C (black solid)
150 °C (red dashed)



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Inverter / Brake Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$

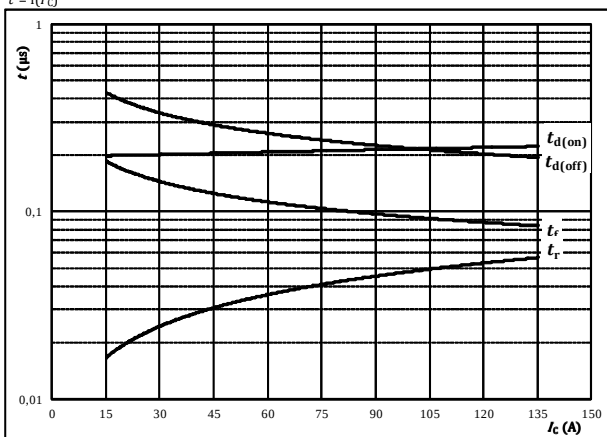


figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$

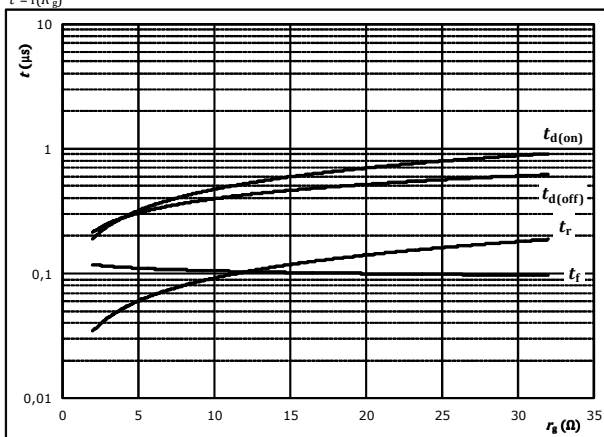


figure 7. FWD

Typical reverse recovery time as a function of collector current

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

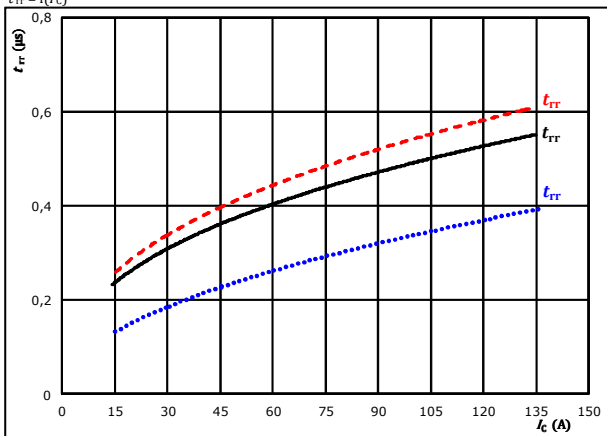
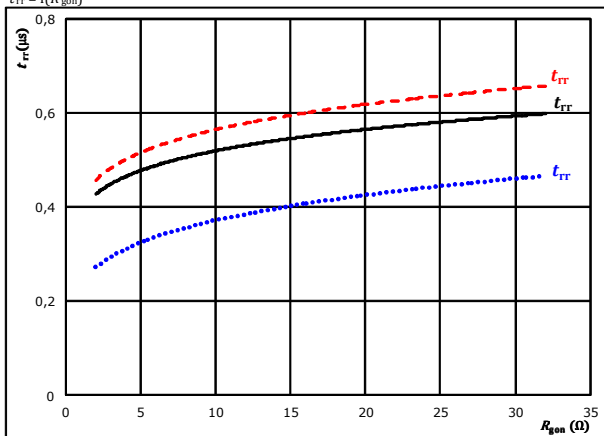


figure 8. FWD

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

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





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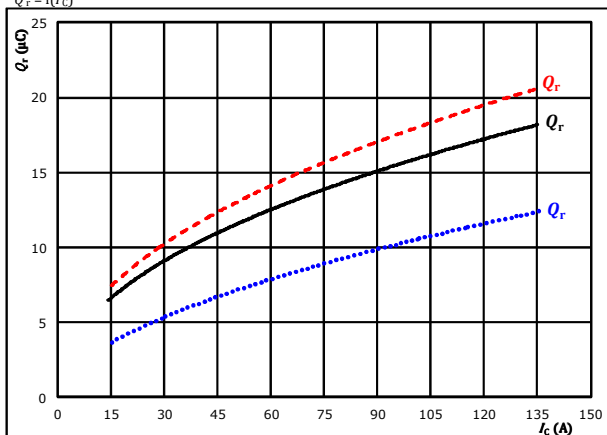
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datasheet

