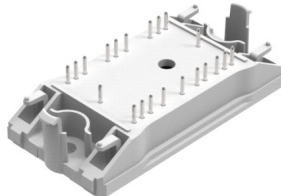
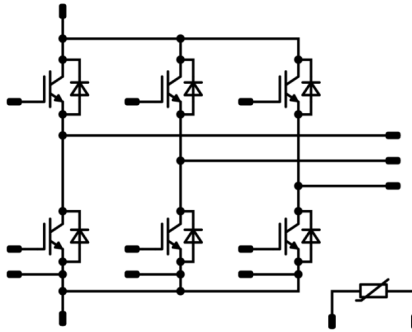




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flow PACK 0		1200 V / 35 A
<div>Features</div> <ul style="list-style-type: none">• IGBT M7 with low V_{CEsat} and improved EMC behavior• Compact and low inductive design• Built-in NTC	<div>flow 0 12 mm housing</div> 	
<div>Target applications</div> <ul style="list-style-type: none">• Industrial Drives	<div>Schematic</div> 	
<div>Types</div> <ul style="list-style-type: none">• 10-FZ126PA035M7-P860F78		

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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	49	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	70	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	107	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C



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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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	40	A
Repetitive peak forward current	I_{FRM}		70	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	75	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* $t_p = 2\text{ s}$	6000	V
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			>12,7	mm
Clearance			9,22	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production



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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 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	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						0,89		K/W
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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}	$Q_{tFWD} = 4,3 \mu\text{C}$ $Q_{tFWD} = 6,2 \mu\text{C}$ $Q_{tFWD} = 6,9 \mu\text{C}$				25 125 150		1,45 1,92 2,09		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		2,40 3,17 3,42		



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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 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	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,27		K/W
-------------------------------------	---------------	---	--	--	--	--	--	------	--	-----

Dynamic

Peak recovery current	I_{RRM}	$di/dt = 2681 \text{ A/}\mu\text{s}$ $di/dt = 2670 \text{ A/}\mu\text{s}$ $di/dt = 2690 \text{ A/}\mu\text{s}$	± 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		4,34 6,18 6,90		μC
Reverse recovered energy	E_{rec}					25 125 150		1,96 2,82 3,13		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		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$				100	-5		5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 1 \%$				25		3962		K
B-value	$B_{(25/100)}$	Tol. $\pm 1 \%$				25		4000		K
Vincotech NTC Reference									I	



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Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

