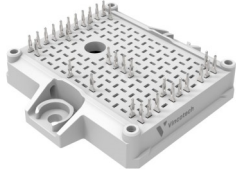
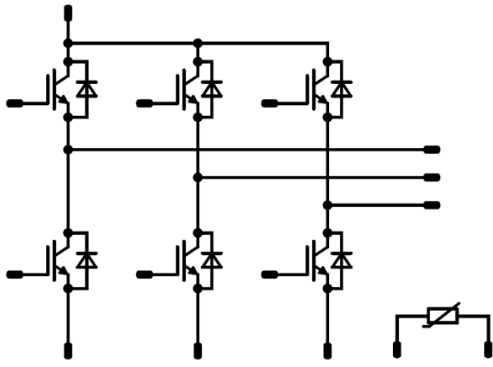




Vincotech

<i>flowPACK E2</i>	600 V / 100 A
<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;">Features</div> <ul style="list-style-type: none"> Trench Fieldstop IGBT3 technology Standard industrial housing Optimized $R_{th(j-s)}$ with Phase Change Material Built-in NTC 	<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;">flow E2 12 mm housing</div> <div style="text-align: center;">  </div>
<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; margin-bottom: 5px;">Schematic</div> <div style="text-align: center;">  </div>
<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;">Types</div> <ul style="list-style-type: none"> 10-EY066PA100SA-L194F38T 	

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		600	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	88	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	152	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$ $V_{CC} = 360\text{ V}$ $T_j = 150\text{ °C}$	6	µs
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}		600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	73	A
Repetitive peak forward current	I_{FRM}		300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	107	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_{top}		-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			min. 12,7	mm
Clearance			9,08	mm
Comparative Tracking Index	CTI		≥ 600	

*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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0016	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CESat}		15		100	25 125	1,05	1,57 1,75	1,85	V
Collector-emitter cut-off current	I_{CES}		0	600		25			5,1	μA
Gate-emitter leakage current	I_{GES}		20	0		25			600	nA
Internal gate resistance	r_g							2		Ω
Input capacitance	C_{ies}							6160		pF
Output capacitance	C_{oes}	$f = 1$ Mhz	25	20		25		384		
Reverse transfer capacitance	C_{res}							183		

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,62		K/W
-------------------------------------	---------------	---------------------------------------	--	--	--	--	--	------	--	-----

Dynamic

Turn-on delay time	$t_{d(on)}$					25 125 150		104 107 108		ns
Rise time	t_r	$R_{gon} = 2$ Ω $R_{goff} = 2$ Ω				25 125 150		20 23 24		
Turn-off delay time	$t_{d(off)}$					25 125 150		167 191 196		
Fall time	t_f		±15	350	100	25 125 150		45 68 79		
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 4,2$ μC $Q_{tFWD} = 8,2$ μC $Q_{tFWD} = 9$ μC				25 125 150		1,698 2,734 3,009		
Turn-off energy (per pulse)	E_{off}					25 125 150		2,422 3,297 3,485		



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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_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F			100	25 125	1,2	1,67 1,69	1,9	V
Reverse leakage current	I_R		600		25			660	μA

Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)	0,88	K/W

Dynamic

Parameter	Symbol	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Peak recovery current	I_{RRM}				25 125 150		73 84 86		A
Reverse recovery time	t_{rr}				25 125 150		172 263 280		ns
Recovered charge	Q_r	$di/dt = 5442$ A/μs $di/dt = 4043$ A/μs $di/dt = 3821$ A/μs	±15	350	100	25 125 150	4,151 8,189 8,993		μC
Reverse recovered energy	E_{rec}				25 125 150		1,009 1,962 2,123		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$				25 125 150		4156 1829 1500		A/μs

Thermistor

Parameter	Symbol	Conditions	Value	Unit
Rated resistance	R		25	kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 493$ Ω	100	%
Power dissipation	P		25	mW
Power dissipation constant			25	mW/K
B-value	$B_{(25/50)}$	Tol. ±2 %	25	K
B-value	$B_{(25/100)}$	Tol. ±2 %	25	K
Vincotech NTC Reference				K

