
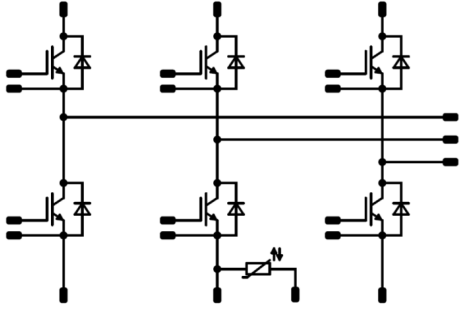




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<i>flow PACK 2</i>	1200 V / 75 A
<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;">Features</div> <ul style="list-style-type: none"> IGBT4 (1200V) technology for low saturation losses and improved EMC behavior Compact and low inductive design Integrated temperature sensor <div style="background-color: #eee; padding: 5px; margin-bottom: 5px;">Target applications</div> <ul style="list-style-type: none"> Industrial drives <div style="background-color: #eee; padding: 5px;">Types</div> <ul style="list-style-type: none"> 30-P2126PA075SC-L288F09Y 	<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;"><i>flow 2 17 mm housing</i></div> <div style="text-align: center; padding: 10px;">  </div> <div style="background-color: #eee; padding: 5px; margin-bottom: 5px;">Schematic</div> <div style="text-align: center; padding: 10px;">  </div>

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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	91	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	225	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	232	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$T_j \leq 150\text{ °C}$	10	μs
	V_{CC}	$V_{GE} = 15\text{ V}$	800	V
Maximum Junction Temperature	T_{jmax}		175	$^{\circ}C$



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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	$T_j = T_{jmax}$ $T_s = 80\text{°C}$	84	A
Repetitive peak forward current	I_{FRM}		150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{°C}$	154	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* $t_p = 2\text{ s}$	4000	V
		AC Test Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			min. 12,7	mm
Clearance			min. 12,7	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	$V_{GE(th)}$	$V_{CE} = V_{CE}$			0,0026	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		75	25 0 150	1,58	1,83 2,12 2,19	2,07	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			1	μA
Gate-emitter leakage current	I_{GES}		20	0		25			120	nA
Internal gate resistance	r_g							10		Ω
Input capacitance	C_{ies}	$f = 1$ MHz	0	25		25		4300		pF
Reverse transfer capacitance	C_{res}							160		

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK						0,41		K/W
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IGBT Switching

Turn-on delay time	$t_{d(on)}$	$R_{goff} = 4 \Omega$ $R_{gon} = 4 \Omega$	± 15	600	75	25		149		ns
Rise time	t_r					125		160		
						150		164		
						25		39		
Turn-off delay time	$t_{d(off)}$					125		44		
						150		43		
		25		250						
Fall time	t_f	125		312						
		150		329						
		25		76						
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 7,2 \mu C$ $Q_{tFWD} = 12,8 \mu C$ $Q_{tFWD} = 14,8 \mu C$				25		7,677		mWs
						125		10,716		
						150		11,421		
Turn-off energy (per pulse)	E_{off}					25		4,222		
						125		6,490		
						150		7,220		



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Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		

Inverter Diode

Static

Parameter	Symbol	V_{GS} [V]	V_{DS} [V]	I_D [A]	I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F			75		25 125 150		1,74 1,75 1,74	2,05	V
Reverse leakage current	I_r		1200			25 150			14	μA

Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK	0,61	K/W

FWD Switching

Parameter	Symbol	dI/dt [A/μs]	V_{GS} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Peak recovery current	I_{RRM}				75	25 125 150		40 49 52		A
Reverse recovery time	t_{rr}				75	25 125 150		351 497 546		ns
Recovered charge	Q_r	$dI/dt = 2324$ A/μs $dI/dt = 1749$ A/μs $dI/dt = 1360$ A/μs	±15	600	75	25 125 150		7,180 12,829 14,755		μC
Reverse recovered energy	E_{rec}				75	25 125 150		2,500 4,587 5,374		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$				75	25 125 150		116 103 99		A/μs

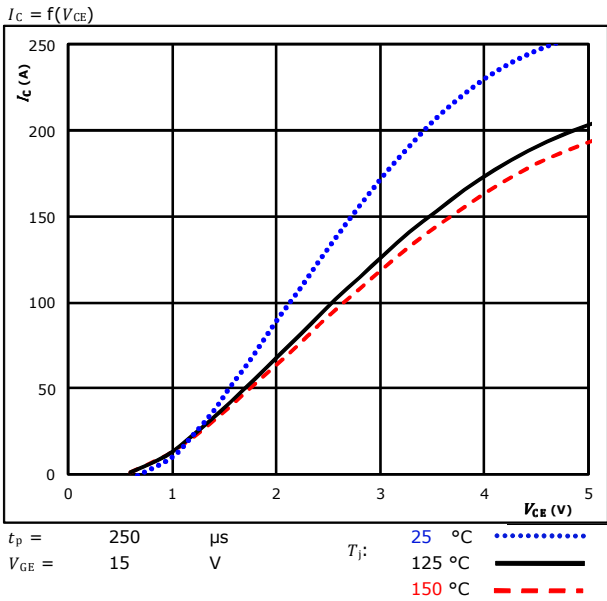
Thermistor

Parameter	Symbol	Conditions	Value	Unit
Rated resistance	R		25	kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1486$ Ω	100	%
Power dissipation	P		25	mW
Power dissipation constant			25	mW/K
B-value	$B_{(25/50)}$	Tol. ±3%	25	K
B-value	$B_{(25/100)}$	Tol. ±3%	25	K
Vincotech NTC Reference				B

