Vincotech

10-EY122PA008ME01-LU38F06T
datasheet

flowDual E2 SiC **1200 V / 8 mΩ**

Topology features
- Temperature sensor
- Half Bridge

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

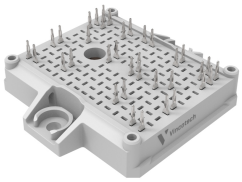
Housing features
- Base isolation: AlN
- Convex shaped substrate for superior thermal contact
- Compact housing
- CTI600 housing material
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

Extra features
- AlN Substrate
- Equivalent: FF6MR12W2M1H_B70

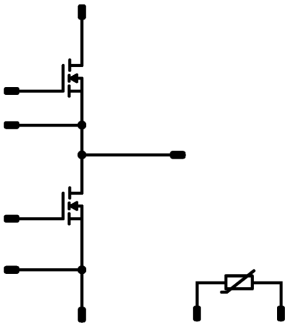
Target applications
- Charging Stations
- Energy Storage Systems
- Power Supply
- Solar Inverters
- Welding & Cutting

Types
- 10-EY122PA008ME01-LU38F06T

flow E2 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	174	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	480	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	407	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
Creepage distance			>12,7	mm
Clearance			9,05	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		160	25 125 150	5,6	8,65 11,31 12,56	10,4[1]	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$			0,046	25	1,8	2,5	3,6	V
Gate to Source Leakage Current	I_{GSS}		15	0		25		40	1000	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25		4	76	µA
Internal gate resistance	r_g							0,425		Ω
Gate charge	Q_g		-4/15	800	160	25		472		nC
Short-circuit input capacitance	C_{iss}	f = 100 kHz	0	1000	0	25		13428		pF
Short-circuit output capacitance	C_{oss}							516		
Reverse transfer capacitance	C_{rss}							32		
Diode forward voltage	V_{SD}		0		80	25		4,6		V
Thermal										
Thermal resistance junction to sink[2]	$R_{th(j-s)}$	λ_{pastc} = 3,4 W/mK (PSX)						0,23		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	-4/15	600	160	25 125 150		47,44 41,82 41		ns
Rise time	t_r					25 125 150		27,73 23,55 22,54		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		97,94 108,16 111,04		ns
Fall time	t_f					25 125 150		11,84 12,1 12,3		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,73 µC Q_{rFWD}=2,01 µC Q_{rFWD}=2,56 µC				25 125 150		3,84 3,75 3,86		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		1,39 1,34 1,34		mWs
Peak recovery current	I_{RRM}	di/dt=7877 A/µs di/dt=7976 A/µs di/dt=9066 A/µs				25 125 150		65,62 100,98 115,2		A
Reverse recovery time	t_{rr}					25 125 150		19,97 33,87 38,28		ns
Recovered charge	Q_r					25 125 150		0,73 2,01 2,56		µC
Reverse recovered energy	E_{rec}					25 125 150		0,076 0,381 0,533		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		10743,09 7016,04 7213,8		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	

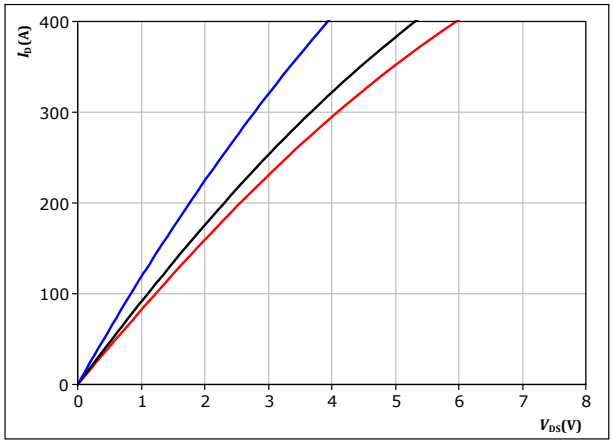
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Half-Bridge Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

