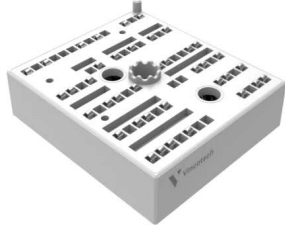
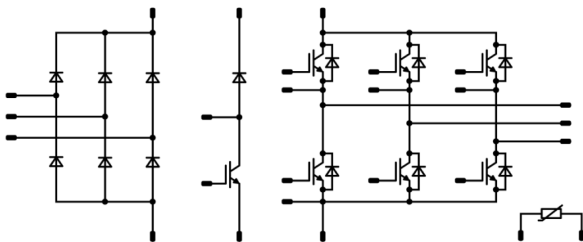




Vincotech

MiniSKiP® PIM 2		1200 V / 25 A
Features • IGBT M7 with low V_{CEsat} and improved EMC behavior • Solder-free spring contact technology • Built-in PTC		MiniSKiP® 2 housing 
Target applications • Industrial Drives		Schematic 
Types • 80-M212PMA025M7-K229A70		

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		25	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	99	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		25	A
Repetitive peak forward current	I_{FRM}	T_j limited by T_{jmax}	50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	75	W
Maximum junction temperature	T_{jmax}		175	°C

Rectifier Diode

Peak Repetitive Reverse Voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F		35	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	270	A
Surge current capability	I_{st}		370	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	64	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



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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0025	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		25	25 125 150		1,65 1,89 1,95	1,95	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			70	µA
Gate-emitter leakage current	I_{GES}		20	0		25			500	nA
Input capacitance	C_{ies}		0	10		25		4800		pF
Output capacitance	C_{oes}							170		
Reverse transfer capacitance	C_{res}							57		
Gate charge	Q_g		15	600	25	25		180		nC

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5 \text{ W/mK}$ (HPTP)						0,96		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{goff} = 16 \Omega$ $R_{gon} = 16 \Omega$	± 15	600	25	25 125 150		147 149 145		ns
Rise time	t_r					25 125 150		29 33 34		
Turn-off delay time	$t_{d(off)}$					25 125 150		171 191 196		
Fall time	t_f					25 125 150		95 110 115		
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 2,5 \mu C$ $Q_{tFWD} = 3,9 \mu C$ $Q_{tFWD} = 4,3 \mu C$				25 125 150		2,06 2,66 2,82		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		1,67 2,18 2,29		



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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 / Brake Diode

Static

Forward voltage	V_F				25	25 125 150		1,63 1,70 1,69	2,1	V
Reverse leakage current	I_R			1200		25			35	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5$ W/mK (HPTP)						1,26		K/W
-------------------------------------	---------------	-------------------------------------	--	--	--	--	--	------	--	-----

Dynamic

Peak recovery current	I_{RRM}	$di/dt = 645$ A/μs $di/dt = 673$ A/μs $di/dt = 633$ A/μs	± 15	600	25	25 125 150		21 23 23		A
Reverse recovery time	t_{rr}					25 125 150		254 367 404		ns
Recovered charge	Q_r					25 125 150		2,54 3,88 4,28		μC
Reverse recovered energy	E_{rec}					25 125 150		0,88 1,45 1,61		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		217 134 132		A/μs

Rectifier Diode

Static

Forward voltage	V_F				35	25 125	0,8	1,17 1,13	1,6	V
Reverse leakage current	I_r			1600		25 145			50 1100	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5$ W/mK (HPTP)						1,10		K/W
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80-M212PMA025M7-K229A70

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	

Thermistor

Rated resistance	R					25		1		kΩ
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	



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80-M212PMA025M7-K229A70 datasheet