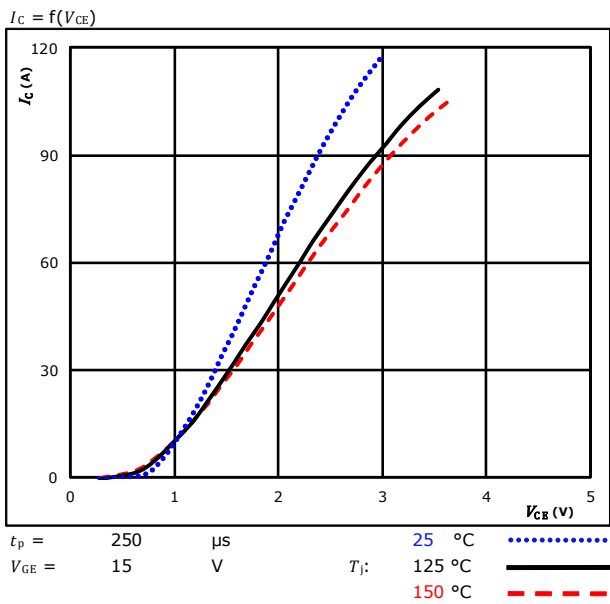


figure 2. IGBT

Typical output characteristics

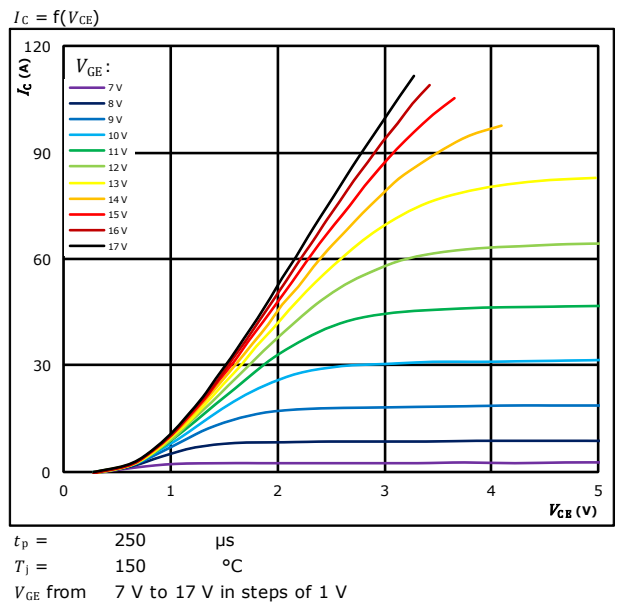


figure 3. IGBT

Typical transfer characteristics

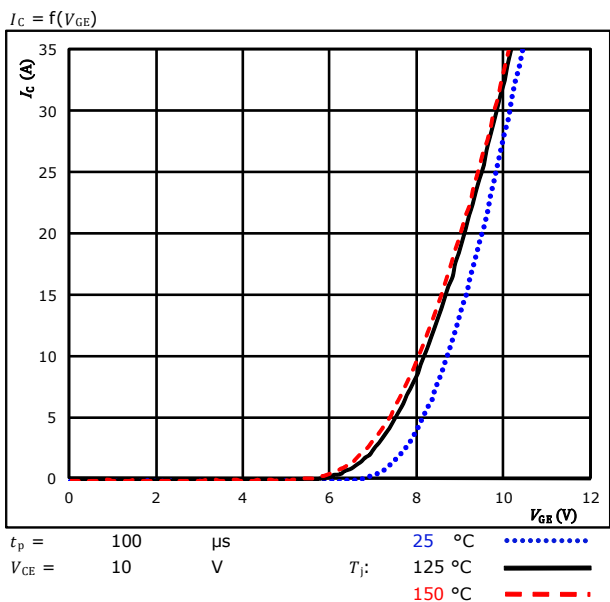
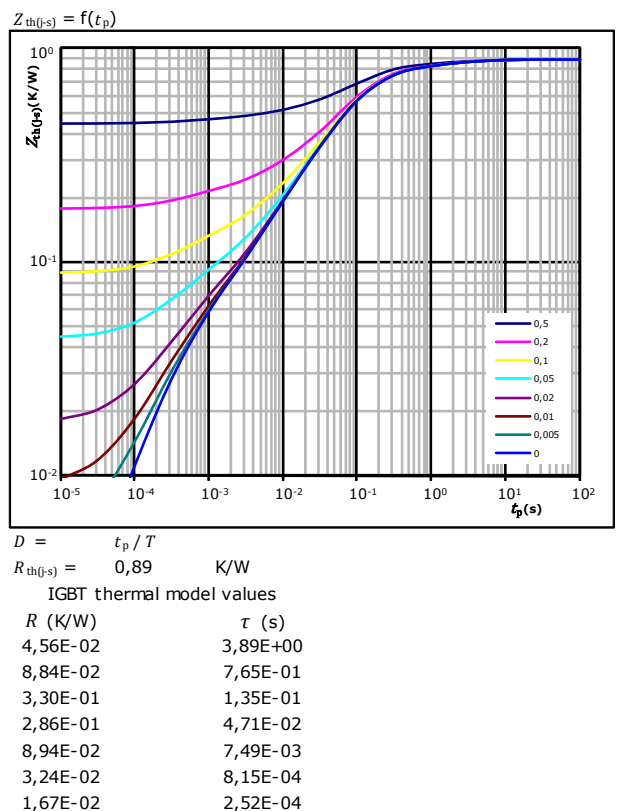


figure 4. IGBT

Transient thermal impedance as function of pulse duration



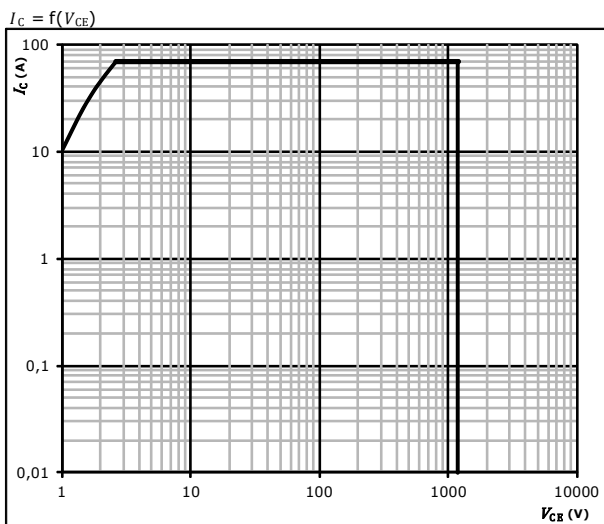


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Inverter Switch Characteristics

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 Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

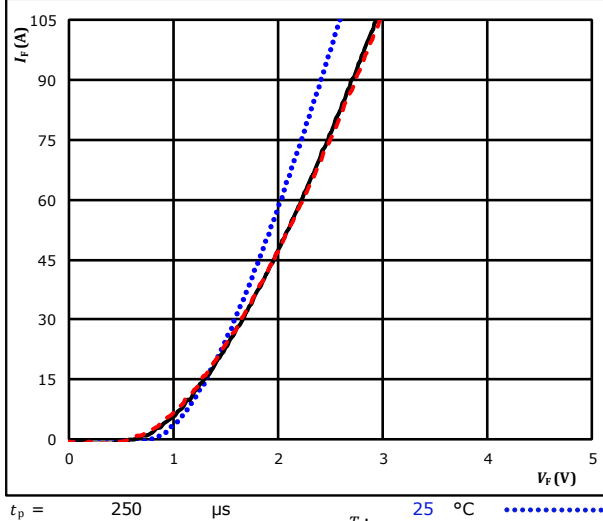
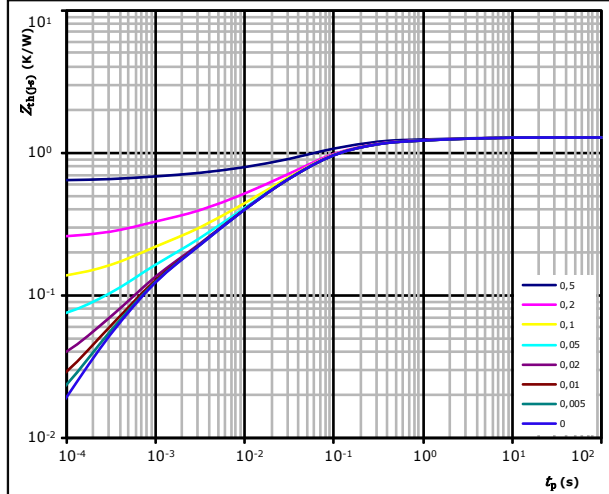


figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$$D = t_p / T$$

$$R_{th(j-s)} = 1,27 \text{ K/W}$$

FWD thermal model values

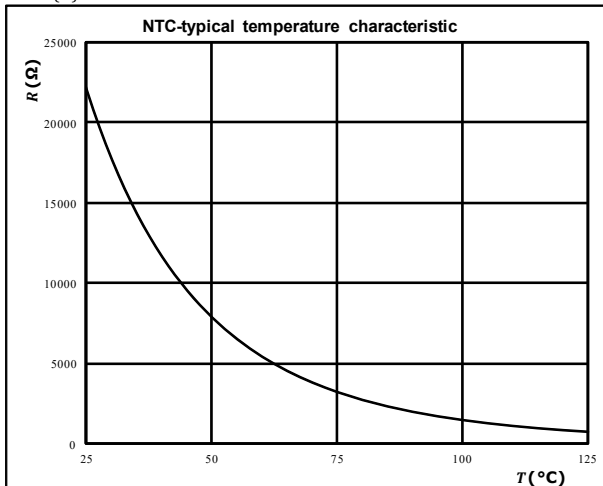
R (K/W)	τ (s)
5,82E-02	3,40E+00
1,11E-01	5,24E-01
4,63E-01	9,20E-02
3,72E-01	2,94E-02
1,72E-01	5,46E-03
9,36E-02	6,17E-04

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic
as a function of temperature

$$R = f(T)$$





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Inverter Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

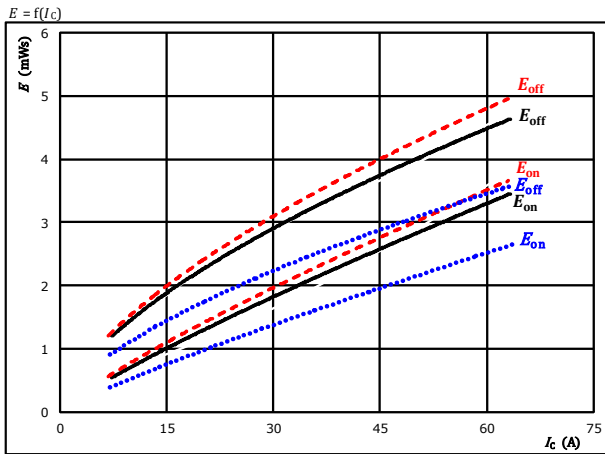


figure 2. IGBT

Typical switching energy losses as a function of gate resistor

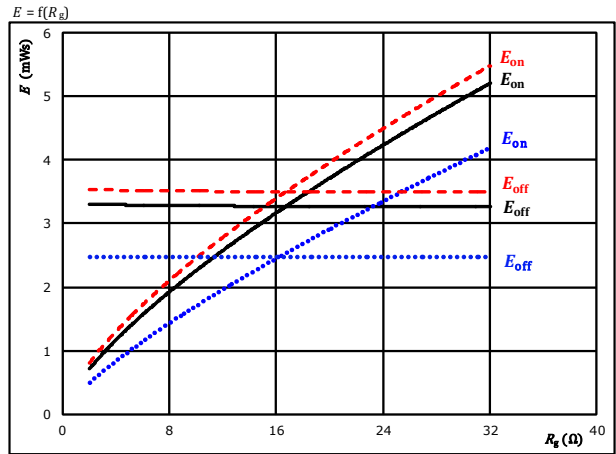


figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

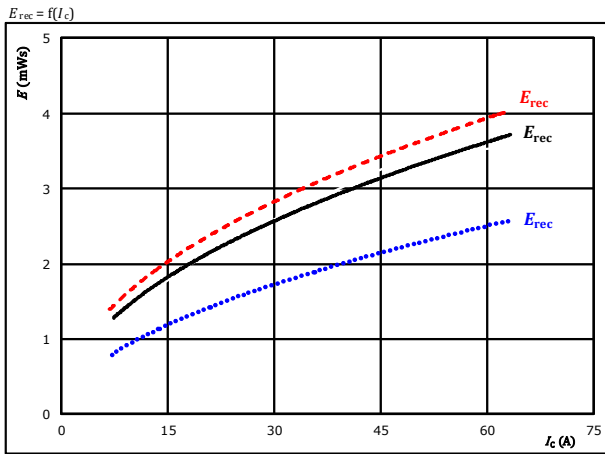
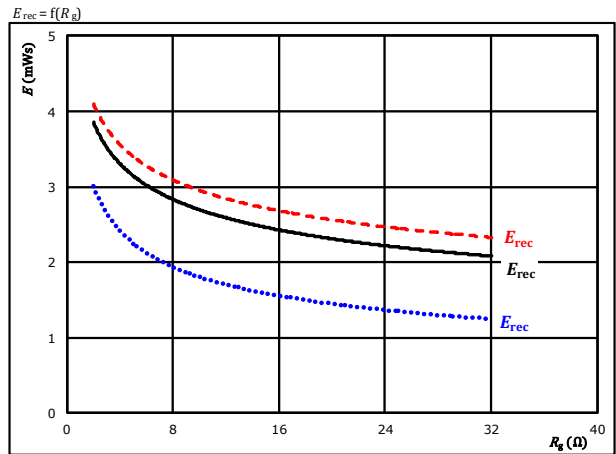


figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor





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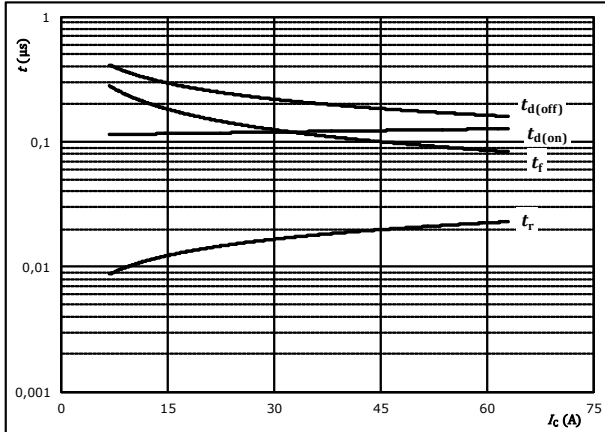
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Inverter Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