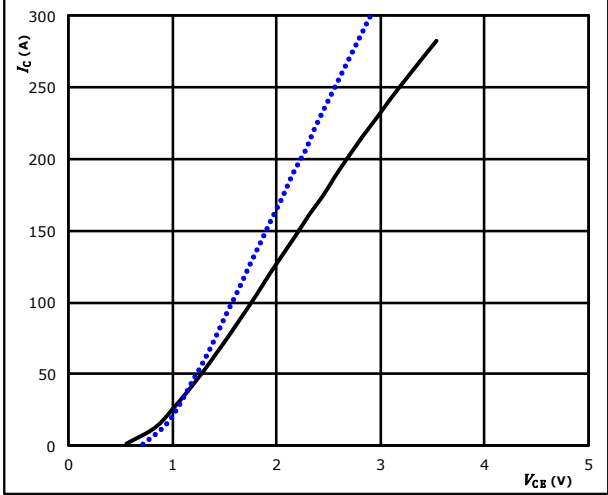


Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

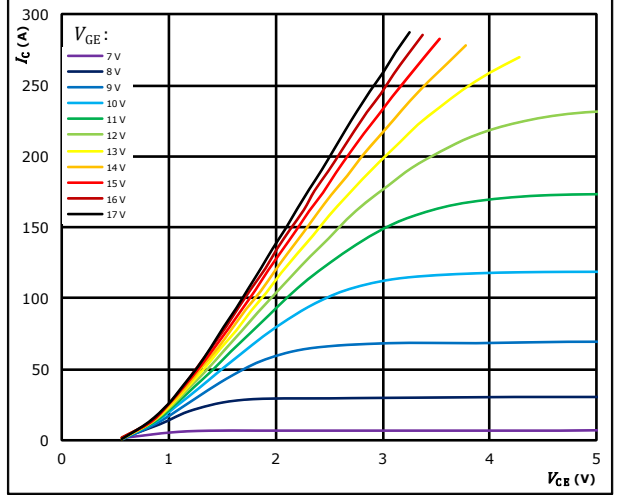


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue line)
 $125 \text{ } ^\circ C$ (solid black line)

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

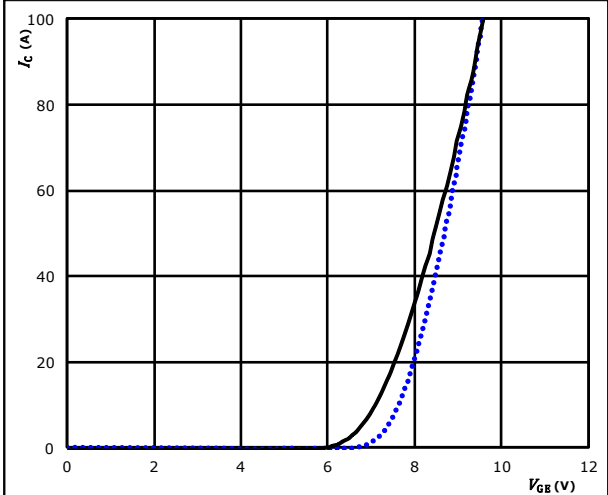


$t_p = 250 \mu s$
 $T_j = 125 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

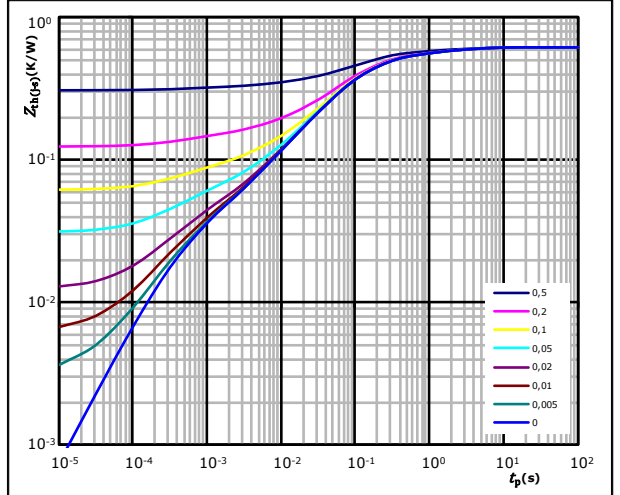


$t_p = 100 \mu s$
 $V_{CE} = 10 V$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue line)
 $125 \text{ } ^\circ C$ (solid black line)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$
 $R_{th(j-s)} = 0,62 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
6,37E-02	2,64E+00
1,09E-01	4,49E-01
3,30E-01	8,36E-02
7,06E-02	1,83E-02
2,75E-02	3,23E-03
2,32E-02	3,87E-04



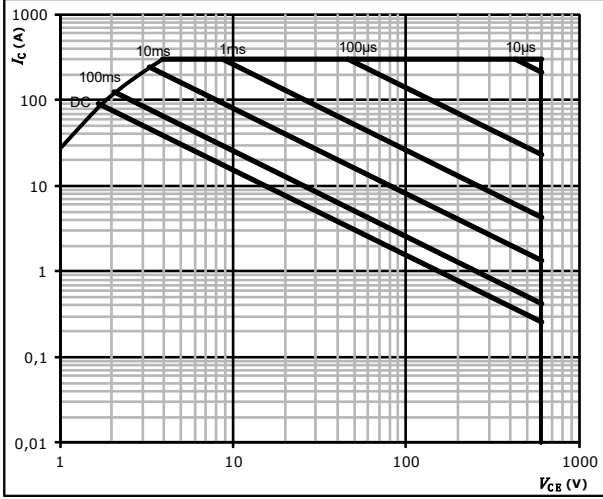
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Inverter Switch Characteristics

