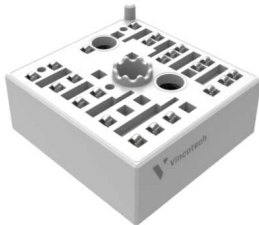
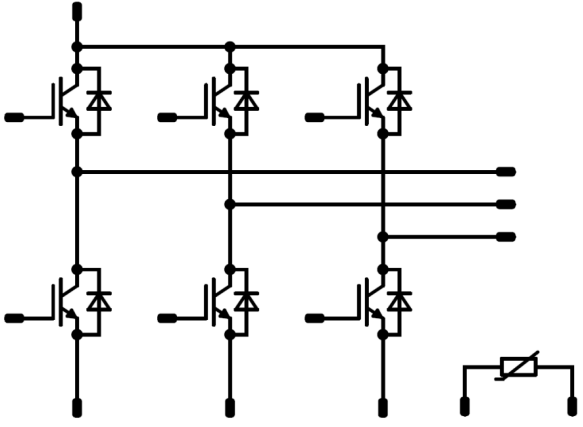




Vincotech

MiniSkiiP®PACK 1		1200 V / 35 A
Features • IGBT M7 with low V_{CEsat} and improved EMC behavior • Built-in PTC • Solder-free spring contact technology • Open emitter configuration		MiniSkiiP® 1 housing 
Target applications • Industrial Drives		Schematic 
Types • 80-M1126PA035M7-K210F70		

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	35	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	70	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	129	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum junction temperature	T_{jmax}		175	°C



Vincotech

80-M1126PA035M7-K210F70
datasheet

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Inverter Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	35	A
Repetitive peak forward current	I_{FRM}		70	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	89	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* $t_p = 2\text{ s}$	5500	V
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance		With std lid For more information see handling instructions	6,3	mm
Clearance		With std lid For more information 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 Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0035	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		35	25 125 150		1,48 1,64 1,68	1,75	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			0,08	mA
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		8000		pF
Output capacitance	C_{oes}							280		
Reverse transfer capacitance	C_{res}							95		
Gate charge	Q_g		15	600	35	25		300		nC

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5 \text{ W/mK}$ (HPTP)						0,73		K/W
-------------------------------------	---------------	--	--	--	--	--	--	------	--	-----

Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{goff} = 8 \Omega$ $R_{gon} = 8 \Omega$	± 15	600	35	25 125 150		124 122 121		ns
Rise time	t_r					25 125 150		14 17 18		
Turn-off delay time	$t_{d(off)}$					25 125 150		179 203 208		
Fall time	t_f					25 125 150		95 118 119		
Turn-on energy (per pulse)	E_{on}	$Q_{iFWD} = 4,3 \mu\text{C}$ $Q_{iFWD} = 6,2 \mu\text{C}$ $Q_{iFWD} = 6,9 \mu\text{C}$				25 125 150		1,450 1,924 2,088		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		2,395 3,173 3,417		



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 Diode

Static

Forward voltage	V_F				35	25 125 150		1,66 1,76 1,75	2,1	V
Reverse leakage current	I_R			1200		25			40	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5$ W/mK (HPTP)						1,06		K/W
-------------------------------------	---------------	--	--	--	--	--	--	------	--	-----

Dynamic

Peak recovery current	I_{RRM}	$di/dt = 2681$ A/μs $di/dt = 2670$ A/μs $di/dt = 2690$ A/μs	± 15	600	35	25 125 150		77 76 77		A
Reverse recovery time	t_{rr}					25 125 150		157 284 311		ns
Recovered charge	Q_r					25 125 150		4,335 6,177 6,898		μC
Reverse recovered energy	E_{rec}					25 125 150		1,959 2,817 3,128		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		2734 2205 2101		A/μs

Thermistor

Rated resistance	R					25		1		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1670$ Ω				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/K²
Vincotech PTC Reference									E	



