



<i>flowPACK E2</i>	1200 V / 100 A
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><b>Features</b></p> <ul style="list-style-type: none"> <li>IGBT Mitsubishi gen 7 technology with low <math>V_{CEsat}</math> and improved EMC behavior</li> <li>Standard industrial package</li> <li>Built-in NTC</li> </ul> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><b>Target applications</b></p> <ul style="list-style-type: none"> <li>Industrial Drives</li> <li>UPS</li> </ul> </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><b>Types</b></p> <ul style="list-style-type: none"> <li>10-EY126PA100M7-L198F78T</li> <li>10-E2126PA100M7-L198F78Z</li> </ul> </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><i>flow E2 12 mm housing</i></p> <div style="display: flex; justify-content: space-around; align-items: center;"> </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> <span>Press-fit pin</span> <span>Solder pin</span> </div> </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #ccc; margin: 0;"><b>Schematic</b></p> </div>

## Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
<b>Inverter Switch</b>				
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 $T_{jmax}$	200	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	174	W
Gate-emitter voltage	$V_{GES}$		$\pm 20$	V
Maximum junction temperature	$T_{jmax}$		175	°C



## Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
<b>Inverter Diode</b>				
Peak repetitive reverse voltage	$V_{RRM}$		1200	V
Continuous (direct) forward current	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	72	A
Repetitive peak forward current	$I_{FRM}$		200	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	121	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			min. 12,7	mm
Clearance			9,08	mm
Comparative Tracking Index	CTI		≥ 600	

\*100 % tested in production



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**10-EY126PA100M7-L198F78T**  
**10-E2126PA100M7-L198F78Z**  
 datasheet

## Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$I_D$ [A]	$T_j$ [°C]	Min	Typ	Max	

### Inverter Switch

#### Static

Parameter	Symbol	$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$I_D$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$				0,01	25	5,4	6	6,6	V
Collector-emitter saturation voltage	$V_{CESat}$	15			100	25 125 150		1,61 1,82 1,91	1,85	V
Collector-emitter cut-off current	$I_{CES}$	0	1200			25			100	μA
Gate-emitter leakage current	$I_{GES}$	20	0			25			500	nA
Internal gate resistance	$r_g$							0		Ω
Input capacitance	$C_{ies}$							21000		pF
Output capacitance	$C_{oes}$	0	10		25			700		
Reverse transfer capacitance	$C_{res}$							280		
Gate charge	$Q_g$	15	600	100		25		700		nC

#### Thermal

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

#### Dynamic

Parameter	Symbol	$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$I_D$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$					25 125 150		118 118 118		ns
Rise time	$t_r$					25 125 150		10 12 13		
Turn-off delay time	$t_{d(off)}$					25 125 150		174 200 206		
Fall time	$t_f$					25 125 150		83 96 107		
Turn-on energy (per pulse)*	$E_{on}$					25 125 150		3,26 4,87 5,37		mWs
Turn-off energy (per pulse)*	$E_{off}$					25 125 150		6,61 8,77 9,49		

\*  $L_s = 12$  nH



### Characteristic Values

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

#### Inverter Diode

##### Static

Parameter	Symbol	$V_{GS}$ [V]	$V_{CE}$ [V]	$I_C$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Forward voltage	$V_F$			100	25 125 150		1,82 1,96 1,97	2,1	V
Reverse leakage current	$I_R$		1200		25			40	µA

##### Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)	0,79	K/W

##### Dynamic

Parameter	Symbol	$V_{GS}$ [V]	$V_{CE}$ [V]	$I_C$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Peak recovery current	$I_{RRM}$			100	25 125 150		178 166 165		A
Reverse recovery time	$t_{rr}$			100	25 125 150		149 312 339		ns
Recovered charge	$Q_r$			100	25 125 150		11,60 17,27 19,18		µC
Reverse recovered energy	$E_{rec}$			100	25 125 150		5,14 7,75 8,59		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$			100	25 125 150		4044 2649 2147		A/µs

#### Thermistor

Parameter	Symbol	Conditions	Value	Unit
Rated resistance	$R$		5	kΩ
Deviation of $R_{100}$	$\Delta_{R/R}$	$R_{100} = 493 \Omega$	-5	+
Power dissipation	$P$		245	mW
Power dissipation constant			1,4	mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 2 \%$	3375	K
B-value	$B_{(25/100)}$	Tol. $\pm 2 \%$	3437	K
Vincotech NTC Reference				K

