Vincotech

B0-EP122PA002ME-PG88F18T
datasheet

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_2O_3
- CTI600 housing material
- Compact, baseplate-less housing
- VINcoPress Technology
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

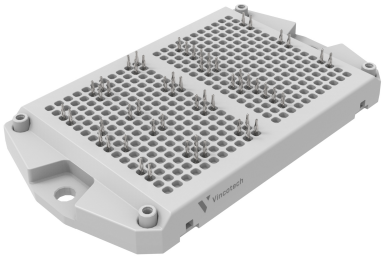
Target applications

- Charging Stations
- Power Supply
- UPS

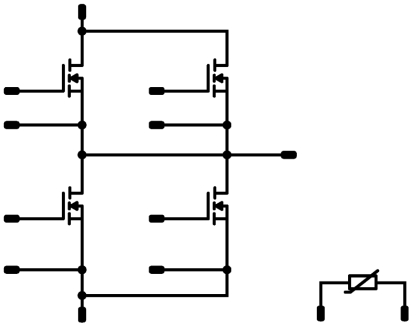
Types

- B0-EP122PA002ME-PG88F18T

flow E3 12 mm housing



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Half-Bridge Switch				
Drain-source voltage	V_{DSS}		1200	V
Drain current (DC current)	I_D	T_j = T_{jmax} T_s = 80 °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 °C	743	W
Gate-source voltage	V_{GSS}		-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 s	6000	V
Isolation voltage	V_{isol}	AC Voltage t_p = 1 min	2500	V
Creepage distance			>12,7	mm
Clearance			10,01	mm
Comparative Tracking Index	CTI		≥ 600	

*100 % tested in production

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[1]	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[2]	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,13		K/W

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

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	
Thermistor										
Static										
Rated resistance	R					25		5		kΩ
Deviation of R100	$\Delta_{R/R}$	R_{100} = 493 Ω				100	-5		5	%
Power dissipation	P							245		mW
Power dissipation constant	d					25		1,4		mW/K
B-value	$B_{(25/50)}$	Tol. ±2 %						3375		K
B-value	$B_{(25/100)}$	Tol. ±2 %						3437		K
Vincotech Thermistor Reference									K	

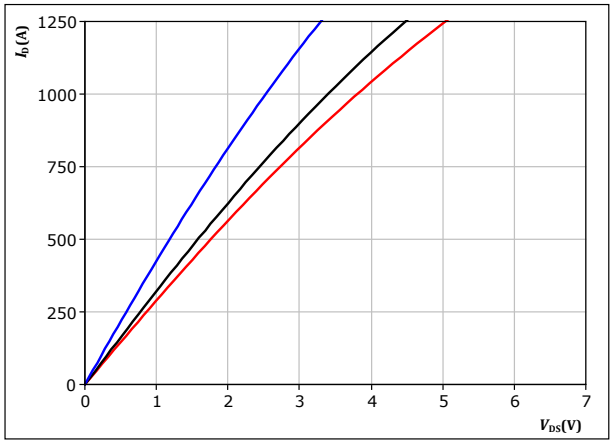
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Half-Bridge Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