Vincotech

80-M1126PA035M7-K210F70 datasheet

Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

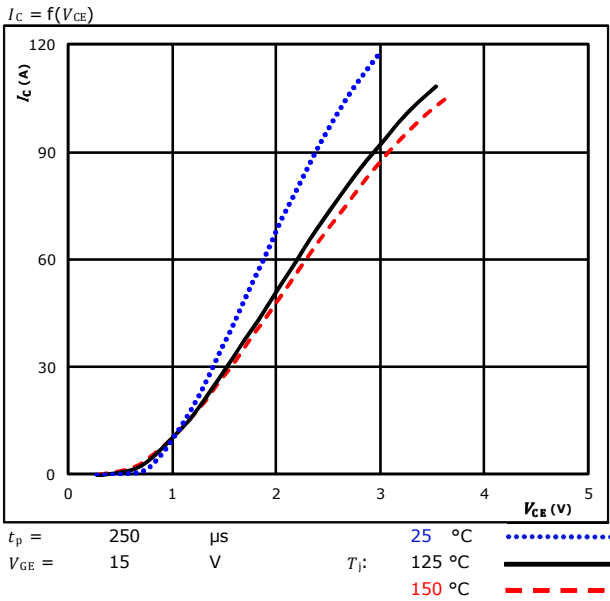


figure 2. IGBT

Typical output characteristics

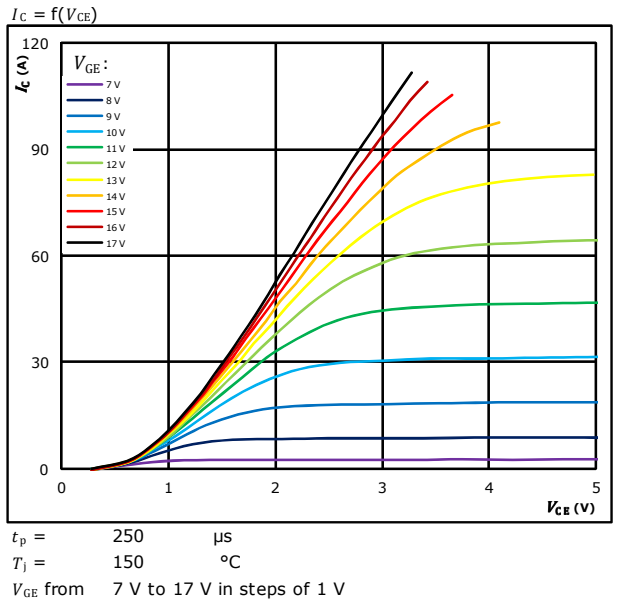


figure 3. IGBT

Typical transfer characteristics

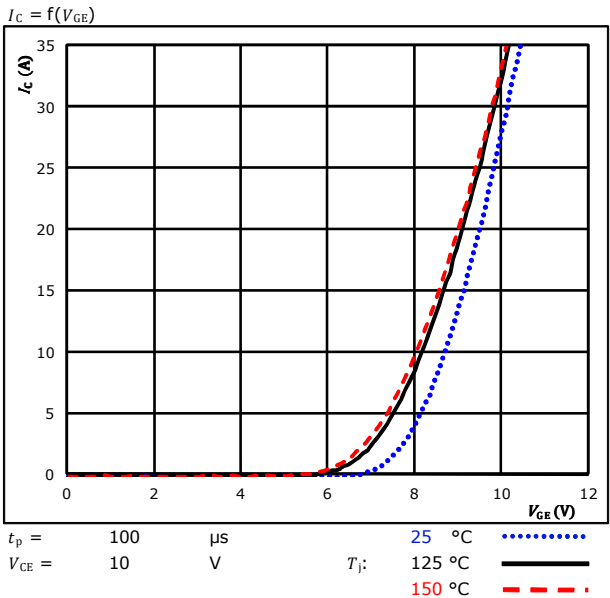
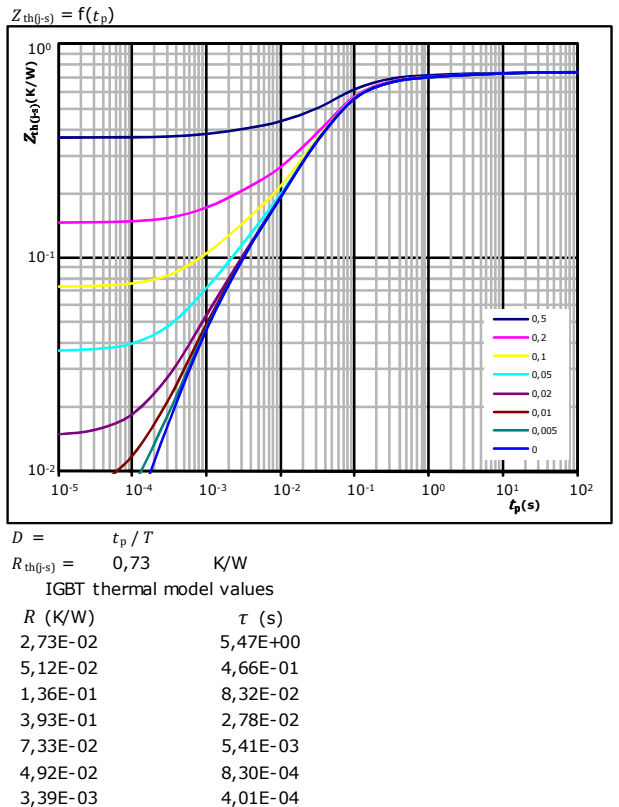