Inverter / Brake Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_C)$$

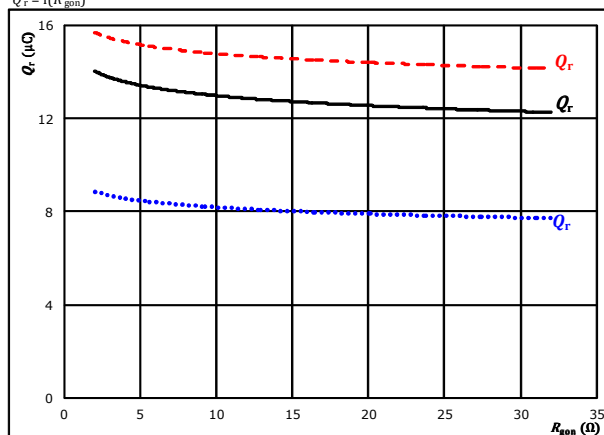


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $T_j: 25$ °C
 125 °C ———
 150 °C - - - - -

figure 10. FWD

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

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

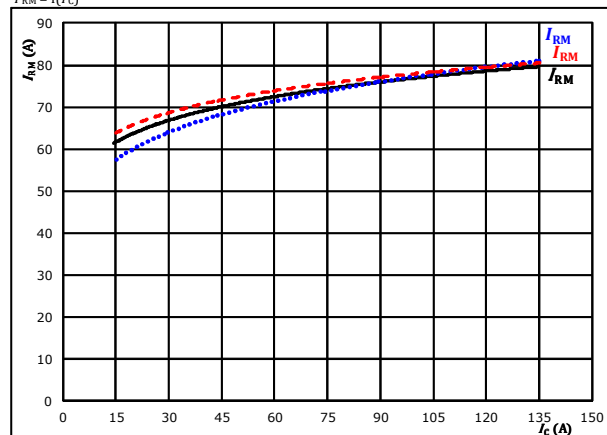


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 75$ A
 $T_j: 25$ °C
 125 °C ———
 150 °C - - - - -

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

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

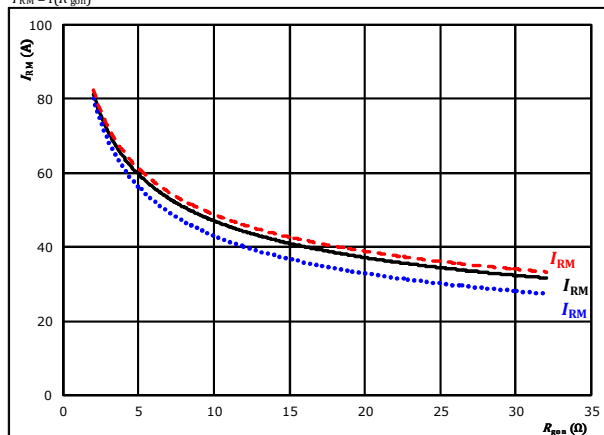


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $T_j: 25$ °C
 125 °C ———
 150 °C - - - - -

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
 $V_{GE} = \pm 15$ V
 $I_C = 75$ A
 $T_j: 25$ °C
 125 °C ———
 150 °C - - - - -