Inverter / Brake Switch Characteristics

figure 1. IGBT

Typical output characteristics

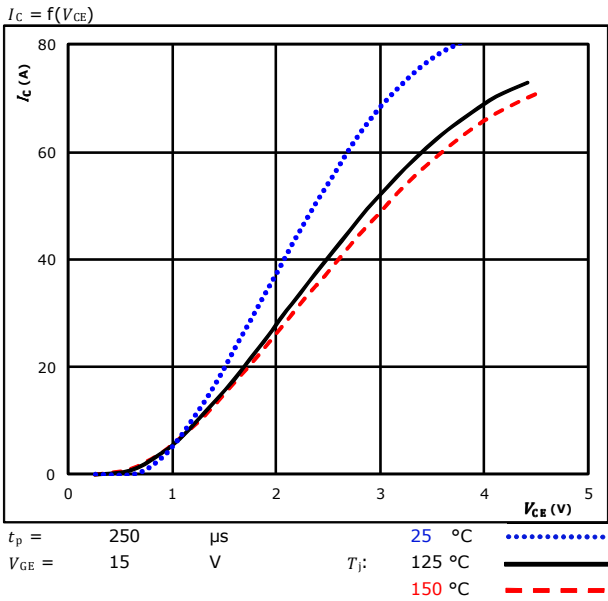


figure 2. IGBT

Typical output characteristics

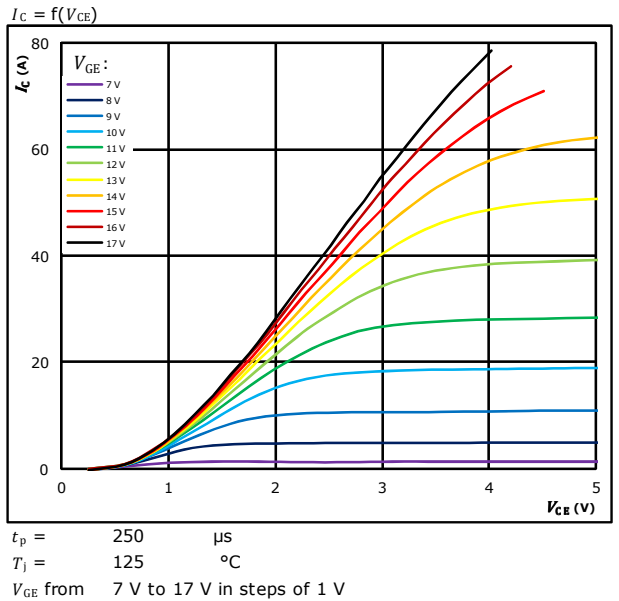


figure 3. IGBT

Typical transfer characteristics

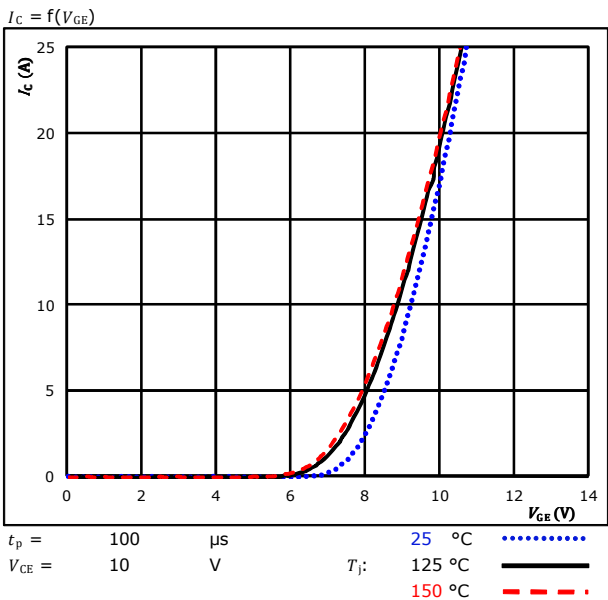
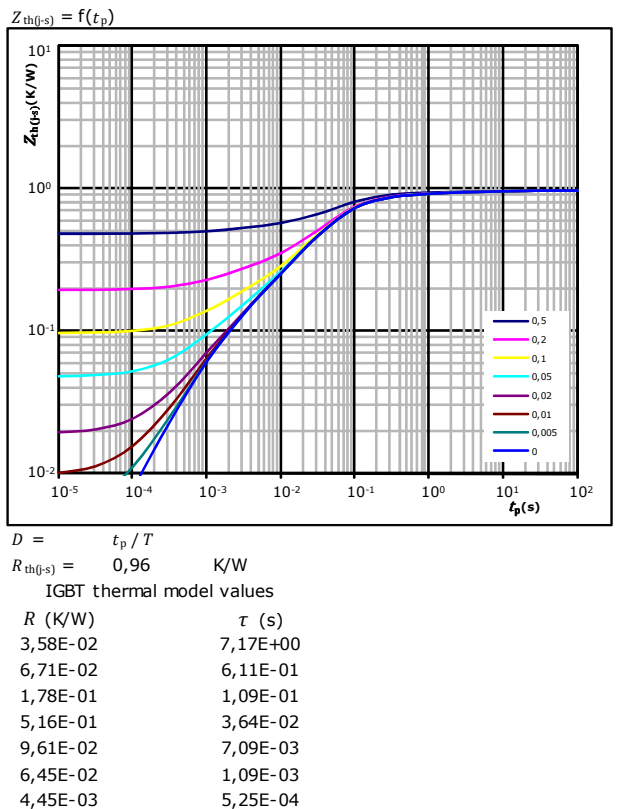


figure 4. IGBT

Transient thermal impedance as function of pulse duration



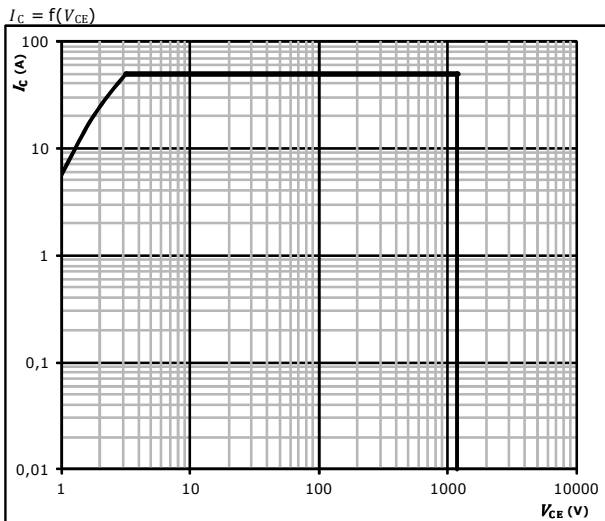


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Inverter / Brake Switch Characteristics

figure 5. IGBT

Safe operating area



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



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Inverter / Brake Diode Characteristics

figure 1. FWD

Typical forward characteristics

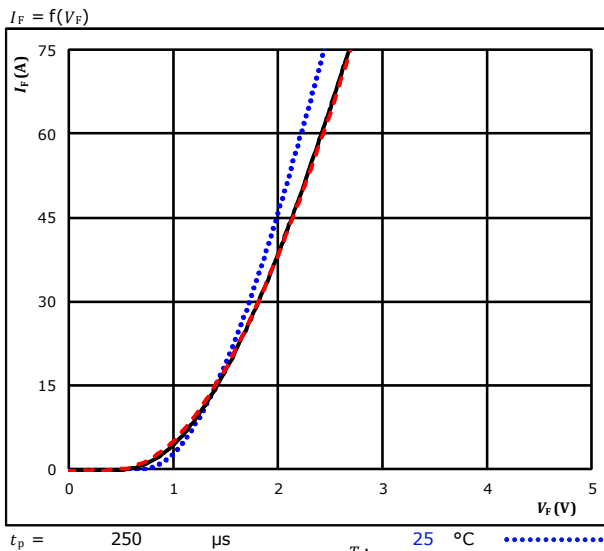
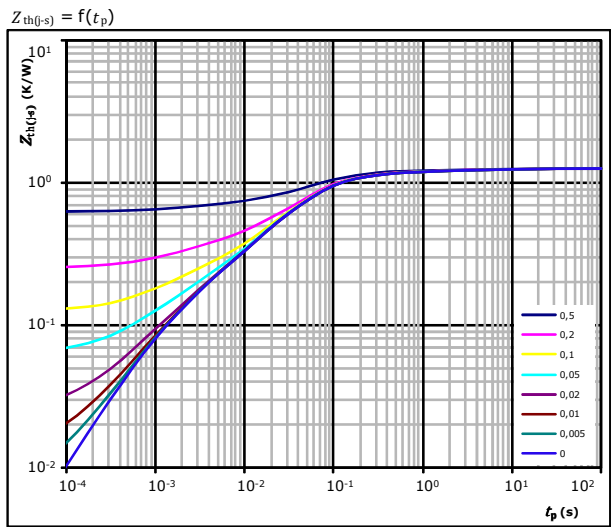