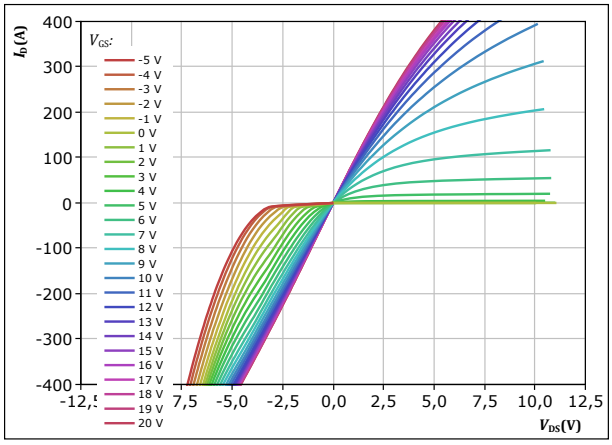


t_p =	250	µs	T_j:	25 °C
V_{GS} =	15	V		125 °C
				150 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



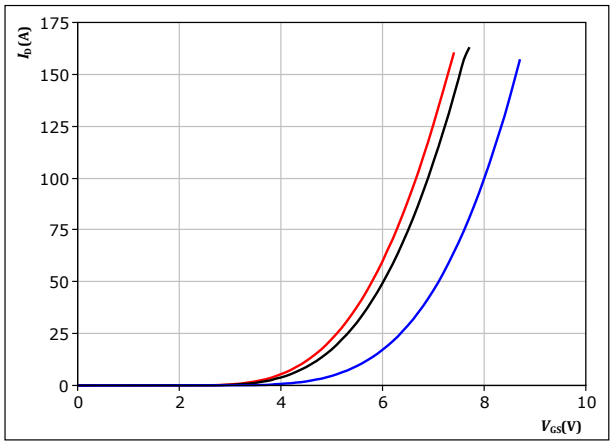
t_p =	250	µs
T_j =	150	°C

V_{GS} from -5 V to 20 V in steps of 1 V

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

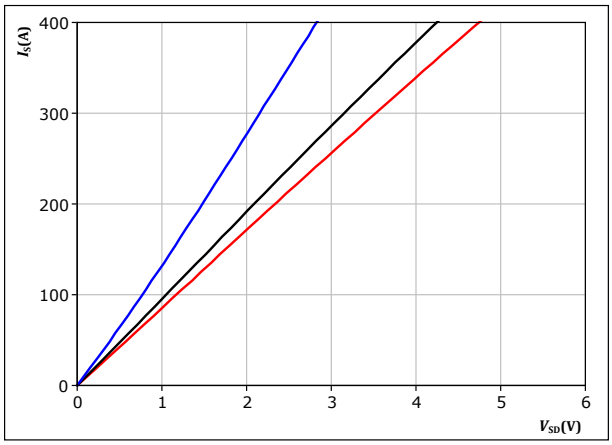


t_p =	250	µs	T_j:	25 °C
V_{DS} =	10	V		125 °C
				150 °C

figure 4. **MOSFET**

Typical reverse drain current characteristics

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



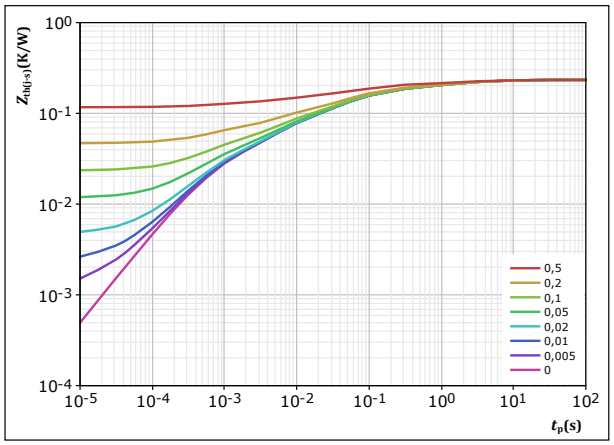
t_p =	250	µs	T_j:	25 °C
V_{GS} =	15	V		125 °C
				150 °C