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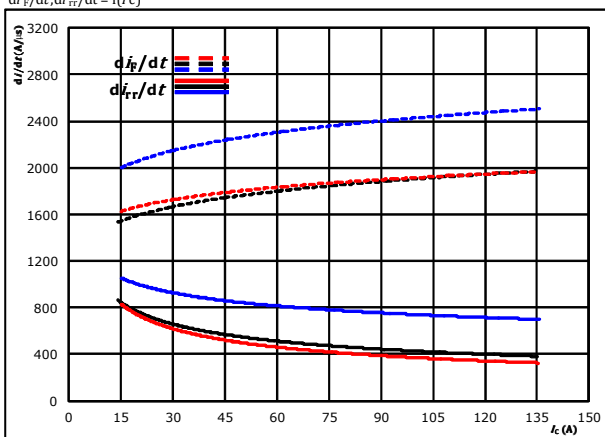
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datasheet

Inverter / Brake Switching Characteristics

figure 13. FWD

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

$$di_f/dt, di_{rr}/dt = f(I_c)$$

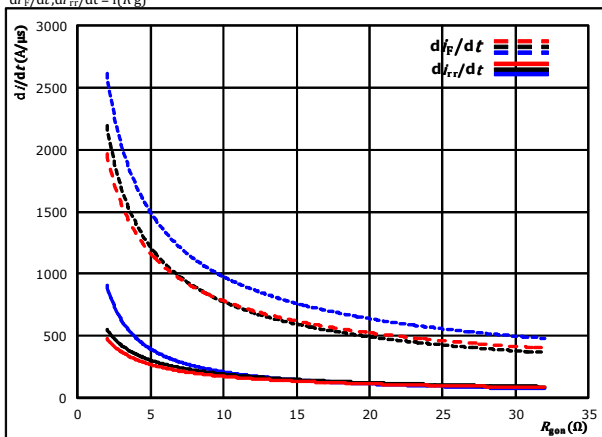


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{g0n} = 2$ Ω
 $T_j = 25$ °C
125 °C
150 °C

figure 14. FWD

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

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

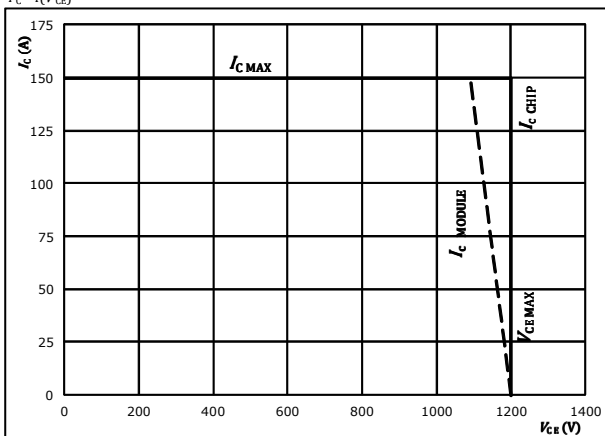


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 75$ A
 $T_j = 25$ °C
125 °C
150 °C

figure 15. IGBT

Reverse bias safe operating area

$$I_c = f(V_{CB})$$



At $T_j = 175$ °C
 $R_{g0n} = 2$ Ω
 $R_{g0ff} = 2$ Ω



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Inverter / Brake Switching Definitions

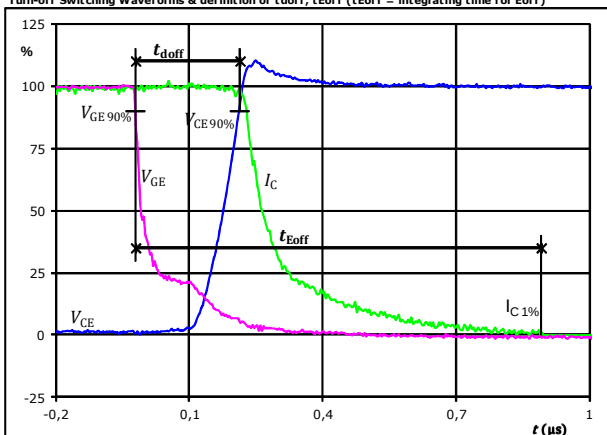
General conditions

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})