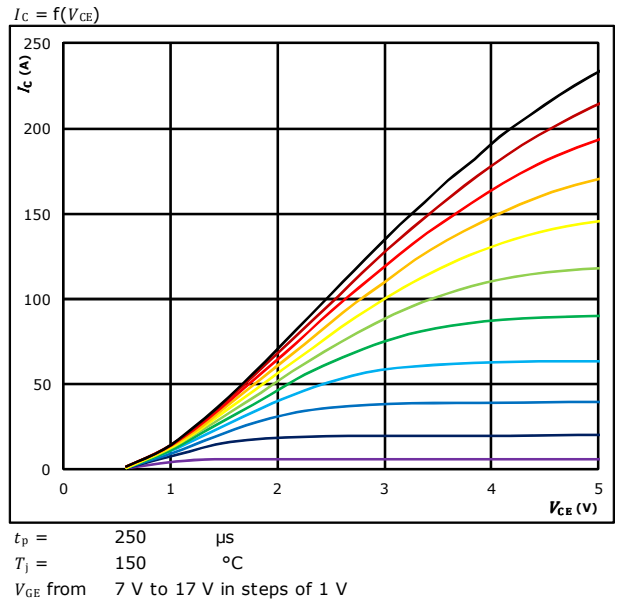


Inverter Switch Characteristics

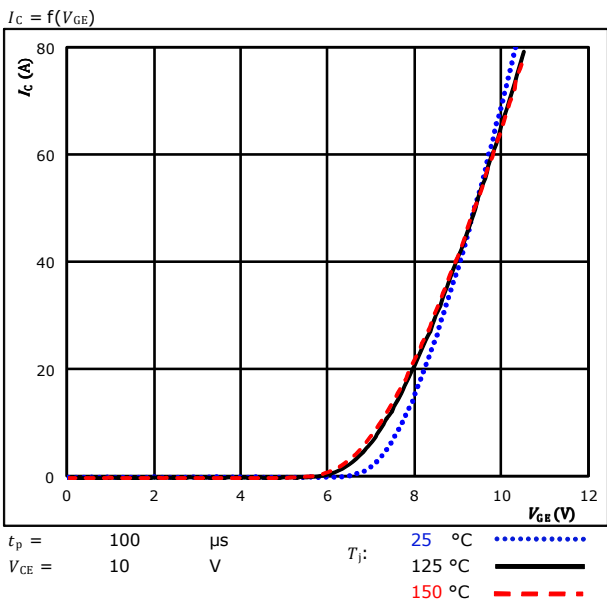
Typical output characteristics IGBT



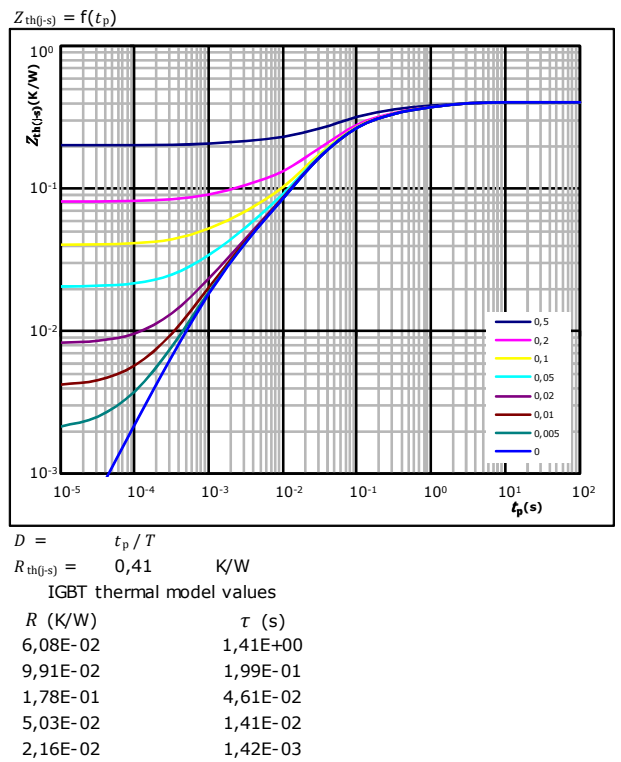
Typical output characteristics IGBT



Typical transfer characteristics IGBT



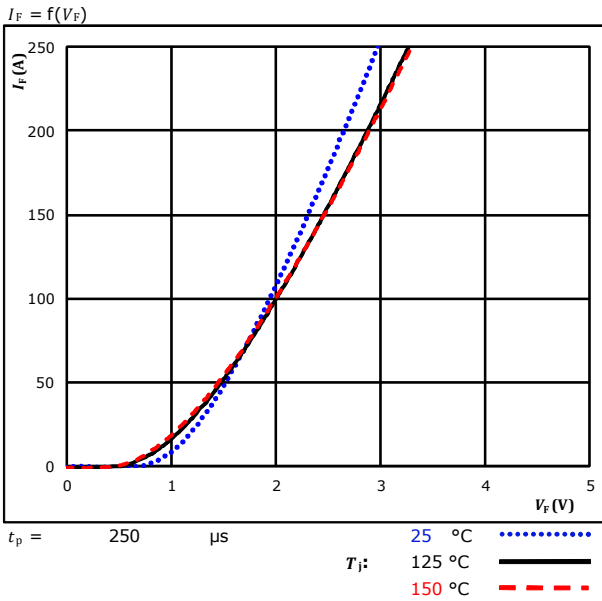
Transient Thermal Impedance as function of Pulse duration IGBT



