



**flowDUAL E3 SiC**

**1200 V / 2 mΩ**

**Topology features**

- Kelvin Emitter for improved switching performance
- Temperature sensor

**Component features**

- High Blocking Voltage with low drain source on state resistance
- High speed SiC-MOSFET technology
- Resistant to Latch-up

**Housing features**

- Base isolation: Al<sub>2</sub>O<sub>3</sub>
- CTI600 housing material
- Compact, baseplate-less housing
- VINcoPress Technology
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

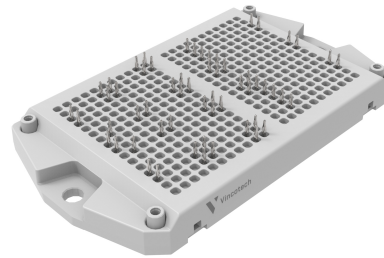
**Target applications**

- Charging Stations
- Power Supply
- UPS

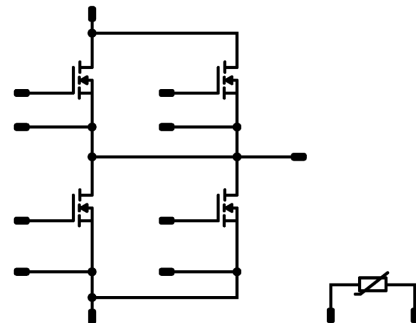
**Types**

- B0-EP122PA002ME-PG88F18T

**flow E3 12 mm housing**



**Schematic**





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**B0-EP122PA002ME-PG88F18T**  
datasheet

## Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
<b>Half-Bridge Switch</b>				
Drain-source voltage	$V_{DS}$		1200	V
Drain current (DC current)	$I_D$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	451	A
Peak drain current	$I_{DM}$	$t_p$ limited by $T_{jmax}$	2000	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	743	W
Gate-source voltage	$V_{GS}$		-4 / 15	V
		dynamic	-8 / 19	
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
Isolation voltage	$V_{isol}$	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			>12,7	mm
Clearance			10,01	mm
Comparative Tracking Index	CTI		≥ 600	

\*100 % tested in production



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### Characteristic Values

Parameter	Symbol	Conditions					Values			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		

### Half-Bridge Switch

#### Static

Drain-source on-state resistance	$r_{DS(on)}$		15		600	25 125 150	1,4	2,39 3,2 3,56	2,6 <sup>(1)</sup>	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$			0,184	25	1,8	2,5	3,6	V
Gate to Source Leakage Current	$I_{GSS}$		15	0		25		80	2000	nA
Zero Gate Voltage Drain Current	$I_{DSS}$		0	1200		25		8	320	μA
Internal gate resistance	$r_g$							0,3		Ω
Gate charge	$Q_g$		-4/15	800	600	25		1816		nC
Short-circuit input capacitance	$C_{iss}$	$f = 1$ Mhz	0	1000	0	25		46216		pF
Short-circuit output capacitance	$C_{oss}$							1840		
Reverse transfer capacitance	$C_{rss}$							100		
Diode forward voltage	$V_{SD}$		0		300	25		4,6		V

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						0,13		K/W
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**B0-EP122PA002ME-PG88F18T**  
datasheet

### Characteristic Values

Parameter	Symbol	Conditions					Values			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						
<b>Dynamic</b>														
Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4 \Omega$ $R_{goff} = 4 \Omega$	-3/18	600	600	25		63,45		ns				
						125		55,71						
						150		53,86						
Rise time	$t_r$					25		48,48						
						125		43,66		ns				
						150		43,26						
Turn-off delay time	$t_{d(off)}$					25		231,52						
						125		257,95		ns				
						150		264,3						
Fall time	$t_f$					25		32,2						
						125		33,31		ns				
						150		33,77						
Turn-on energy (per pulse)	$E_{on}$					$Q_{rFWD}=4,55 \mu C$ $Q_{tFWD}=9,68 \mu C$ $Q_{rFWD}=12,12 \mu C$				25		8,04		mWs
										125		7,31		
										150		7,28		
Turn-off energy (per pulse)	$E_{off}$					25		18,14		mWs				
						125		18,08						
						150		18,42						
Peak recovery current	$I_{RRM}$					25		232,51		A				
						125		375,19						
						150		430,34						
Reverse recovery time	$t_{rr}$					25		32,68		ns				
						125		42,77						
						150		46,9						
Recovered charge	$Q_r$	$di/dt=14568 A/\mu s$ $di/dt=15525 A/\mu s$ $di/dt=17475 A/\mu s$				25		4,55		$\mu C$				
						125		9,68						
						150		12,12						
Reverse recovered energy	$E_{rec}$					25		2,17		mWs				
						125		4,96						
						150		6,2						
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25		19934,37		A/ $\mu s$				
						125		31493,41						
						150		35702,14						



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### Characteristic Values

Parameter	Symbol	Conditions					Values			Unit	
		$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$V_{CE}$ [V]	$V_F$ [V]	$I_D$ [A]	$I_C$ [A]	$I_F$ [A]		$T_j$ [°C]

### Thermistor

#### Static

Rated resistance	$R$					25		5		kΩ
Deviation of R100	$A_{R/R}$	$R_{100} = 493 \Omega$				100	-5		5	%
Power dissipation	$P$							245		mW
Power dissipation constant	$d$					25		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 Thermistor Reference									K	

<sup>(1)</sup> Value at chip level

<sup>(2)</sup> Only valid with pre-applied Vincotech thermal interface material.

