

*flow*PACK 0B

1200 V / 8 A

**Features**

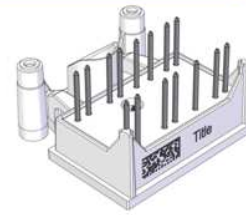
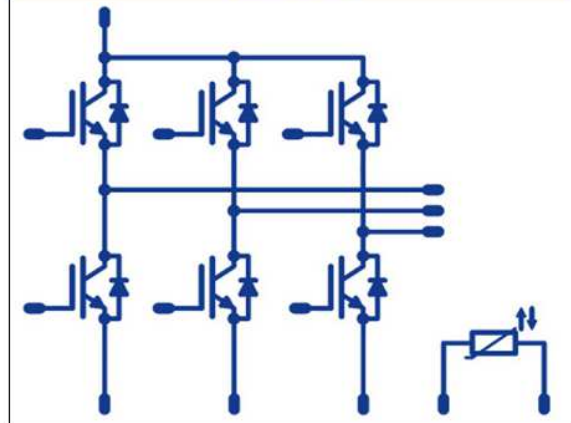
- IGBT4 (1200V) technology
- Open emitter topology
- New ultra-compact housing
- Single-screw heat sink mounting

**Target applications**

- Dedicated design for motor drive

**Types**

- 10-0B126PA008SC-M998F09

**flow0 17mm housing**

**Schematic**


### Inverter switch maximum ratings

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

Parameter	Symbol	Condition	Value	Unit
Collector-emitter break down voltage	$V_{CES}$		1200	V
DC collector current	$I_C$	$T_j=T_{jmax}$ $T_h=80^\circ\text{C}$	13	A
Pulsed collector current	$I_{Cpulse}$	$t_p$ limited by $T_{jmax}$	24	A
Power dissipation	$P_{tot}$	$T_j=T_{jmax}$ $T_h=80^\circ\text{C}$	45	W
Gate-emitter peak voltage	$V_{GE}$		$\pm 20$	V
Short circuit ratings	$t_{SC}$ $V_{CC}$	$T_j \leq 150^\circ\text{C}$ $V_{GE} = 15\text{V}$	10 800	$\mu\text{s}$ V
Maximum Junction Temperature	$T_{jmax}$		175	$^\circ\text{C}$

### Inverter diode maximum ratings

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

Parameter	Symbol	Conditions	Value	Unit
Peak Repetitive Reverse Voltage	$V_{RRM}$		1200	V
DC forward current	$I_F$	$T_j=T_{jmax}$ $T_h=80^\circ\text{C}$	18	A
Repetitive peak forward current	$I_{FRM}$		20	A
Power dissipation	$P_{tot}$	$T_j=T_{jmax}$ $T_h=80^\circ\text{C}$	40	W
Maximum Junction Temperature	$T_{jmax}$		175	$^\circ\text{C}$

### Inverter switch characteristic values

Parameter	Symbol	Conditions					Value			Unit
		$V_{GE}$ [V]	$V_{CE}$ [V]	$I_C$ [A]	$T_j$ [°C]	Min	Typ	Max		
<b>Static</b>										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$			0,0003	25 125	5,3	5,8	6,3	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		8	25 150	1,58	1,85 2,25	2,07	V
Collector-emitter cut-off	$I_{CES}$		0	1200		25 125			1	$\mu$ A
Gate-emitter leakage current	$I_{GES}$		20	0		25 125			120	nA
Integrated Gate resistor	$R_{gint}$							none		$\Omega$
Input capacitance	$C_{ies}$							490		pF
Output capacitance	$C_{oss}$	$f=1$ MHz	0	25		25		36		
Reverse transfer capacitance	$C_{rss}$							30		
Gate charge	$Q_{Gate}$		15	960	8	25		53		nC
<b>Thermal</b>										
Thermal resistance chip to heatsink	$R_{thJH}$	Thermal grease thickness $\leq$ 50 $\mu$ m $\lambda = 1$ W/mK						2,1		K/W

### Inverter dynamic values

Parameter	Symbol	Conditions					Value			Unit
		$V_{GE}$ [V] or $V_{GS}$ [V]	$V_r$ [V] or $V_{CE}$ [V]	$I_C$ [A] or $I_F$ [A] or $I_D$ [A]	$T_j$ [°C]	Min	Typ	Max		
<b>IGBT Switching</b>										
Turn-on delay time	$t_{d(on)}$					25 150		58 59		ns
Rise time	$t_r$	$R_{goff}=32\Omega$ $R_{gon}=32\Omega$				25 150		23 22		
Turn-off delay time	$t_{d(off)}$		$\pm 15$	600	8	25 150		177 244		
Fall time	$t_f$					25 150		64 137		
Turn-on energy loss per pulse	$E_{on}$	$Q_{rr}FWD=0,8\mu C$				25 150		0,510 0,826		mWs
Turn-off energy loss per pulse	$E_{off}$					25 150		0,455 0,784		
<b>FWD Switching</b>										
Peak recovery current	$I_{RRM}$	338				25 150		7 9		A
Reverse recovery time	$t_{rr}$	338				25 150		241 416		ns
Reverse recovery charge	$Q_{rr}$	338	$\pm 15$	600	8	25 150		0,808 1,658		$\mu$ C
Reverse recovered energy	$E_{rec}$	338				25 150		0,315 0,661		mWs
Peak rate of fall of recovery current	$di(rec)_{max}/dt$	338				25 150		89 51		A/ $\mu$ s

### Inverter diode characteristic values

Parameter	Symbol	Conditions					Value			Unit	
		$di_f/dt$ [A/us]	$V_r$ [V]	$I_F$ [A]	$T_j$	Min	Typ	Max			
<b>Static</b>											
Forward voltage	$V_F$			10	25°C 150°C		1,76 1,68	2,05		V	
Reverse leakage current	$I_{rm}$		1200		25°C 150°C			2,7 -		μA	
<b>Thermal</b>											
Thermal resistance chip to heatsink	$R_{thJH}$	Thermal grease thickness ≤ 50 μm $\lambda = 1$ W/mK						2,4			K/W