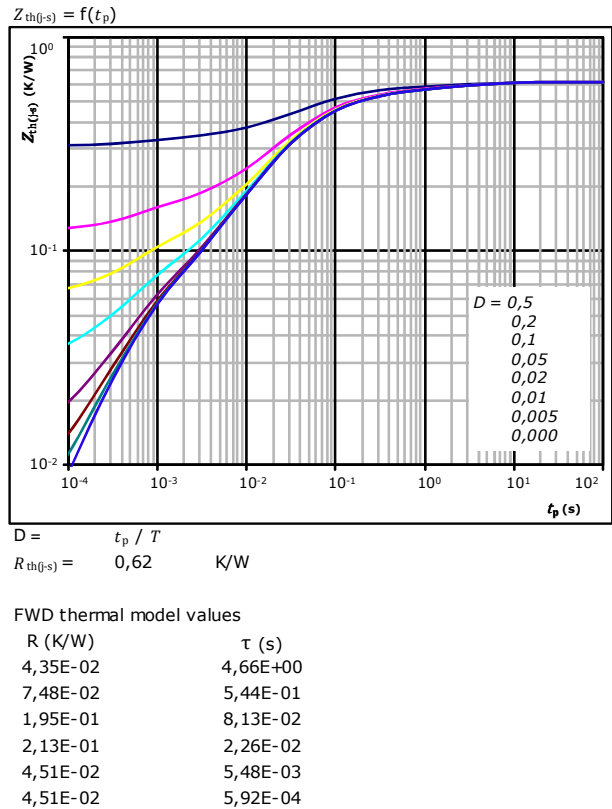


Inverter Diode Characteristics

Typical forward characteristics FWD



Transient thermal impedance as a function of pulse width FWD

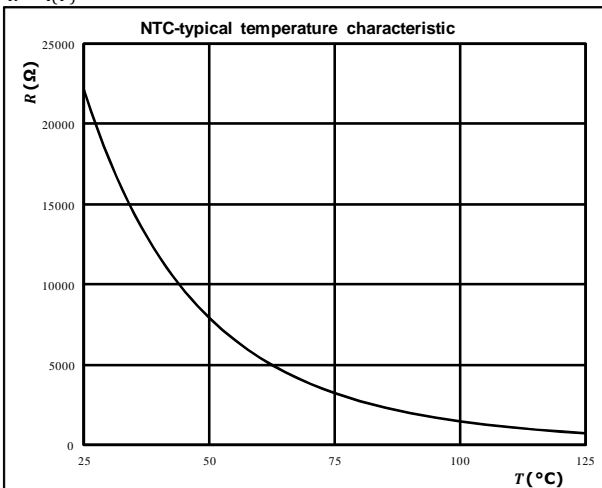


Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic as a function of temperature

$R = f(T)$

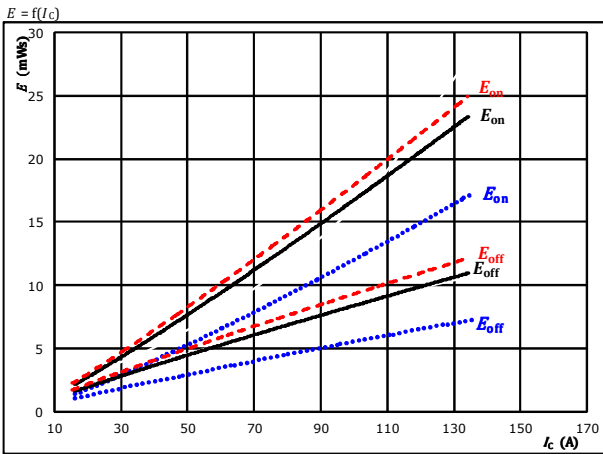




Switching Characteristics

Figure 1. IGBT

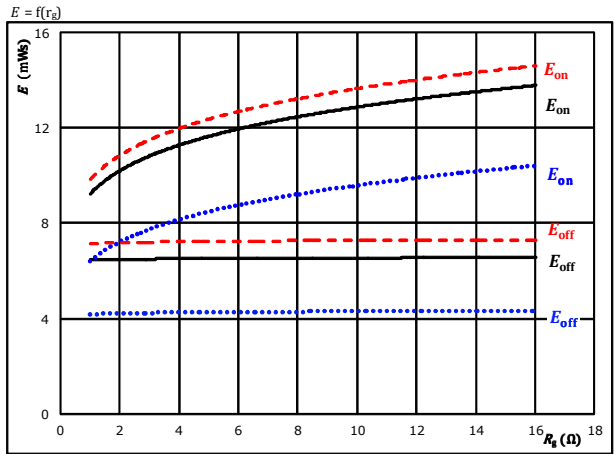
Typical switching energy losses as a function of collector current



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω
 T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

Figure 2. IGBT

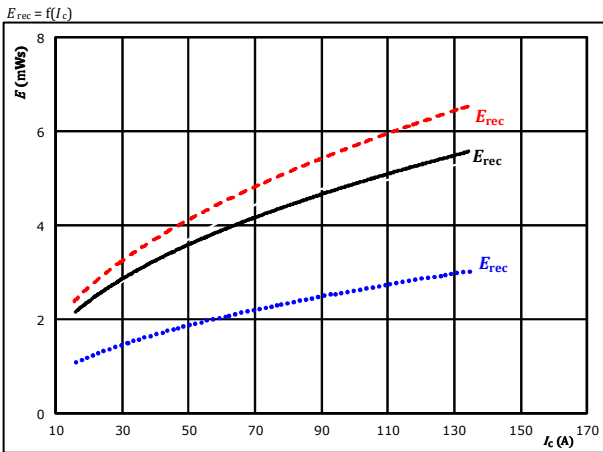
Typical switching energy losses as a function of gate resistor



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 75$ A
 T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

Figure 3. FWD

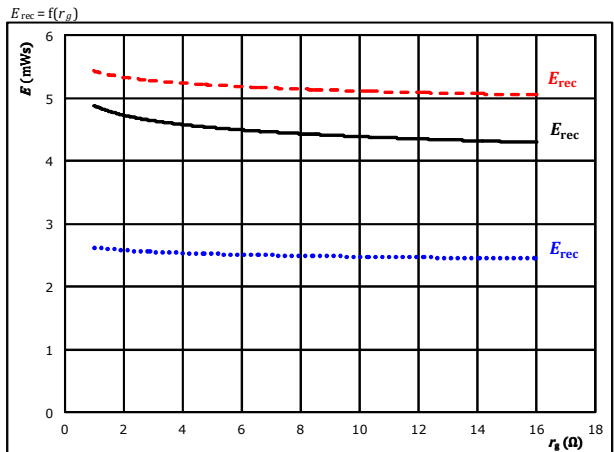
Typical reverse recovered energy loss as a function of collector current