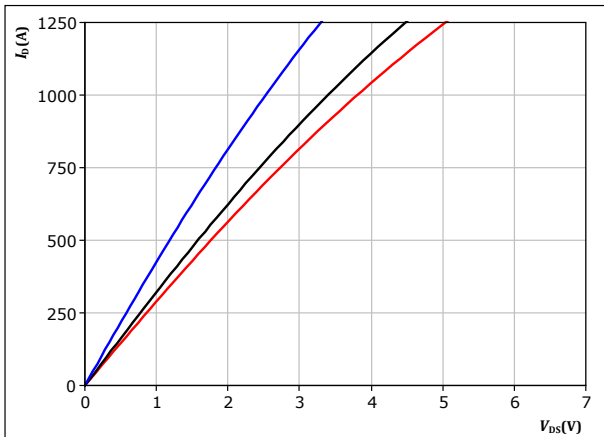


## Half-Bridge Switch Characteristics

**figure 1.** MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

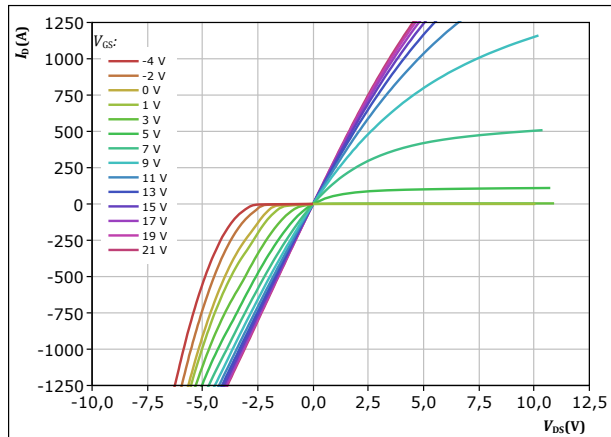


$t_p = 250 \mu s$   
 $V_{GS} = 15 V$   
 $T_j: 25 \text{ }^\circ C$   
 $125 \text{ }^\circ C$   
 $150 \text{ }^\circ C$

**figure 2.** MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

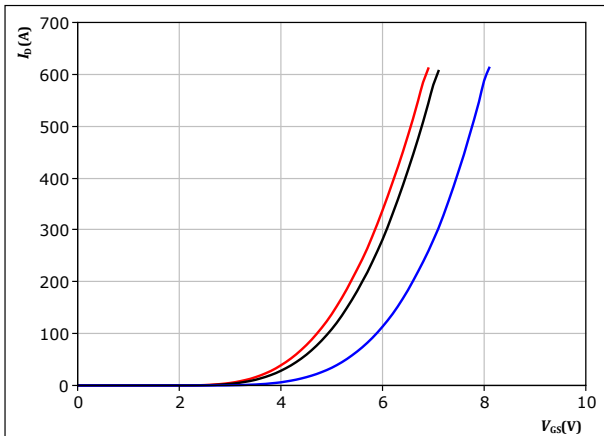


$t_p = 250 \mu s$   
 $T_j = 150 \text{ }^\circ C$   
 $V_{GS}$  from -4 V to 21 V in steps of 2 V

**figure 3.** MOSFET

Typical transfer characteristics

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

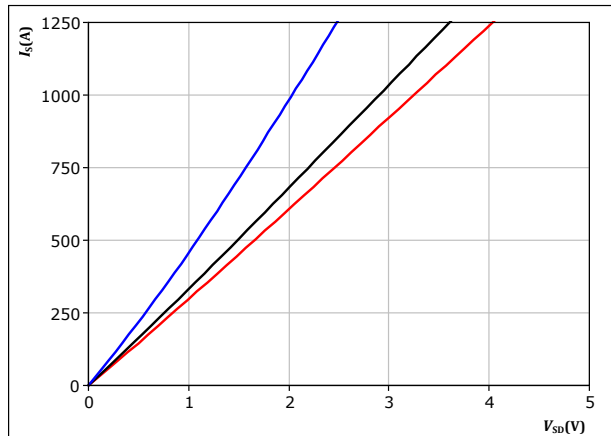


$t_p = 250 \mu s$   
 $V_{DS} = 20 V$   
 $T_j: 25 \text{ }^\circ C$   
 $125 \text{ }^\circ C$   
 $150 \text{ }^\circ C$

**figure 4.** MOSFET

Typical reverse drain current characteristics

$$I_{SD} = f(V_{SD})$$



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

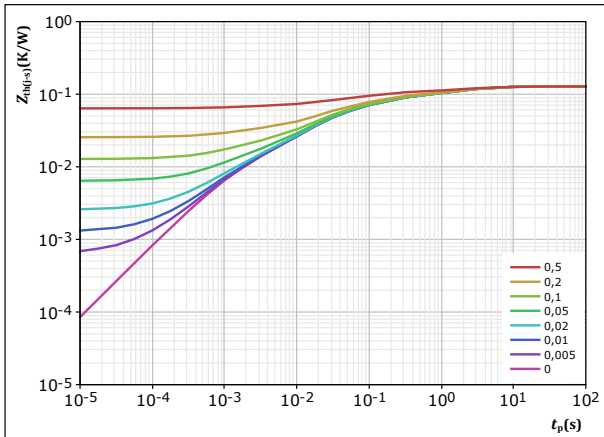


## Half-Bridge Switch Characteristics

**figure 5.** MOSFET

Transient thermal impedance as a function of pulse width

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



$$D = \frac{t_p}{T}$$

$$R_{th(j-c)} = 0,128 \text{ K/W}$$

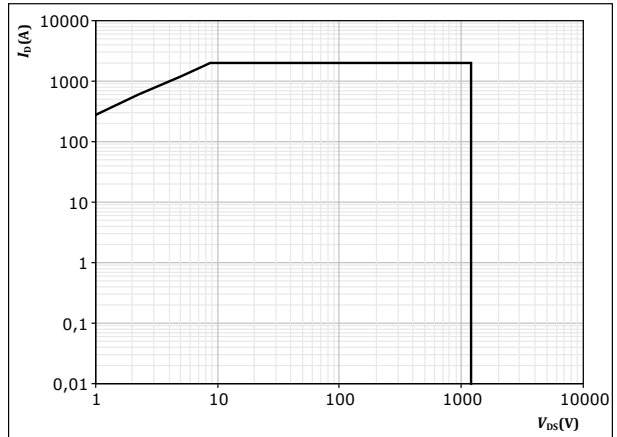
MOSFET thermal model values

R (K/W)	$\tau$ (s)
1,58E-02	4,36E+00
2,75E-02	1,11E+00
4,08E-02	1,07E-01
3,58E-02	1,93E-02
7,85E-03	1,26E-03