figure 4. IGBT

Transient thermal impedance as function of pulse duration



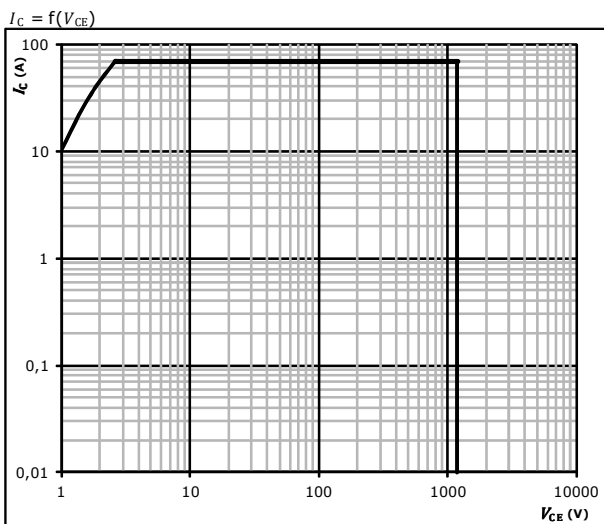


Vincotech

Inverter Switch Characteristics

figure 5. IGBT

Safe operating area



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



Vincotech

Inverter Diode Characteristics

figure 1. FWD

Typical forward characteristics

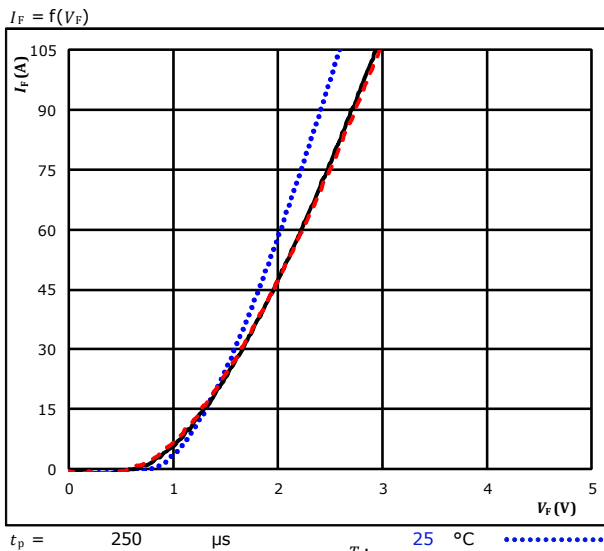
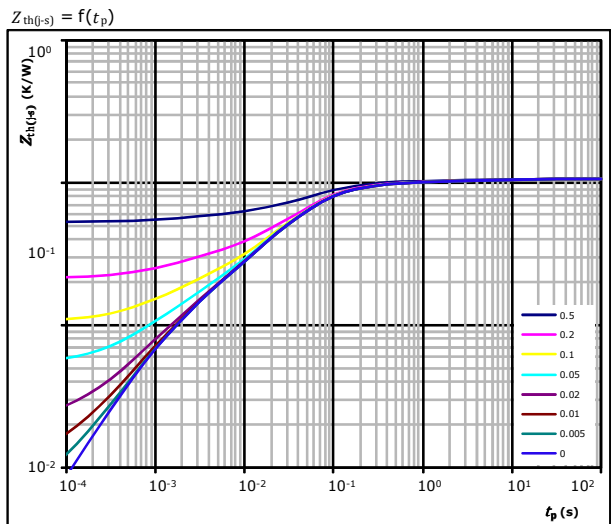


figure 2. FWD

Transient thermal impedance as a function of pulse width



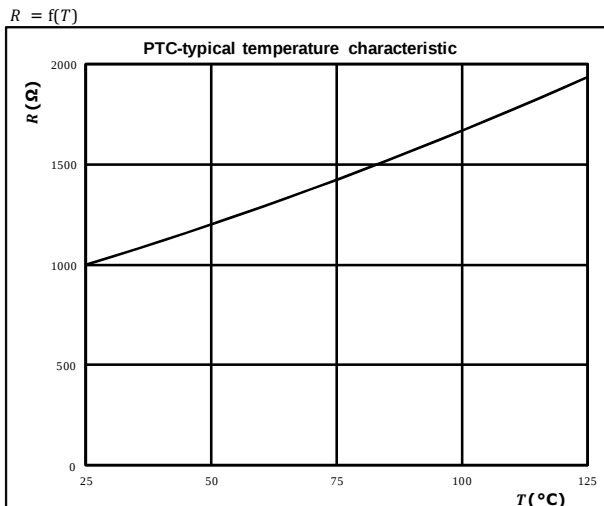
FWD thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
3,96E-02	7,93E+00
7,42E-02	6,75E-01
1,97E-01	1,21E-01
5,70E-01	4,03E-02
1,06E-01	7,84E-03
7,13E-02	1,20E-03
4,92E-03	5,81E-04

Thermistor Characteristics

figure 1. Thermistor

Typical PTC characteristic
as a function of temperature



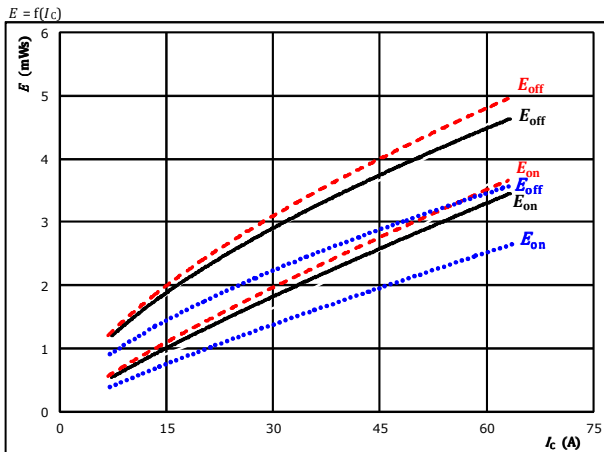


Vincotech

Inverter Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current



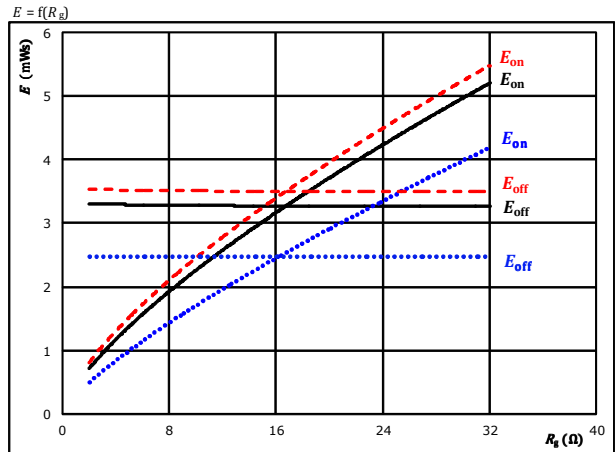
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω
 $R_{goff} = 8$ Ω

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

figure 2. IGBT

Typical switching energy losses as a function of gate resistor



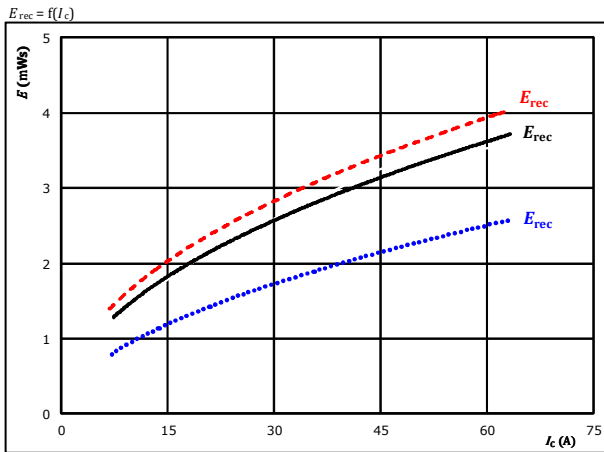
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 35$ A