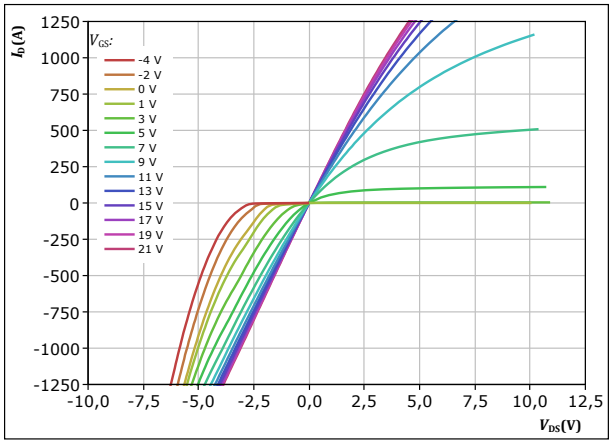
t_p = 250 µs
V_{GS} = 15 V

T_j: 25 °C, 125 °C, 150 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

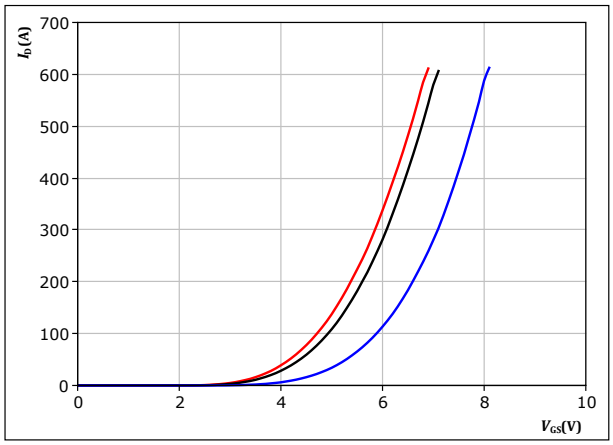


t_p = 250 µs
T_j = 150 °C
V_{GS} from -4 V to 21 V in steps of 2 V

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$



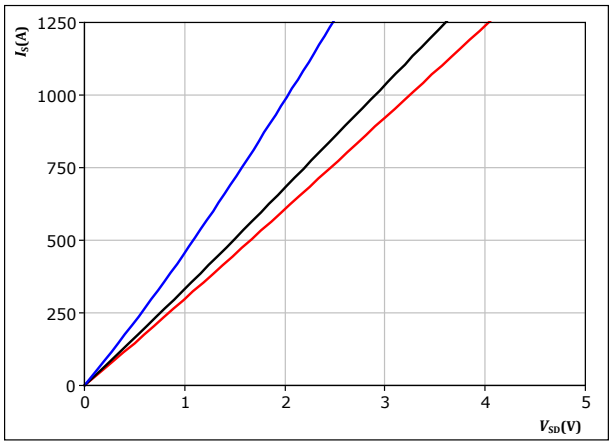
t_p = 250 µs
V_{DS} = 20 V

T_j: 25 °C, 125 °C, 150 °C

figure 4. **MOSFET**

Typical reverse drain current characteristics

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



t_p = 250 µs
V_{GS} = 15 V

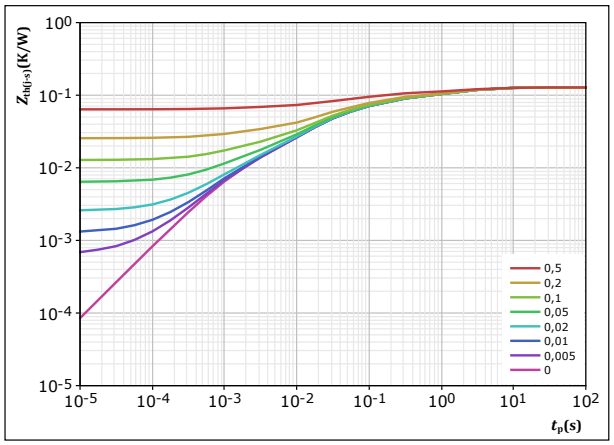
T_j: 25 °C, 125 °C, 150 °C

Half-Bridge Switch Characteristics

figure 5. **MOSFET**

Transient thermal impedance as a function of pulse width

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



$D =$ t_p / T

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

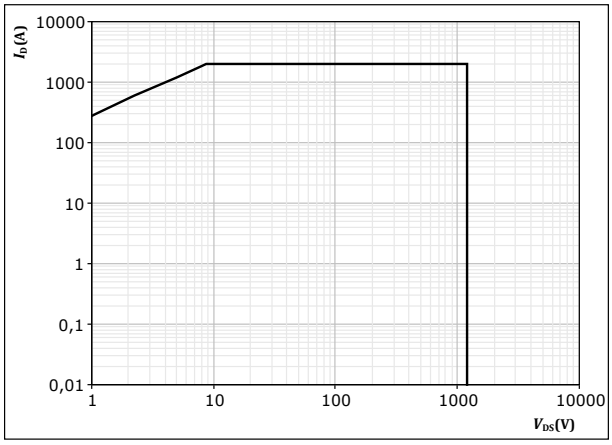