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ 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
 $I_C = 75$ A
 T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

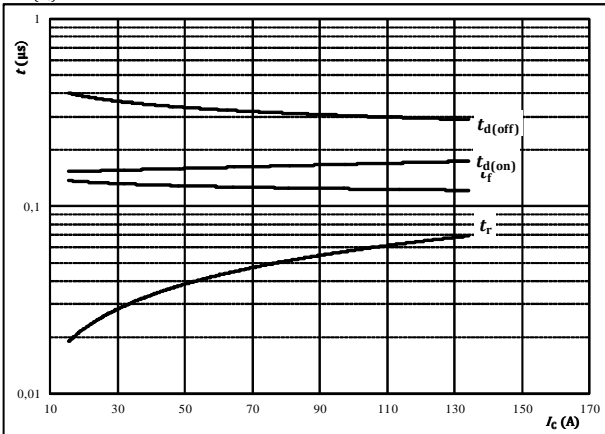


Switching Characteristics

Figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



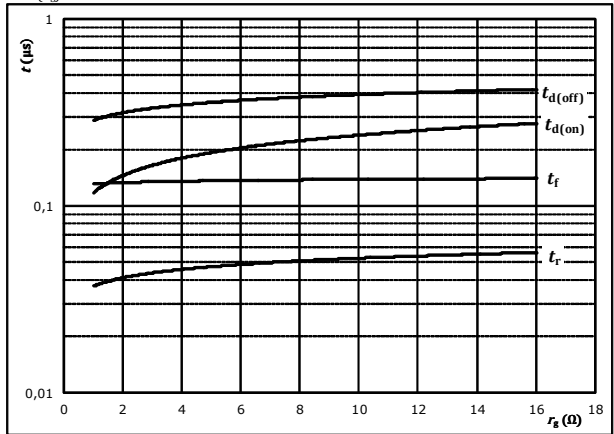
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{gon} =$	4	Ω
$R_{goff} =$	4	Ω

Figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(r_g)$$



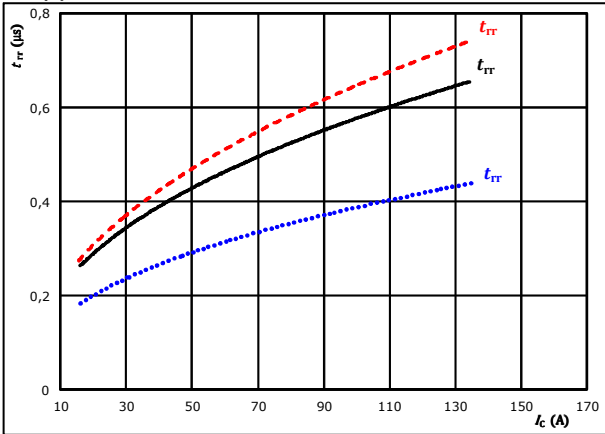
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_C =$	75	A

Figure 7. FWD

Typical reverse recovery time as a function of collector current

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

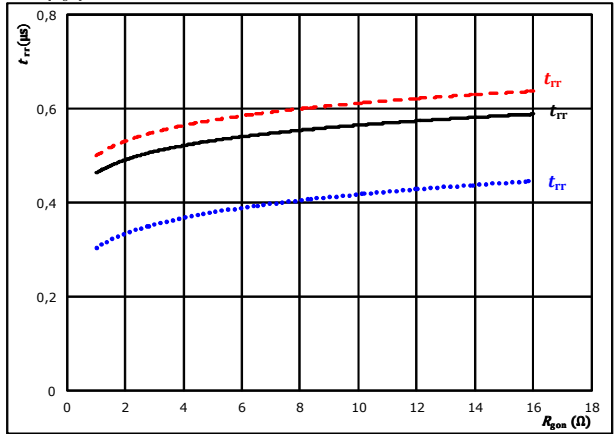


At	$V_{CE} =$	600	V	$T_j:$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$R_{gon} =$	4	Ω		150 °C	-----

Figure 8. FWD

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

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

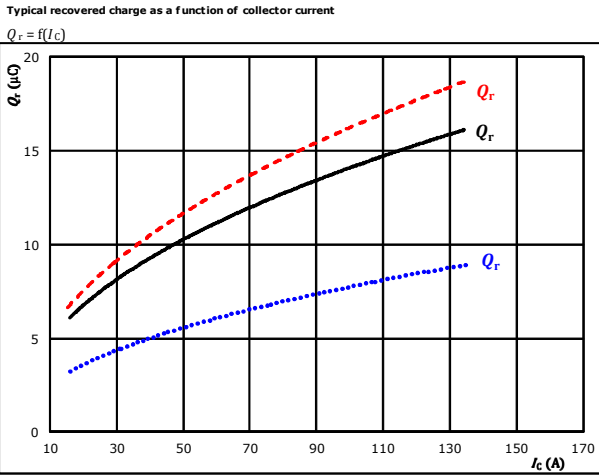


At	$V_{CE} =$	600	V	$T_j:$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$I_C =$	75	A		150 °C	-----