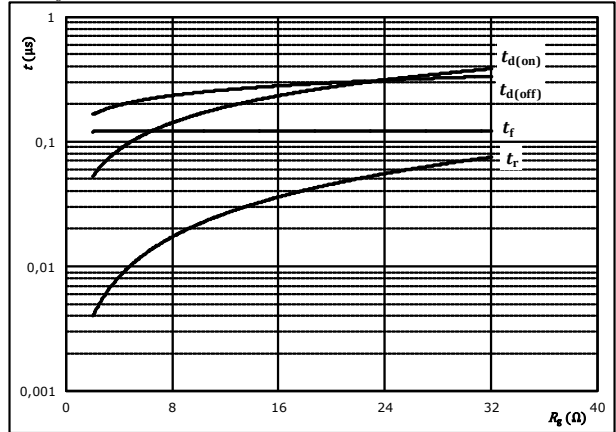
With an inductive load at

$T_j =$	150	°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

$$t = f(R_g)$$



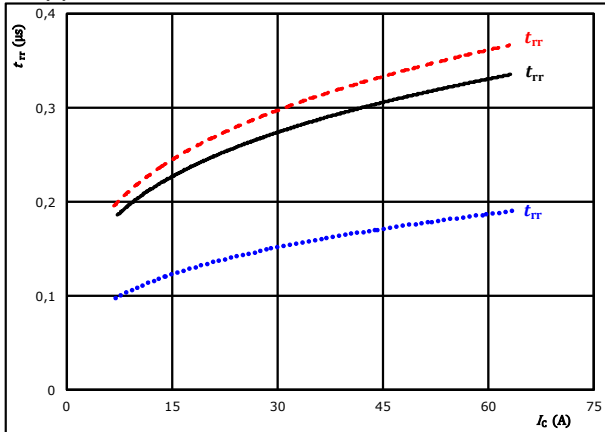
With an inductive load at

$T_j =$	150	°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

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

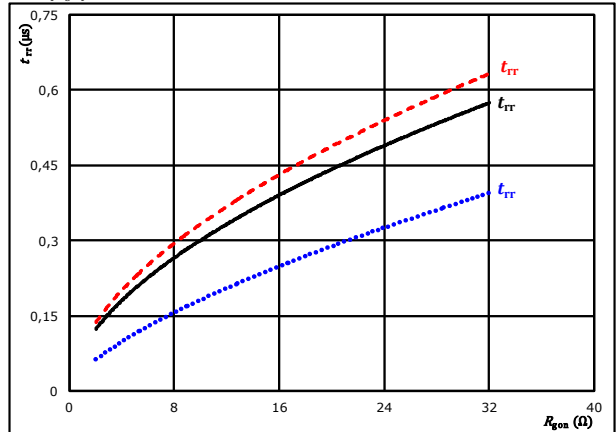


At	$V_{CE} =$	600	V	$T_j:$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$R_{gon} =$	8	Ω		150 °C	-----

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	————
	$I_C =$	35	A		150 °C	-----



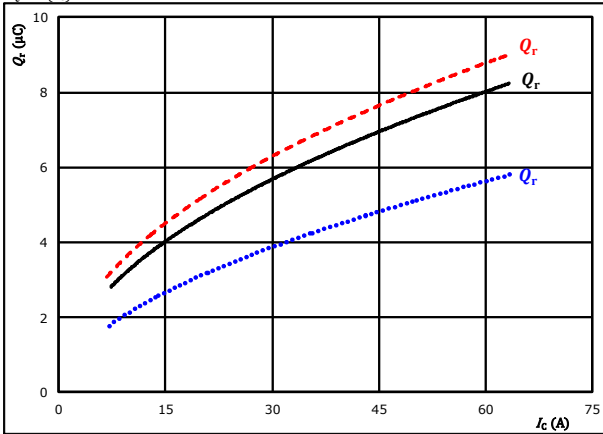
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Inverter Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_C)$$

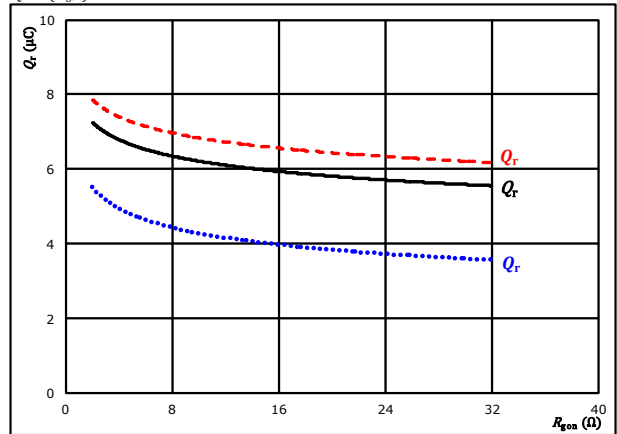


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω
 $T_j = 25$ °C
125 °C ———
150 °C - - - - -