figure 2. FWD

Transient thermal impedance as a function of pulse width



FWD thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
4,70E-02	9,42E+00
8,81E-02	8,02E-01
2,34E-01	1,43E-01
6,77E-01	4,79E-02
1,26E-01	9,31E-03
8,47E-02	1,43E-03
5,84E-03	6,90E-04



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Rectifier Diode Characteristics

figure 1. Rectifier Diode
Typical forward characteristics

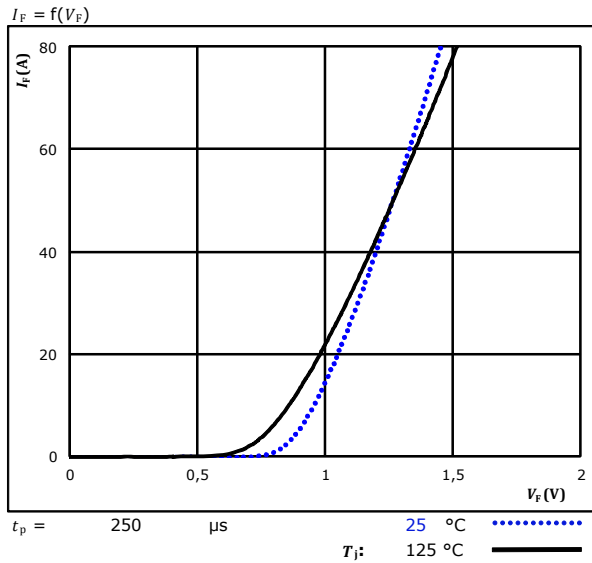
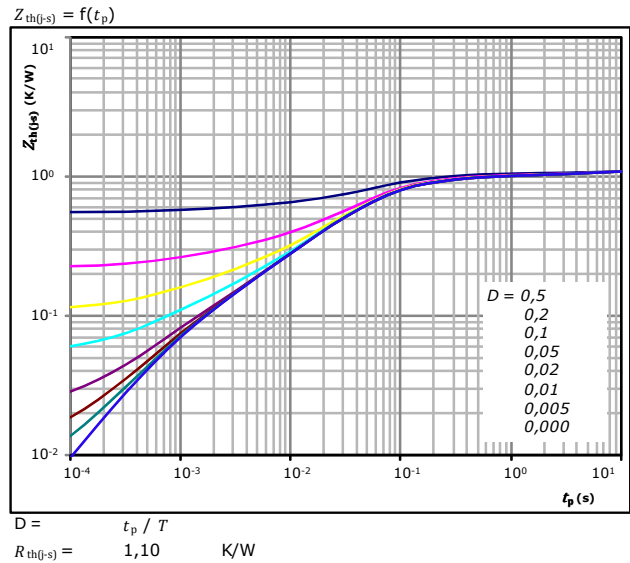


figure 2. Rectifier Diode
Transient thermal impedance as a function of pulse width

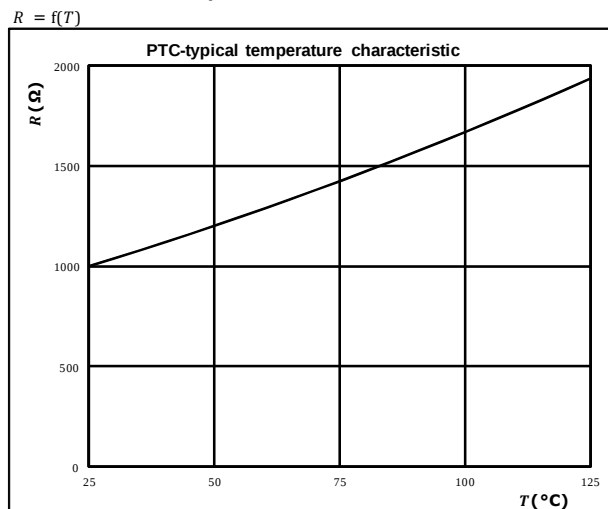


Diode thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
1,03E-01	7,70E+00
1,17E-01	4,31E-01
5,19E-01	6,42E-02
2,38E-01	2,35E-02
7,64E-02	3,81E-03

PTC Characteristics

figure 1. Thermistor
Typical PTC characteristic
as a function of temperature





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Inverter / Brake Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