### Thermistor

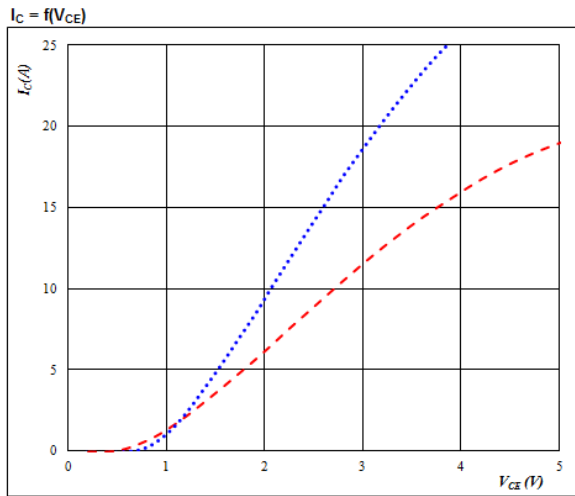
Parameter	Symbol	Conditions					Value			Unit
		$V_{GE}$ [V]	$V_{CE}$ [V]	$I_C$ [A]	$T_j$ [°C]	Min	Typ	Max		
Rated resistance	R				25		21,5			kΩ
Deviation of R100	$\Delta R/R$	R100=1486 Ω			100	-4,5		+4,5		%
Power dissipation	P				25		210			mW
Power dissipation constant					25		3,5			mW/K
B-value	B(25/50)				25		3884			K
B-value	B(25/100)				25		3964			K
Vincotech NTC Reference								F		

### Module Properties

Parameter	Symbol	Conditions	Value	Unit
<b>Thermal Properties</b>				
Storage temperature	$T_{stg}$		-40...+125	°C
Operation temperature under switching condition	$T_{op}$		-40...+( $T_{jmax} - 25$ )	°C
<b>Insulation Properties</b>				
Insulation voltage	$V_{is}$	DC voltage	4000	V
Creepage distance			min 12,7	mm
Clearance			min 12,7	mm
Comparative tracking index	CTI		>200	

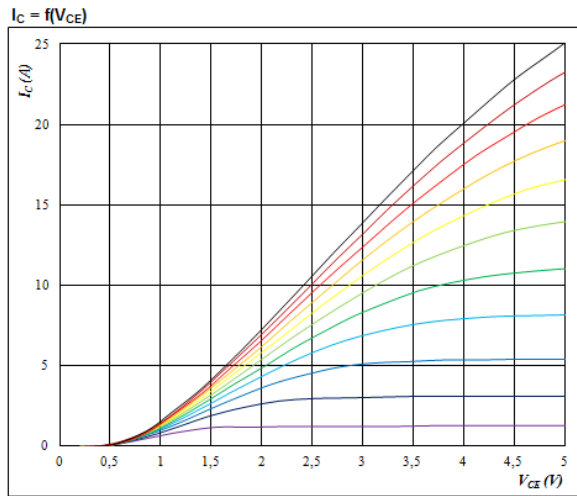
### Inverter switch characteristics

Typical output characteristics IGBT



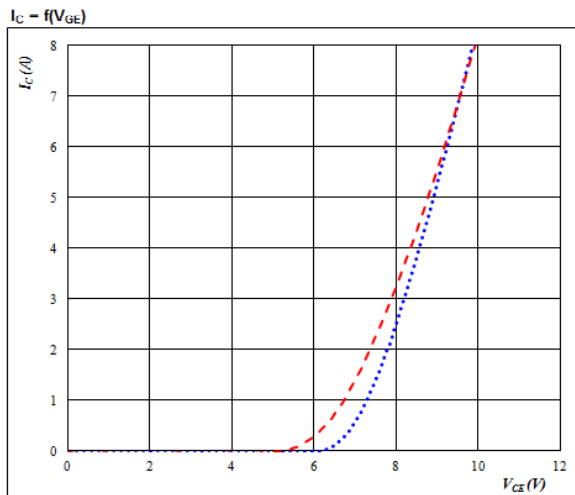
$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j: 25 \text{ }^\circ C$  (dotted blue)  
 $125 \text{ }^\circ C$  (solid black)  
 $150 \text{ }^\circ C$  (dashed red)

Typical output characteristics IGBT



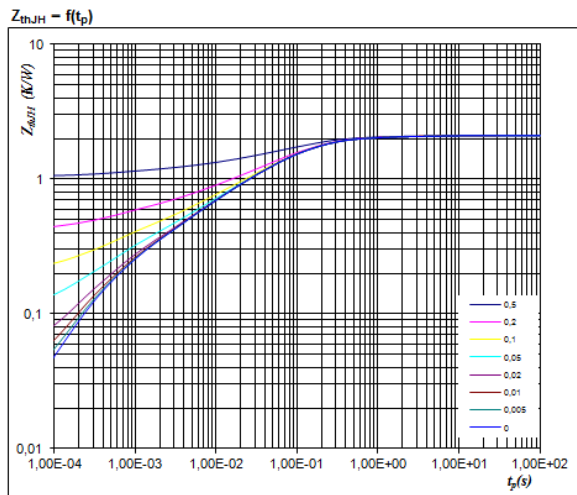
$t_p = 250 \mu s$   
 $T_j = 150 \text{ }^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

Typical transfer characteristics IGBT



$t_p = 100 \mu s$   
 $V_{CE} = 10 V$   
 $T_j: 25 \text{ }^\circ C$  (dotted blue)  
 $125 \text{ }^\circ C$  (solid black)  
 $150 \text{ }^\circ C$  (dashed red)

Transient thermal impedance as a function of pulse width IGBT



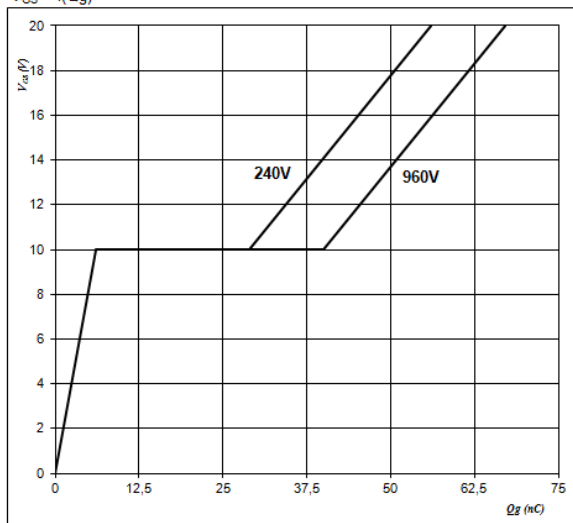
$D = t_p / T$   
 $R_{thJH} = 2,1 \text{ K/W}$   
 IGBT thermal model values

R (K/W)	Tau (s)
6,03E-02	4,78E+00
1,65E-01	5,92E-01
7,42E-01	1,24E-01
5,13E-01	3,81E-02
3,31E-01	8,51E-03
1,32E-01	1,73E-03
1,28E-01	3,64E-04