figure 10. FWD

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

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

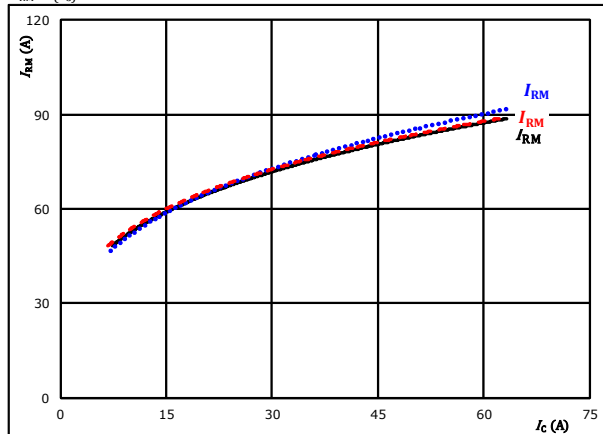


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 35$ A
 $T_j = 25$ °C
125 °C ———
150 °C - - - - -

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

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

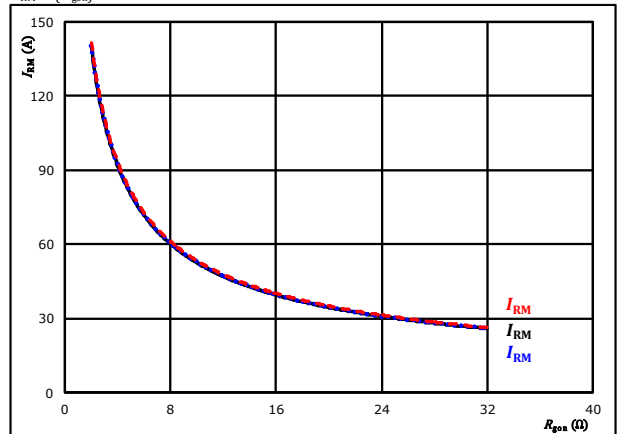


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω
 $T_j = 25$ °C
125 °C ———
150 °C - - - - -

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 - - - - -

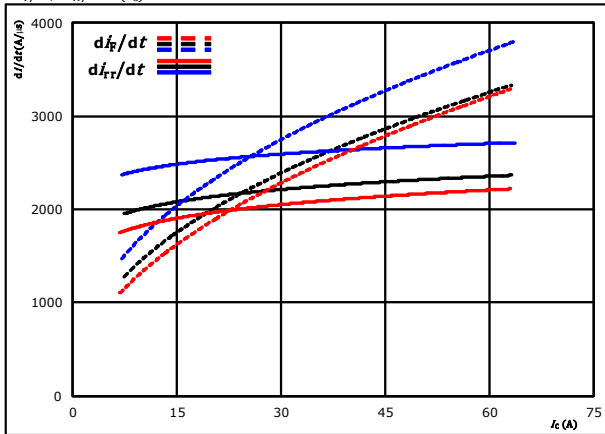


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Inverter Switching Characteristics

figure 13. FWD

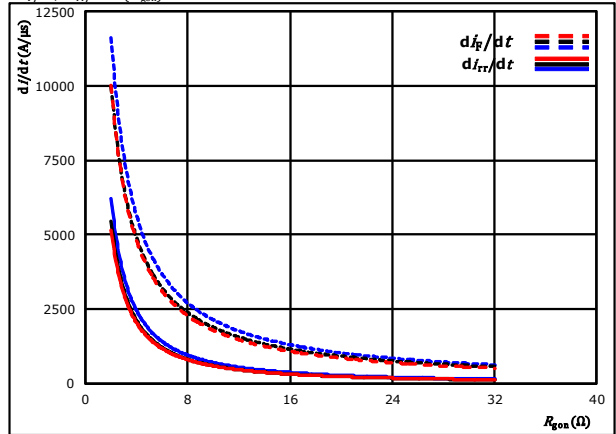
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_F/dt, di_{rr}/dt = f(I_C)$



At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{g0n} = 8$ Ω
 $T_J = 25^\circ\text{C}$ (blue dotted)
 125°C (black solid)
 150°C (red dashed)

figure 14. FWD

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_F/dt, di_{rr}/dt = f(R_{g0n})$

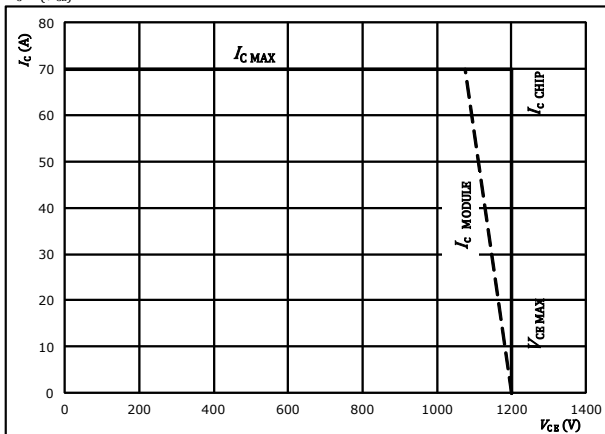


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 35$ A
 $T_J = 25^\circ\text{C}$ (blue dotted)
 125°C (black solid)
 150°C (red dashed)

figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_J = 175^\circ\text{C}$
 $R_{g0n} = 8$ Ω
 $R_{g0ff} = 8$ Ω