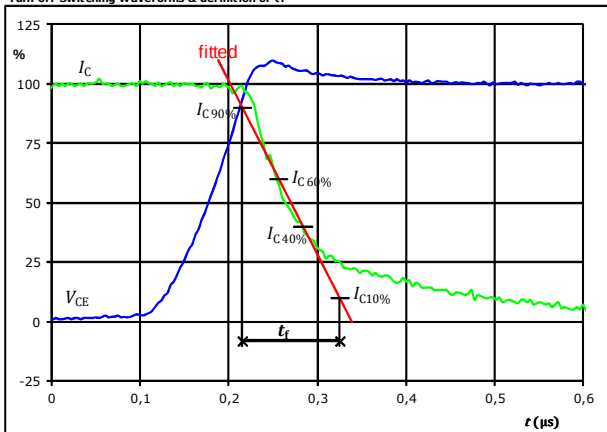


$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	76	A
$t_{doff} =$	0,233	μs
$t_{Eoff} =$	0,913	μs

figure 3.

IGBT

Turn-off Switching Waveforms & definition of t_f

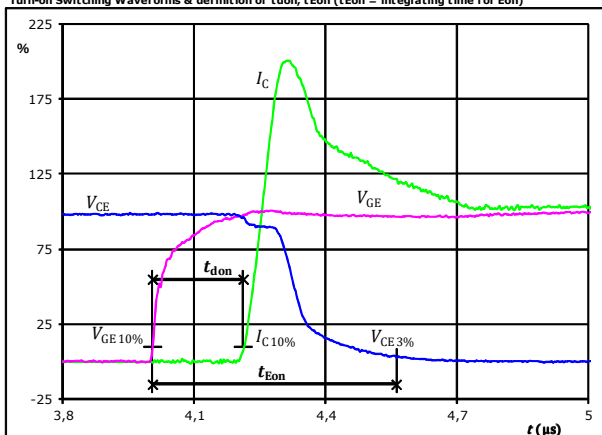


$V_C(100\%) =$	600	V
$I_C(100\%) =$	76	A
$t_f =$	0,113	μs

figure 2.

IGBT

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

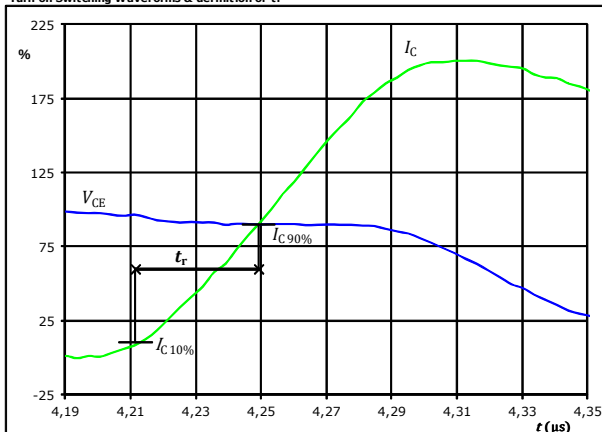


$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	76	A
$t_{don} =$	0,208	μs
$t_{Eon} =$	0,556	μs

figure 4.