figure 5. IGBT

Safe operating area

$$I_C = f(V_{CE})$$



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



Inverter Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

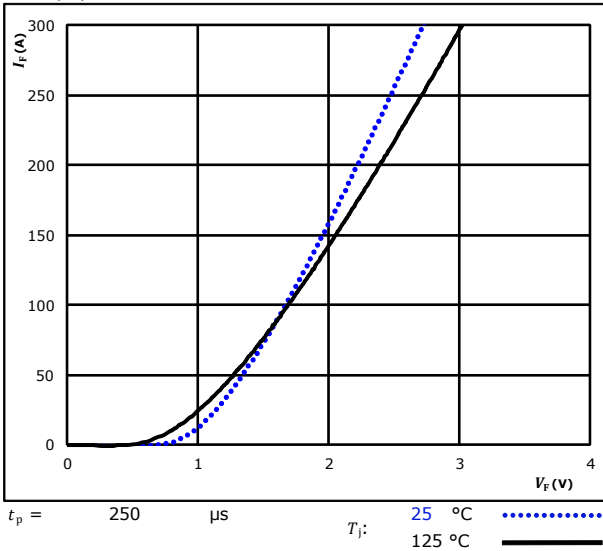
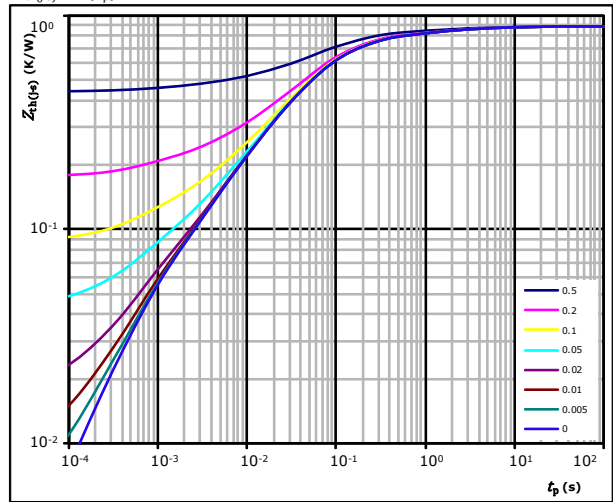


figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,88\text{ K/W}$
 FWD thermal model values

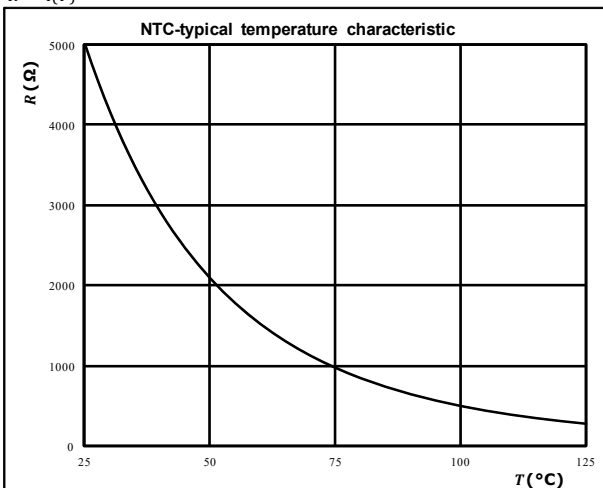
R (K/W)	τ (s)
3,86E-02	6,39E+00
8,37E-02	9,86E-01
2,73E-01	1,34E-01
3,45E-01	3,87E-02
1,03E-01	6,86E-03
4,12E-02	7,75E-04

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic as a function of temperature

$$R = f(T)$$



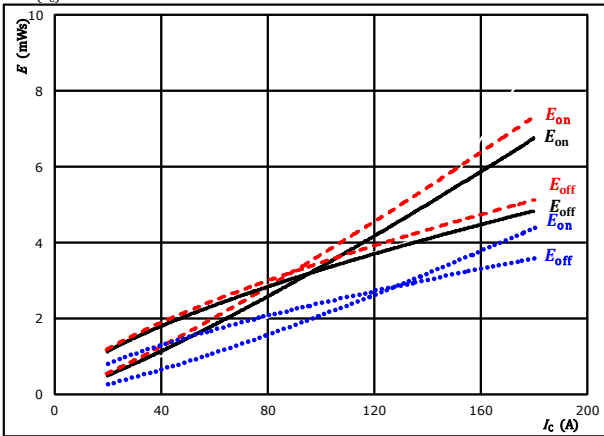


Inverter Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$

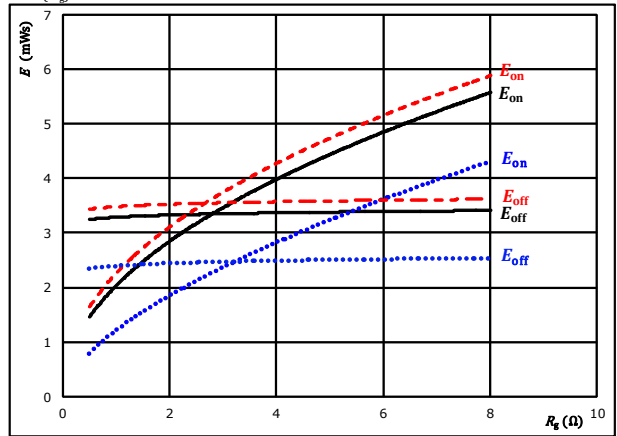


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{g\text{on}} = 2$ Ω
 $R_{g\text{off}} = 2$ Ω
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$