MOSFET thermal model values

R (K/W)	τ (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 °C

$V_{GS} =$ 15 V

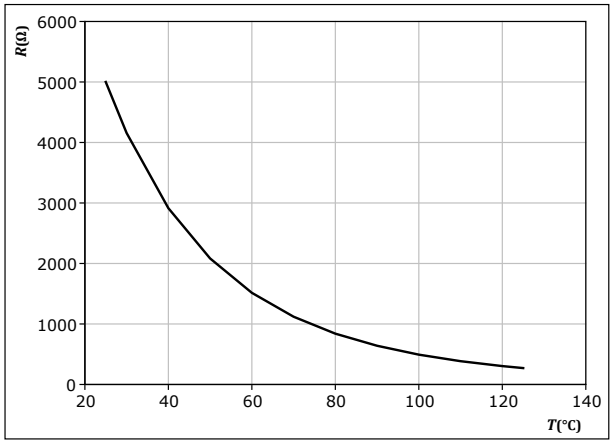
$T_j =$ T_{jmax}

Thermistor Characteristics

figure 7. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

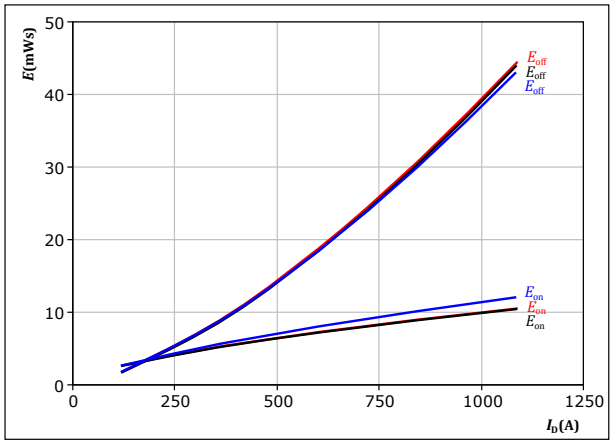


Half-Bridge Switching Characteristics

figure 8. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



With an inductive load at

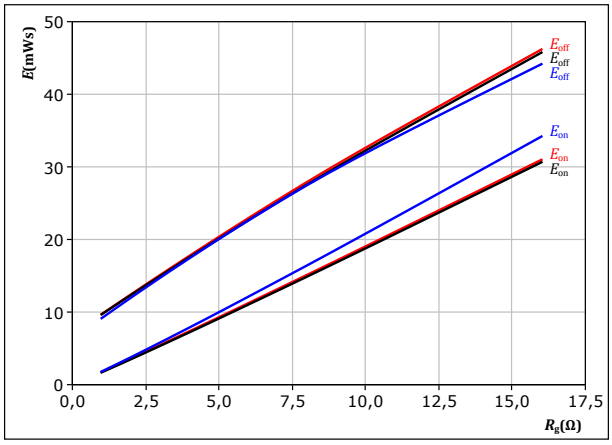
V_{DS} =	600	V
V_{GS} =	-3/18	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

T_j: 25 °C, 125 °C, 150 °C

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

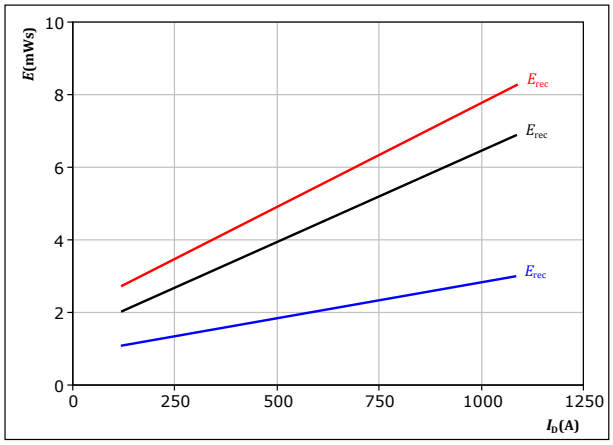
V_{DS} =	600	V
V_{GS} =	-3/18	V
I_D =	600	A

T_j: 25 °C, 125 °C, 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

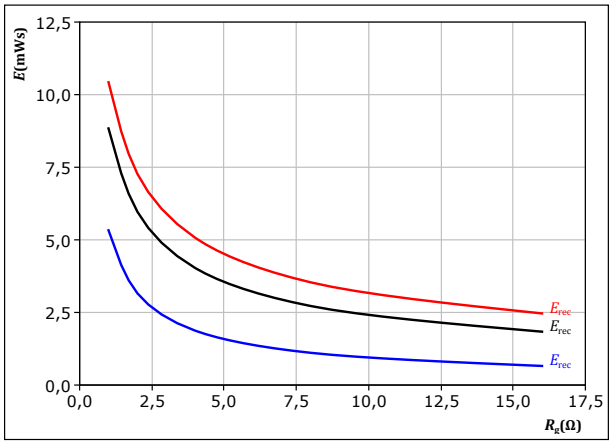
V_{DS} =	600	V
V_{GS} =	-3/18	V
R_{gon} =	4	Ω