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

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current



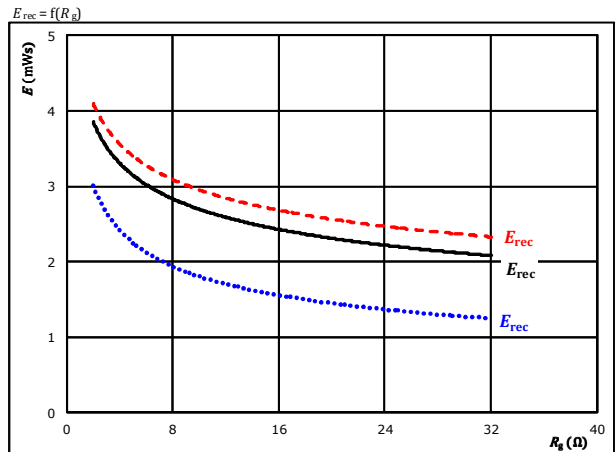
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω

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

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
 $I_C = 35$ A

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



Vincotech

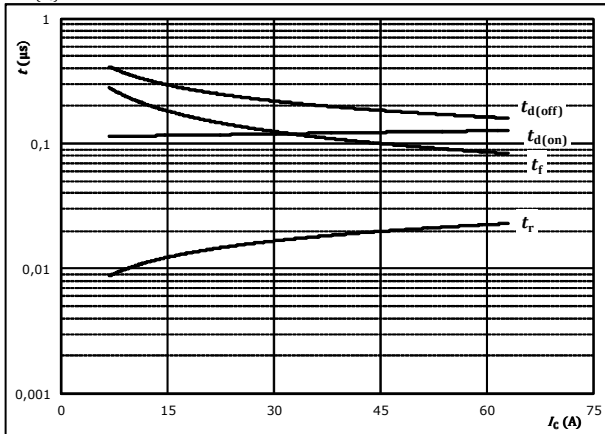
80-M1126PA035M7-K210F70 datasheet

Inverter Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



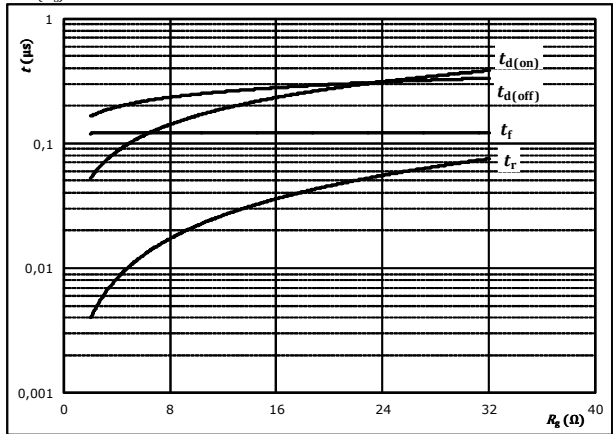
With an inductive load at

$T_j =$	150	$^{\circ}C$
$V_{CE} =$	600	V
$V_{GE} =$	± 15	V
$R_{gon} =$	8	Ω
$R_{goff} =$	8	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



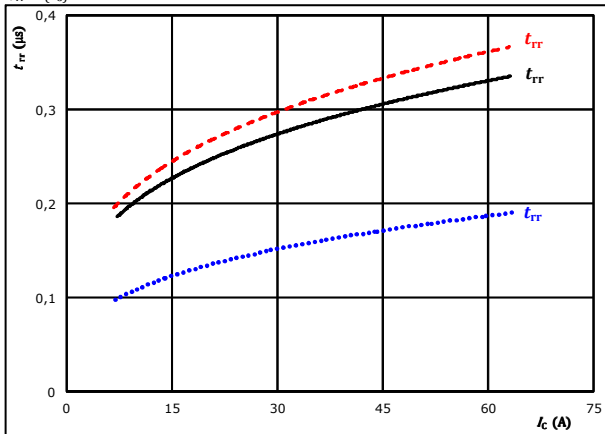
With an inductive load at

$T_j =$	150	$^{\circ}C$
$V_{CE} =$	600	V
$V_{GE} =$	± 15	V
$I_C =$	35	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

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

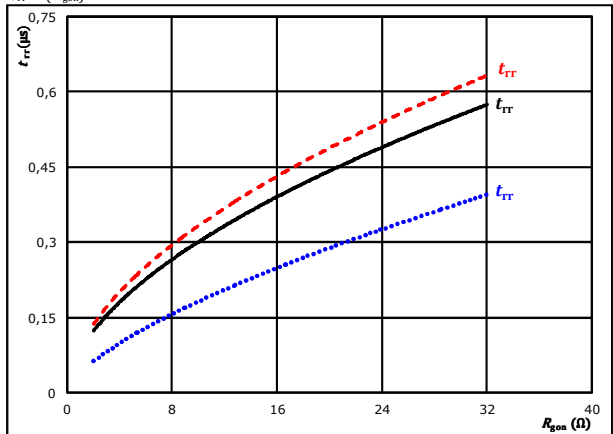


At	$V_{CE} =$	600	V	$T_j:$	25 $^{\circ}C$	
	$V_{GE} =$	± 15	V		125 $^{\circ}C$	————
	$R_{gon} =$	8	Ω		150 $^{\circ}C$	-----

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 $^{\circ}C$	
	$V_{GE} =$	± 15	V		125 $^{\circ}C$	————
	$I_C =$	35	A		150 $^{\circ}C$	-----