IGBT

Turn-on Switching Waveforms & definition of t_r



$V_C(100\%) =$	600	V
$I_C(100\%) =$	76	A
$t_r =$	0,038	μs



Vincotech

80-M312PMA075M7-K429A70 datasheet

Inverter / Brake Switching Characteristics

figure 5. IGBT

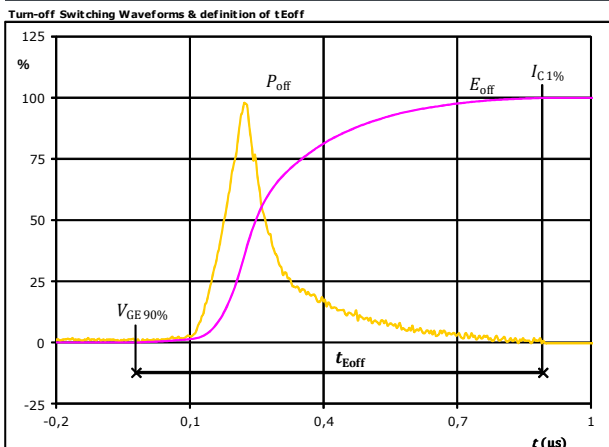


figure 6. IGBT

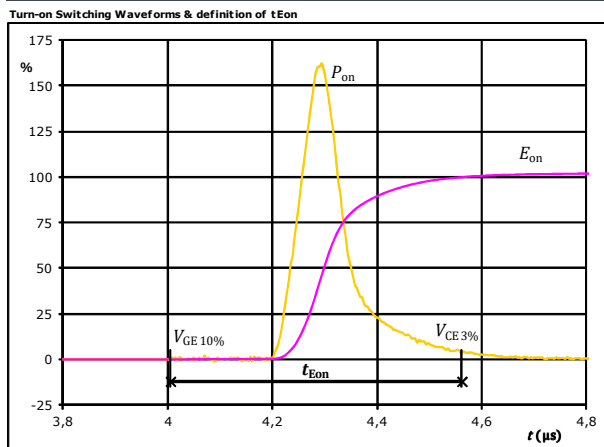
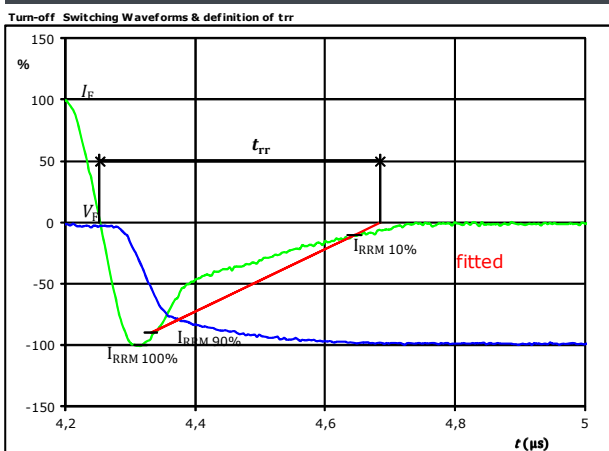


figure 7. FWD



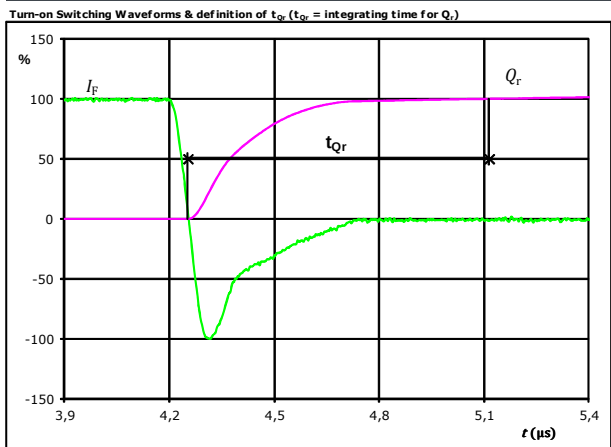


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datasheet

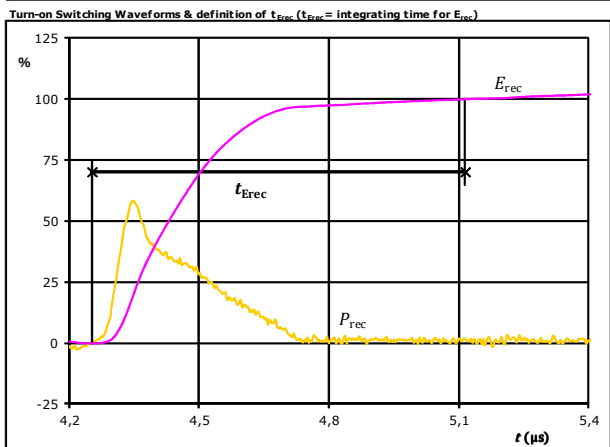
Inverter / Brake Switching Characteristics

figure 8. FWD



$I_F(100\%) = 76 \text{ A}$
 $Q_r(100\%) = 13,39 \text{ } \mu\text{C}$
 $t_{Qr} = 0,86 \text{ } \mu\text{s}$

figure 9. FWD



$P_{rec}(100\%) = 45,36 \text{ kW}$
 $E_{rec}(100\%) = 5,19 \text{ mJ}$
 $t_{Erec} = 0,86 \text{ } \mu\text{s}$