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

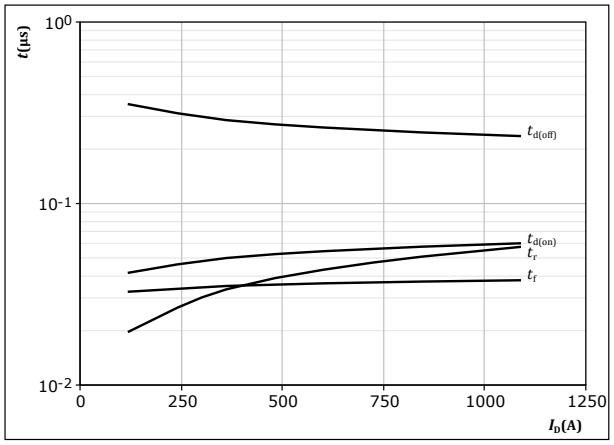
T_j: 25 °C, 125 °C, 150 °C

Half-Bridge Switching Characteristics

figure 12. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



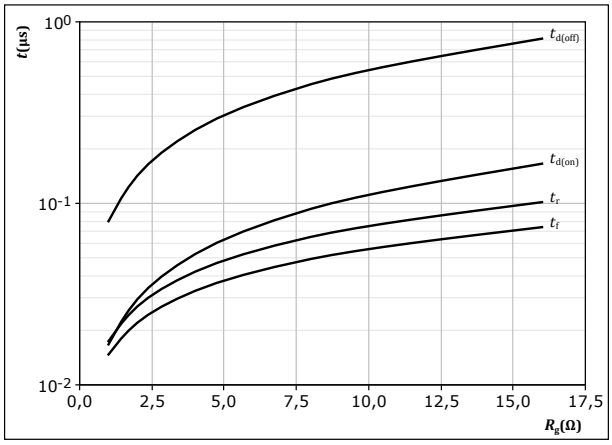
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	-3/18	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 13. **MOSFET**

Typical switching times as a function of MOSFET turn on gate resistor

$t = f(R_g)$



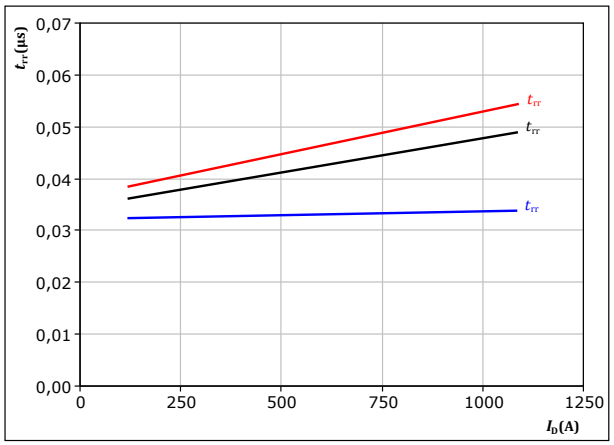
With an inductive load at

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

figure 14. **MOSFET**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$

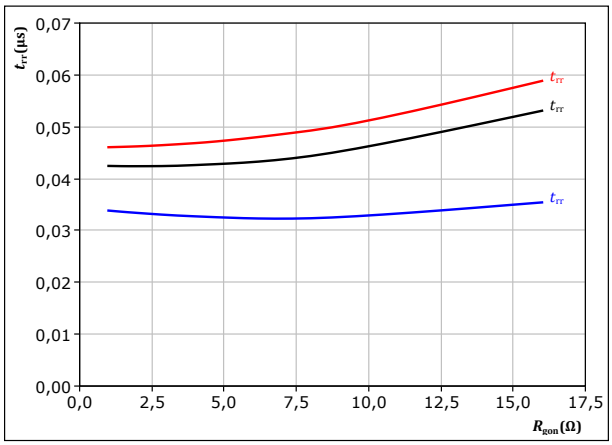


At	V_{DS} =	600	V	
	V_{GS} =	-3/18	V	T_j: 25 °C
	R_{gon} =	4	Ω	125 °C
				150 °C

figure 15. **MOSFET**

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

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



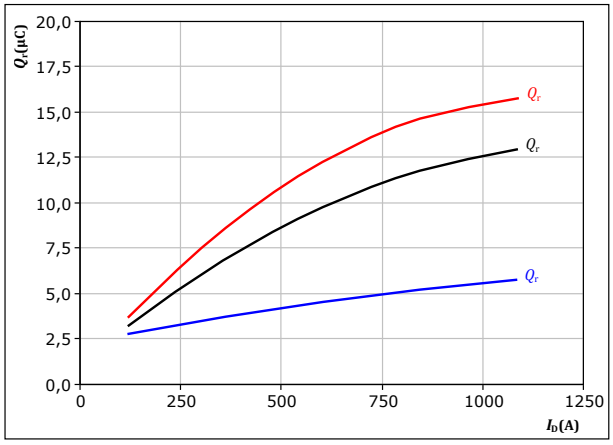
At	V_{DS} =	600	V	
	V_{GS} =	-3/18	V	T_j: 25 °C
	I_D =	600	A	125 °C
				150 °C