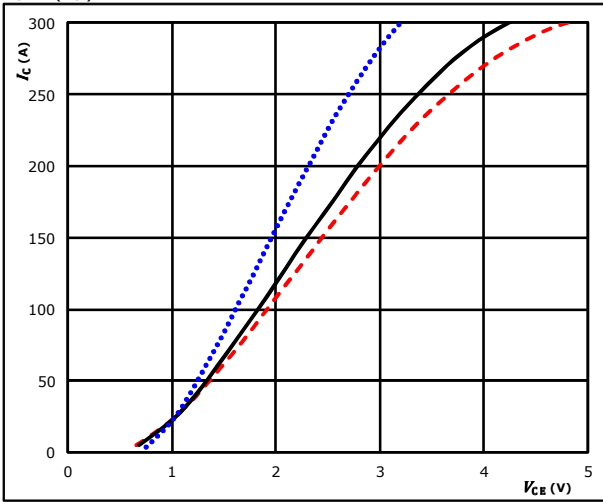


## Inverter Switch Characteristics

**figure 1.** IGBT

Typical output characteristics

$I_C = f(V_{CE})$

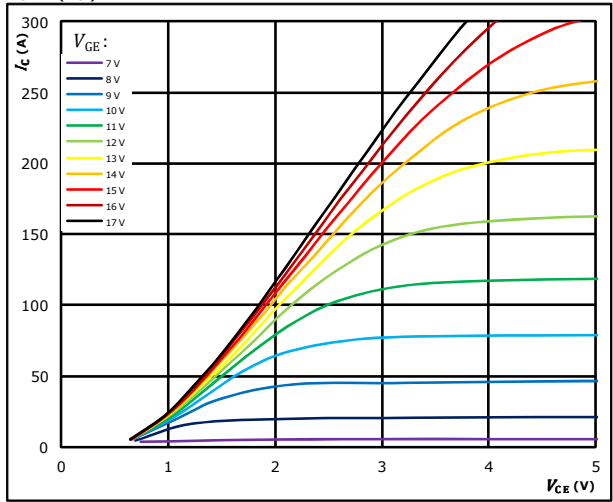


$t_p = 250 \mu\text{s}$        $T_j: 25 \text{ }^\circ\text{C}$       .....  
 $V_{GE} = 15 \text{ V}$        $T_j: 125 \text{ }^\circ\text{C}$       ———  
                                   $T_j: 150 \text{ }^\circ\text{C}$       - - - -

**figure 2.** IGBT

Typical output characteristics

$I_C = f(V_{CE})$

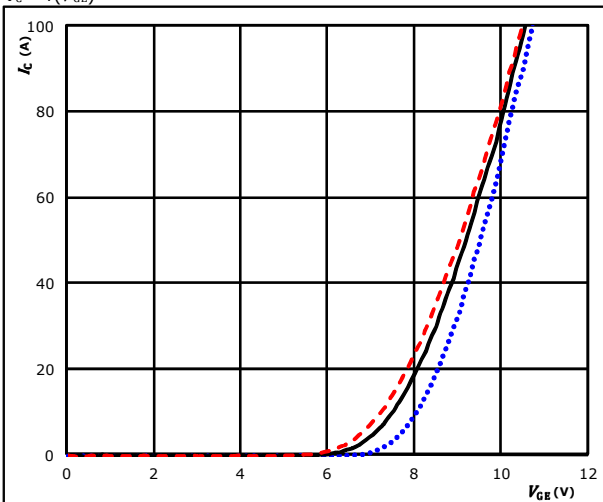


$t_p = 250 \mu\text{s}$        $T_j = 150 \text{ }^\circ\text{C}$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

**figure 3.** IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

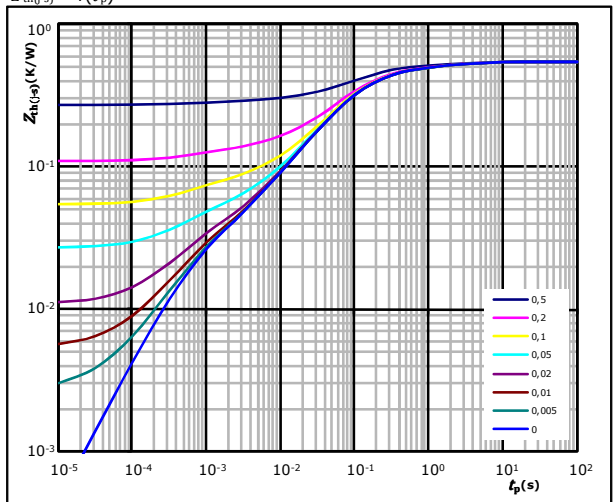


$t_p = 100 \mu\text{s}$        $T_j: 25 \text{ }^\circ\text{C}$       .....  
 $V_{CE} = 10 \text{ V}$        $T_j: 125 \text{ }^\circ\text{C}$       ———  
                                   $T_j: 150 \text{ }^\circ\text{C}$       - - - -

**figure 4.** IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,55 \text{ K/W}$

IGBT thermal model values

$R$ (K/W)	$\tau$ (s)
5,00E-02	2,85E+00
9,49E-02	5,03E-01
2,74E-01	9,38E-02
8,25E-02	3,17E-02
2,20E-02	5,55E-03
2,13E-02	5,96E-04