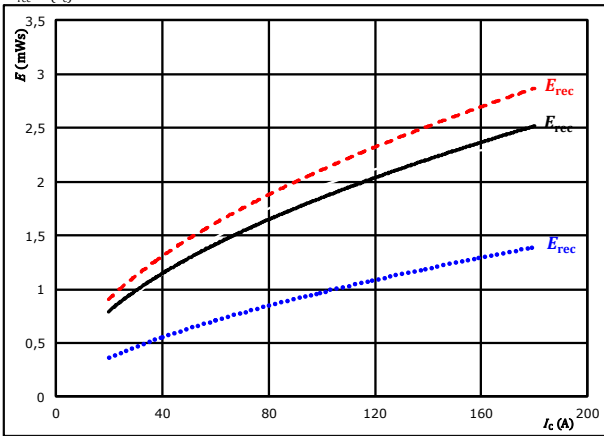


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 100$ A
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$$E_{rec} = f(I_c)$$

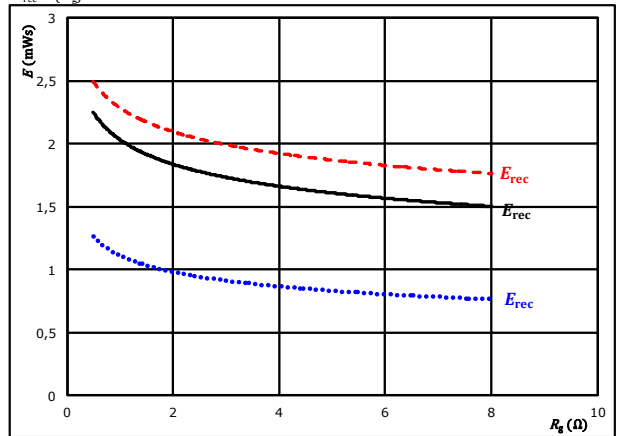


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{g\text{on}} = 2$ Ω
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$$E_{rec} = f(R_g)$$



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 100$ A
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)



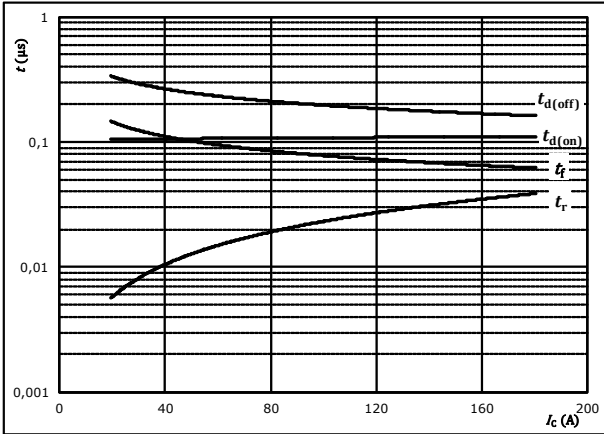
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Inverter Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



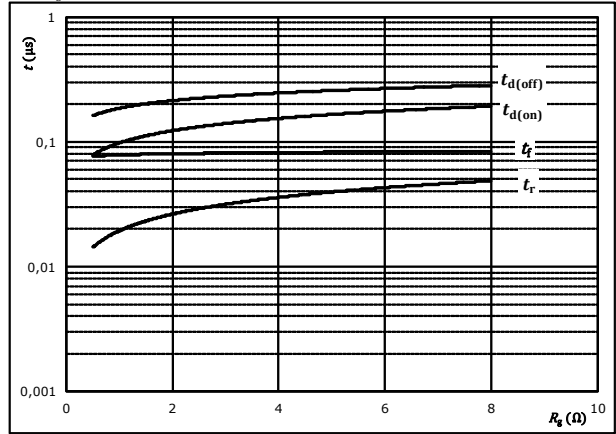
With an inductive load at

$T_j = 150$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



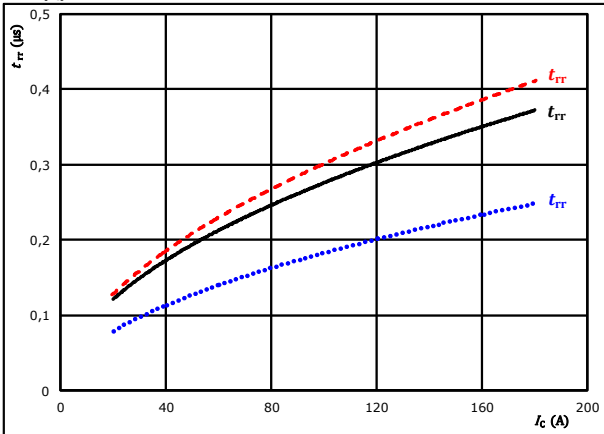
With an inductive load at

$T_j = 150$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 100$ A

figure 7. FWD

Typical reverse recovery time as a function of collector current

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



With an inductive load at

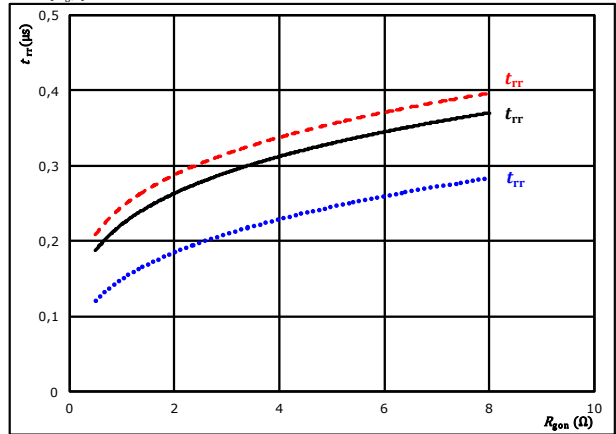
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