Half-Bridge Switching Characteristics

figure 16. **MOSFET**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

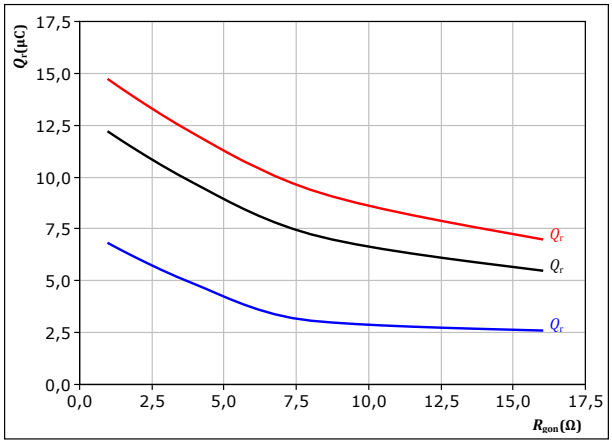


At					
V_{DS} =	600	V		25 °C
V_{GS} =	-3/18	V	T_j:	125 °C
R_{gon} =	4	Ω		150 °C

figure 17. **MOSFET**

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

$Q_r = f(R_{gon})$

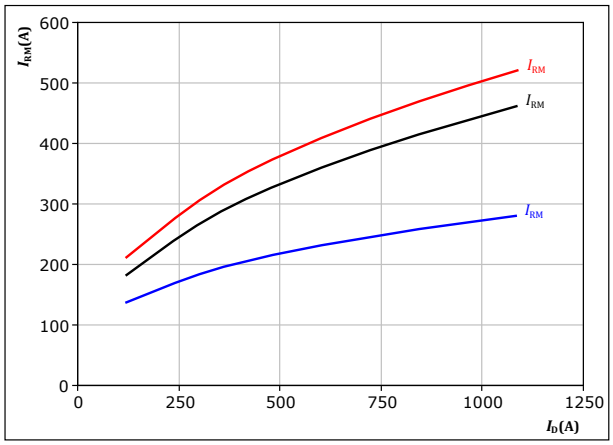


At					
V_{DS} =	600	V		25 °C
V_{GS} =	-3/18	V	T_j:	125 °C
I_D =	600	A		150 °C

figure 18. **MOSFET**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

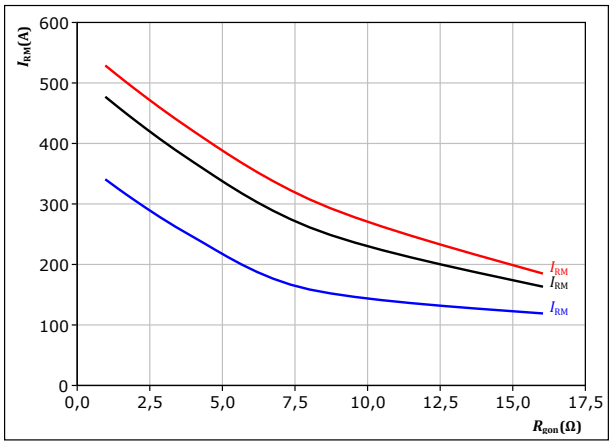


At					
V_{DS} =	600	V		25 °C
V_{GS} =	-3/18	V	T_j:	125 °C
R_{gon} =	4	Ω		150 °C

figure 19. **MOSFET**

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

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



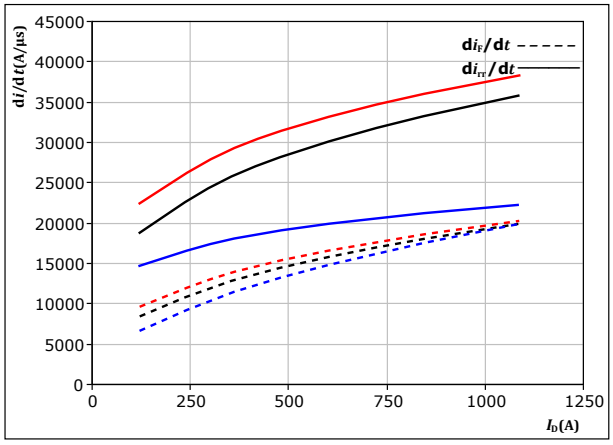
At					
V_{DS} =	600	V		25 °C
V_{GS} =	-3/18	V	T_j:	125 °C
I_D =	600	A		150 °C