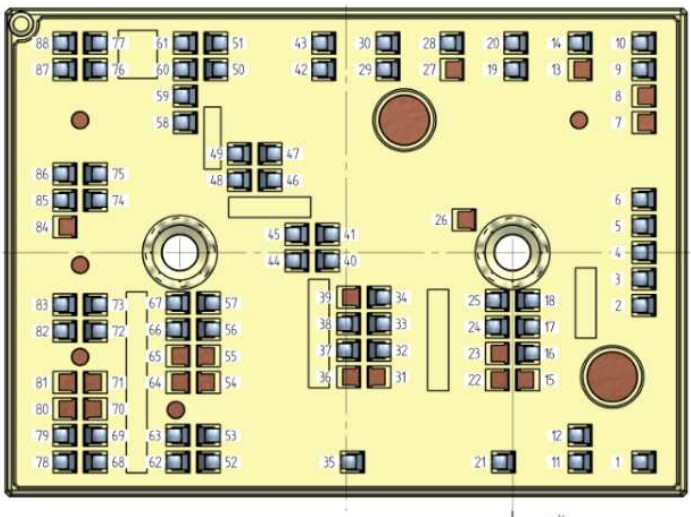
80-M312PMA075M7-K429A70

datasheet

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Ordering Code & Marking						
Version			Ordering Code			
With std lid (6.5mm height) + no thermal grease			80-M312PMA075M7-K429A70-/0A/			
With thin lid (2.8mm height) + no thermal grease			80-M312PMA075M7-K429A70-/0B/			
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)			80-M312PMA075M7-K429A70-/1A/			
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)			80-M312PMA075M7-K429A70-/1B/			
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)			80-M312PMA075M7-K429A70-/4A/			
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)			80-M312PMA075M7-K429A70-/4B/			
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)			80-M312PMA075M7-K429A70-/5A/			
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)			80-M312PMA075M7-K429A70-/5B/			
		Text	Name	Date code	UL & VIN	Lot
			NN-NNNNNNNNNNNNNN-TTTTTWW	WWYY	UL VIN	LLLLL
		Datanatrix	Type&Ver	Lot number	Serial	Date code
			TTTTTTVV	LLLLL	SSSS	WWYY

Outline							
PCB pad table [mm]				PCB pad table [mm]			
Pin	X	Y	Function	Pin	X	Y	Function
1	15,83	-25,3	G16	45	-25,9	2,2	DC+Br
2	15,83	-6,4	S16	46	10,82	8,74	Br
3	15,83	-3,2	Ph3	47	10,82	11,94	Br
4	15,83	0	Ph3	48	-32,82	8,74	Br
5	15,83	3,2	Ph3	49	-32,82	11,94	Br
6	15,83	6,4	Ph3	50	4,32	22,1	DC-Br
7	Not assembled			51	4,32	25,3	DC-Br
8	Not assembled			52	3,42	-25,3	DC+rect
9	15,83	22,1	G15	53	3,42	-22,1	DC+rect
10	15,83	25,3	S15	54	Not assembled		
11	8,13	-25,3	Therm2	55	Not assembled		
12	8,13	-22,1	Therm1	56	3,42	-9,3	DC+Inv
13	Not assembled			57	3,42	-6,1	DC+Inv
14	8,13	25,3	DC-Inv	58	-39,32	15,7	G27
15	Not assembled			59	-39,32	18,9	S27
16	41,82	-12,18	S14	60	-39,32	22,1	DC-Br
17	41,82	-8,98	Ph2	61	-39,32	25,3	DC-Br
18	41,82	-5,79	Ph2	62	-40,22	-25,3	DC+rect
19	0,43	22,1	G13	63	-40,22	-22,1	DC+rect
20	0,43	25,3	S13	64	Not assembled		
21	-1,07	-25,3	G14	65	Not assembled		
22	Not assembled			66	-40,22	-9,3	DC+Inv
23	Not assembled			67	-40,22	-6,09	DC+Inv
24	-1,82	-8,98	Ph2	68	-10,18	-25,3	ACIn1
25	-1,82	-5,79	Ph2	69	-10,18	-22,1	ACIn1
26	Not assembled			70	Not assembled		
27	Not assembled			71	Not assembled		
28	-7,27	25,3	DC-Inv	72	-10,18	-9,5	ACIn2
29	-14,97	22,1	G11	73	-10,18	-6,3	ACIn2
30	-14,97	25,3	S11	74	-10,18	6,3	DC-rect
31	Not assembled			75	-10,18	9,5	DC-rect
32	23,95	-11,82	Ph1	76	-10,18	22,1	ACIn3
33	23,95	-8,63	Ph1	77	-10,18	25,3	ACIn3
34	23,95	-5,42	S12	78	-53,82	-25,3	ACIn1
35	-19,22	-25,3	G12	79	-53,82	-22,1	ACIn1
36	Not assembled			80	Not assembled		
37	-19,7	-11,82	Ph1	81	Not assembled		
38	-19,7	-8,62	Ph1	82	-53,82	-9,5	ACIn2
39	Not assembled			83	-53,82	-6,3	ACIn2
40	17,74	-1	DC+Br	84	Not assembled		
41	17,74	2,2	DC+Br	85	-53,82	6,3	DC-rect
42	-22,67	22,1	DC-Inv	86	-53,82	9,5	DC-rect
43	-22,67	25,3	DC-Inv	87	-53,82	22,1	ACIn3
44	-25,9	-1	DC+Br	88	-53,82	25,3	ACIn3