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

figure 8. FWD

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

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 100$ A

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

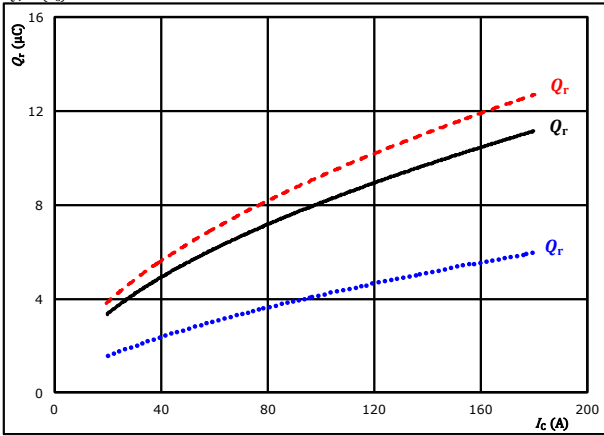


Inverter Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

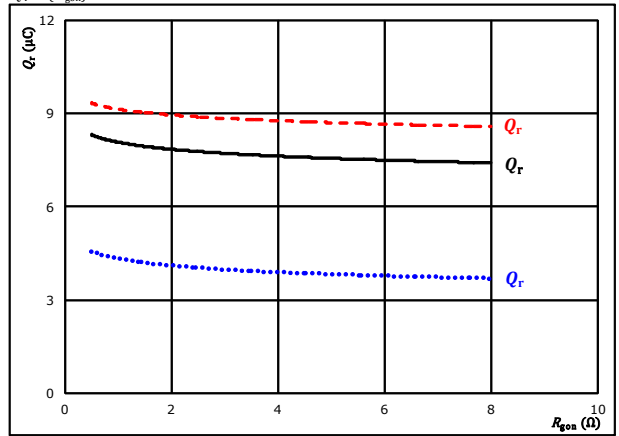


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

figure 10. FWD

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

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

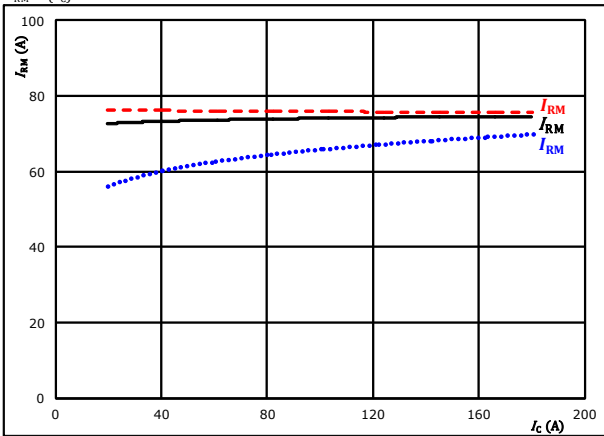


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 100$ A
 T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

figure 11. FWD

Typical peak reverse recovery current current as a function of collector current

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

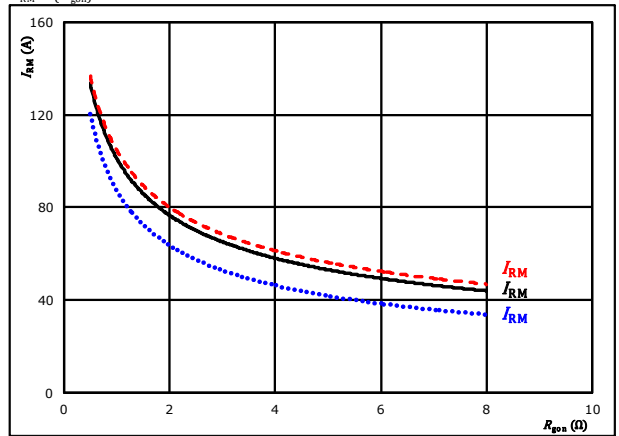


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

figure 12. FWD

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

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



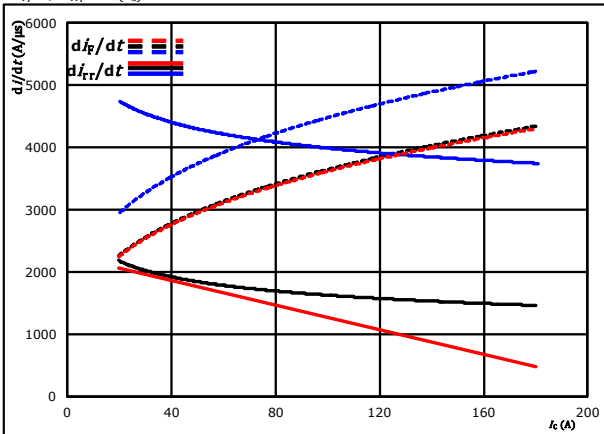
With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 100$ A
 T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)