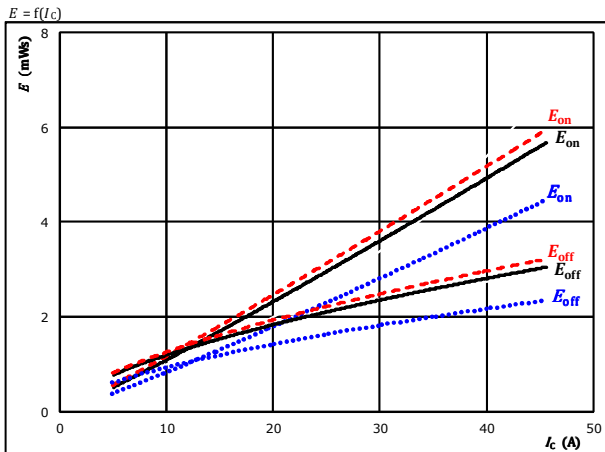


figure 2. IGBT

Typical switching energy losses as a function of gate resistor

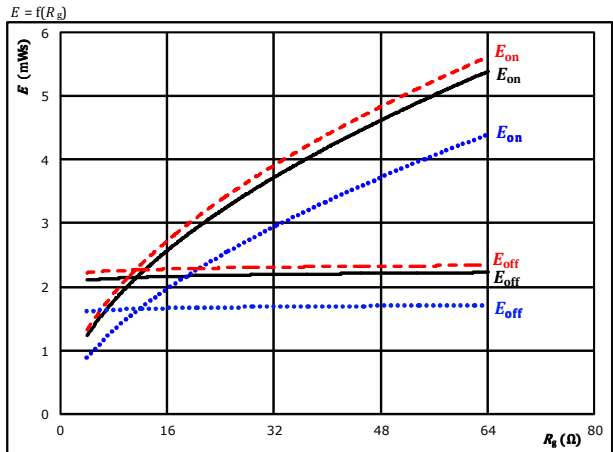


figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

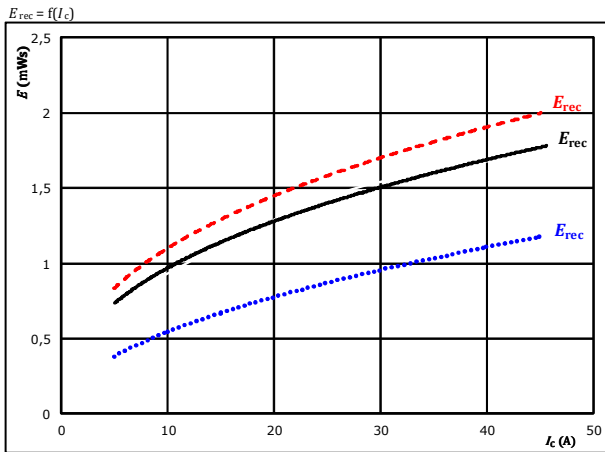
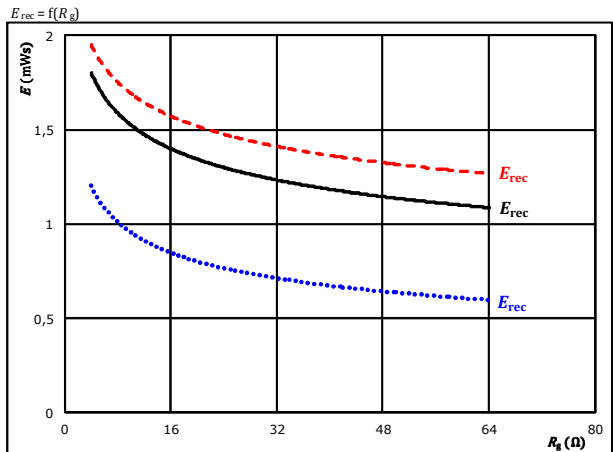


figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor





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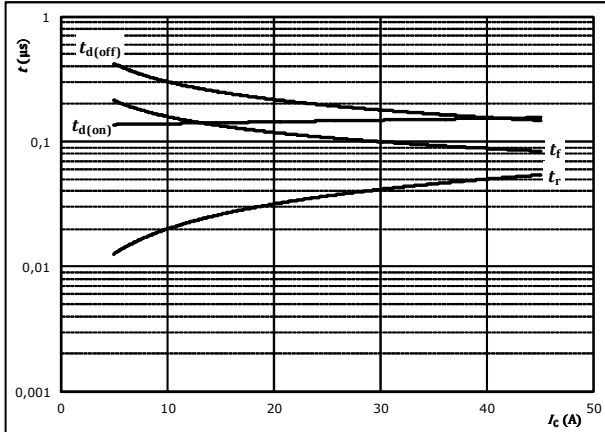
80-M212PMA025M7-K229A70 datasheet

Inverter / Brake Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



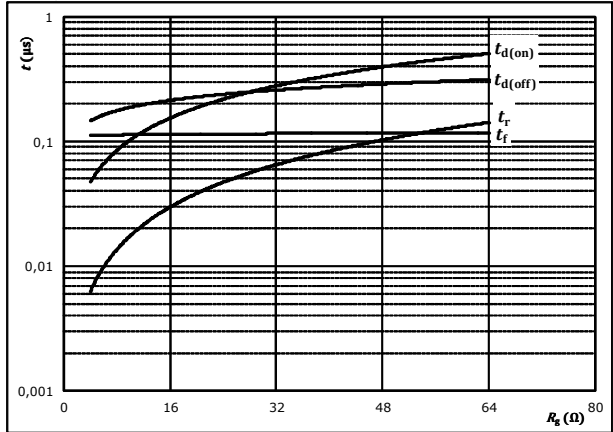
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{gon} =$	16	Ω
$R_{goff} =$	16	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