Vincotech

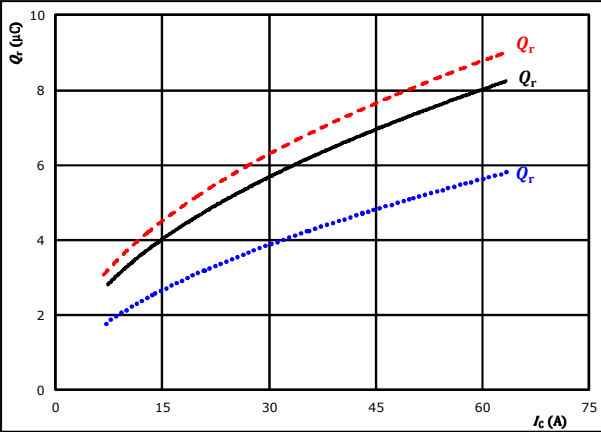
80-M1126PA035M7-K210F70 datasheet

Inverter Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_C)$$

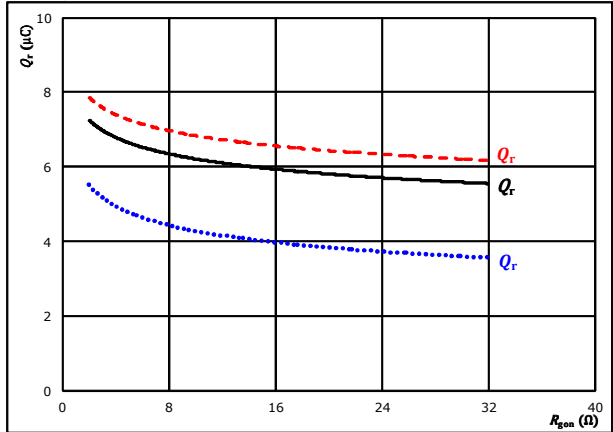


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω
 T_j : 25 °C
125 °C ———
150 °C - - - - -

figure 10. FWD

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

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

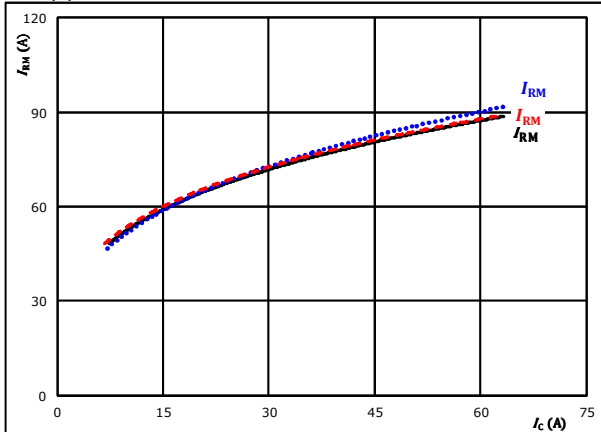


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 35$ A
 T_j : 25 °C
125 °C ———
150 °C - - - - -

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

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

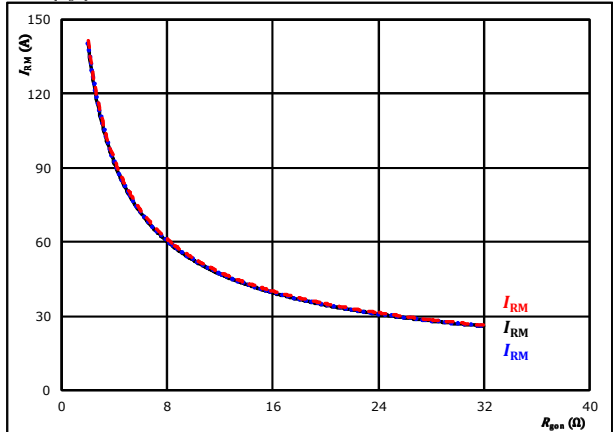


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω
 T_j : 25 °C
125 °C ———
150 °C - - - - -

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
 $I_C = 35$ A
 T_j : 25 °C
125 °C ———
150 °C - - - - -

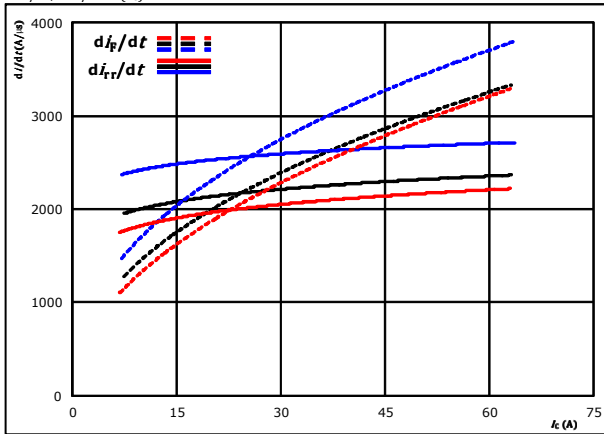


Vincotech

Inverter Switching Characteristics

figure 13. FWD

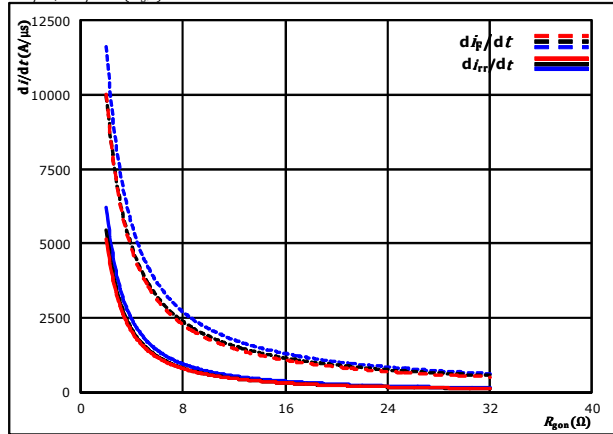
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_F/dt, di_{rr}/dt = f(I_C)$



At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{g0n} = 8$ 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
 $di_F/dt, di_{rr}/dt = f(R_{g0n})$