Inverter Switching Characteristics

figure 13. FWD

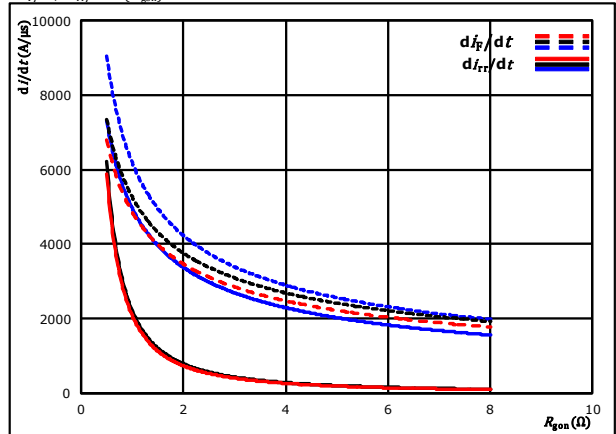
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_C)$



With an inductive load at
 $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C
 $R_{gon} = 2$ Ω $T_j = 150$ °C

figure 14. FWD

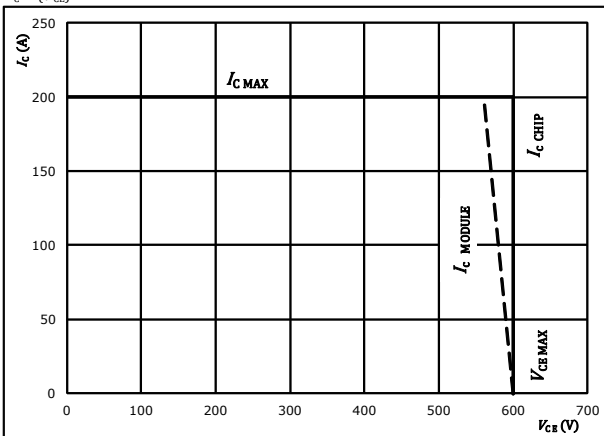
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{gon})$



With an inductive load at
 $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C
 $I_C = 100$ A $T_j = 150$ °C

figure 15. IGBT

Reverse bias safe operating area
 $I_C = f(V_{CB})$



At
 $T_j = 125$ °C
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

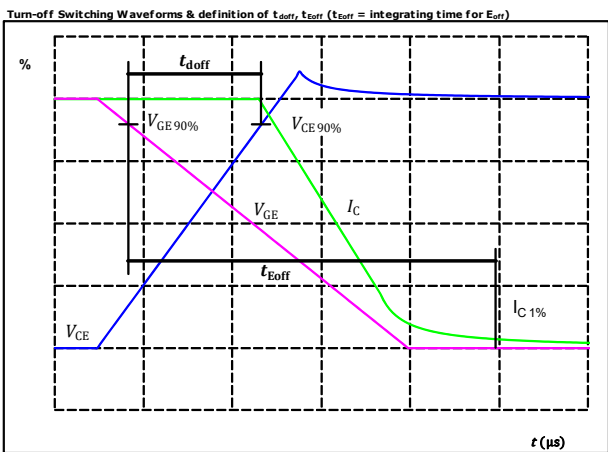


Inverter Switching Definitions

General conditions

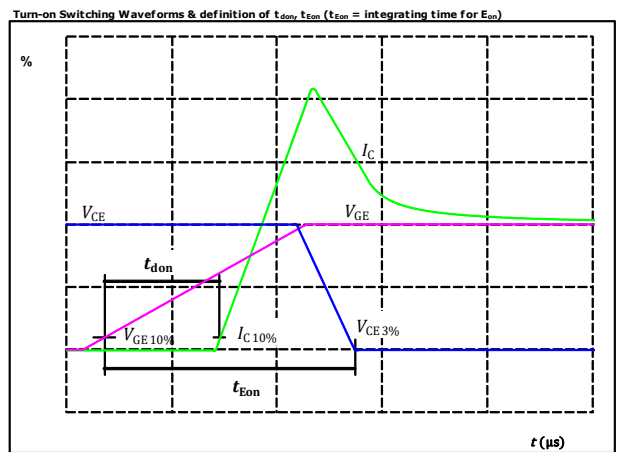
T_j	=	125 °C
R_{gon}	=	2 Ω
R_{goff}	=	2 Ω

figure 1. IGBT



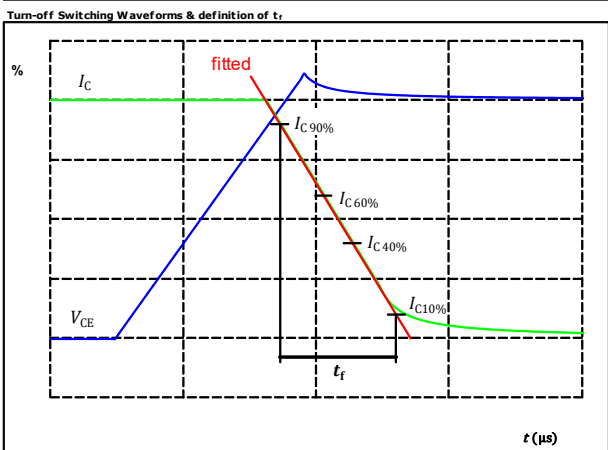
$V_{CE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	100	A
$t_{doff} =$	191	ns