**figure 6.** MOSFET

Safe operating area

$$I_D = f(V_{DS})$$



D = single pulse

$$T_s = 80 \text{ } ^\circ\text{C}$$

$$V_{GS} = 15 \text{ V}$$

$$T_i = T_{jmax}$$

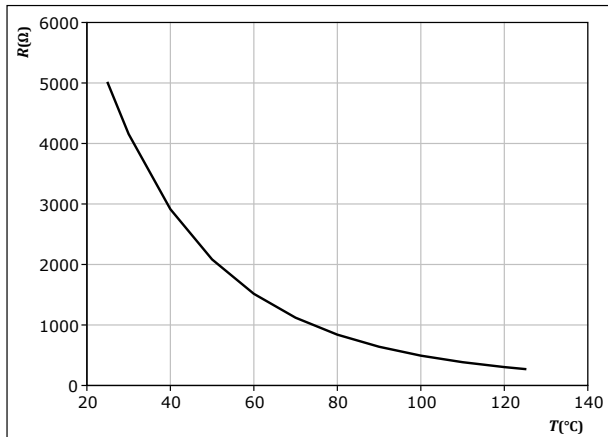


## Thermistor Characteristics

**figure 7.** Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$



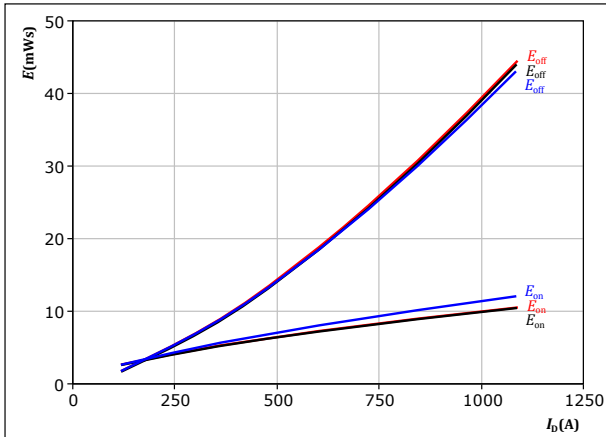




## Half-Bridge Switching Characteristics

**figure 8.** MOSFET

Typical switching energy losses as a function of drain current  
 $E = f(I_D)$

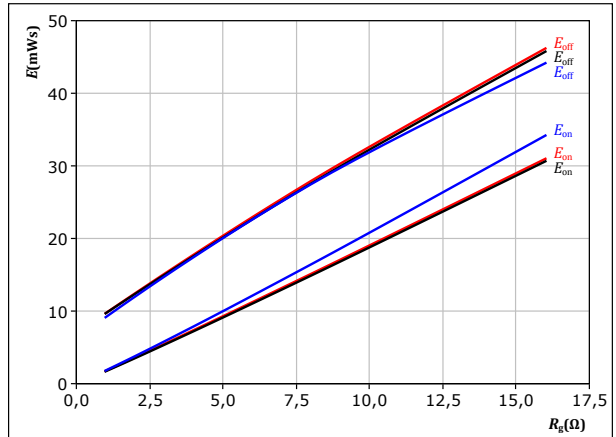


With an inductive load at

$V_{DS} =$	600	V	$T_j:$	25 °C
$V_{GS} =$	-3/18	V		125 °C
$R_{gon} =$	4	$\Omega$		150 °C
$R_{goff} =$	4	$\Omega$		

**figure 9.** MOSFET

Typical switching energy losses as a function of MOSFET turn on gate resistor  
 $E = f(R_g)$

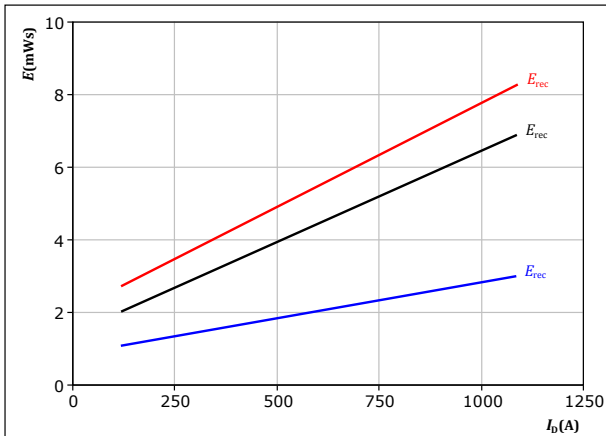


With an inductive load at

$V_{DS} =$	600	V	$T_j:$	25 °C
$V_{GS} =$	-3/18	V		125 °C
$I_D =$	600	A		150 °C

**figure 10.** MOSFET

Typical reverse recovered energy loss as a function of drain current  
 $E_{rec} = f(I_D)$