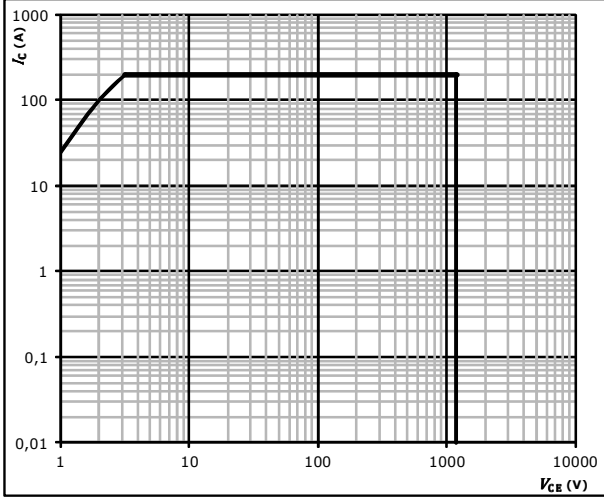


### Inverter Switch Characteristics

**figure 5. IGBT**

Safe operating area

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



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

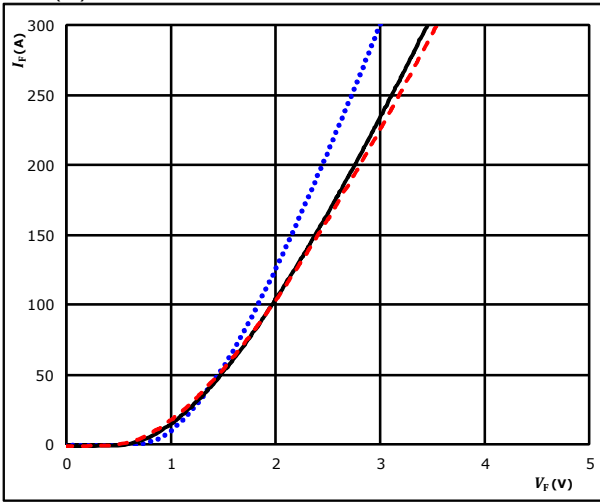


### Inverter Diode Characteristics

**figure 1.** FWD

Typical forward characteristics

$$I_F = f(V_F)$$

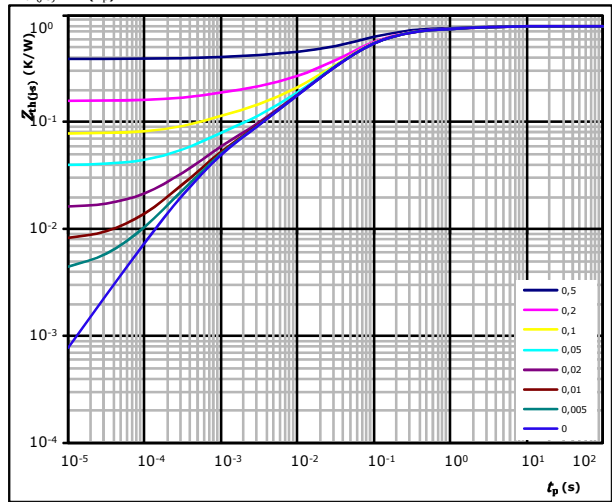


$t_p = 250 \mu s$   
 $T_j$ : 25 °C (blue dotted line)  
 125 °C (black solid line)  
 150 °C (red dashed line)

**figure 2.** FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,79 \text{ K/W}$   
 FWD thermal model values

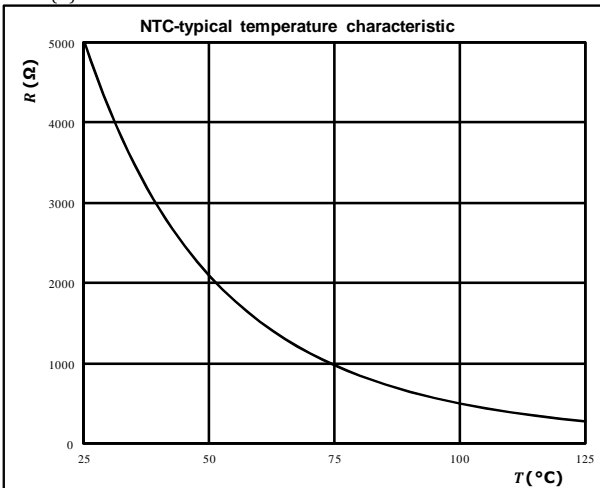
$R$ (K/W)	$\tau$ (s)
4,05E-02	3,25E+00
9,02E-02	5,38E-01
3,71E-01	8,95E-02
1,97E-01	3,04E-02
5,23E-02	4,59E-03
3,58E-02	6,26E-04