figure 2. IGBT



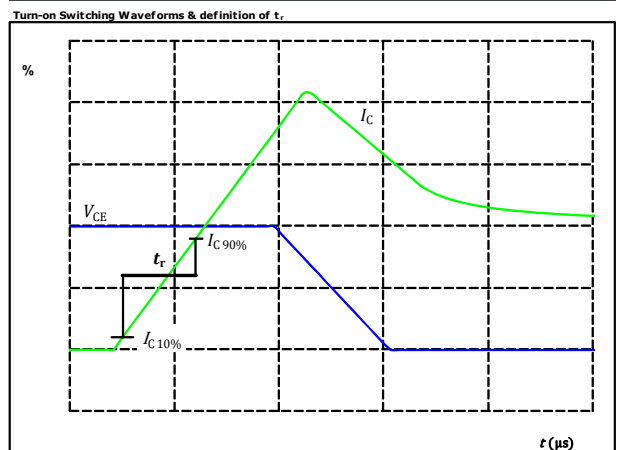
$V_{CE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	100	A
$t_{don} =$	107	ns

figure 3. IGBT



$V_C(100\%) =$	350	V
$I_C(100\%) =$	100	A
$t_f =$	68	ns

figure 4. IGBT



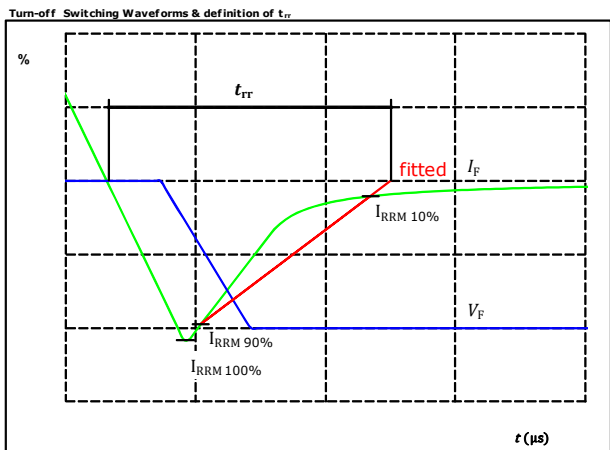
$V_C(100\%) =$	350	V
$I_C(100\%) =$	100	A
$t_r =$	23	ns



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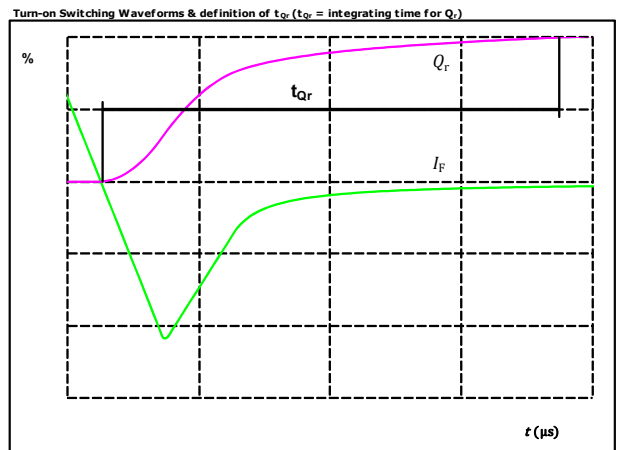
Inverter Switching Characteristics

figure 5. FWD



$V_F(100\%) =$	350	V
$I_F(100\%) =$	100	A
$I_{RRM}(100\%) =$	84	A
$t_{rr} =$	263	ns

figure 6. FWD



$I_F(100\%) =$	100	A
$Q_r(100\%) =$	8,19	μC



Vincotech

Ordering Code & Marking								
Version				Ordering Code				
without thermal paste 12 mm housing with Press-fit pins				10-EY066PA100SA-L194F38T				
with thermal paste 12 mm housing with Press-fit pins				10-EY066PA100SA-L194F38T-/3/				
NN-NNNNNNNNNNNN TTTTWW WWYY UL VIN LLLLL SSSS			Name		Date code	UL & VIN	Lot	Serial
Text			NN-NNNNNNNNNNNN-TTTTWW		WWYY	UL VIN	LLLLL	SSSS
Datamatrix		Type&Ver	Lot number	Serial	Date code			
		TTTTWW	LLLLL	SSSS	WWYY			