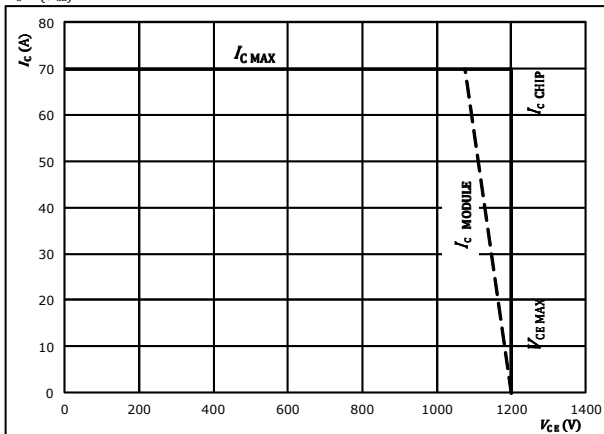


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 35$ A
 $T_J = 25$ °C
 125 °C
 150 °C

figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_J = 175$ °C
 $R_{g0n} = 8$ Ω
 $R_{g0ff} = 8$ Ω



Vincotech

80-M1126PA035M7-K210F70
datasheet

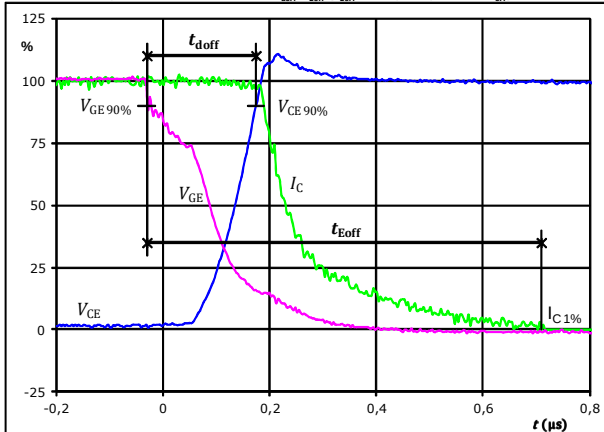
Inverter Switching Characteristics

General conditions

T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. IGBT

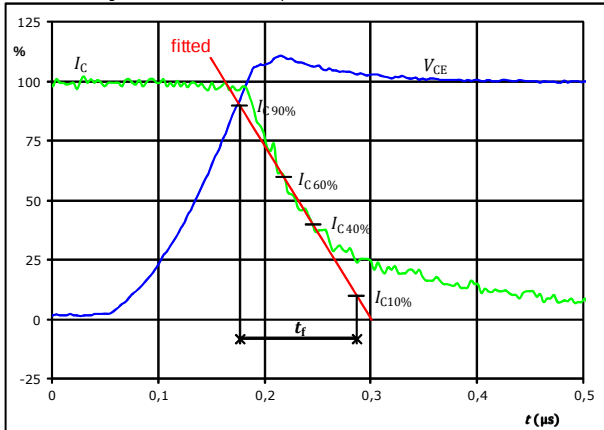
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$	=	-15	V
$V_{GE}(100\%)$	=	15	V
$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	35	A
t_{doff}	=	0,203	μs
t_{Eoff}	=	0,739	μs

figure 3. IGBT

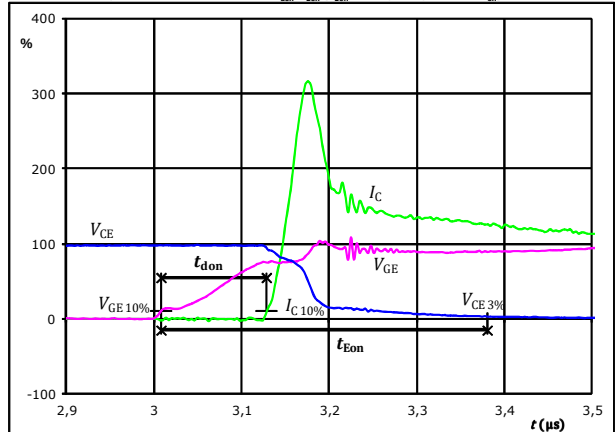
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	35	A
t_f	=	0,118	μs

figure 2. IGBT

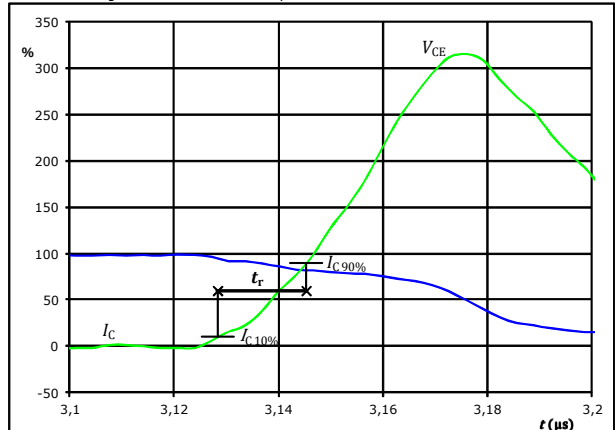
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$	=	-15	V
$V_{GE}(100\%)$	=	15	V
$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	35	A
t_{don}	=	0,122	μs
t_{Eon}	=	0,372	μs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	35	A
t_r	=	0,017	μs