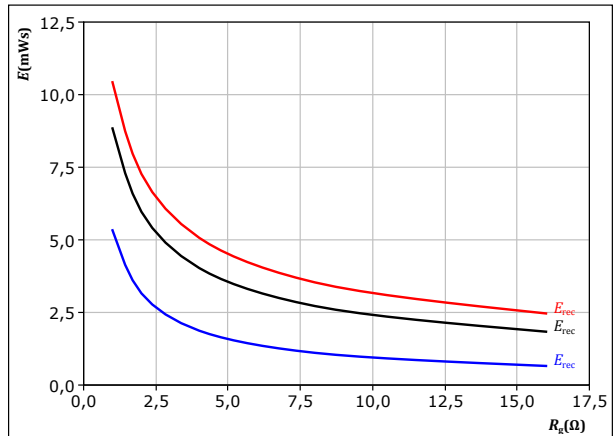


With an inductive load at

$V_{DS} =$	600	V	$T_j:$	25 °C
$V_{GS} =$	-3/18	V		125 °C
$R_{gon} =$	4	$\Omega$		150 °C

**figure 11.** MOSFET

Typical reverse recovered energy loss as a function of MOSFET turn on gate resistor  
 $E_{rec} = f(R_g)$



With an inductive load at

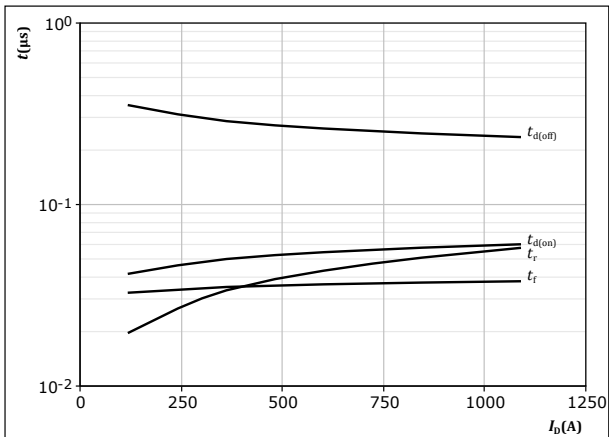
$V_{DS} =$	600	V	$T_j:$	25 °C
$V_{GS} =$	-3/18	V		125 °C
$I_D =$	600	A		150 °C



## Half-Bridge Switching Characteristics

**figure 12.** MOSFET

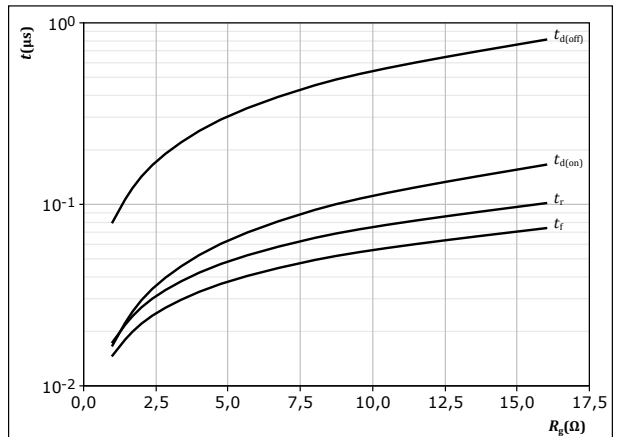
Typical switching times as a function of drain current  
 $t = f(I_D)$



With an inductive load at  
 $T_j = 150 \text{ } ^\circ\text{C}$   
 $V_{DS} = 600 \text{ V}$   
 $V_{GS} = -3/18 \text{ V}$   
 $R_{gon} = 4 \text{ } \Omega$   
 $R_{goff} = 4 \text{ } \Omega$

**figure 13.** MOSFET

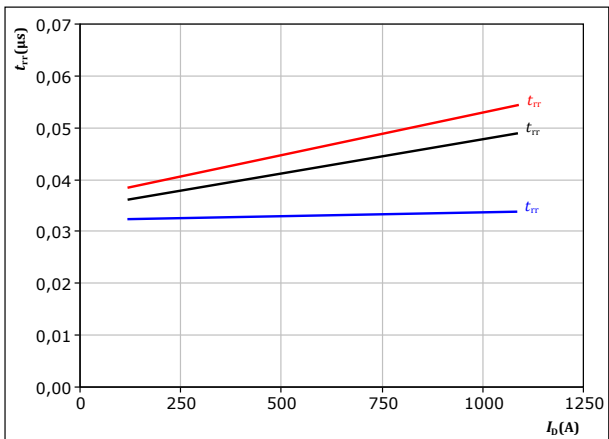
Typical switching times as a function of MOSFET turn on gate resistor  
 $t = f(R_g)$



With an inductive load at  
 $T_j = 150 \text{ } ^\circ\text{C}$   
 $V_{DS} = 600 \text{ V}$   
 $V_{GS} = -3/18 \text{ V}$   
 $I_D = 600 \text{ A}$

**figure 14.** MOSFET

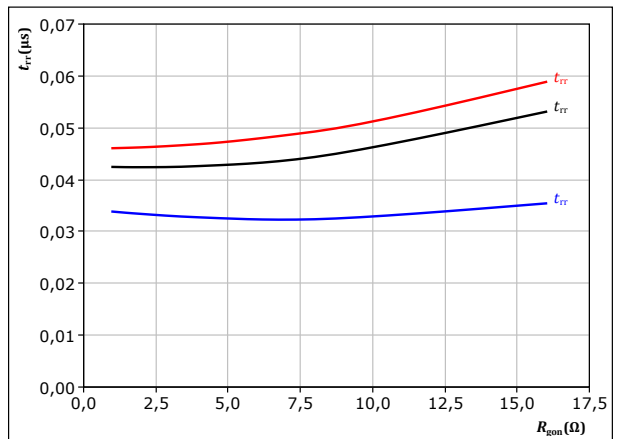
Typical reverse recovery time as a function of drain current  
 $t_{rr} = f(I_D)$