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)

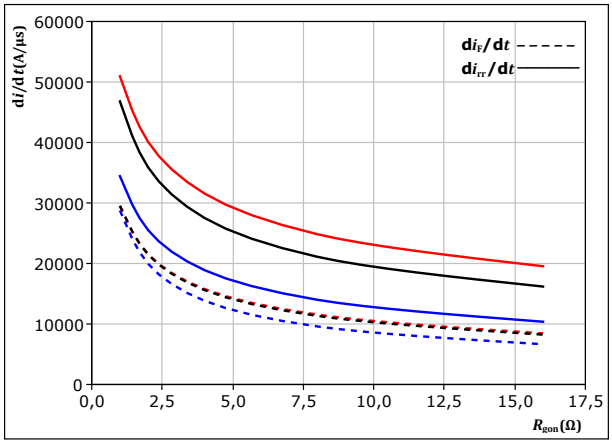


At					
	V_{DS} =	600	V		
	V_{GS} =	-3/18	V	T_j:	25 °C
	R_{gon} =	4	Ω		125 °C
					150 °C

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_{gon})

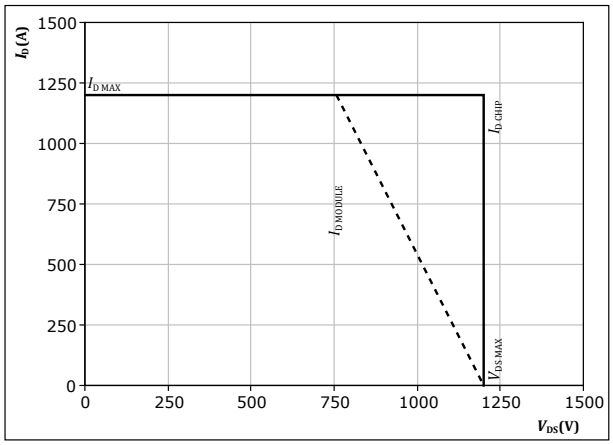


At					
	V_{DS} =	600	V		
	V_{GS} =	-3/18	V	T_j:	25 °C
	I_D =	600	A		125 °C
					150 °C

figure 22. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



At			
	T_j =	150	°C
	R_{gon} =	4	Ω
	R_{goff} =	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})