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datasheet

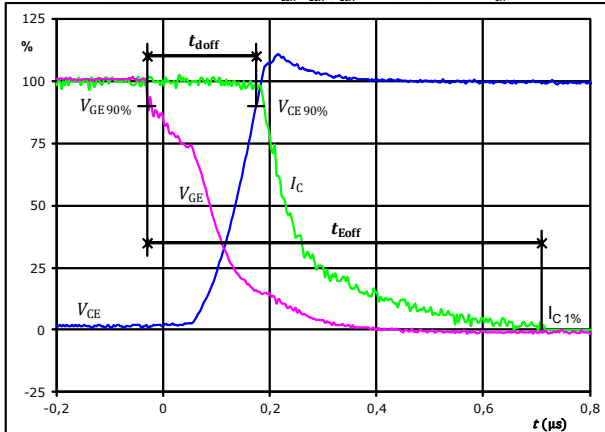
Inverter Switching Definitions

General conditions

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

figure 1. IGBT

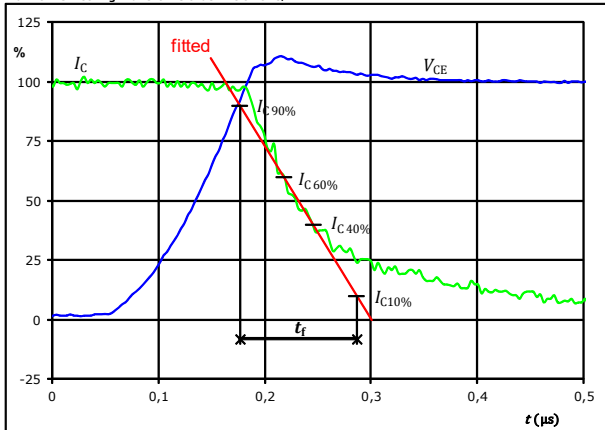
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$	=	-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

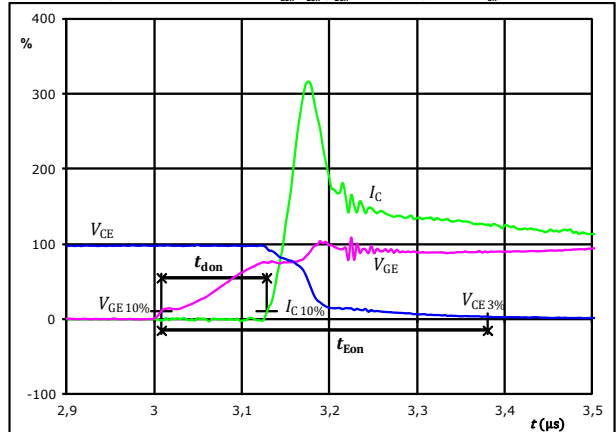
Turn-off Switching Waveforms & definition of t_r



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

figure 2. IGBT

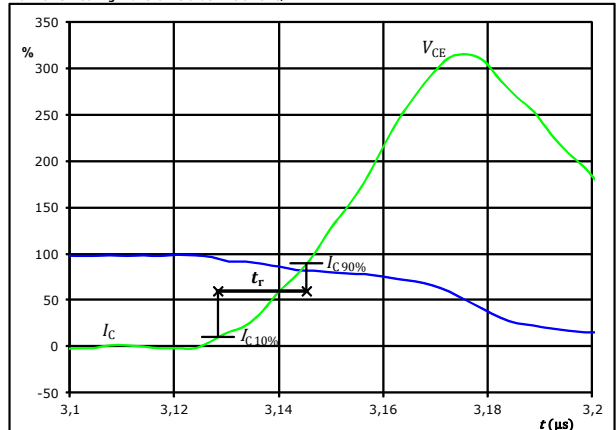
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$	=	-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



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Inverter Switching Characteristics