At  $V_{DS} = 600 \text{ V}$   
 $V_{GS} = -3/18 \text{ V}$   
 $R_{gon} = 4 \text{ } \Omega$   
 $T_j$ : — 25 °C  
— 125 °C  
— 150 °C

**figure 15.** MOSFET

Typical reverse recovery time as a function of MOSFET turn on gate resistor  
 $t_{rr} = f(R_{gon})$



At  $V_{DS} = 600 \text{ V}$   
 $V_{GS} = -3/18 \text{ V}$   
 $I_D = 600 \text{ A}$   
 $T_j$ : — 25 °C  
— 125 °C  
— 150 °C

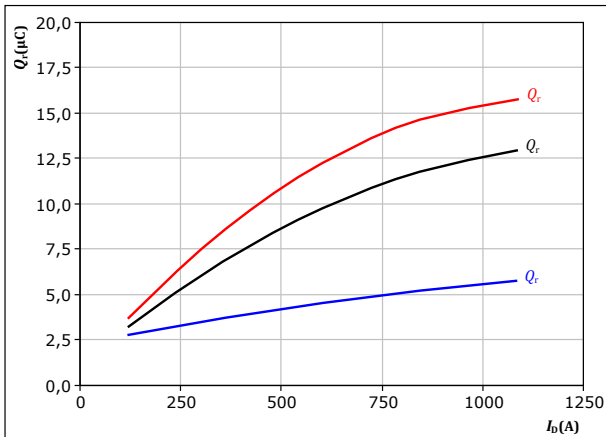


## Half-Bridge Switching Characteristics

**figure 16.** MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$



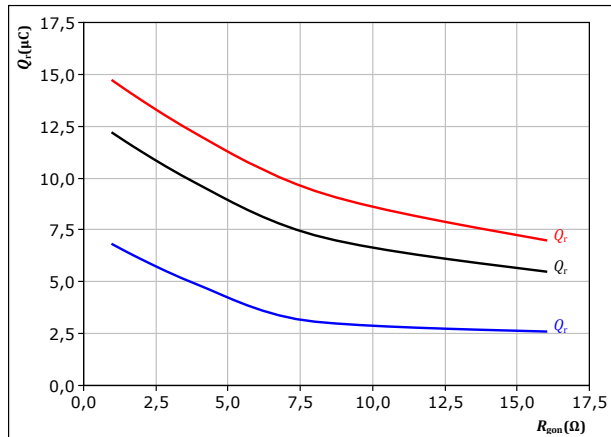
At  $V_{DS} = 600$  V  
 $V_{GS} = -3/18$  V  
 $R_{gon} = 4$   $\Omega$

$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C

**figure 17.** MOSFET

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

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



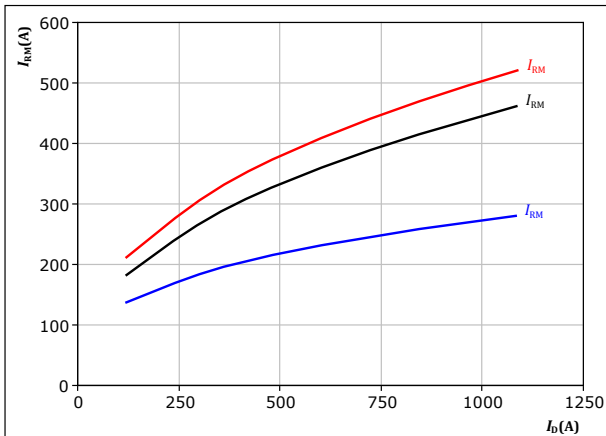
At  $V_{DS} = 600$  V  
 $V_{GS} = -3/18$  V  
 $I_D = 600$  A

$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C

**figure 18.** MOSFET

Typical peak reverse recovery current as a function of drain current

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



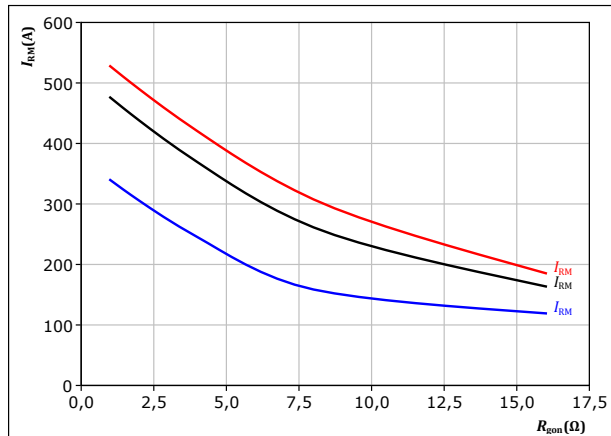
At  $V_{DS} = 600$  V  
 $V_{GS} = -3/18$  V  
 $R_{gon} = 4$   $\Omega$

$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C

**figure 19.** MOSFET

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

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



At  $V_{DS} = 600$  V  
 $V_{GS} = -3/18$  V  
 $I_D = 600$  A

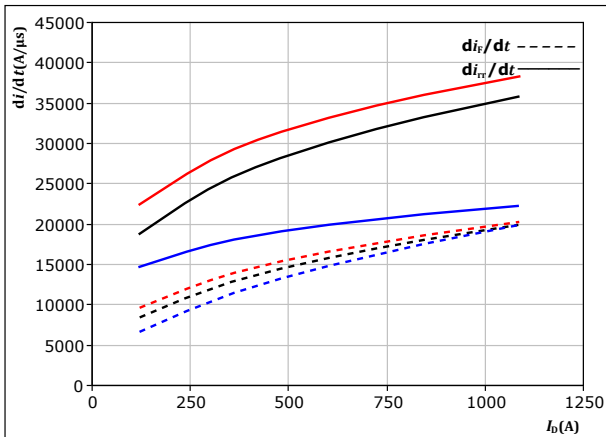
$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C