### Thermistor Characteristics

**figure 1.** Thermistor

Typical NTC characteristic as a function of temperature

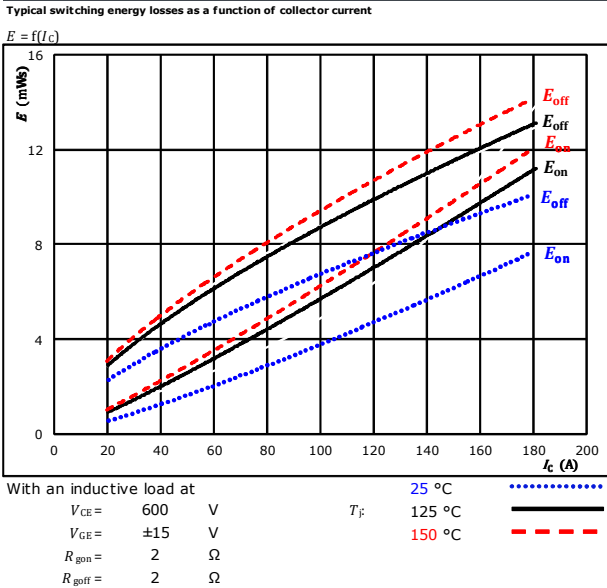
$$R = f(T)$$



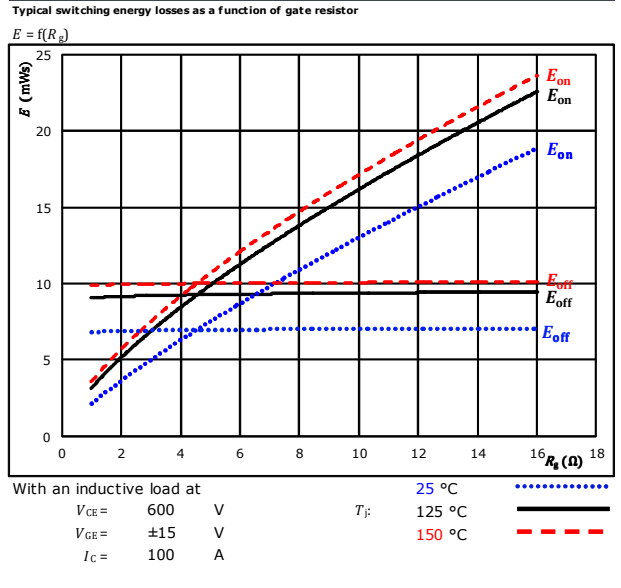


## Inverter Switching Characteristics

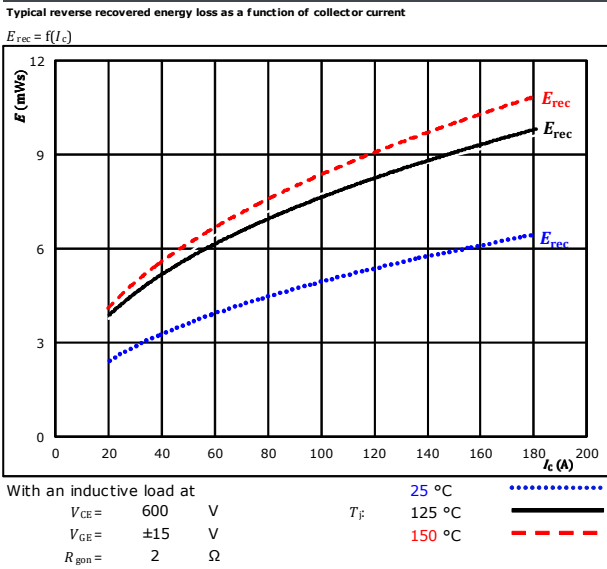
**figure 1.** IGBT



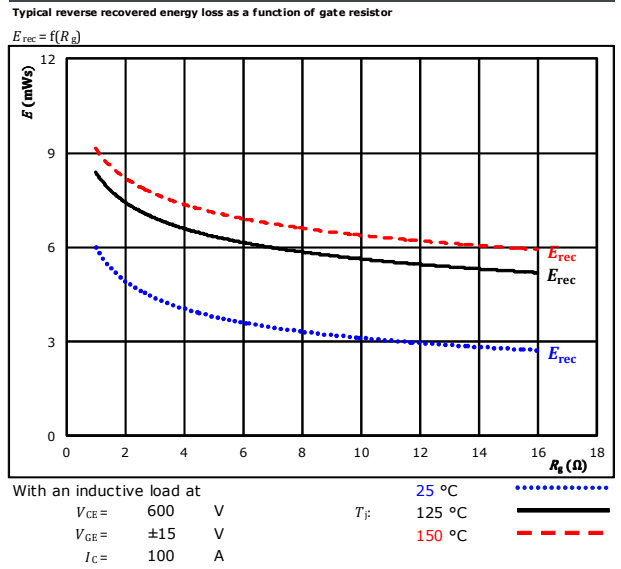
**figure 2.** IGBT



**figure 3.** FWD



**figure 4.** FWD







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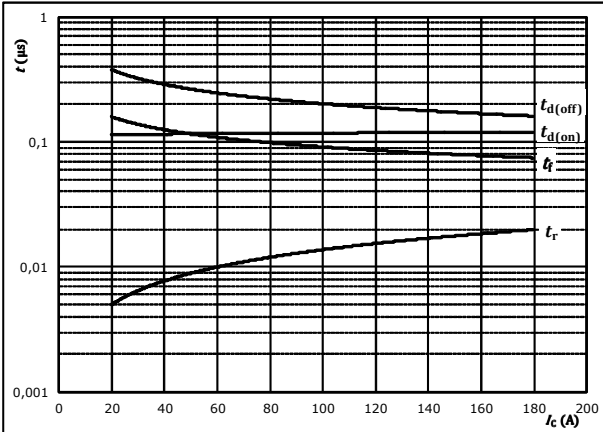
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## Inverter Switching Characteristics

**figure 5.** IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



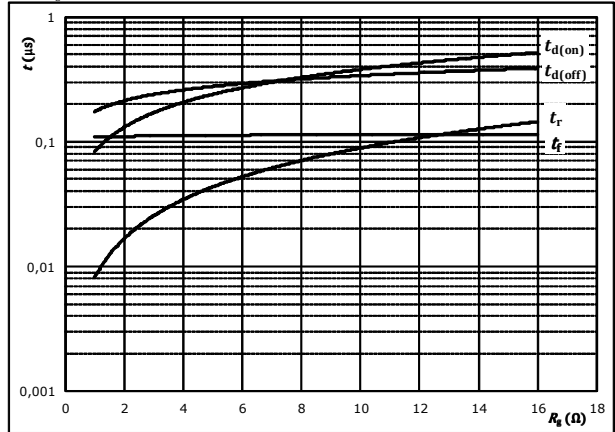
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{g(on)} =$	2	Ω
$R_{g(off)} =$	2	Ω

**figure 6.** IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



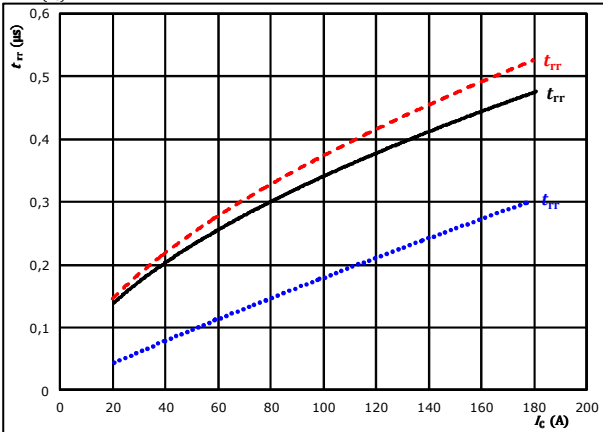
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_C =$	100	A