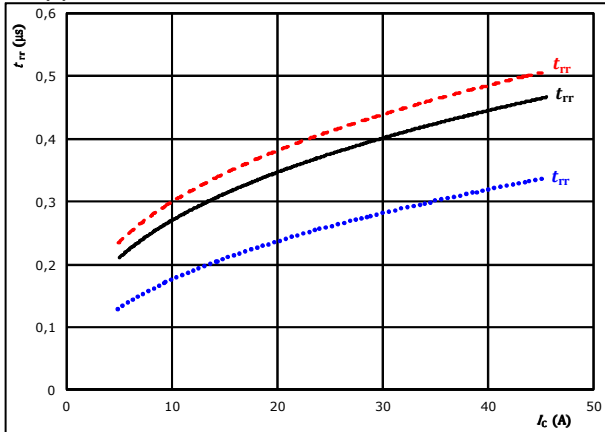
With an inductive load at

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

figure 7. FWD

Typical reverse recovery time as a function of collector current

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

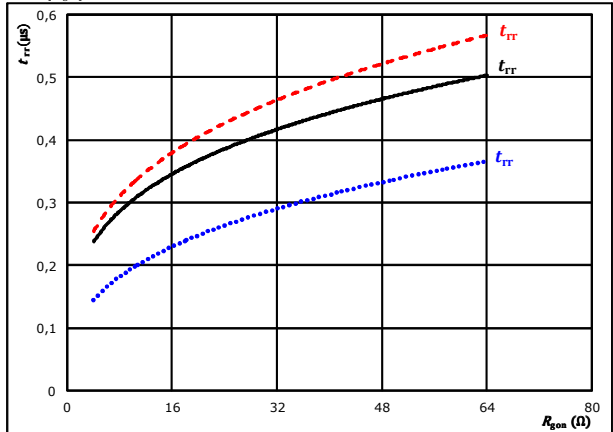


At	$V_{CE} =$	600	V	$T_j:$	25 °C	
	$V_{GE} =$	±15	V		125 °C	————
	$R_{gon} =$	16	Ω		150 °C	-----

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



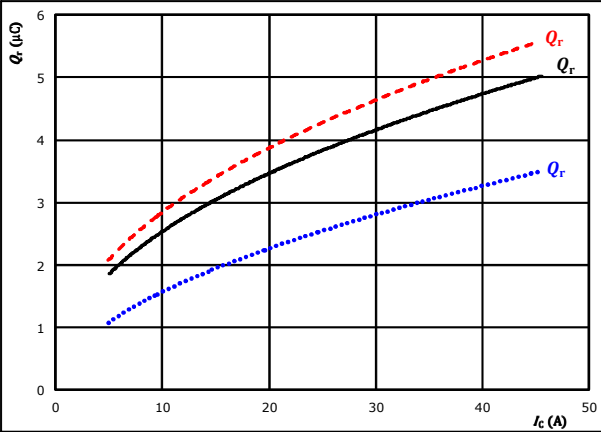
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Inverter / Brake Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_C)$$

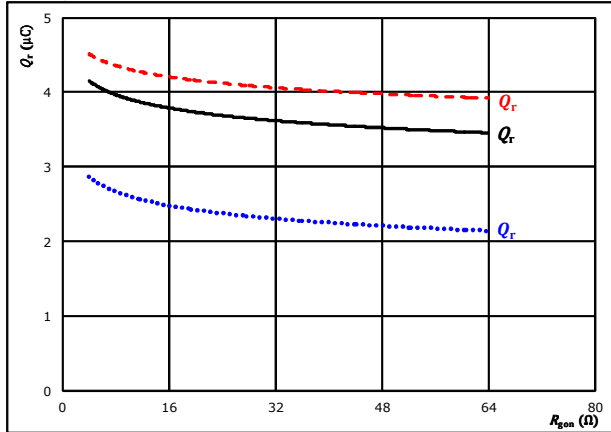


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 T_j : 25 °C (dotted blue)
125 °C (solid black)
150 °C (dashed red)

figure 10. FWD

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

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

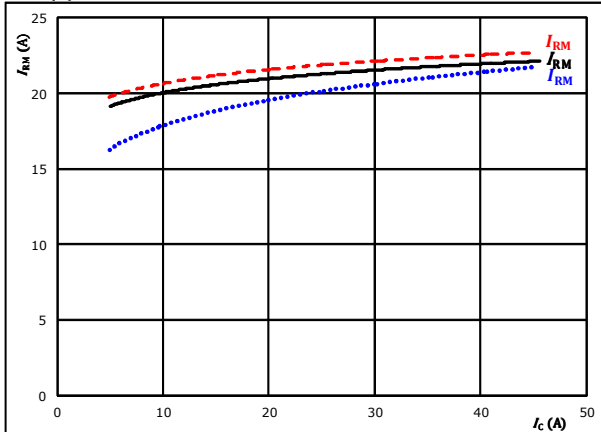


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 25$ A
 T_j : 25 °C (dotted blue)
125 °C (solid black)
150 °C (dashed red)

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

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

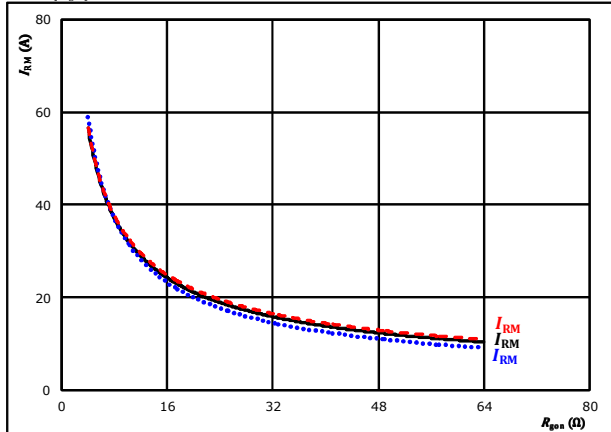


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 T_j : 25 °C (dotted blue)
125 °C (solid black)
150 °C (dashed red)

figure 12. FWD

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

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



At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 25$ A
 T_j : 25 °C (dotted blue)
125 °C (solid black)
150 °C (dashed red)