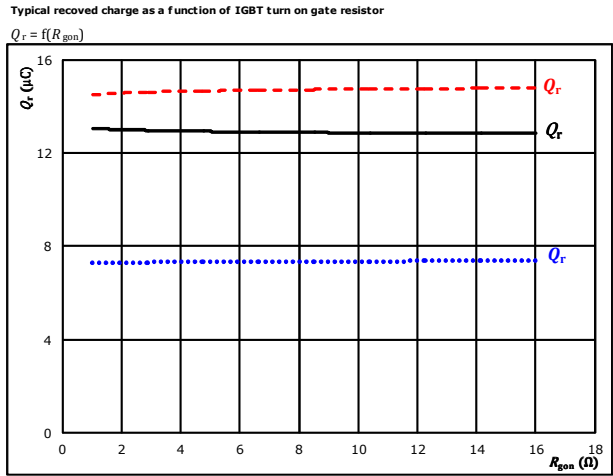
Switching Characteristics

Figure 9. FWD
Typical recovered charge as a function of collector current



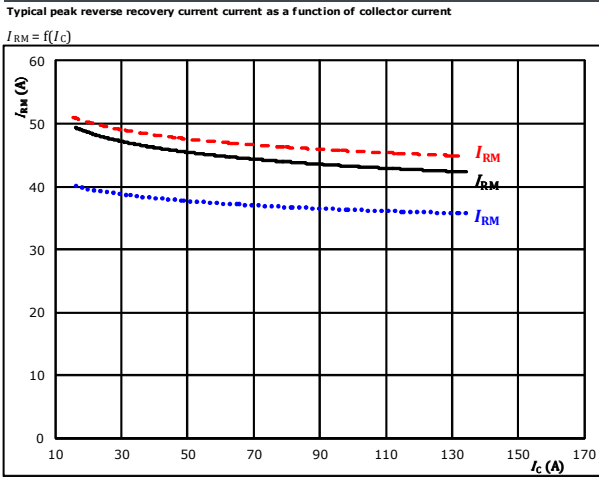
At $V_{CE} = 600$ V $T_j: 25$ °C
 $V_{GE} = \pm 15$ V $T_j: 125$ °C ———
 $R_{gpn} = 4$ Ω $T_j: 150$ °C - - - - -

Figure 10. FWD
Typical recovered charge as a function of IGBT turn on gate resistor



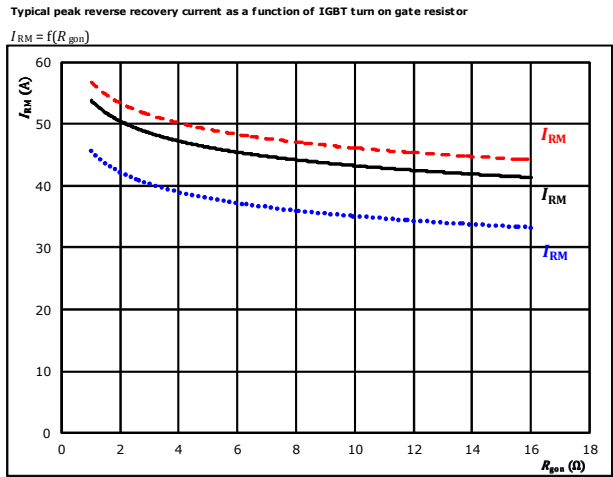
At $V_{CE} = 600$ V $T_j: 25$ °C
 $V_{GE} = \pm 15$ V $T_j: 125$ °C ———
 $I_c = 75$ A $T_j: 150$ °C - - - - -

Figure 11. FWD
Typical peak reverse recovery current current as a function of collector current



At $V_{CE} = 600$ V $T_j: 25$ °C
 $V_{GE} = \pm 15$ V $T_j: 125$ °C ———
 $R_{gpn} = 4$ Ω $T_j: 150$ °C - - - - -

Figure 12. FWD
Typical peak reverse recovery current current as a function of IGBT turn on gate resistor



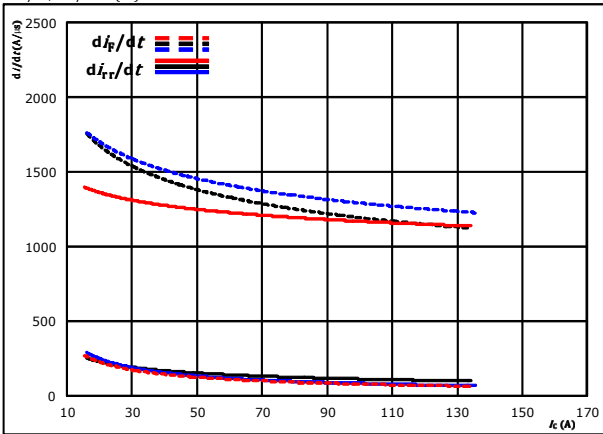
At $V_{CE} = 600$ V $T_j: 25$ °C
 $V_{GE} = \pm 15$ V $T_j: 125$ °C ———
 $I_c = 75$ A $T_j: 150$ °C - - - - -



Switching Characteristics

Figure 13. FWD

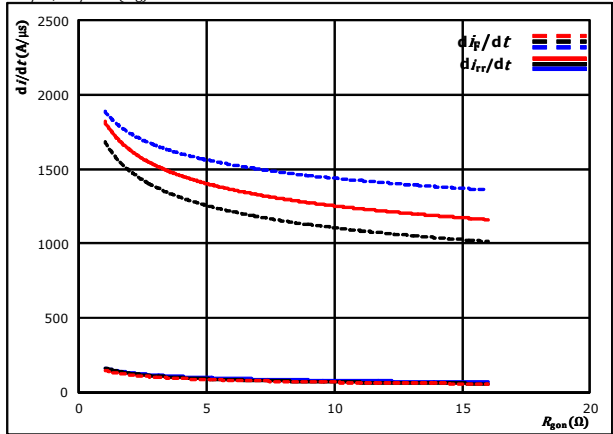
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 $T_j = 25$ °C
 125 °C
 150 °C