Vincotech

80-M1126PA035M7-K210F70 datasheet

Inverter Switching Characteristics

figure 5. IGBT

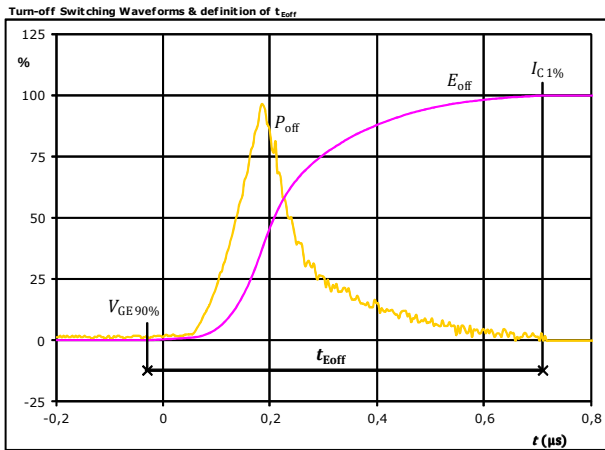


figure 6. IGBT

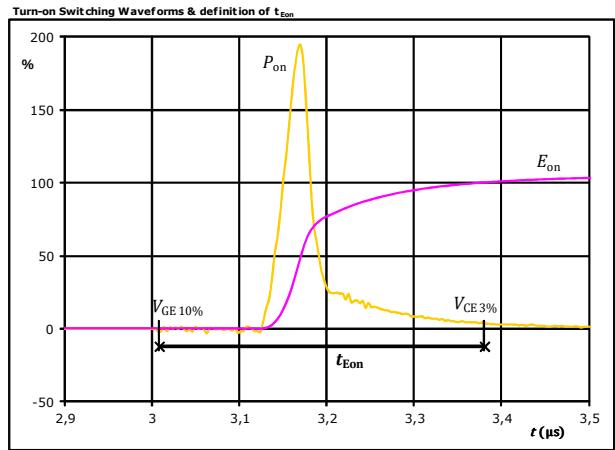
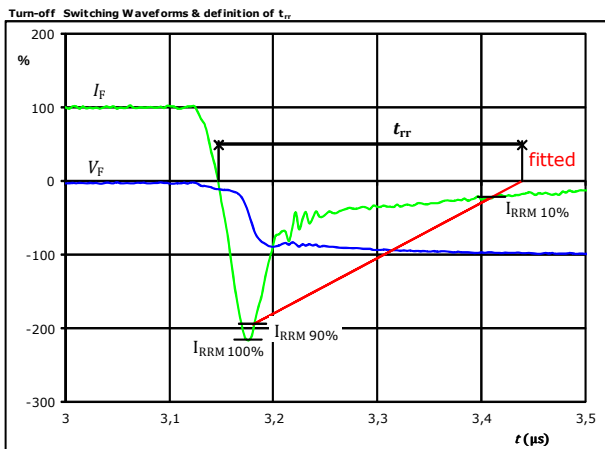


figure 7. FWD





Vincotech

Inverter Switching Characteristics

figure 8. FWD

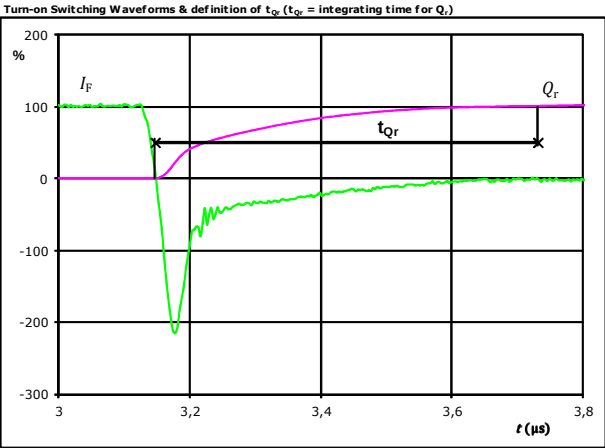
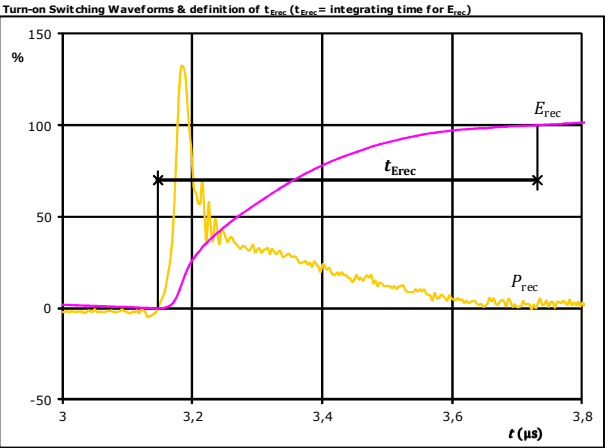