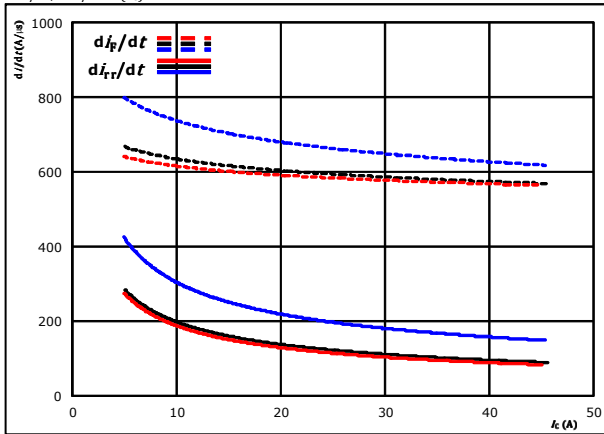
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datasheet

Inverter / Brake Switching Characteristics

figure 13. FWD

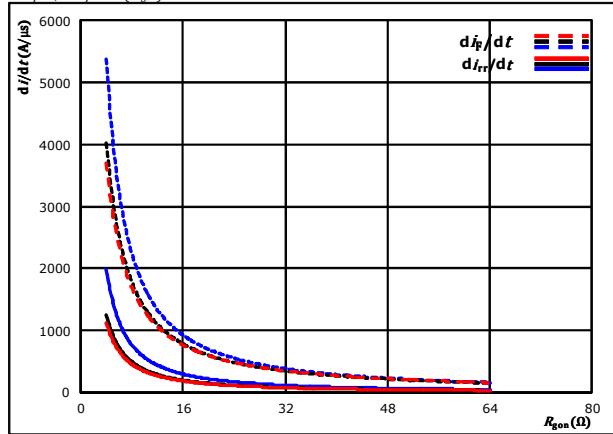
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_F/dt, di_{rr}/dt = f(I_C)$



At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{g0n} = 16$ 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
 $di_F/dt, di_{rr}/dt = f(R_{g0n})$

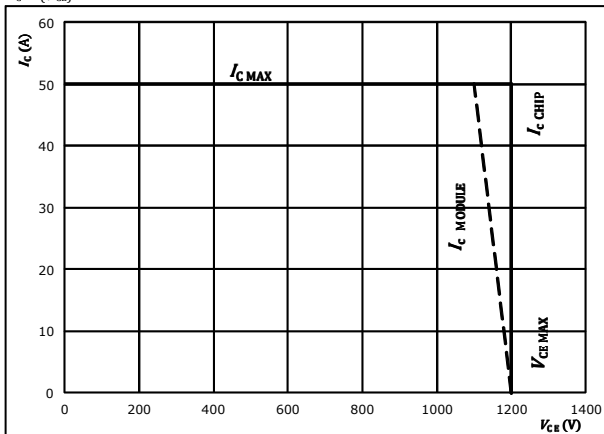


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 25$ A
 $T_J = 25$ °C
 125 °C
 150 °C

figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_J = 175$ °C
 $R_{g0n} = 16$ Ω
 $R_{g0ff} = 16$ Ω



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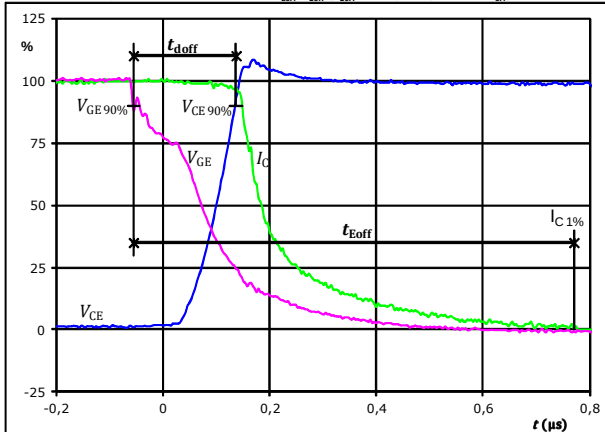
Inverter / Brake Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

figure 1. IGBT

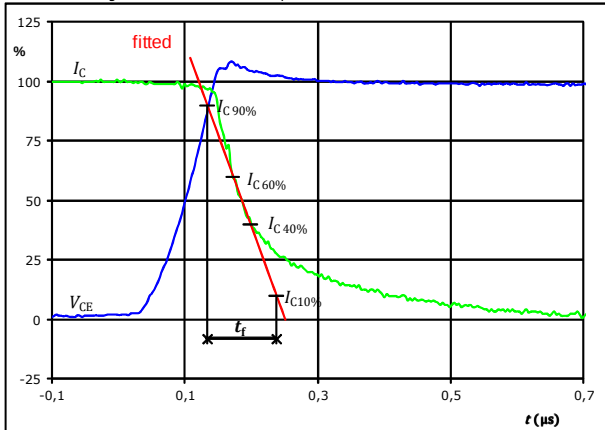
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	25	A
$t_{doff} =$	0,191	μs
$t_{Eoff} =$	0,826	μs

figure 3. IGBT

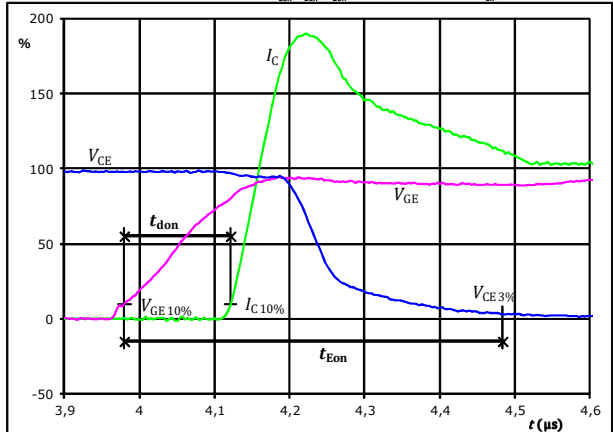
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	600	V
$I_C(100\%) =$	25	A
$t_f =$	0,110	μs