### Inverter switch characteristics

Gate voltage vs Gate charge IGBT

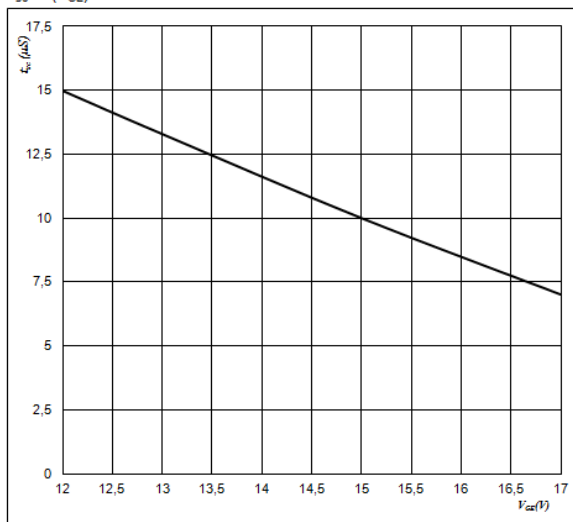
$$V_{GS} = f(Q_g)$$



At  
I<sub>C</sub> = 8 A

Short circuit withstand time as a function of Vge IGBT

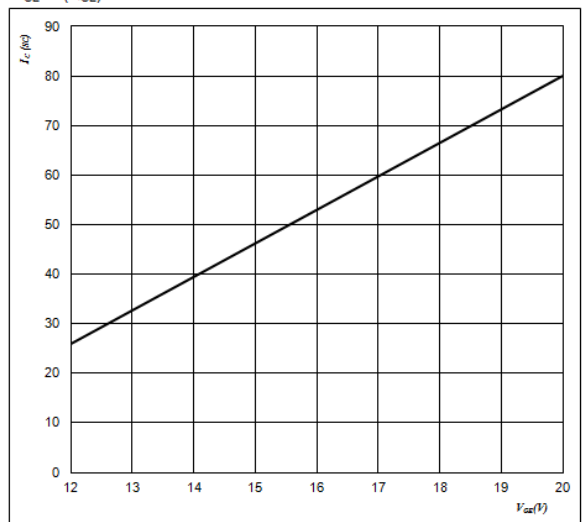
$$t_{sc} = f(V_{GE})$$



At  
V<sub>CE</sub> = 600 V  
T<sub>j</sub> ≤ 25 °C

Typical short circuit collector current as a function of Vge IGBT

$$I_C = f(Q_{GE})$$



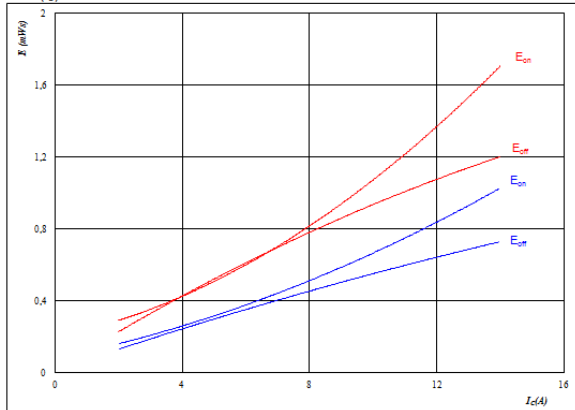
At  
V<sub>CE</sub> ≤ 600 V  
T<sub>j</sub> = 25 °C

## Inverter switching characteristics

**Figure 1. IGBT**

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



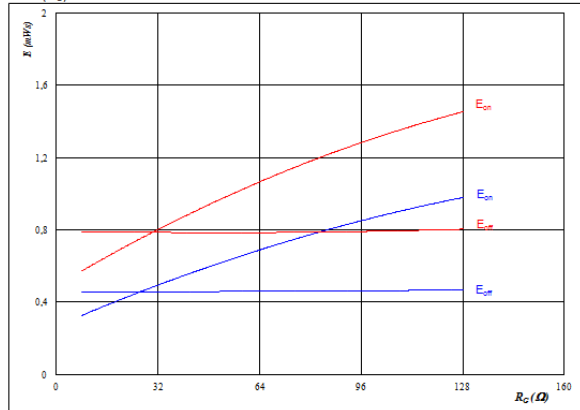
With an inductive load at

$$\begin{array}{ll}
 T_J = 25/125/150 & ^\circ\text{C} \\
 V_{CE} = 600 & \text{V} \\
 V_{GE} = \pm 15 & \text{V} \\
 R_{gon} = 32 & \Omega \\
 R_{goff} = 32 & \Omega
 \end{array}$$

**Figure 2. IGBT**

Typical switching energy losses as a function of gate resistor

$$E = f(R_G)$$



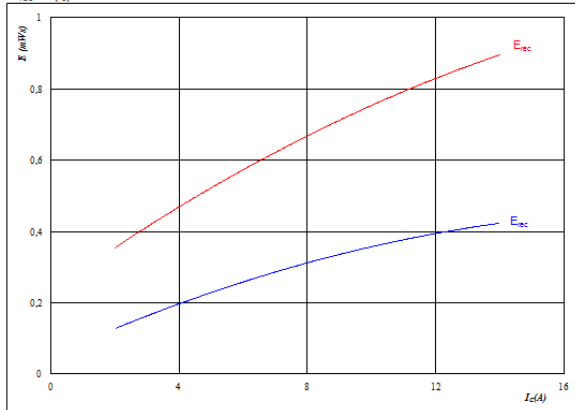
With an inductive load at

$$\begin{array}{ll}
 T_J = 25/125/150 & ^\circ\text{C} \\
 V_{CE} = 600 & \text{V} \\
 V_{GE} = \pm 15 & \text{V} \\
 I_C = 8 & \text{A}
 \end{array}$$

**Figure 3. FWD**

Typical reverse recovery energy loss as a function of collector (drain) current

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



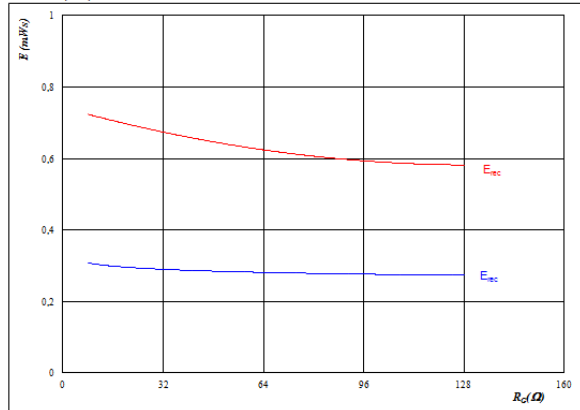
With an inductive load at

$$\begin{array}{ll}
 T_J = 25/125/150 & ^\circ\text{C} \\
 V_{CE} = 600 & \text{V} \\
 V_{GE} = \pm 15 & \text{V} \\
 R_{gon} = 32 & \Omega \\
 R_{goff} = 32.015 & \Omega
 \end{array}$$