Figure 14. FWD

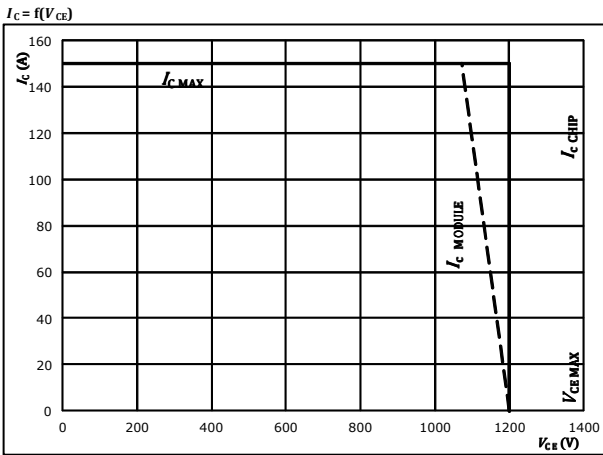
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_g)$



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



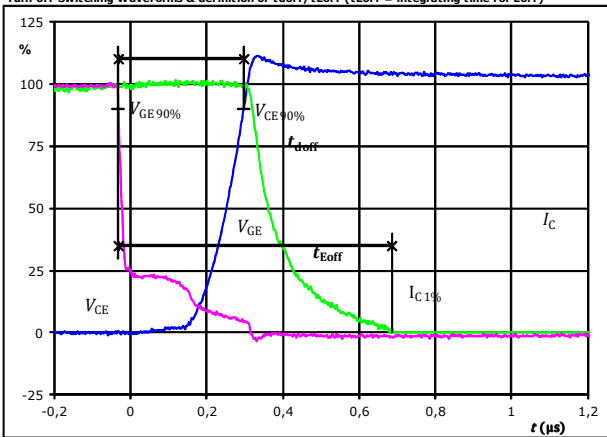
At $T_j = 175$ °C
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω



Switching Characteristics

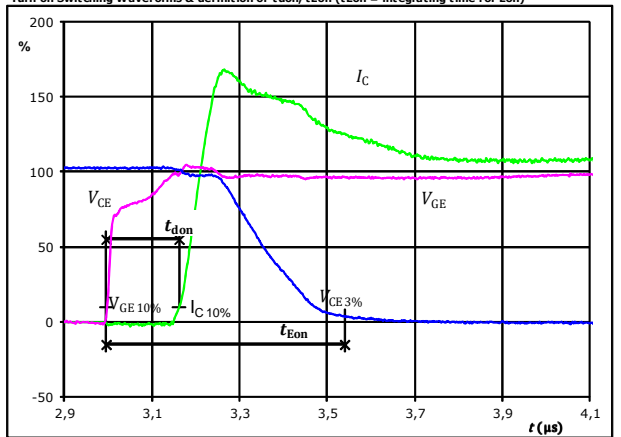
General conditions	
T_j	= 150 °C
R_{gon}	= 4 Ω
R_{goff}	= 4 Ω

Figure 1. IGBT
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for Eoff)



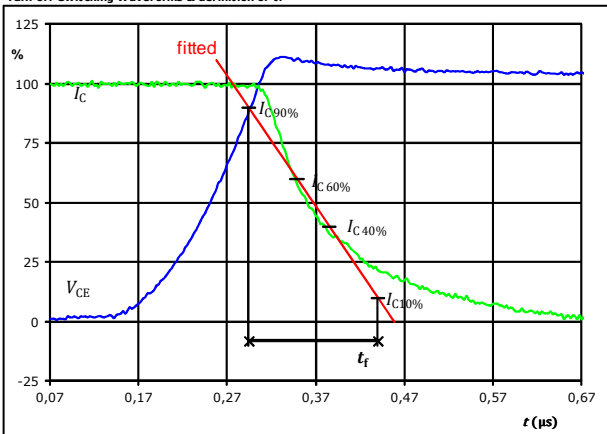
$V_{GE}(0\%)$	=	-15	V
$V_{GE}(100\%)$	=	15	V
$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	75	A
t_{doff}	=	0,329	μs
t_{Eoff}	=	0,718	μs

Figure 2. IGBT
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for Eon)



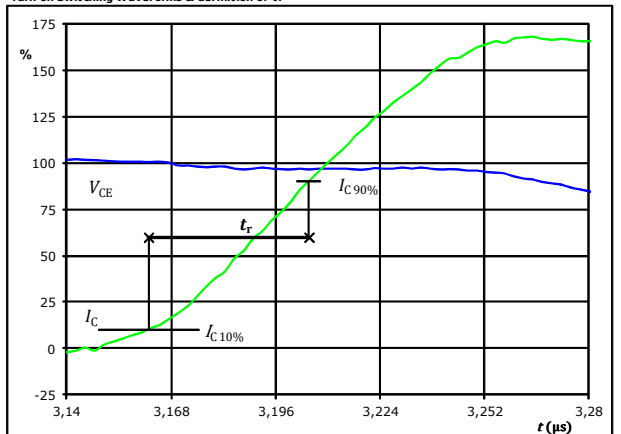
$V_{GE}(0\%)$	=	-15	V
$V_{GE}(100\%)$	=	15	V
$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	75	A
t_{don}	=	0,164	μs
t_{Eon}	=	0,544	μs

Figure 3. IGBT
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	75	A
t_f	=	0,136	μs

Figure 4. IGBT
Turn-on Switching Waveforms & definition of t_r



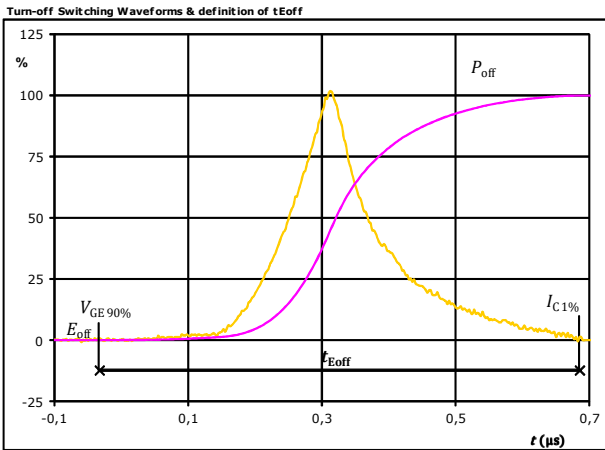
$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	75	A
t_r	=	0,043	μs