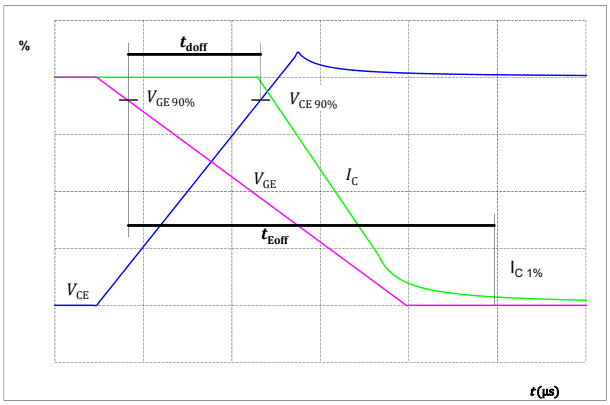


figure 24. **MOSFET**

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

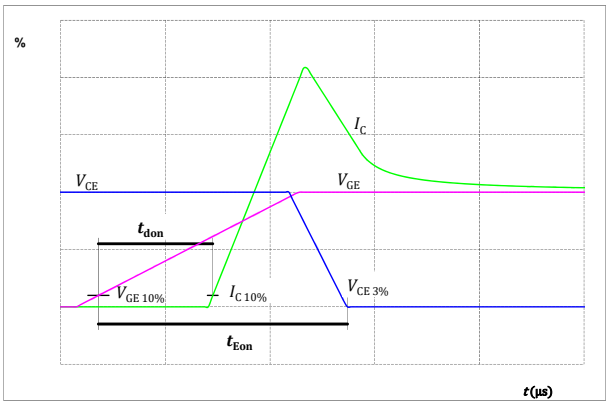


figure 25. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

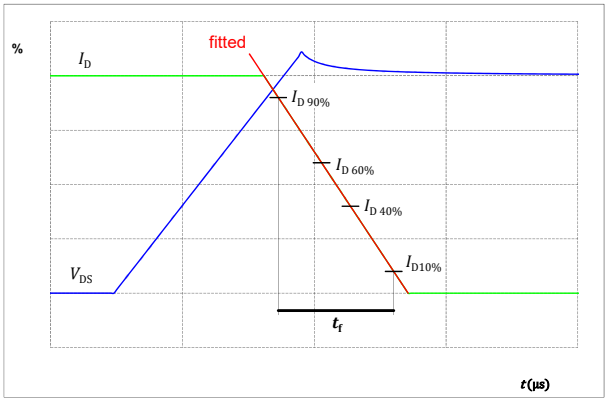
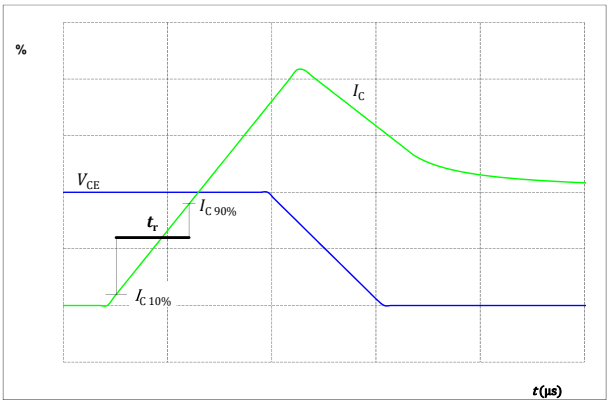


figure 26. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



Half-Bridge Switching Definitions

figure 27. **FWD**

Turn-off Switching Waveforms & definition of t_{trr}

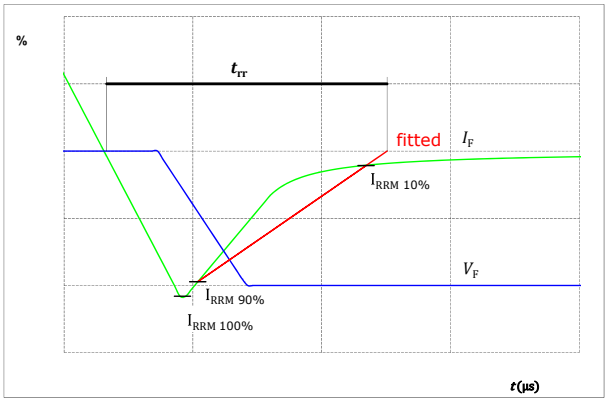


figure 28. **FWD**

Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})

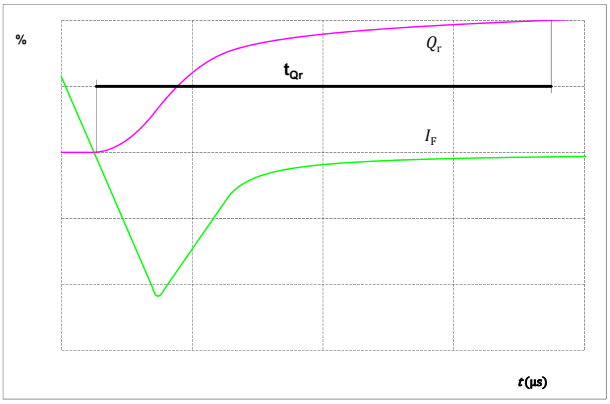
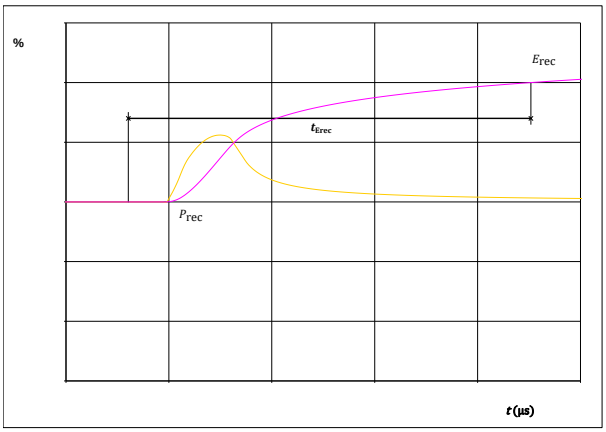