## Half-Bridge Switching Characteristics

**figure 20.** MOSFET

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

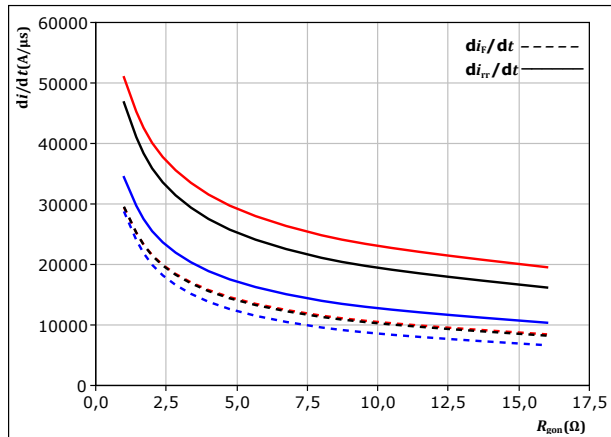


At  $V_{DS} = 600$  V  
 $V_{GS} = -3/18$  V  
 $R_{g(on)} = 4$  Ω

$T_j$ : 25 °C (blue)  
 125 °C (black)  
 150 °C (red)

**figure 21.** MOSFET

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



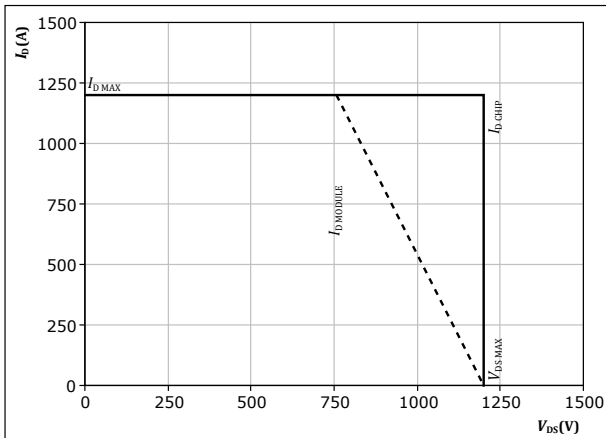
At  $V_{DS} = 600$  V  
 $V_{GS} = -3/18$  V  
 $I_D = 600$  A

$T_j$ : 25 °C (blue)  
 125 °C (black)  
 150 °C (red)

**figure 22.** MOSFET

Reverse bias safe operating area

$I_D = f(V_{DS})$



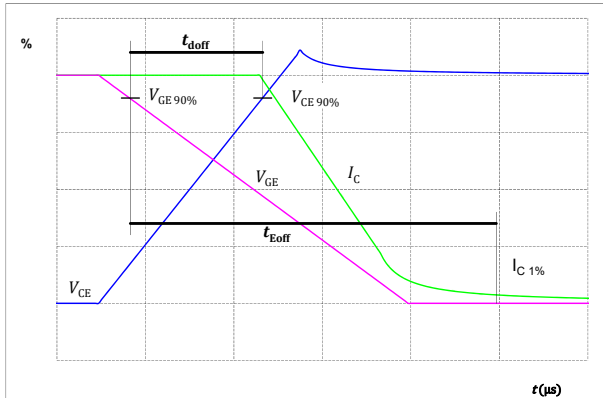
At  $T_j = 150$  °C  
 $R_{g(on)} = 4$  Ω  
 $R_{g(off)} = 4$  Ω