**figure 7.** FWD

Typical reverse recovery time as a function of collector current

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

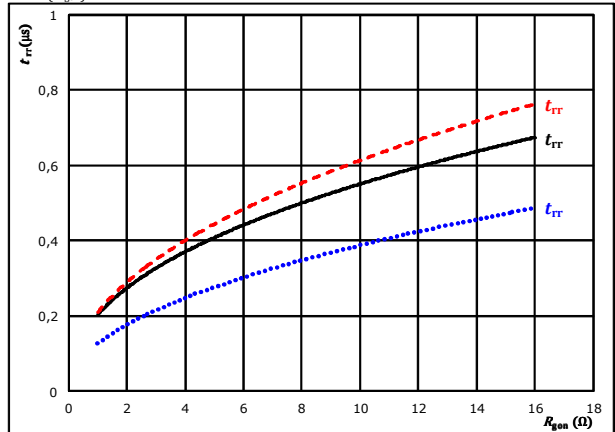


At	$V_{CE} =$	600	V	$T_j:$	25 °C	.....
	$V_{GE} =$	±15	V		125 °C	————
	$R_{g(on)} =$	2	Ω		150 °C	-----

**figure 8.** FWD

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

$$t_{rr} = f(R_{g(on)})$$



At	$V_{CE} =$	600	V	$T_j:$	25 °C	.....
	$V_{GE} =$	±15	V		125 °C	————
	$I_C =$	100	A		150 °C	-----

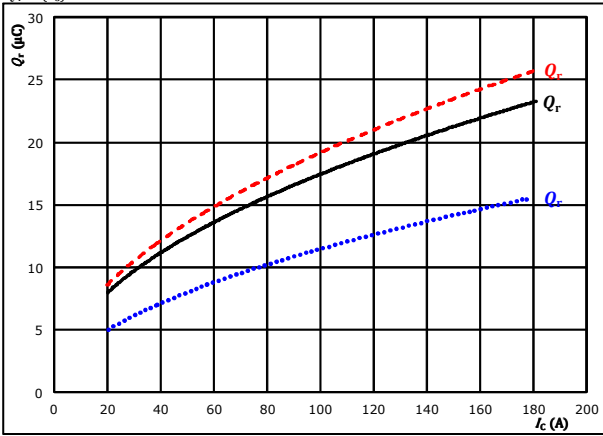


## Inverter Switching Characteristics

**figure 9.** FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



At  $V_{CE} = 600$  V  $T_j = 25$  °C  $R_{gpn} = 2$  Ω

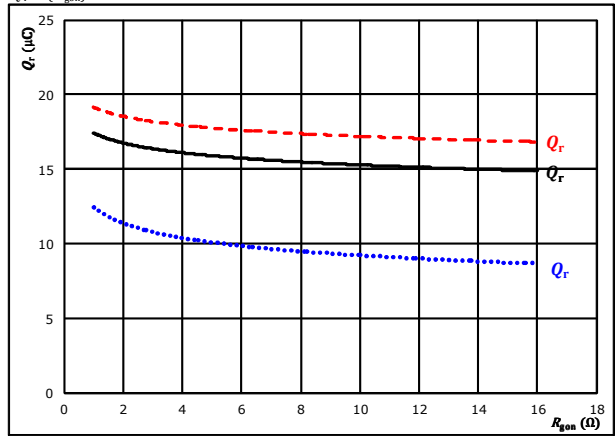
$V_{GE} = \pm 15$  V  $T_j = 125$  °C

$R_{gpn} = 2$  Ω  $T_j = 150$  °C

**figure 10.** FWD

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

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



At  $V_{CE} = 600$  V  $T_j = 25$  °C

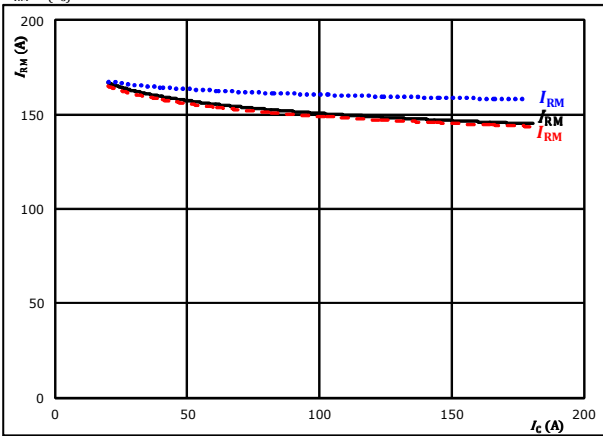
$V_{GE} = \pm 15$  V  $T_j = 125$  °C

$I_c = 100$  A  $T_j = 150$  °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  $T_j = 25$  °C