**Figure 4. FWD**

Typical reverse recovery energy loss as a function of gate resistor

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



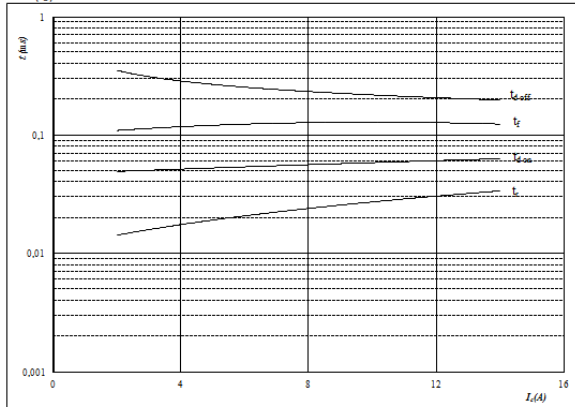
With an inductive load at

$$\begin{array}{ll}
 T_J = 25/125/150 & ^\circ\text{C} \\
 V_{CE} = 600 & \text{V} \\
 V_{GE} = \pm 15 & \text{V} \\
 I_C = 8 & \text{A}
 \end{array}$$

**Figure 5. IGBT**

Typical switching times as a function of collector current

$$t = f(I_C)$$



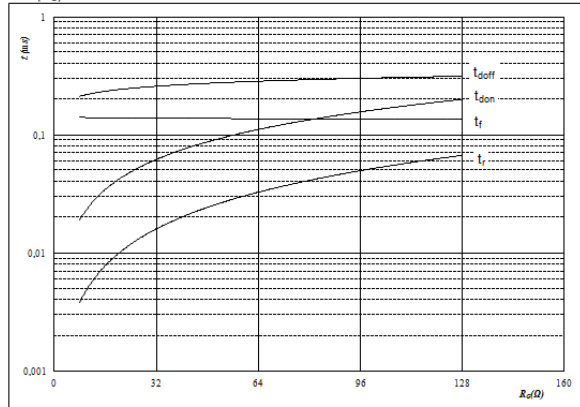
With an inductive load at

$$\begin{array}{ll}
 T_J = 0 & ^\circ\text{C} \\
 V_{CE} = 600 & \text{V} \\
 V_{GE} = \pm 15 & \text{V} \\
 R_{gon} = 32 & \Omega \\
 R_{goff} = 32 & \Omega
 \end{array}$$

**Figure 6. IGBT**

Typical switching times as a function of gate resistor

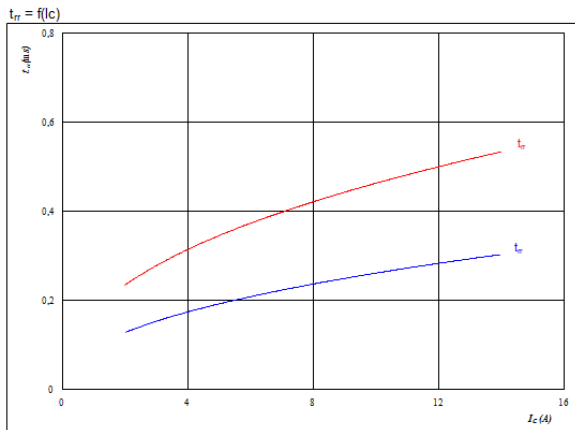
$$t = f(R_G)$$



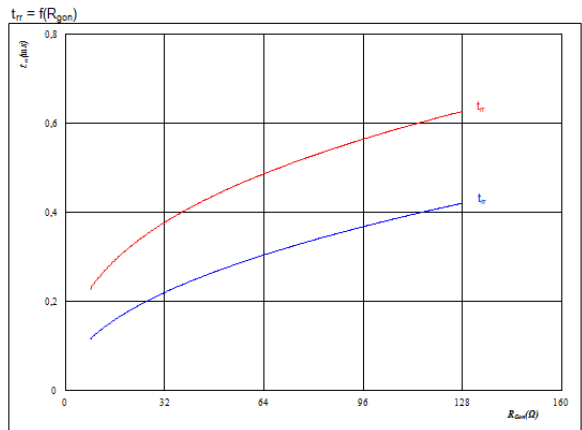
With an inductive load at

$$\begin{array}{ll}
 T_J = 0 & ^\circ\text{C} \\
 V_{CE} = 600 & \text{V} \\
 V_{GE} = \pm 15 & \text{V} \\
 I_C = 8 & \text{A}
 \end{array}$$

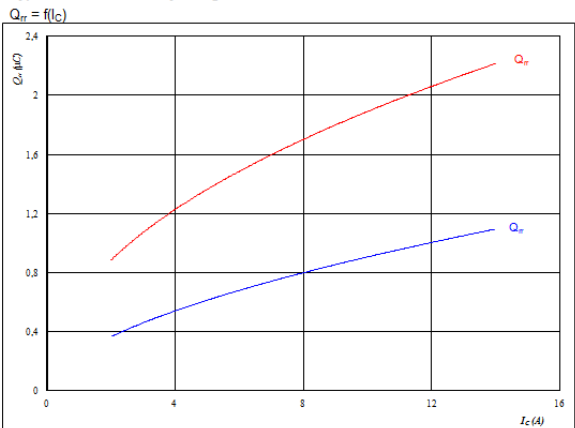
## Inverter switching characteristics

**Figure 7.** Typical reverse recovery time as a function of collector current FWD


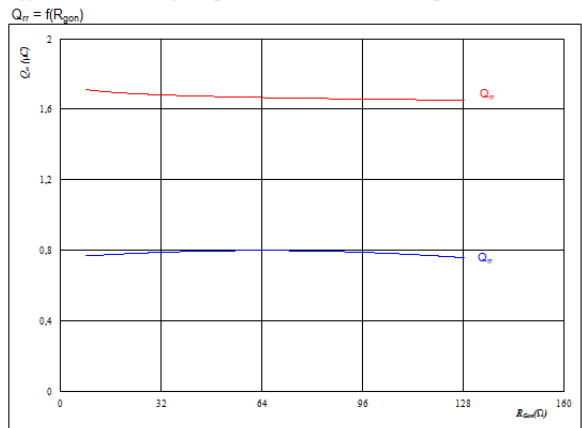
At  
 $T_j = 25/125/150$  °C  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 32$  Ω