## Half-Bridge Switching Definitions

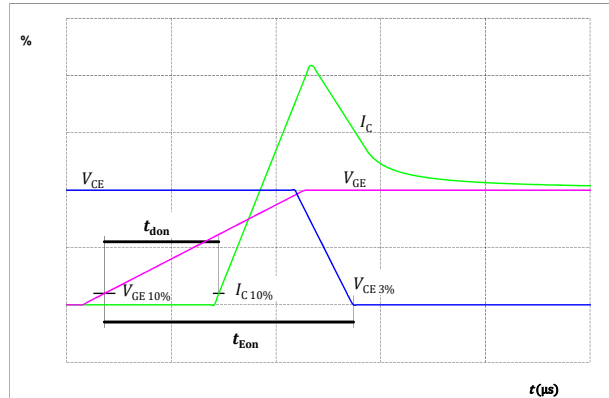
**figure 23.** MOSFET

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



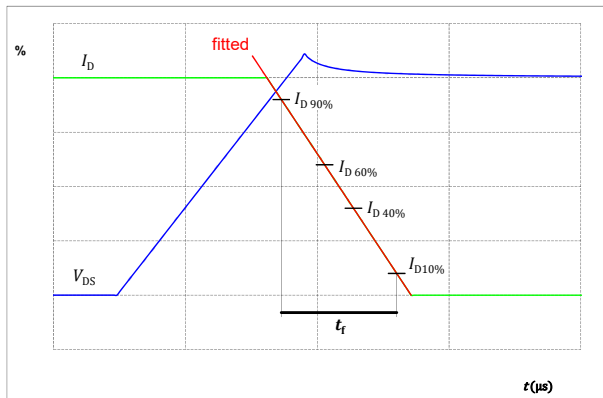
**figure 24.** MOSFET

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



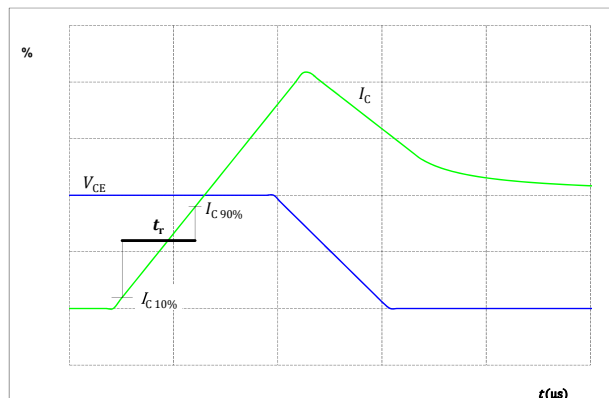
**figure 25.** MOSFET

Turn-off Switching Waveforms & definition of  $t_f$



**figure 26.** MOSFET

Turn-on Switching Waveforms & definition of  $t_r$

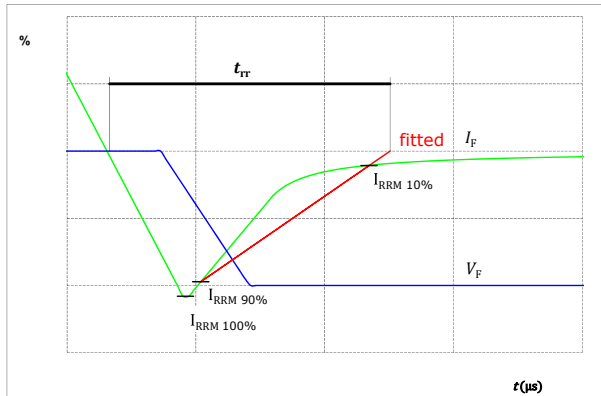




## Half-Bridge Switching Definitions

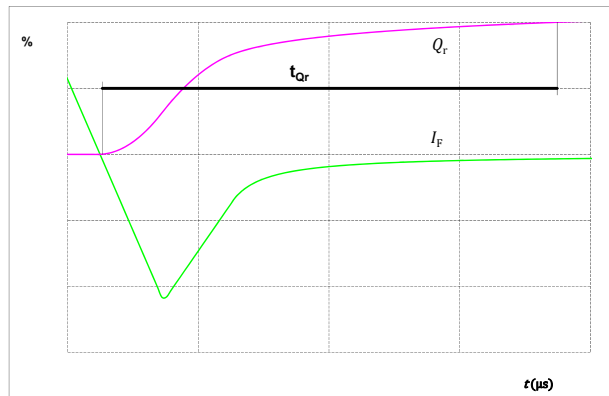
**figure 27.** FWD

Turn-off Switching Waveforms & definition of  $t_{tr}$



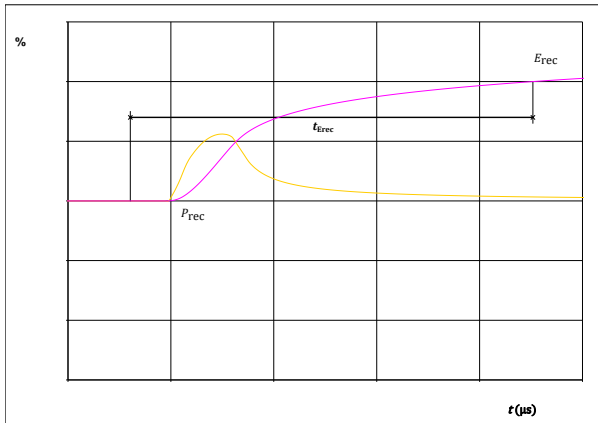
**figure 28.** FWD

Turn-on Switching Waveforms & definition of  $t_{Qr}$  ( $t_{Qr}$  = integrating time for  $Q_r$ )



**figure 29.** FWD

Turn-on Switching Waveforms & definition of  $t_{Erec}$  ( $t_{Erec}$  = integrating time for  $E_{rec}$ )





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**B0-EP122PA002ME-PG88F18T**  
datasheet

Ordering Code	
<b>Version</b>	<b>Ordering Code</b>
Without thermal paste	B0-EP122PA002ME-PG88F18T
With thermal paste (5,2 W/mK, PTM6000HV)	B0-EP122PA002ME-PG88F18T-/7/

Marking							
	<b>Text</b>	<b>Name</b> NN-NNNNNNNNNNNNNN- TTTTTVV		<b>Date code</b> WWYY	<b>UL &amp; VIN</b> UL VIN	<b>Lot</b> LLLLL	<b>Serial</b> SSSS
	<b>Datamatrix</b>	<b>Type&amp;Ver</b> TTTTTVV	<b>Lot number</b> LLLLL	<b>Serial</b> SSSS	<b>Date code</b> WWYY		