figure 2. IGBT

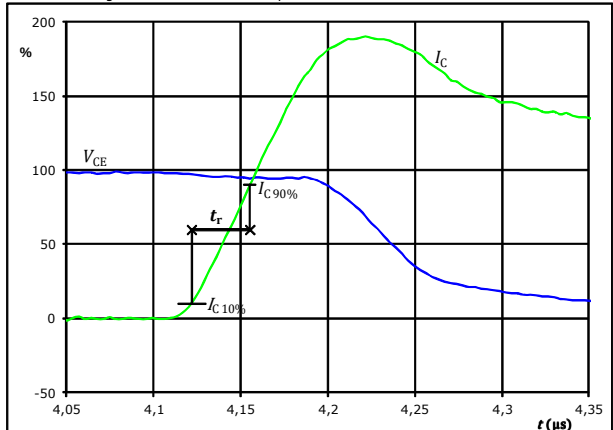
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	25	A
$t_{don} =$	0,149	μs
$t_{Eon} =$	0,504	μs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



$V_C(100\%) =$	600	V
$I_C(100\%) =$	25	A
$t_r =$	0,033	μs



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80-M212PMA025M7-K229A70 datasheet

Inverter / Brake Switching Characteristics

figure 5. IGBT

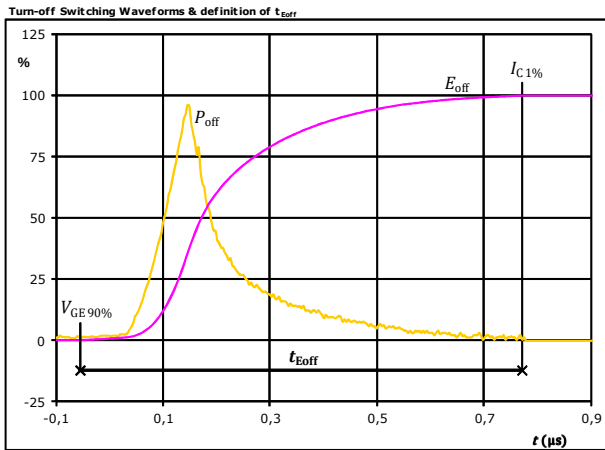


figure 6. IGBT

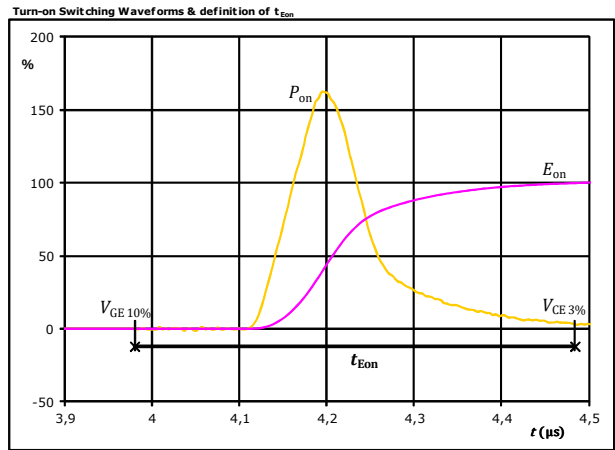
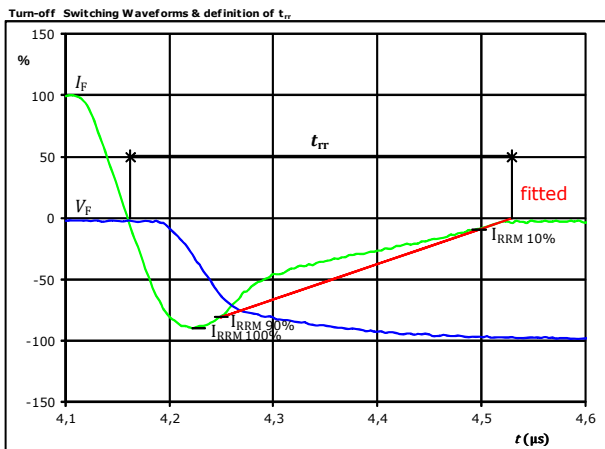


figure 7. FWD





Vincotech

Inverter / Brake Switching Characteristics

figure 8. FWD

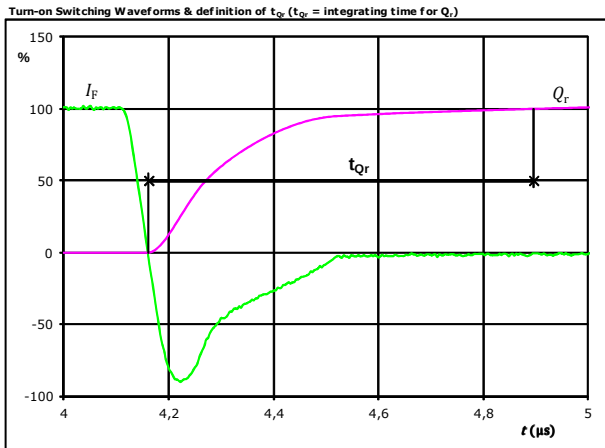
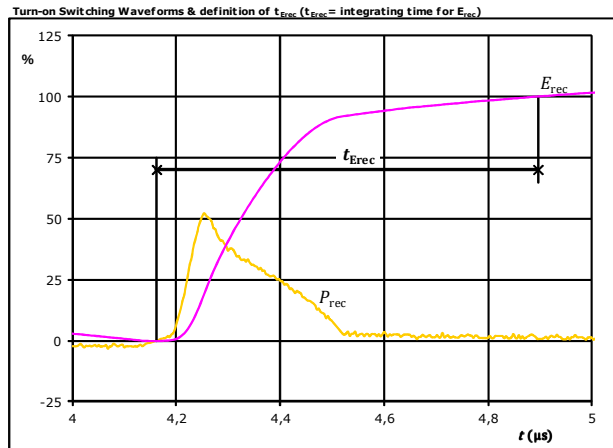