**Figure 8.** Typical reverse recovery time as a function of IGBT turn on gate resistor FWD


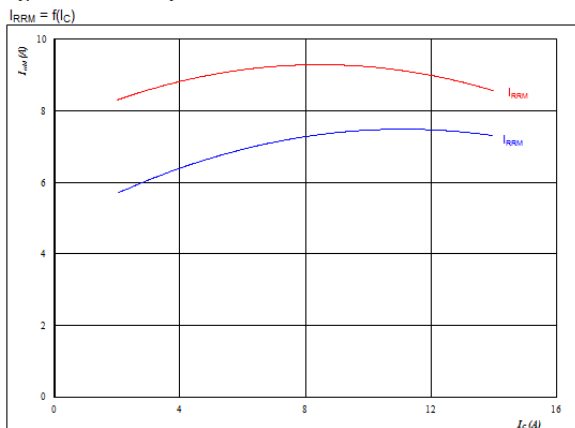
At  
 $T_j = 25/125/150$  °C  
 $V_R = 600$  V  
 $I_F = 8$  A  
 $V_{GE} = \pm 15$  V

**Figure 9.** Typical reverse recovery charge as a function of collector current FWD


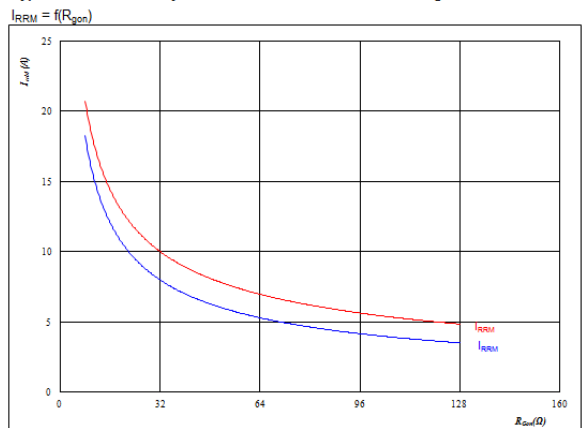
At  
 $T_j = 25/125/150$  °C  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 32$  Ω

**Figure 10.** Typical reverse recovery charge as a function of IGBT turn on gate resistor FWD


At  
 $T_j = 25/125/150$  °C  
 $V_R = 600$  V  
 $I_F = 8$  A  
 $V_{GE} = \pm 15$  V

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


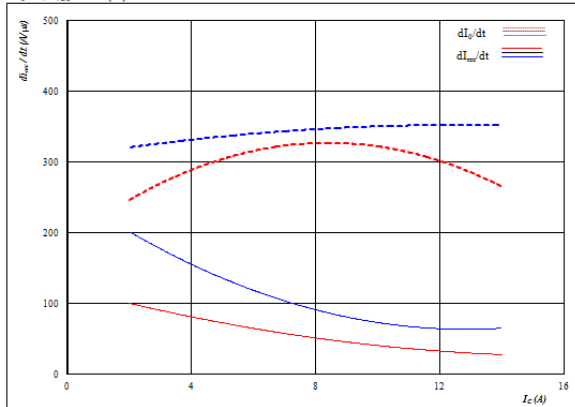
At  
 $T_j = 25/125/150$  °C  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 32$  Ω

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


At  
 $T_j = 25/125/150$  °C  
 $V_R = 600$  V  
 $I_F = 8$  A  
 $V_{GE} = \pm 15$  V

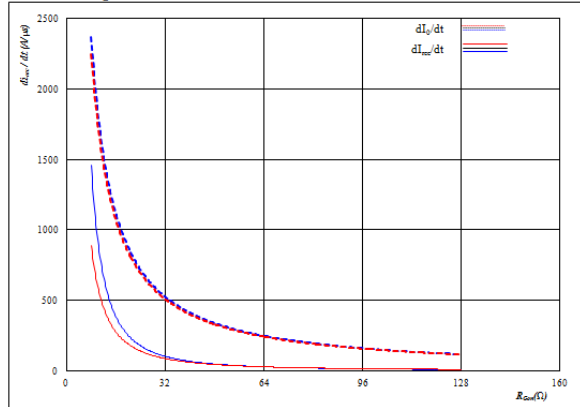
### Inverter switching characteristics

**Figure 13.** FWD  
 Typical rate of fall of forward and reverse recovery current as a function of collector current  
 $dI_F/dt, dI_{RR}/dt = f(I_C)$



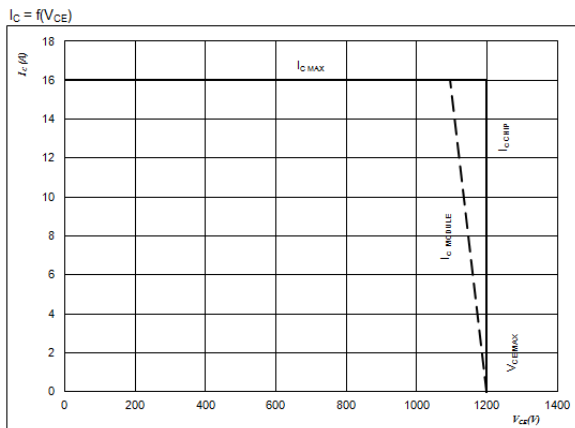
At  
 $T_J = 25/125/150$  °C  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 32$  Ω

**Figure 14.** FWD  
 Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor



At  
 $T_J = 25/125/150$  °C  
 $V_R = 600$  V  
 $I_F = 8$  A  
 $V_{GE} = \pm 15$  V

**Figure 15.** IGBT  
 Reverse bias safe operating area



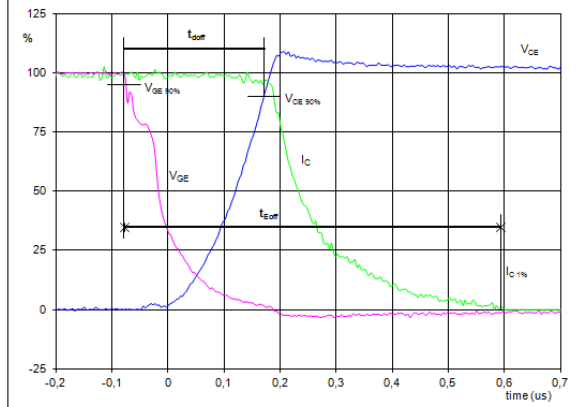
At  
 $T_J = 175$  °C  
 $R_{gon} = 32$  Ω  
 $R_{goff} = 32$  Ω