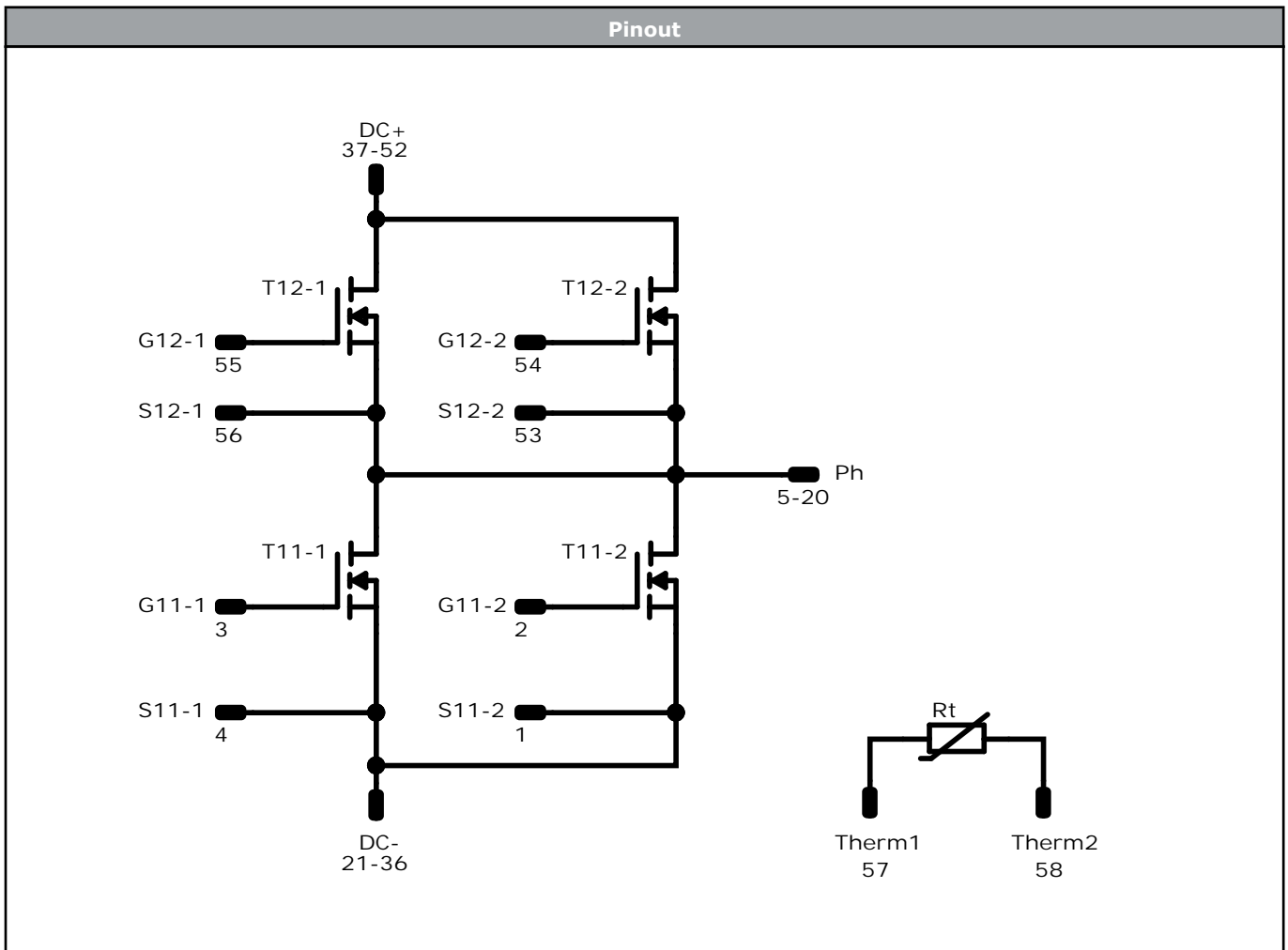
Outline							
Pin table [mm]							
Pin	X	Y	Function	31	32	19,2	DC-
1	0	6,4	S11-2	32	28,8	19,2	DC-
2	0	9,6	G11-2	33	32	0	DC-
3	0	38,4	G11-1	34	28,8	0	DC-
4	0	41,6	S11-1	35	32	3,2	DC-
5	16	3,2	Ph	36	28,8	3,2	DC-
6	12,8	3,2	Ph	37	46,56	3,2	DC+
7	16	6,4	Ph	38	46,56	6,4	DC+
8	12,8	6,4	Ph	39	46,56	9,6	DC+
9	16	19,2	Ph	40	46,56	12,8	DC+
10	12,8	19,2	Ph	41	46,56	16	DC+
11	3,2	19,2	Ph	42	43,36	16	DC+
12	0	22,4	Ph	43	46,56	19,2	DC+
13	0	25,6	Ph	44	43,36	19,2	DC+
14	3,2	28,8	Ph	45	46,56	28,8	DC+
15	12,8	28,8	Ph	46	43,36	28,8	DC+
16	16	28,8	Ph	47	46,56	32	DC+
17	16	41,6	Ph	48	43,36	32	DC+
18	12,8	41,6	Ph	49	46,56	35,2	DC+
19	16	44,8	Ph	50	46,56	38,4	DC+
20	12,8	44,8	Ph	51	46,56	41,6	DC+
21	32	44,8	DC-	52	46,56	44,8	DC+
22	28,8	44,8	DC-	53	72,16	6,4	S12-2
23	32	48	DC-	54	72,16	9,6	G12-2
24	28,8	48	DC-	55	72,16	38,4	G12-1
25	32	28,8	DC-	56	72,16	41,6	S12-1
26	28,8	28,8	DC-	57	72,16	25,6	Therm1
27	32	32	DC-	58	72,16	22,4	Therm2
28	28,8	32	DC-	59	not assembled		
29	32	16	DC-	60	not assembled		
30	28,8	16	DC-				

center of press-fit pin head  
pin head type "T", PCB plated through-hole  $\phi_{\text{thru}} = 0,09 - 0,06$   
for further PCB design rules refer to the latest handling instruction

Tolerance of proposition:  $\pm 0,1\text{mm}$  at the end of the pins  
Dimension of coordinate axis is only offset without tolerance



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Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T13, T12, T14	MOSFET	1200 V	2 mΩ	Half-Bridge Switch	
Rt	Thermistor			Thermistor	






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Packaging instruction				
Standard packaging quantity (SPQ) 40	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for <i>flow</i> E3 packages see vincotech.com website.

Package data
Package data for <i>flow</i> E3 packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at 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
B0-EP122PA002ME-PG88F18T-D1-14	5 May. 2023		
B0-EP122PA002ME-PG88F18T-D2-14	13 Jul. 2023	Correction of Half-Bridge Switch Maximum Ratings	

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