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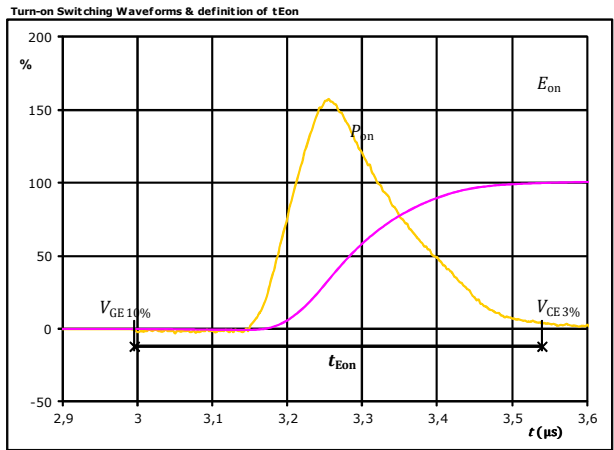
Switching Characteristics

Figure 5. IGBT



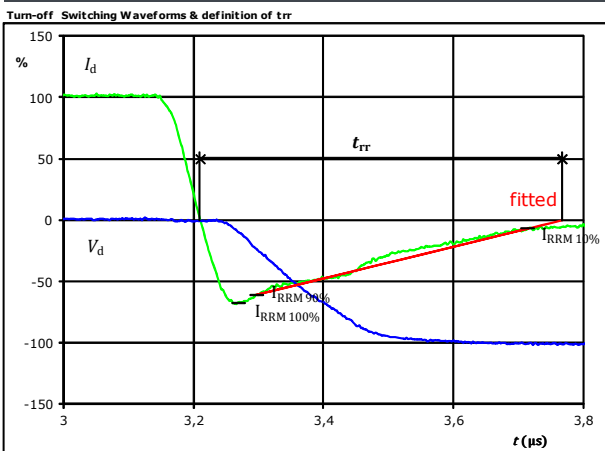
$P_{off}(100\%) = 44,90$ kW
 $E_{off}(100\%) = 7,22$ mJ
 $t_{Eoff} = 0,72$ μs

Figure 6. IGBT



$P_{on}(100\%) = 44,90$ kW
 $E_{on}(100\%) = 11,42$ mJ
 $t_{Eon} = 0,54$ μs

Figure 7. FWD

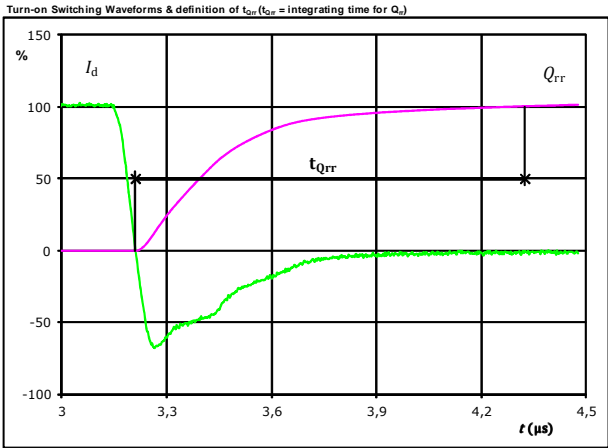


$V_d(100\%) = 600$ V
 $I_d(100\%) = 75$ A
 $I_{RRM}(100\%) = -52$ A
 $t_{rr} = 0,546$ μs