### Switching Definitions

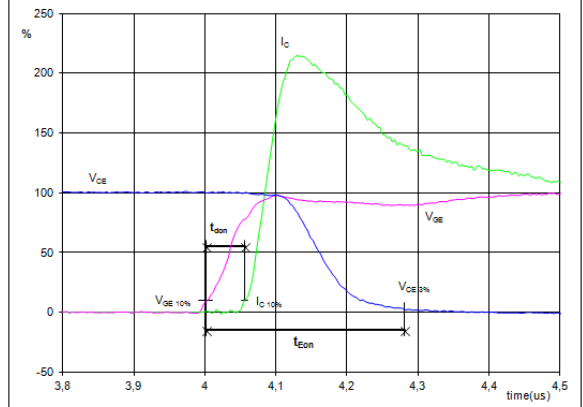
General conditions	
$T_j$	= 150 °C
$R_{\theta on}$	= 32 Ω
$R_{\theta off}$	= 32 Ω

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



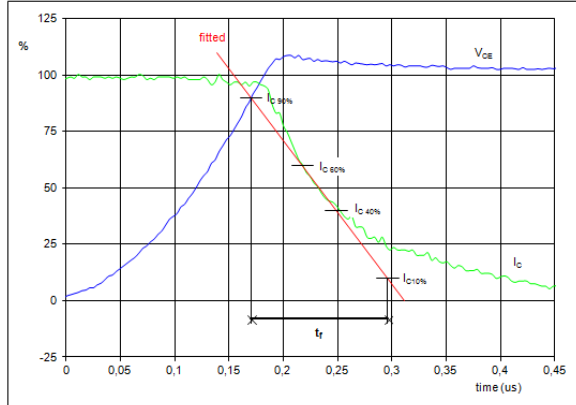
$V_{GE} (0\%) =$	-15	V
$V_{GE} (100\%) =$	15	V
$V_C (100\%) =$	600	V
$I_C (100\%) =$	8	A
$t_{doff} =$	0,24	μs
$t_{Eoff} =$	0,67	μs

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



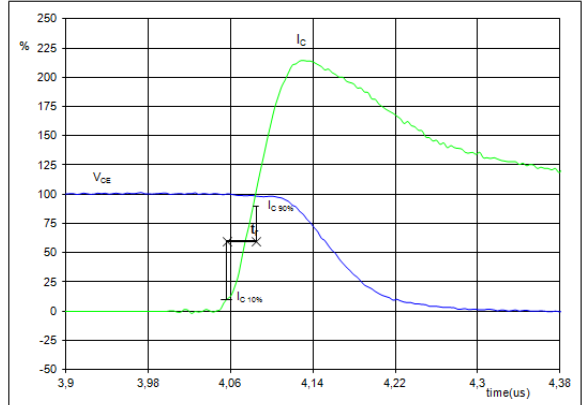
$V_{GE} (0\%) =$	-15	V
$V_{GE} (100\%) =$	15	V
$V_C (100\%) =$	600	V
$I_C (100\%) =$	8	A
$t_{don} =$	0,06	μs
$t_{Eon} =$	0,28	μs

**Figure 3.** IGBT  
 Turn-off Switching Waveforms & definition of  $t_r$



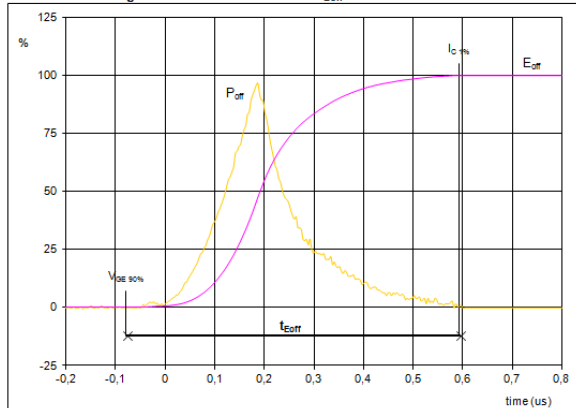
$V_C (100\%) =$	600	V
$I_C (100\%) =$	8	A
$t_r =$	0,14	μs

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



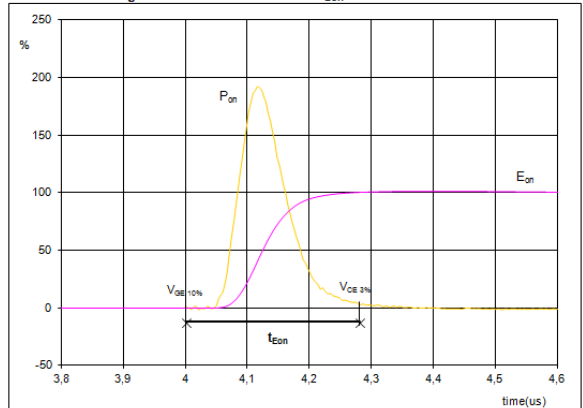
$V_C (100\%) =$	600	V
$I_C (100\%) =$	8	A
$t_r =$	0,02	μs

**Figure 5.** IGBT  
 Turn-off Switching Waveforms & definition of  $t_{Eoff}$

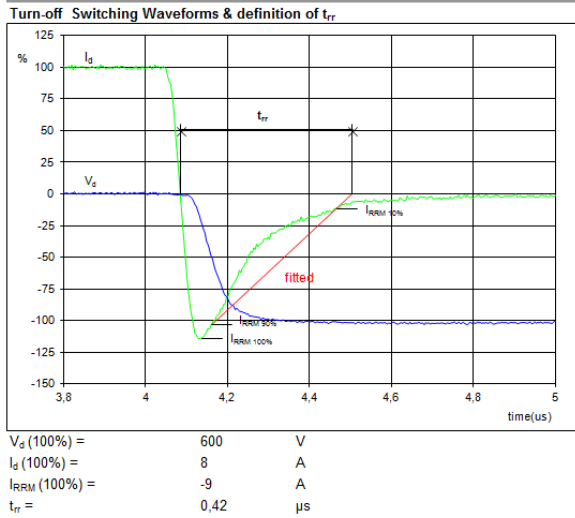
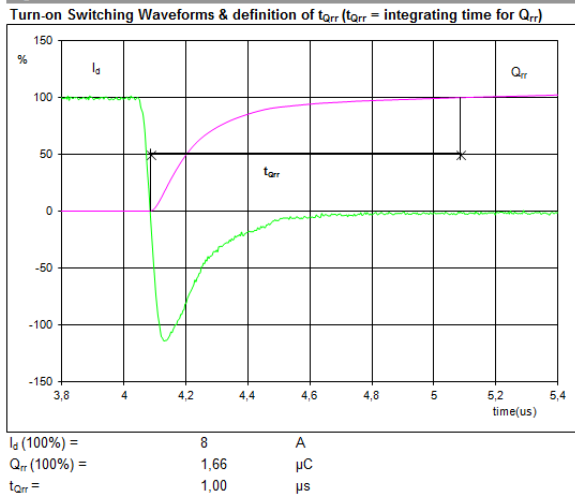
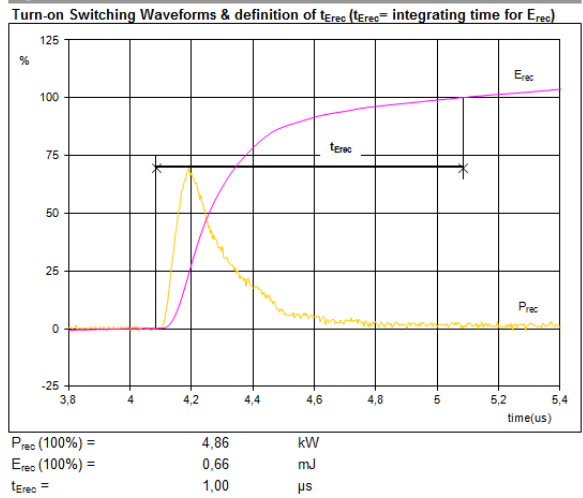