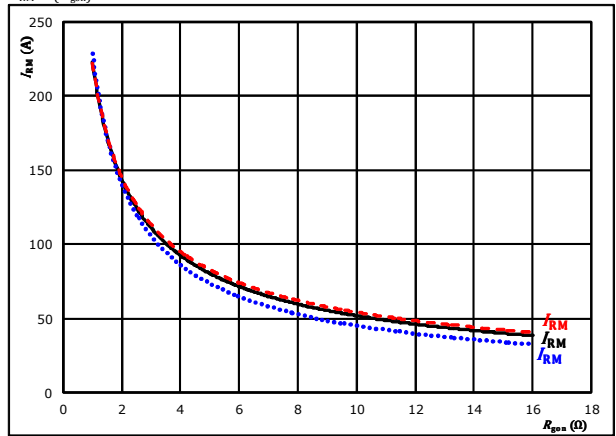
$V_{GE} = \pm 15$  V  $T_j = 125$  °C

$R_{gpn} = 2$  Ω  $T_j = 150$  °C

**figure 12.** FWD

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

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



At  $V_{CE} = 600$  V  $T_j = 25$  °C

$V_{GE} = \pm 15$  V  $T_j = 125$  °C

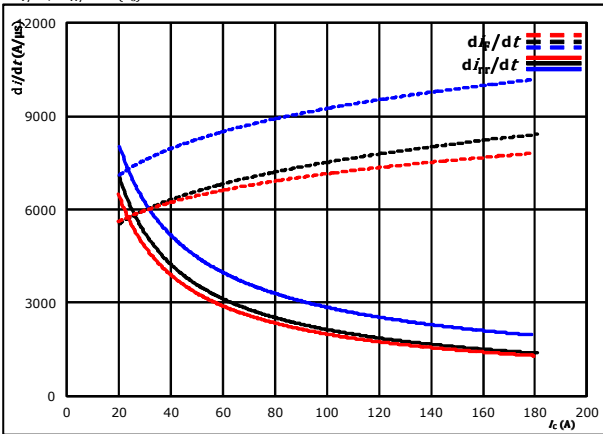
$I_c = 100$  A  $T_j = 150$  °C



## Inverter Switching Characteristics

**figure 13.** FWD

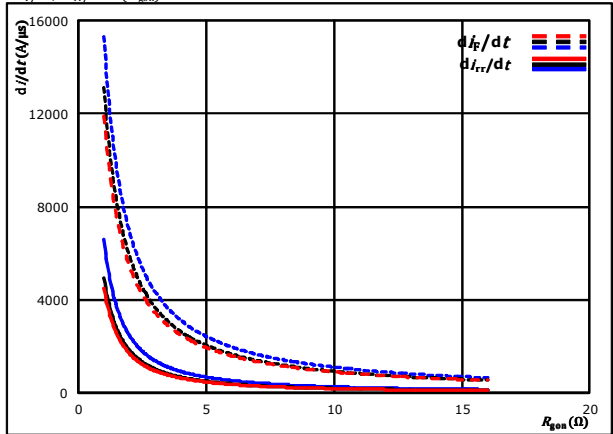
Typical rate of fall of forward and reverse recovery current as a function of collector current  
 $di_{f}/dt, di_{rr}/dt = f(I_C)$



At  $V_{CE} = 600$  V  $T_j = 25$  °C  
 $V_{GE} = \pm 15$  V  $T_j = 125$  °C  
 $R_{g0n} = 2$  Ω  $T_j = 150$  °C

**figure 14.** FWD

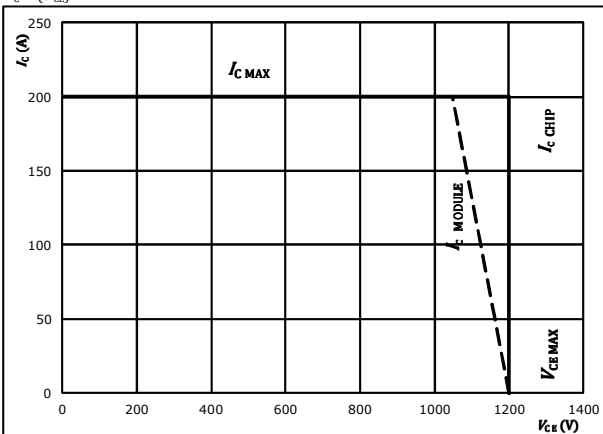
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor  
 $di_{f}/dt, di_{rr}/dt = f(R_{g0n})$



At  $V_{CE} = 600$  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  
 $I_C = f(V_{CE})$



At  $T_j = 125$  °C  
 $R_{g0n} = 2$  Ω  
 $R_{g0ff} = 2$  Ω

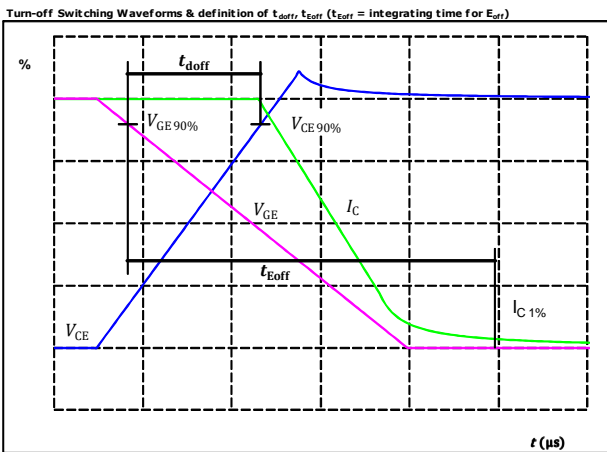


## Inverter Switching Definitions

**General conditions**

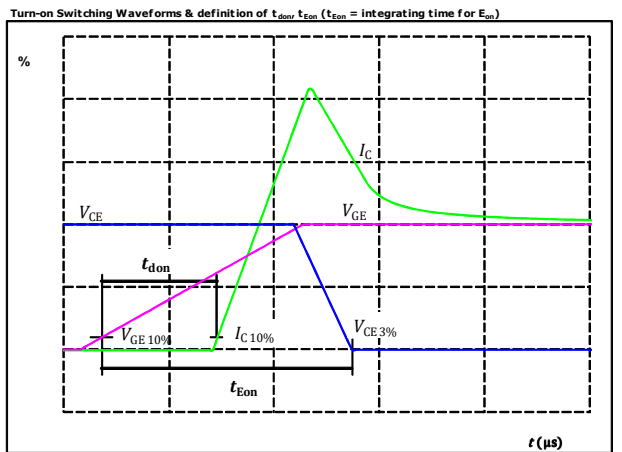
$T_j$	=	125 °C
$R_{gon}$	=	2 $\Omega$
$R_{goff}$	=	2 $\Omega$