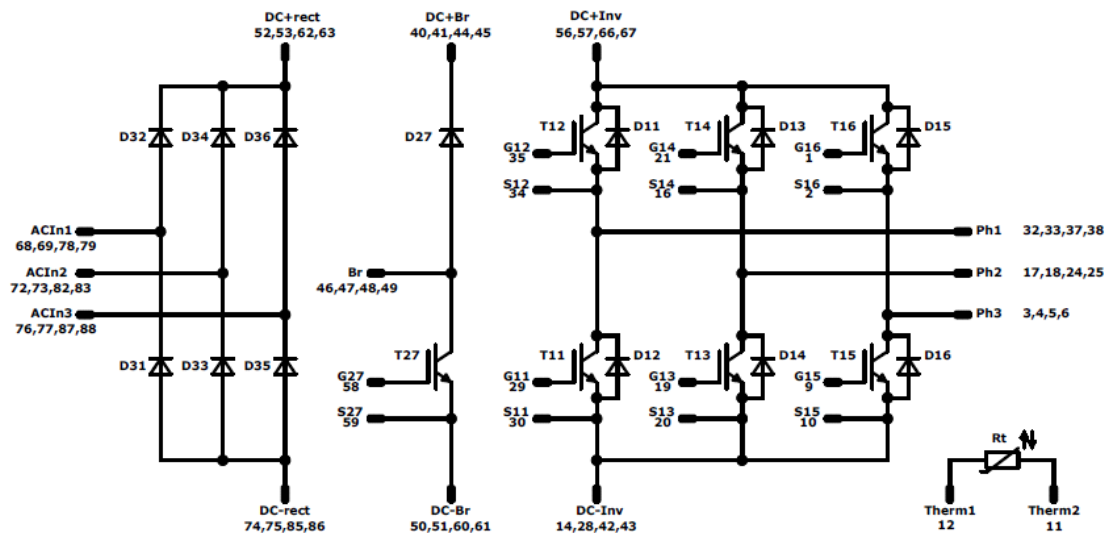


Pad positions refers to center point.
For more informations on pad design please see package data.



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Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11,T12,T13 T14,T15,T16	IGBT	1200 V	75 A	Inverter Switch	
D11,D12,D13 D14,D15,D16	FWD	1200 V	100 A	Inverter Diode	
T27	IGBT	1200 V	75 A	Brake Switch	
D27	FWD	1200 V	100 A	Brake Diode	
D31,D32,D33 D34,D35,D36	Diode	1600 V	50 A	Rectifier Diode	
Rt	Thermistor			Thermistor	



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80-M312PMA075M7-K429A70
datasheet

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.

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-M312PMA075M7-K429A70-D3-14	12 Feb. 2019	Rectifier V_{fmax} corrected	4

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