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

$R_{th(j-s)}$ = 0,234 K/W

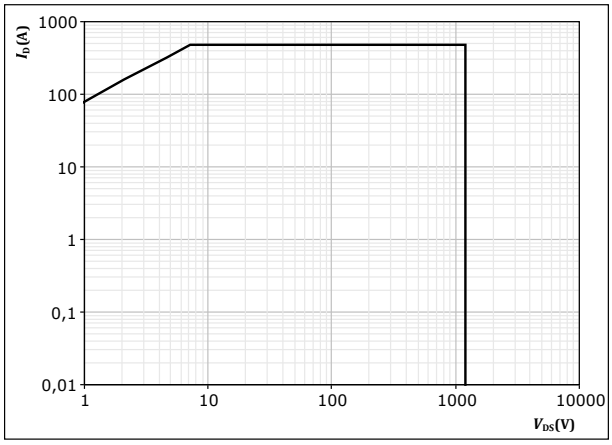
MOSFET thermal model values

R (K/W)	τ (s)
2,13E-02	4,84E+00
3,90E-02	7,93E-01
9,74E-02	6,58E-02
5,19E-02	6,77E-03
2,39E-02	5,91E-04

figure 6. **MOSFET**

Safe operating area

$I_D = f(V_{DS})$



D = single pulse

T_s = 80 °C

V_{GS} = 15 V

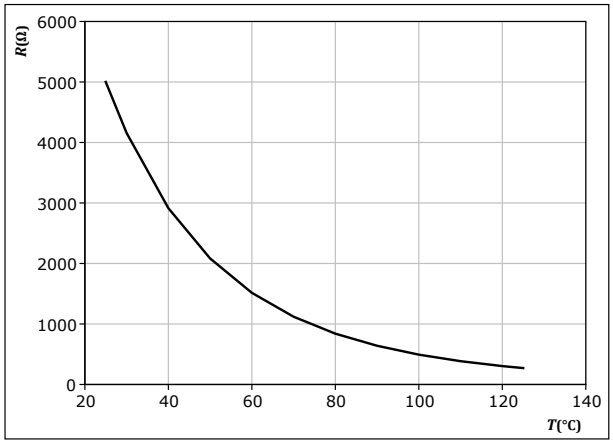
T_j = T_{jmax}

Thermistor Characteristics

figure 7. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

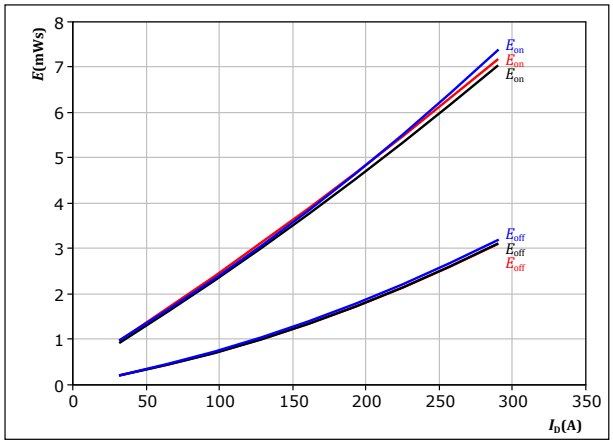


Half-Bridge Switching Characteristics

figure 8. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



With an inductive load at

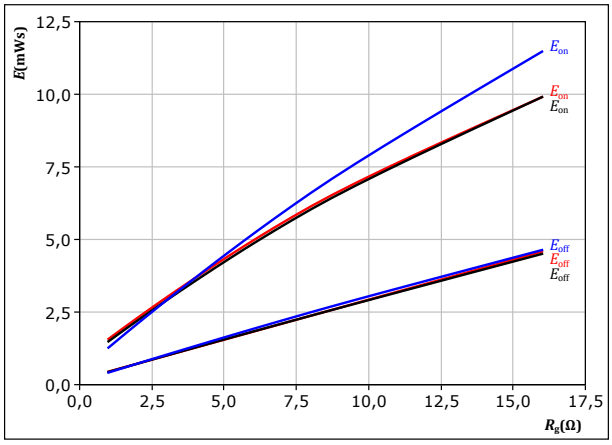
V_{DS} =	600	V	
V_{GS} =	-4/15	V	
R_{gon} =	4	Ω	
R_{goff} =	4	Ω	