**figure 1.** IGBT



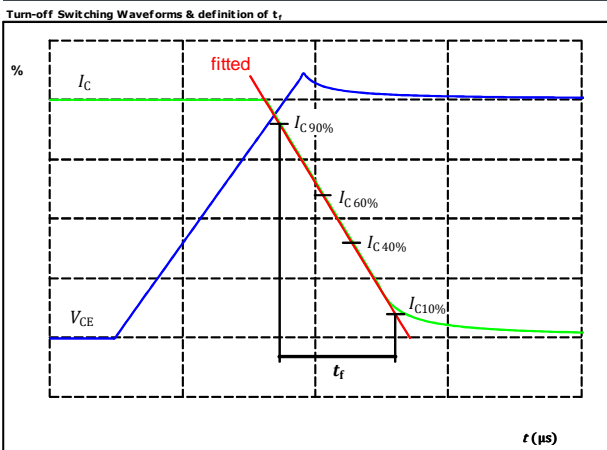
$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	100	A
$t_{doff} =$	200	ns

**figure 2.** IGBT



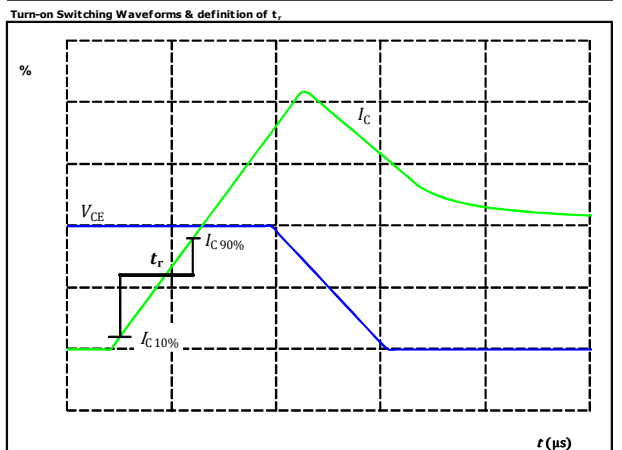
$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	100	A
$t_{don} =$	118	ns

**figure 3.** IGBT



$V_C(100\%) =$	600	V
$I_C(100\%) =$	100	A
$t_f =$	96	ns

**figure 4.** IGBT



$V_C(100\%) =$	600	V
$I_C(100\%) =$	100	A
$t_r =$	12	ns

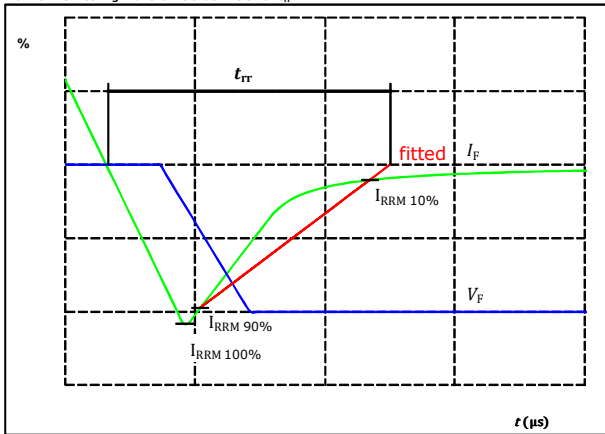


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**10-E2126PA100M7-L198F78Z**  
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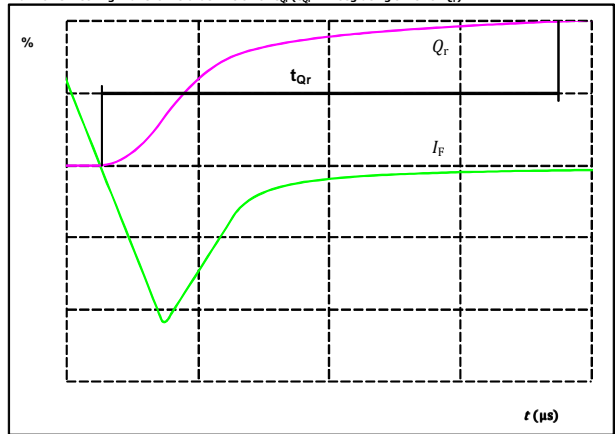
## Inverter Switching Characteristics

**figure 5.** FWD  
 Turn-off Switching Waveforms & definition of  $t_{rr}$



$V_F(100\%) =$	600	V
$I_F(100\%) =$	100	A
$I_{RRM}(100\%) =$	166	A
$t_{rr} =$	312	ns