figure 5. IGBT

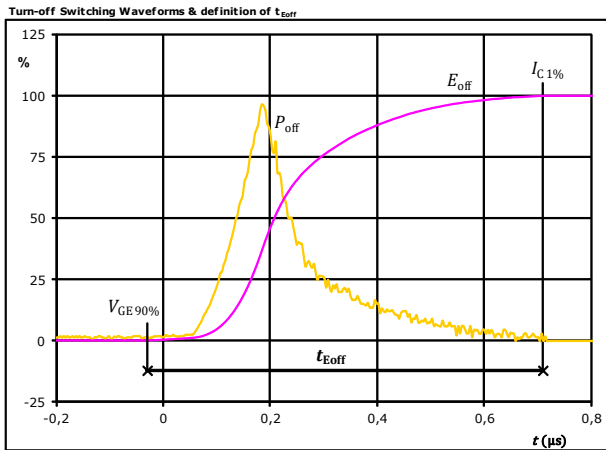


figure 6. IGBT

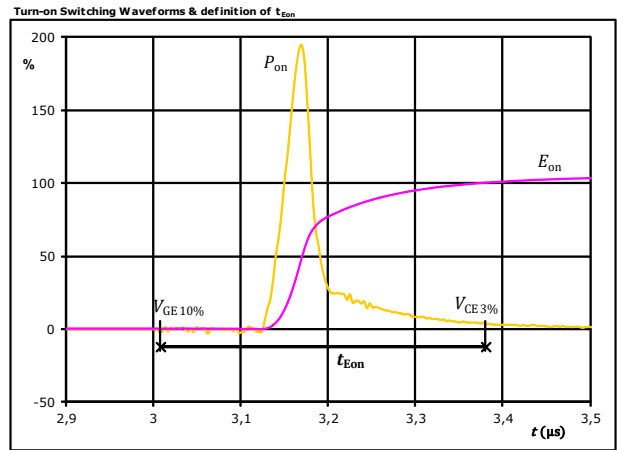
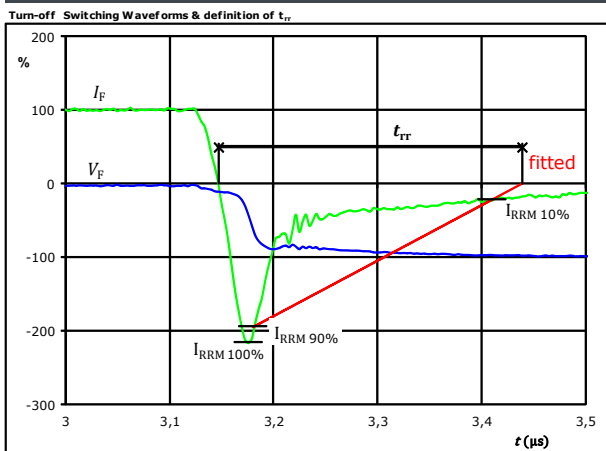


figure 7. FWD





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Inverter Switching Characteristics

figure 8. FWD

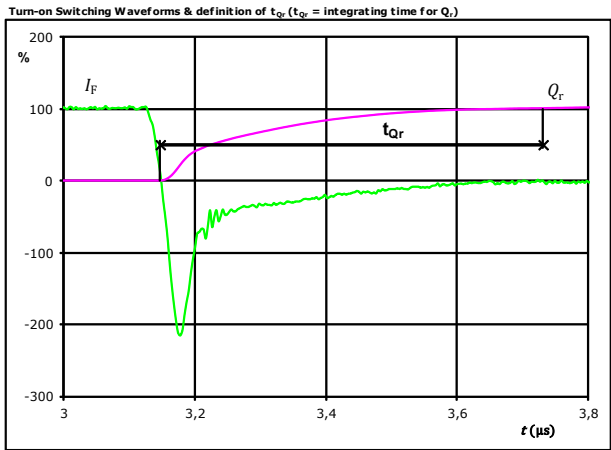
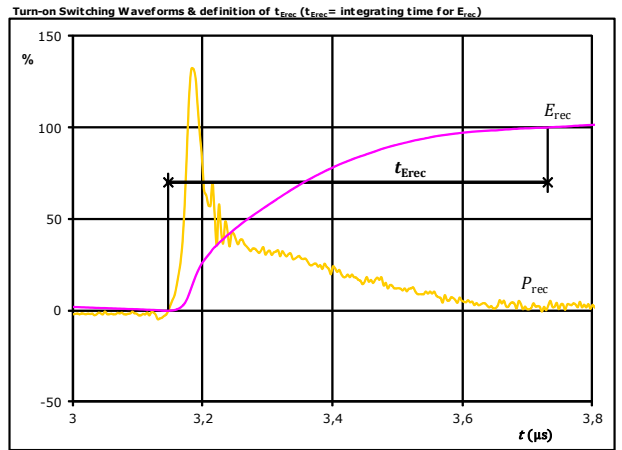