figure 9. FWD





80-M212PMA025M7-K229A70

datasheet

Vincotech

Ordering Code & Marking						
Version			Ordering Code			
With std lid (6.5mm height) + no thermal grease			80-M212PMA025M7-K229A70-/0A/			
With thin lid (2.8mm height) + no thermal grease			80-M212PMA025M7-K229A70-/0B/			
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)			80-M212PMA025M7-K229A70-/1A/			
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)			80-M212PMA025M7-K229A70-/1B/			
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)			80-M212PMA025M7-K229A70-/4A/			
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)			80-M212PMA025M7-K229A70-/4B/			
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)			80-M212PMA025M7-K229A70-/5A/			
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)			80-M212PMA025M7-K229A70-/5B/			
		Text	Name		Date code	UL & VIN
		Datamatrix	Type&Ver	Lot number	Serial	UL VIN
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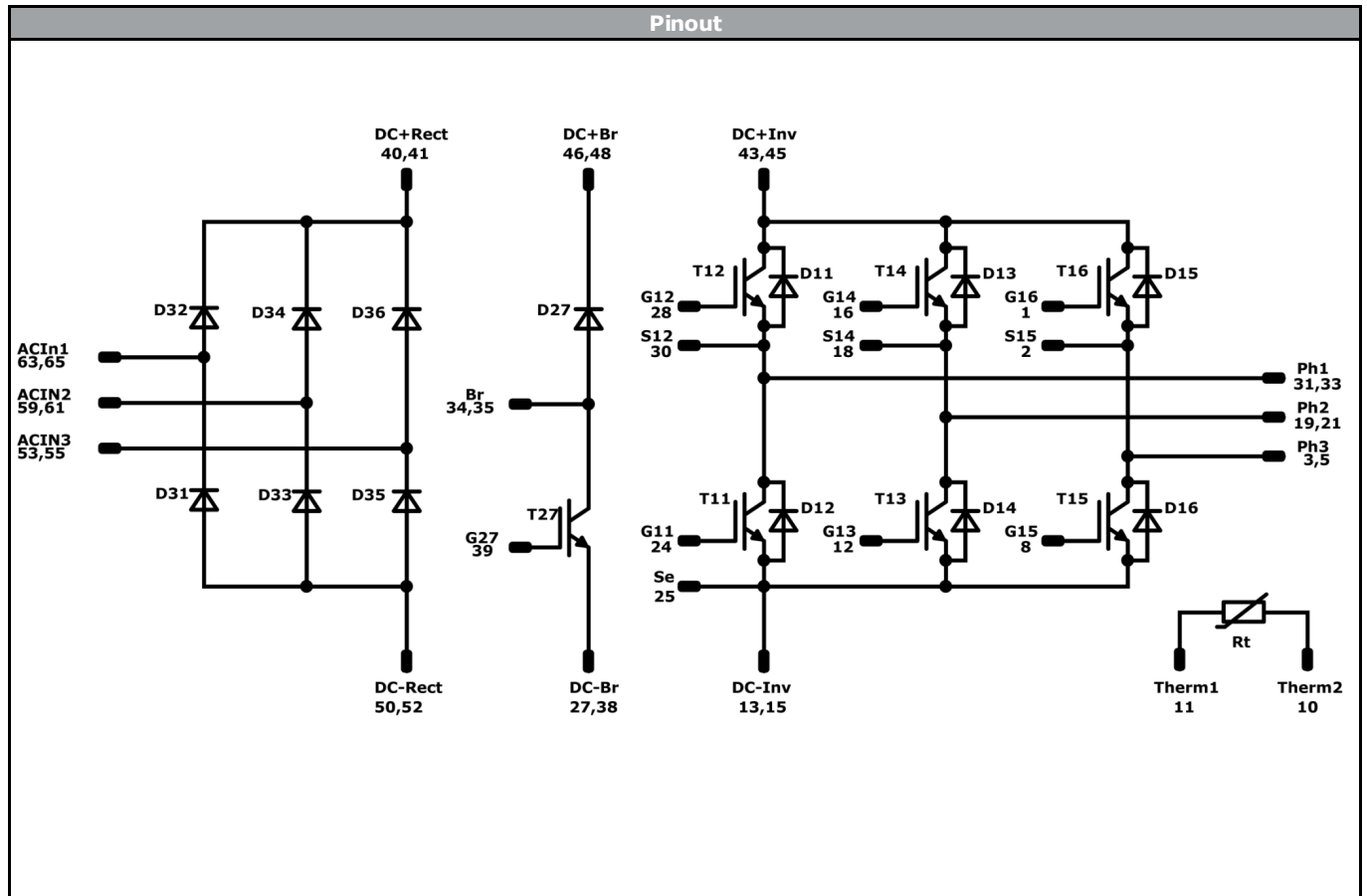
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Pin positions refers to center point. For more informations on pad design please see package data sheet.

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



Vincotech



Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	1200 V	25 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	25 A	Inverter Diode	
T27	IGBT	1200 V	25 A	Brake Switch	
D27	FWD	1200 V	25 A	Brake Diode	
D31, D32, D33, D34, D35, D36	Rectifier	1600 V	35 A	Rectifier Diode	
Rt	PTC			Thermistor	



Vincotech

80-M212PMA025M7-K229A70
datasheet

Packaging instruction			
Standard packaging quantity (SPQ) 72	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for MiniSkiiP® 2 packages see vincotech.com website.

Package data
Package data for MiniSkiiP® 2 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-M212PMA025M7-K229A70-D1-14	21 Nov. 2017		

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Vincotech products are not authorised for use as critical components in life support devices or systems without the express written approval of Vincotech.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
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.