$P_{off} (100\%) =$	4,86	kW
$E_{off} (100\%) =$	0,78	mJ
$t_{Eoff} =$	0,67	μs

**Figure 6.** IGBT  
 Turn-on Switching Waveforms & definition of  $t_{Eon}$

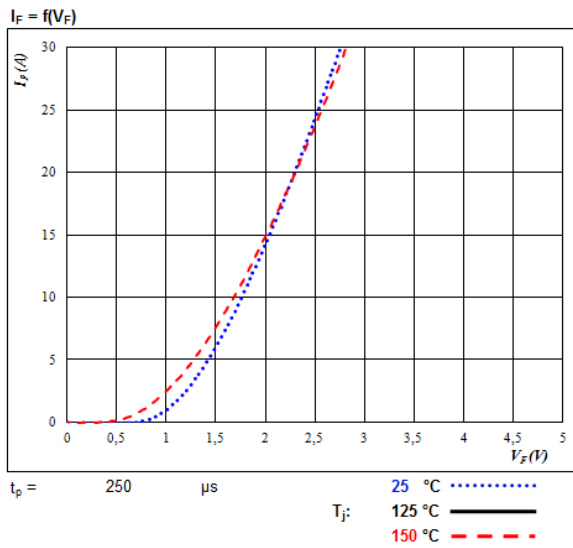


$P_{on} (100\%) =$	4,86	kW
$E_{on} (100\%) =$	0,83	mJ
$t_{Eon} =$	0,28	μs

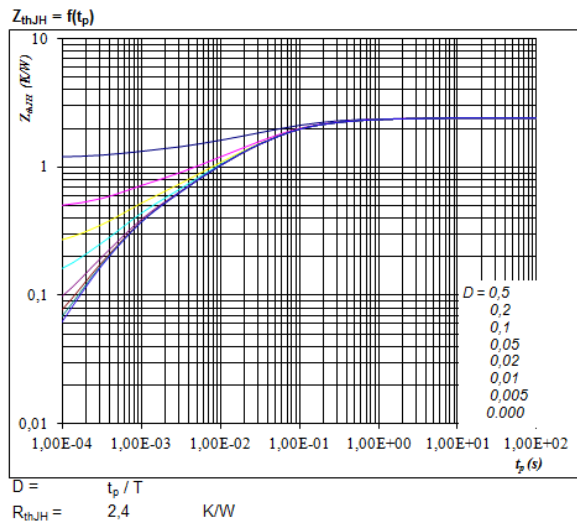
**Switching Definitions**
**Figure 7.** FWD

**Figure 8.** FWD

**Figure 9.** FWD


### Inverter diode characteristics

Typical forward characteristics FWD



Transient thermal impedance as a function of pulse width FWD



FWD thermal model values

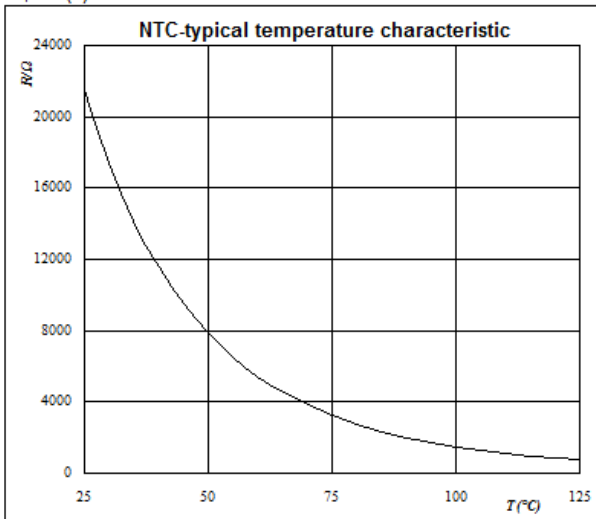
R (K/W)	Tau (s)
7,46E-02	3,12E+00
2,49E-01	3,62E-01
8,60E-01	6,40E-02
5,97E-01	1,50E-02
3,54E-01	3,27E-03
2,60E-01	5,11E-04

### Thermistor

Figure 1 Thermistor

 Typical NTC characteristic  
 as a function of temperature

$R_T = f(T)$



### Ordering Code & Marking

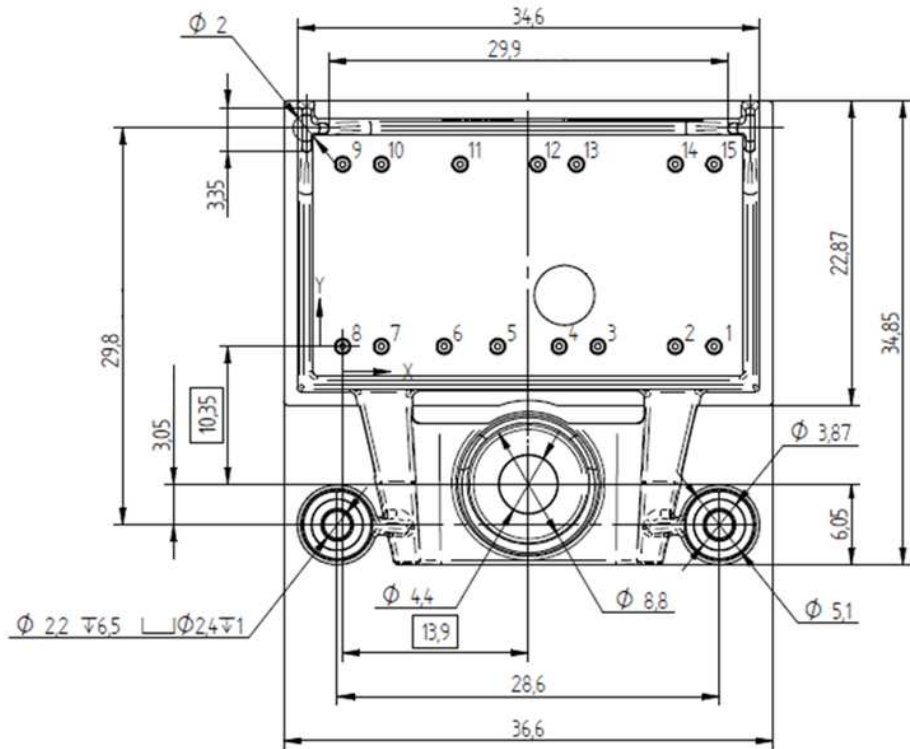
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 17mm housing	10-0B126PA008SC-M998F09	M998F09	M998F09