**figure 6.** FWD  
 Turn-on Switching Waveforms & definition of  $t_{qr}$  ( $t_{qr}$  = integrating time for  $Q_r$ )



$I_F(100\%) =$	100	A
$Q_r(100\%) =$	17,27	$\mu\text{C}$



**10-EY126PA100M7-L198F78T**  
**10-E2126PA100M7-L198F78Z**  
 datasheet

Vincotech

Ordering Code & Marking								
Version			Ordering Code					
without thermal paste 12 mm housing with press-fit pins			10-EY126PA100M7-L198F78T					
with thermal paste 12 mm housing with press-fit pins			10-EY126PA100M7-L198F78T-/3/					
without thermal paste 12 mm housing with Solder pins			10-E2126PA100M7-L198F78Z					
with thermal paste 12 mm housing with Solder pins			10-EY126PA100M7-L198F78T-/3/					
NN-NNNNNNNNNNNN TTTTIV WWYY UL VIN LLLL SSSS			<b>Text</b>	<b>Name</b>	<b>Date code</b>	<b>UL &amp; VIN</b>	<b>Lot</b>	<b>Serial</b>
				NN-NNNNNNNNNNNN-TTTTIV	WWYY	UL VIN	LLLLL	SSSS
			<b>Datamatrix</b>	<b>Type&amp;Ver</b>	<b>Lot number</b>	<b>Serial</b>	<b>Date code</b>	
			TTTTTIV	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+

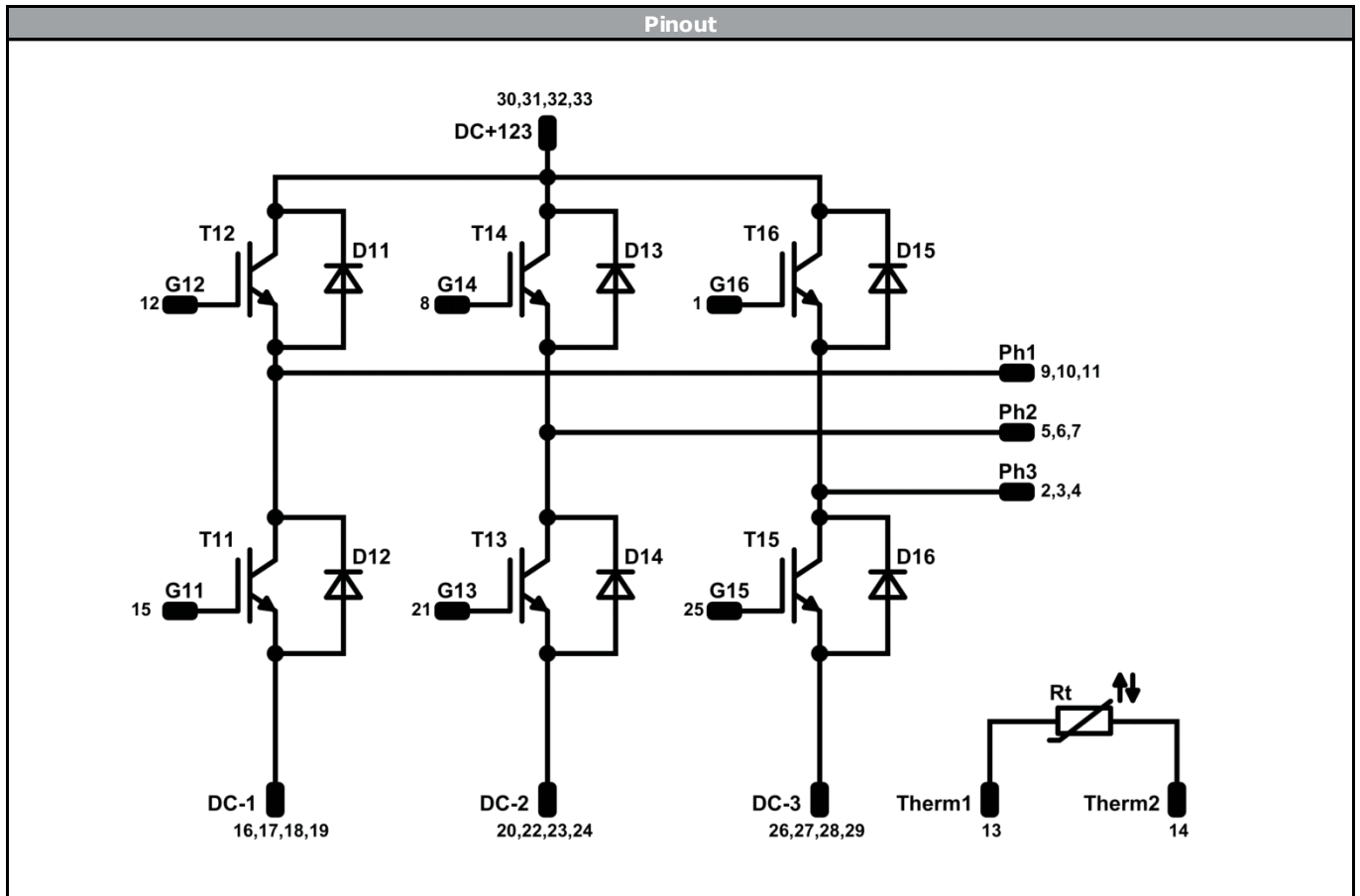
**Outline**

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

Tolerance of pinpositions: ±0,4mm at the end of pins  
Dimension of coordinate axis is only offset without tolerance



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<b>Identification</b>					
<b>ID</b>	<b>Component</b>	<b>Voltage</b>	<b>Current</b>	<b>Function</b>	<b>Comment</b>
T11, T12, T13, T14, T15, T16	IGBT	1200 V	100 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	100 A	Inverter Diode	
Rt	NTC			Thermistor	




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10-EY126PA100M7-L198F78T  
10-E2126PA100M7-L198F78Z  
datasheet

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-Ex126PA100M7-L198F78x-D3-14	04 Dec. 2018	Added Z option to ordering code	1,2,14

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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.