figure 29. **FWD**

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



Vincotech

B0-EP122PA002ME-PG88F18T
datasheet

Ordering Code

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

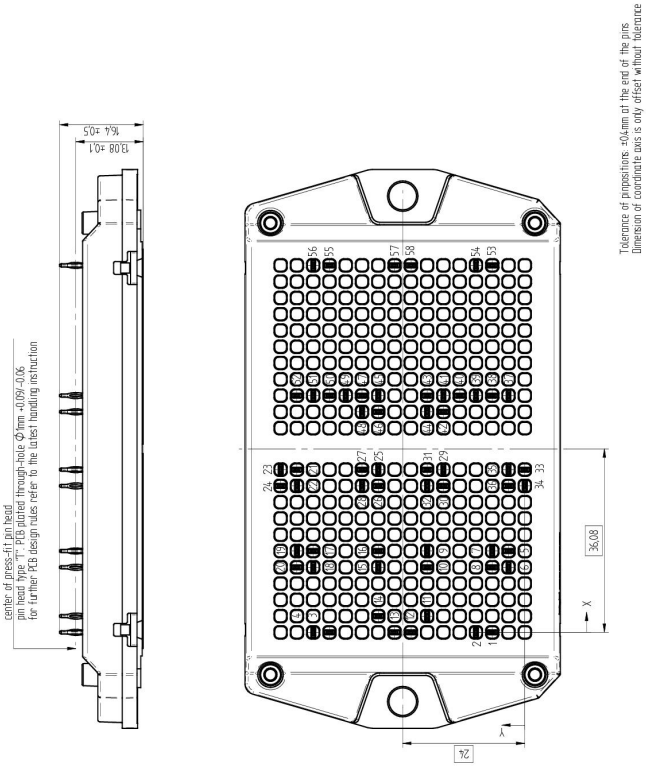
Marking

	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
	Type&Ver	**Lot number**	**Serial**	**Date code**		
Datamatrix	TTTTTTVV	LLLLL	SSSS	WWYY		

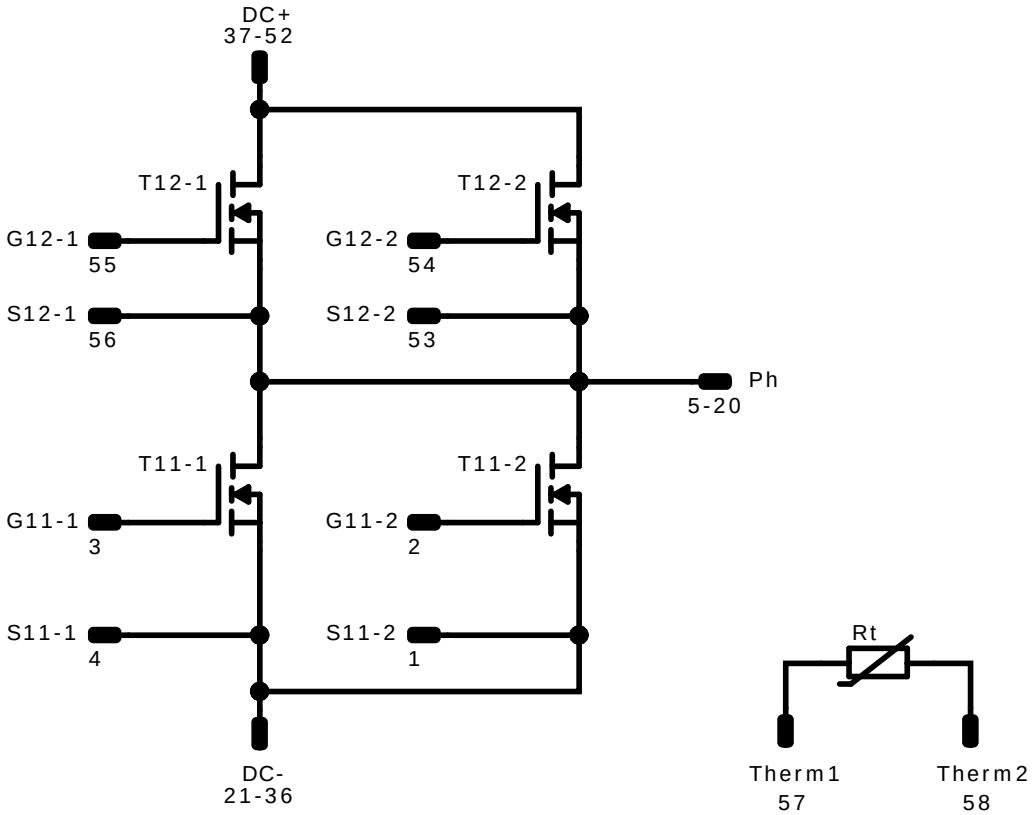
Outline

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-				



Pinout



Identification

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

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

Handling instruction
Handling instructions for *flow* E3 packages see vincotech.com website.

Package data
Package data for *flow* 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	