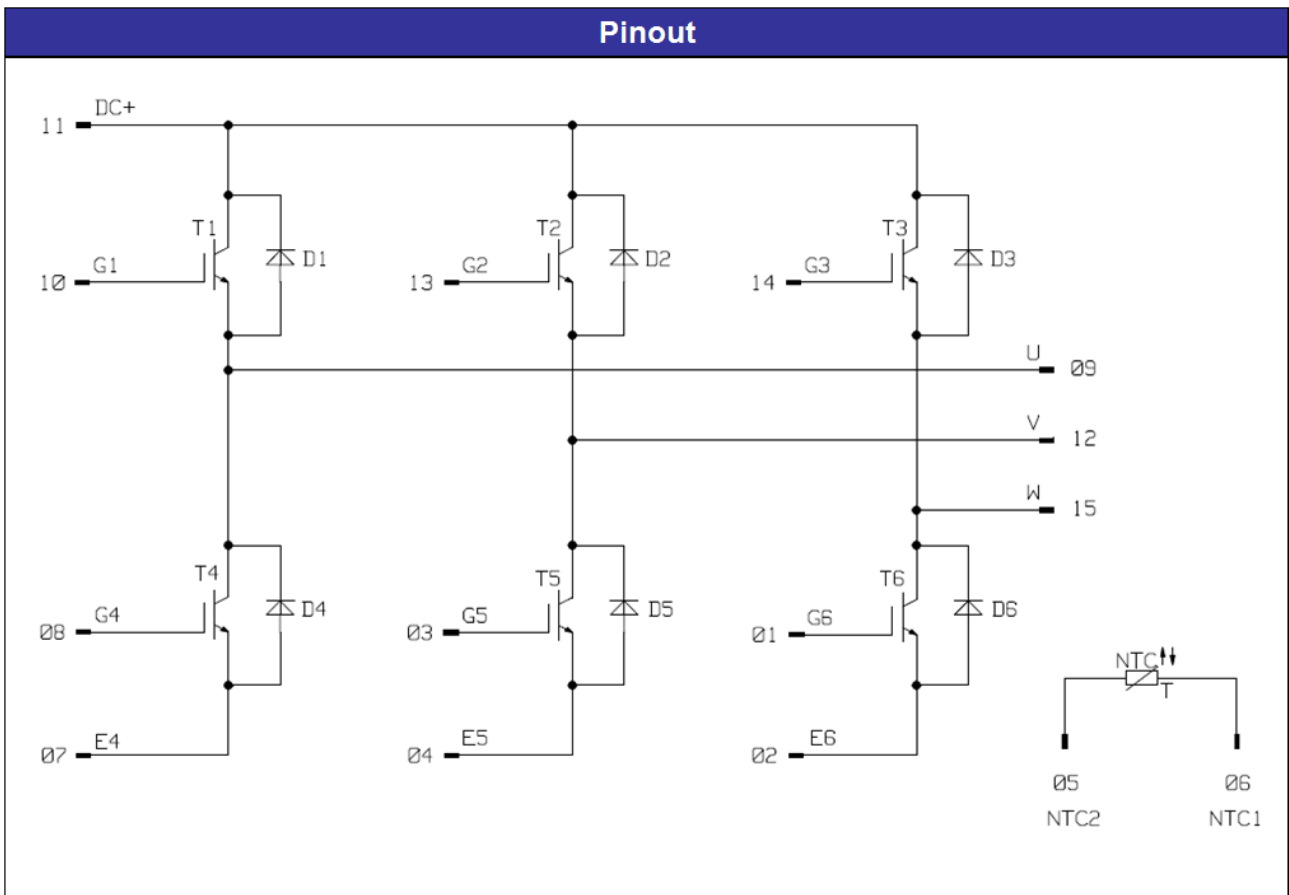
  

Text	Name&Type&VER	Date code	UL & Vinco	Lot	Serial
<div style="display: flex; align-items: center;"> <div style="font-size: 8px; margin-right: 5px;">           NN-NNNNNNNNNN            NN-TTTTTTVV            Vinco LLLLL            WWYY SSSS UL         </div> </div>	NN-NNNNNNNNNNNNNN-TTTTTTVV WWYY UL Vinco LLLLL SSSS	WWYY	UL Vinco	LLLLL	SSSS
	Datamatrix Type & VER TTTTTTVV Lot number LLLLL Serial SSSS Date code WWYY				

### Outline

Pin table [mm]			
Pin	X	Y	Pos
1	27,8	0	G6
2	24,9	0	E6
3	19,1	0	G6
4	16,2	0	E5
5	11,6	0	NTC2
6	7,6	0	NTC1
7	2,9	0	E4
8	0	0	G4
9	0	13,7	U
10	2,9	13,7	G1
11	8,8	13,7	DC+
12	14,6	13,7	V
13	17,5	13,7	G2
14	24,9	13,7	G3
15	27,8	13,7	W





Identification						
ID	Component	Voltage	Technology	Current	Function	Comment
T1-T6	IGBT	1200V		8A	Inverter switch	
D1-D6	FWD	1200V		10A	Inverter diode	
R <sub>t</sub>	NTC				Thermistor	

Packaging instruction			
Standard packaging quantity (SPQ)	200	>SPQ	Standard
		<SPQ	Sample

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

Document No.:	Date:	Modification:	Pages
10-0B126PA008SC-M998F09-T1-14	4 Dec 2014		

Product status definition		
Datasheet Status	Product Status	Definition
Target	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. The data contained is exclusively intended for technically trained staff.

**DISCLAIMER**

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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.