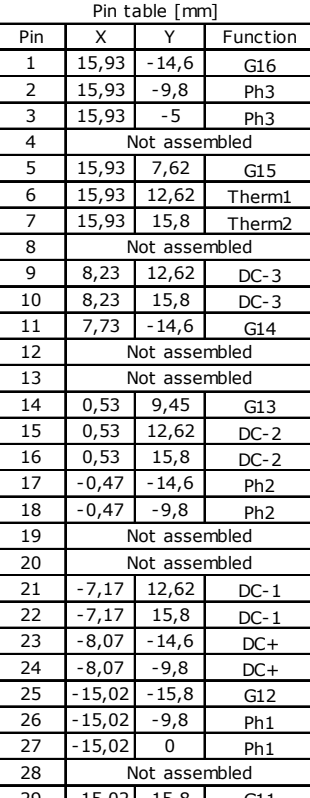
figure 9. FWD





Vincotech

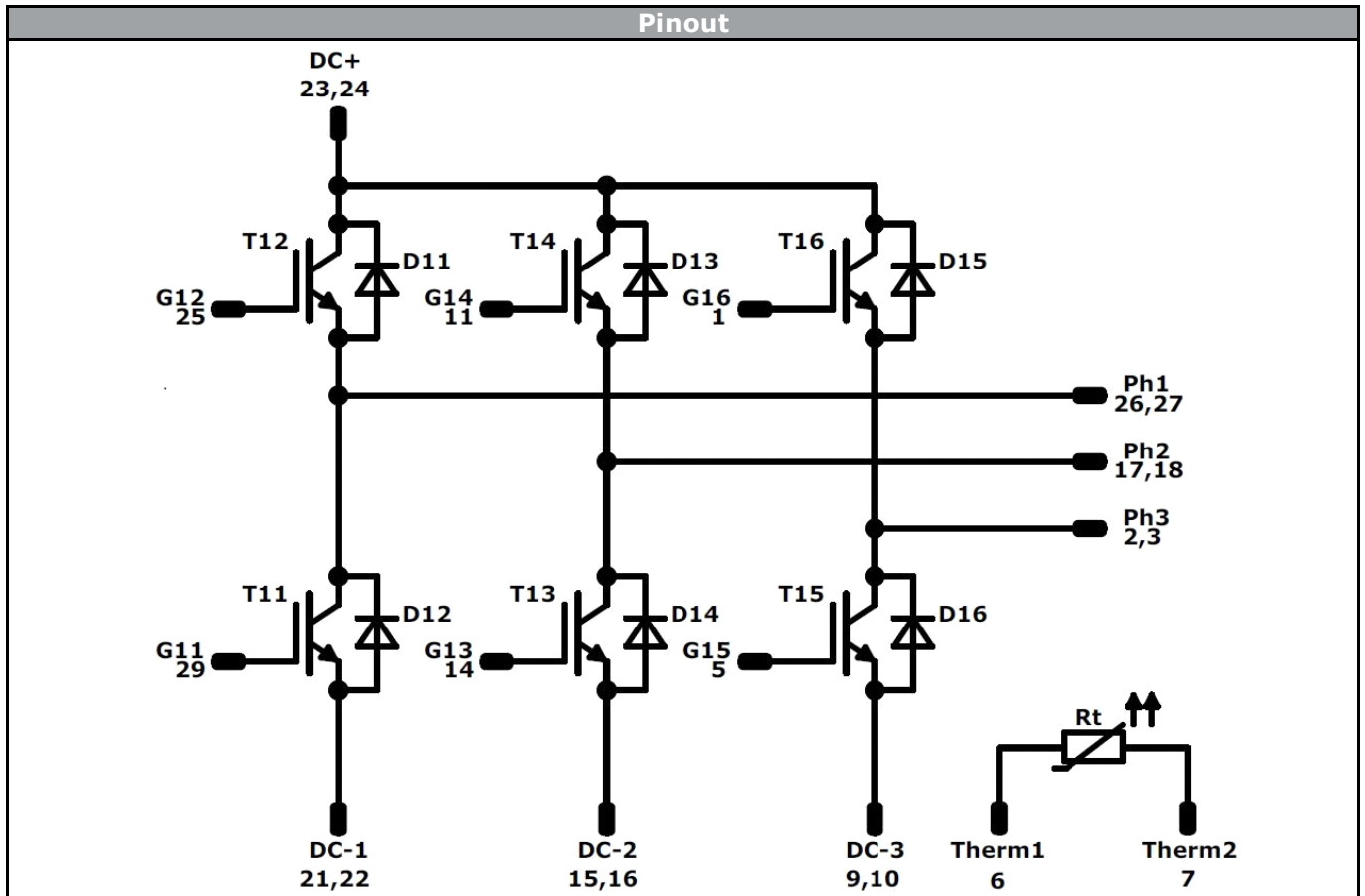
Ordering Code & Marking						
Version			Ordering Code			
With std lid (6.5mm height) + no thermal grease			80-M1126PA035M7-K210F70-/0A/			
With thin lid (2.8mm height) + no thermal grease			80-M1126PA035M7-K210F70-/0B/			
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)			80-M1126PA035M7-K210F70-/1A/			
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)			80-M1126PA035M7-K210F70-/1B/			
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)			80-M1126PA035M7-K210F70-/4A/			
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)			80-M1126PA035M7-K210F70-/4B/			
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)			80-M1126PA035M7-K210F70-/5A/			
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)			80-M1126PA035M7-K210F70-/5B/			
		Text	Name		Date code	UL & VIN
			NN-NNNNNNNNNNNNNN-TTTTIV		WWYY	UL VIN
			Type&Ver	Lot number	Serial	Date code
Datamatrix			TTTTTIV	LLLLL	SSSS	WWYY

Outline			
			
Pin	X	Y	Function
1	15,93	-14,6	G16
2	15,93	-9,8	Ph3
3	15,93	-5	Ph3
4	Not assembled		
5	15,93	7,62	G15
6	15,93	12,62	Therm1
7	15,93	15,8	Therm2
8	Not assembled		
9	8,23	12,62	DC-3
10	8,23	15,8	DC-3
11	7,73	-14,6	G14
12	Not assembled		
13	Not assembled		
14	0,53	9,45	G13
15	0,53	12,62	DC-2
16	0,53	15,8	DC-2
17	-0,47	-14,6	Ph2
18	-0,47	-9,8	Ph2
19	Not assembled		
20	Not assembled		
21	-7,17	12,62	DC-1
22	-7,17	15,8	DC-1
23	-8,07	-14,6	DC+
24	-8,07	-9,8	DC+
25	-15,02	-15,8	G12
26	-15,02	-9,8	Ph1
27	-15,02	0	Ph1
28	Not assembled		
29	-15,02	15,8	G11

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	35 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	35 A	Inverter Diode	
Rt	PTC			Thermistor	



Vincotech

80-M1126PA035M7-K210F70
datasheet

Packaging instruction			
Standard packaging quantity (SPQ) 120	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for MiniSkiiP® 1 packages see vincotech.com website.

Package data
Package data for MiniSkiiP® 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
80-M1126PA035M7-K210F70-D1-14	14 Nov. 2017		

DISCLAIMER

The information, specifications, procedures, methods and recommendations herein (together "information") are presented by Vincotech to reader in good faith, are believed to be accurate and reliable, but may well be incomplete and/or not applicable to all conditions or situations that may exist or occur. Vincotech reserves the right to make any changes without further notice to any products to improve reliability, function or design. No representation, guarantee or warranty is made to reader as to the accuracy, reliability or completeness of said information or that the application or use of any of the same will avoid hazards, accidents, losses, damages or injury of any kind to persons or property or that the same will not infringe third parties rights or give desired results. It is reader's sole responsibility to test and determine the suitability of the information and the product for reader's intended use.

LIFE SUPPORT POLICY

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.