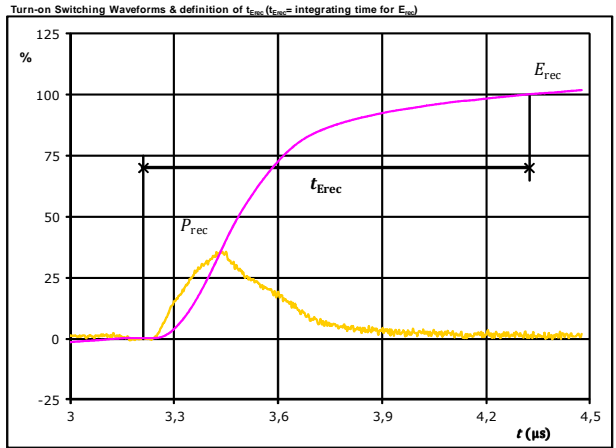
Switching Characteristics

Figure 8. FWD



I_d (100%) =	75	A
Q_{rr} (100%) =	14,76	μC
t_{Qrr} =	1,11	μs

Figure 9. FWD



P_{rec} (100%) =	44,90	kW
E_{rec} (100%) =	5,37	mJ
t_{Erec} =	1,11	μs



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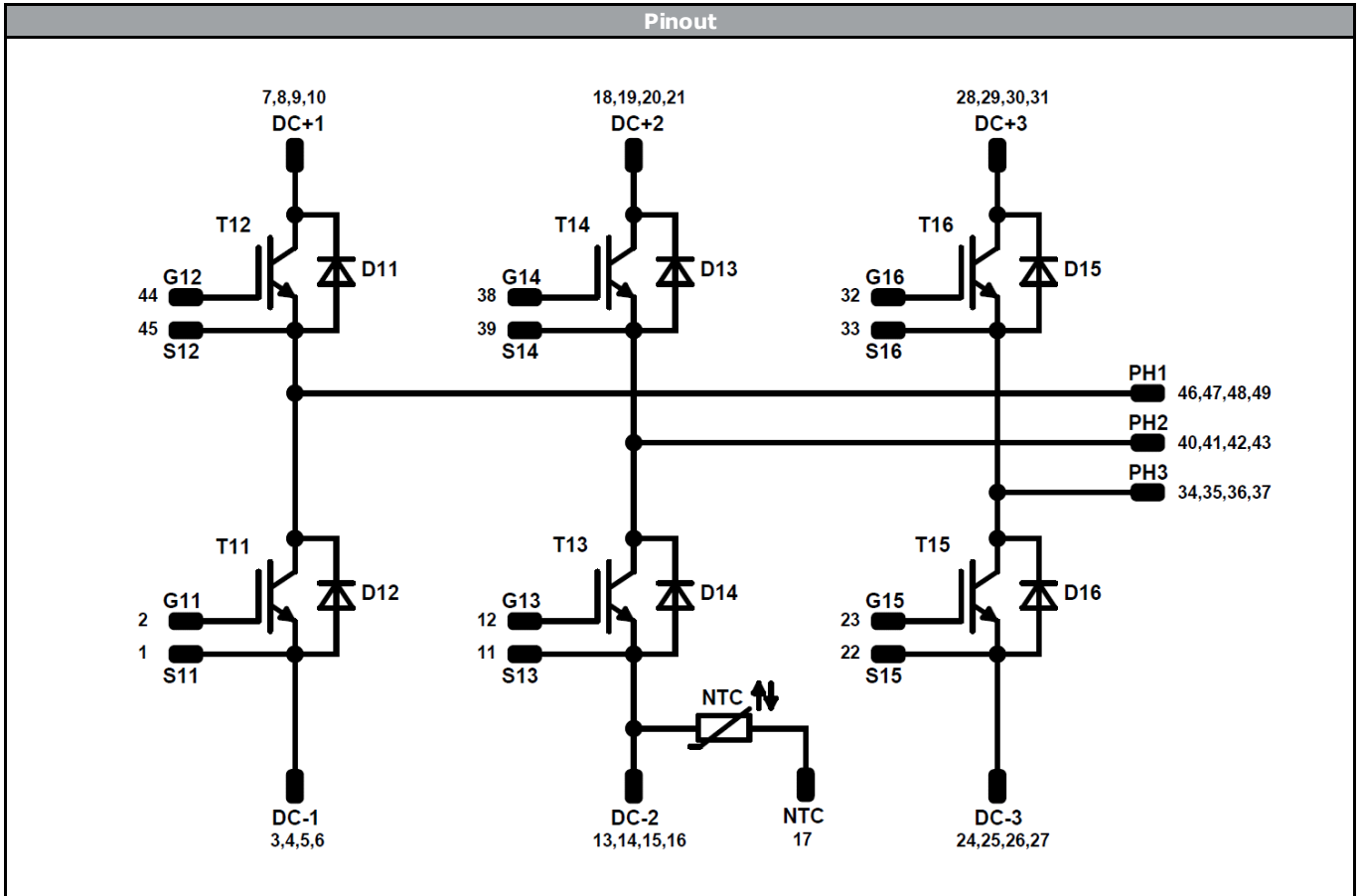
Ordering Code & Marking								
Version			Ordering Code					
without thermal paste 17mm housing			30-P2126PA075SC-L288F09Y					
NN-NNNNNNNNNNNN TTTTIVVWWYY UL VIN LLLLL SSSS			Name		Date code	UL & VIN	Lot	Serial
			N-NNNNNNNNNNNNNN-TTTTTTV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix		Type&Ver	Lot number	Serial	Date code			
		TTTTTIVV	LLLLL	SSSS	WWYY			

Pin table [mm]				Outline	
Pin	X	Y	Function		
1	0,9	0	S11		
2	0,9	3	G11		
3	3,9	0	DC-1		
4	3,9	2,7	DC-1		
5	3,9	5,4	DC-1		
6	6,6	0	DC-1		
7	15,2	0	DC+1		
8	15,2	2,7	DC+1		
9	17,9	0	DC+1		
10	17,9	2,7	DC+1		
11	26,2	0	S13		
12	26,2	3	G13		
13	29,2	0	DC-2		
14	29,2	2,7	DC-2		
15	29,2	5,4	DC-2		
16	31,9	0	DC-2		
17	32,2	4,05	NTC		
18	40,5	0	DC+2		
19	40,5	2,7	DC+2		
20	43,2	0	DC+2		
21	43,2	2,7	DC+2		
22	51,5	0	S15		
23	51,5	3	G15		
24	54,5	0	DC-3		
25	54,5	2,7	DC-3		
26	54,5	5,4	DC-3		
27	57,2	0	DC-3		
28	65,8	0	DC+3		
29	65,8	2,7	DC+3		
30	68,5	0	DC+3		
31	68,5	2,7	DC+3		
32	64,7	36	G16		
33	61,7	36	S16		
34	58,7	36	PH3		
35	56	36	PH3		
36	53,3	36	PH3		
37	50,6	36	PH3		
38	39,4	36	G14		
39	36,4	36	S14		
40	33,4	36	PH2		
41	30,7	36	PH2		
42	28	36	PH2		
43	25,3	36	PH2		
44	14,1	36	G12		
45	11,1	36	S12		
46	8,1	36	PH1		
47	5,4	36	PH1		
48	2,7	36	PH1		
49	0	36	PH1		

Tolerance of pinpositions ±0,5 mm at the end of pins
Dimension of coordinate axis is only offset without tolerance



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Identification					
ID	Component	Voltage	Current	Function	Comment
T11 , T12 , T13 , T14, T15, T16	IGBT	1200 V	75 A	Inverter Switch	
D11 , D12 , D13 , D14, T15, T16	FWD	1200 V	75 A	Inverter Diode	
Rt	Thermistor			Thermistor	




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Packaging instruction			
Standard packaging quantity (SPQ) 42	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for <i>flow 2</i> packages see vincotech.com website.

Package data
Package data for <i>flow 2</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
30-x2126PA075SC-L288F09x-D2-14	28 Mar. 2017		

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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.