Pin table			
Pin	X	Y	Function
1	32	3,2	G16
2	32	0	Ph3
3	28,8	0	Ph3
4	25,6	0	Ph3
5	19,2	0	Ph2
6	16	0	Ph2
7	12,8	0	Ph2
8	12,8	3,2	G14
9	6,4	0	Ph1
10	3,2	0	Ph1
11	0	0	Ph1
12	0	3,2	G12
13	0	19,2	Therm1
14	0	28,8	Therm2
15	0	44,8	G11
16	0	48	DC-1
17	3,2	48	DC-1
18	6,4	48	DC-1
19	9,6	48	DC-1
20	12,8	48	DC-2
21	12,8	44,8	G13
22	16	48	DC-2
23	19,2	48	DC-2
24	22,4	48	DC-2
25	22,4	44,8	G15
26	25,6	48	DC-3
27	28,8	48	DC-3
28	32	48	DC-3
29	32	44,8	DC-3
30	12,8	25,6	DC+
31	12,8	22,4	DC+
32	12,8	19,2	DC+
33	12,8	16	DC+

Outline

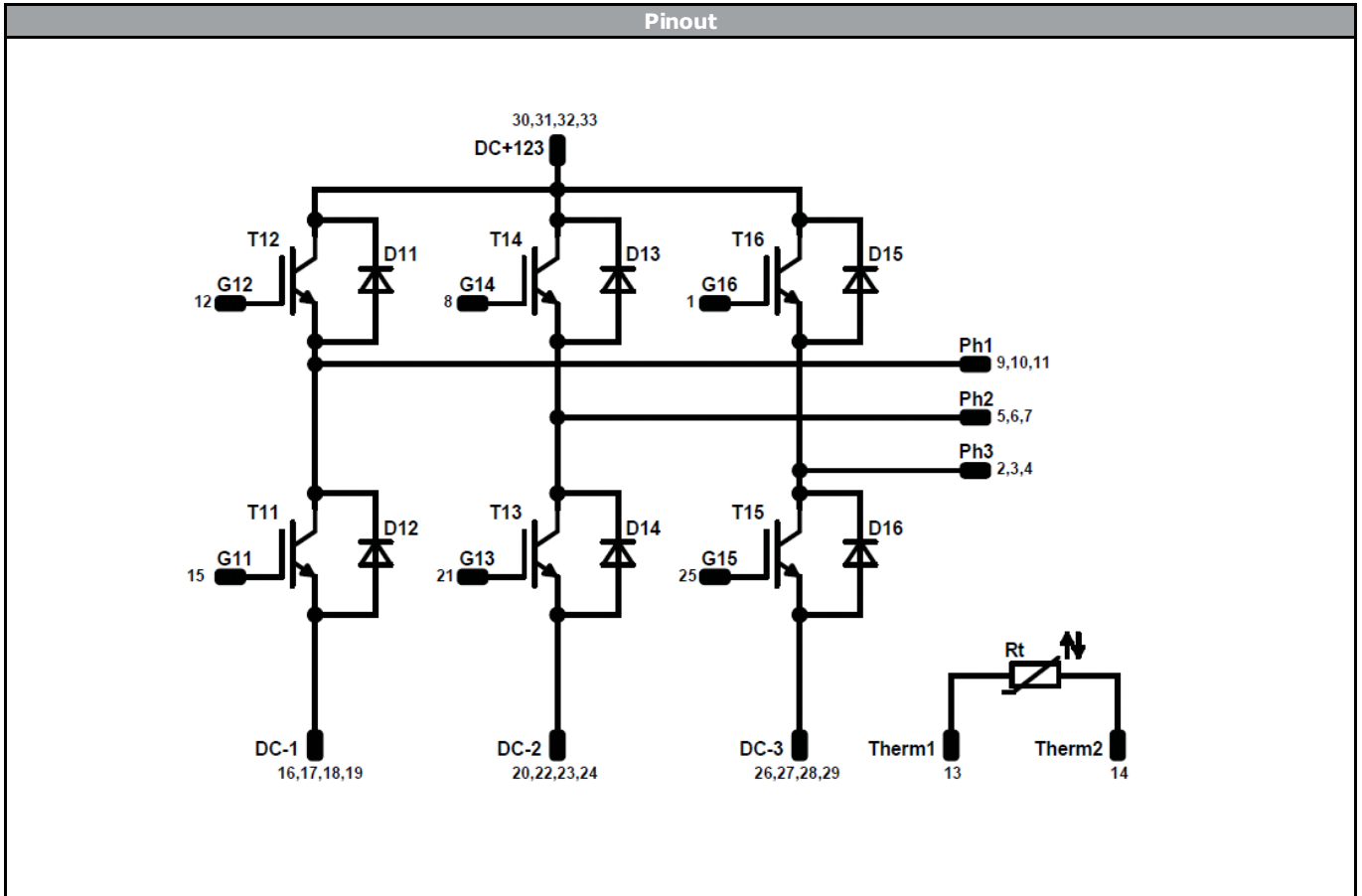
center of press-fit pinhead
for connection parameter see the handling instruction

1308 ±0,1
16,4 ±0,5

Tolerance of pinpositions: ±0,4mm 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	600 V	100 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	600 V	100 A	Inverter Diode	
Rt	NTC			Thermistor	




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Packaging instruction			
Standard packaging quantity (SPQ) 100	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for <i>flow</i> E2 packages see vincotech.com website.

Package data
Package data for <i>flow</i> E2 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-EY066PA100SA-L194F38T-D1-14	23 Aug. 2018		

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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.