figure 9. FWD





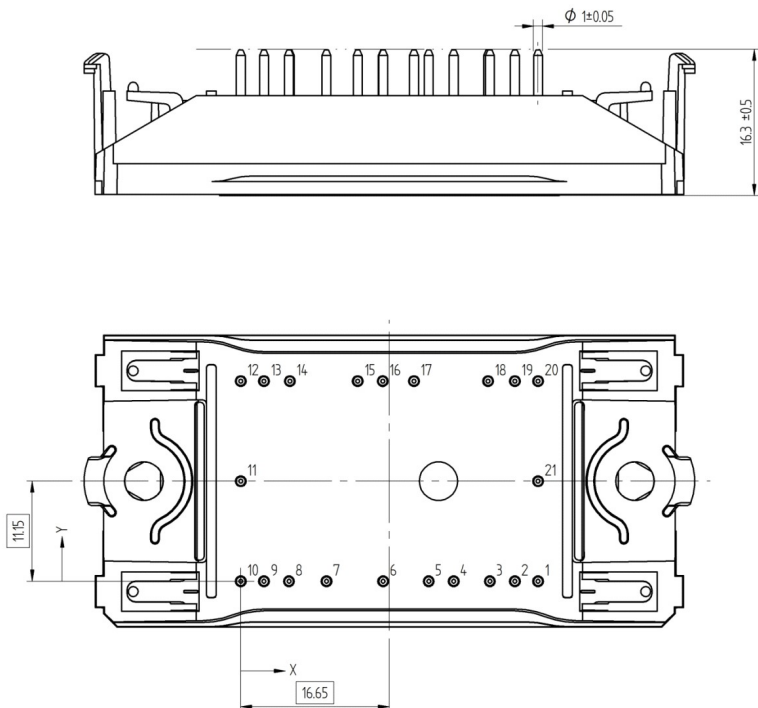


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datasheet

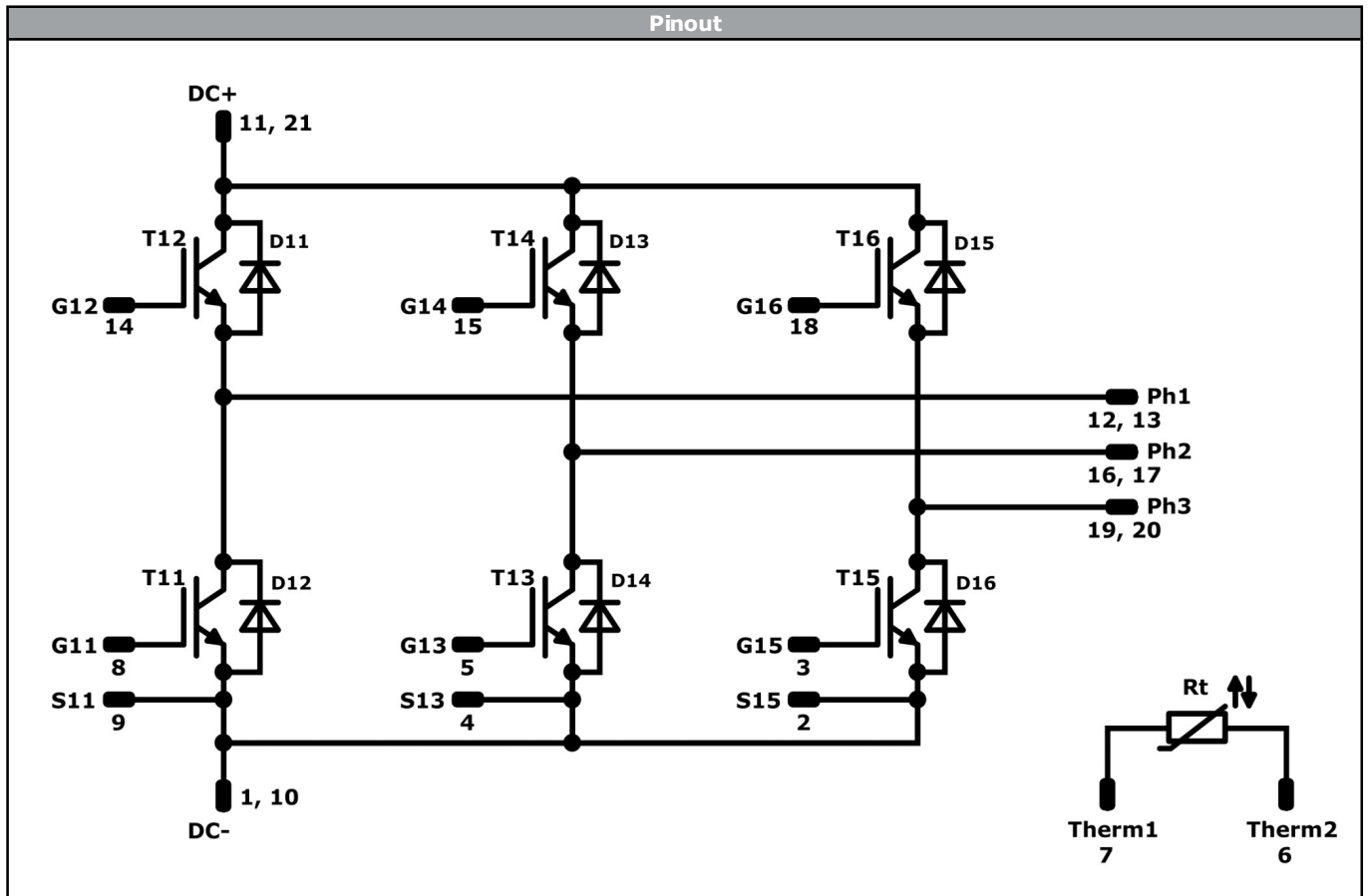
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Ordering Code & Marking										
Version				Ordering Code						
without thermal paste 12 mm housing with solder pins				10-FZ126PA035M7-P860F78						
<div><div>NN-NNNNNNNNNNNNNN TTTTTTVV WWYY UL VIN LLLLL SSSS</div><div></div><div></div></div>				Text	Name		Date code	UL & VIN	Lot	Serial
					NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
				Datamatrix	Type&Ver	Lot number	Serial	Date code		
					TTTTTTTVV	LLLLL	SSSS	WWYY		

Pin table				Outline			
Pin	X	Y	Function				
1	33,3	0	DC-				
2	30,7	0	S15				
3	27,9	0	G15				
4	23,85	0	S13				
5	21,05	0	G13				
6	15,95	0	Therm2				
7	9,6	0	Therm1				
8	5,4	0	G11				
9	2,6	0	S11				
10	0	0	DC-				
11	0	11,15	DC+				
12	0	22,3	Ph1				
13	2,6	22,3	Ph1				
14	5,5	22,3	G12				
15	13,1	22,3	G14				
16	15,9	22,3	Ph2				
17	19,4	22,3	Ph2				
18	27,7	22,3	G16				
19	30,7	22,3	Ph3				
20	33,3	22,3	Ph3				
21	33,3	11,15	DC+				
				Tolerance of pinpositions: ±0.5mm at the end of pins Dimension of coordinate axis is only offset without tolerance			



Vincotech



Identification					
ID	Component	Voltage	Current	Function	Comment
T11-T16	IGBT	1200 V	35 A	Inverter Switch	
D11-D16	FWD	1200 V	35 A	Inverter Diode	
Rt	NTC			Thermistor	




Vincotech

10-FZ126PA035M7-P860F78
datasheet

Packaging instruction			
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for <i>flow 0</i> packages see vincotech.com website.

Package data
Package data for <i>flow 0</i> 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
10-FZ126PA035M7-P860F78-D1k1-14	13 Feb. 2019		

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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.