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

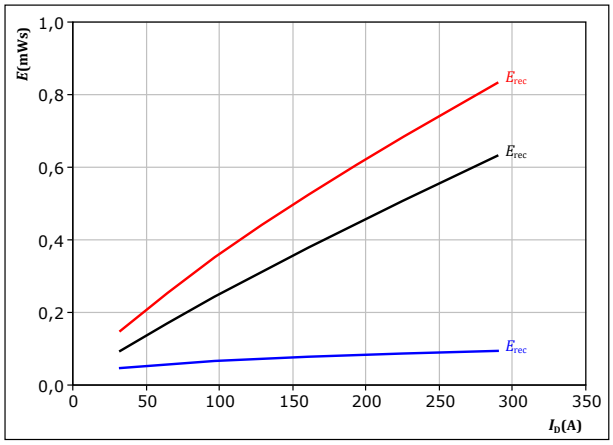
V_{DS} =	600	V	
V_{GS} =	-4/15	V	
I_D =	160	A	

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

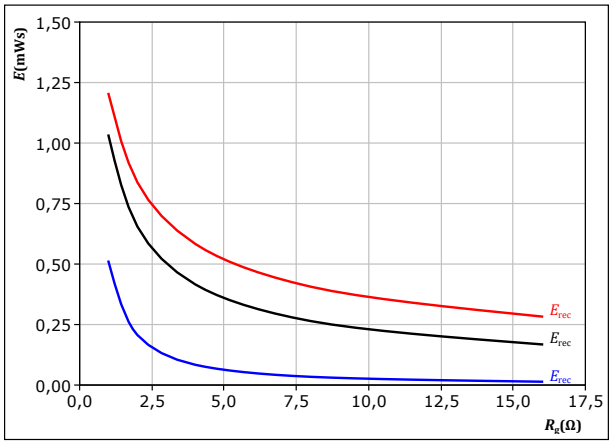
V_{DS} =	600	V	
V_{GS} =	-4/15	V	
R_{gon} =	4	Ω	

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} =	-4/15	V	
I_D =	160	A	

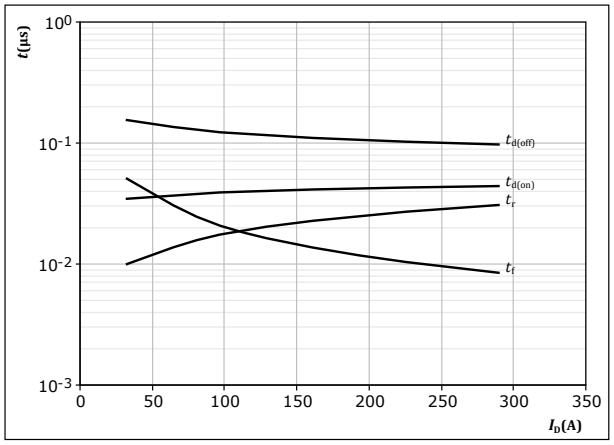
T_j: 25 °C, 125 °C, 150 °C

Half-Bridge Switching Characteristics

figure 12. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



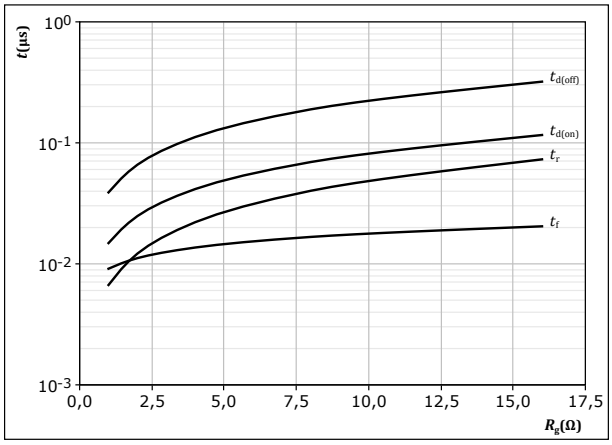
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	-4/15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 13. **MOSFET**

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

$t = f(R_g)$



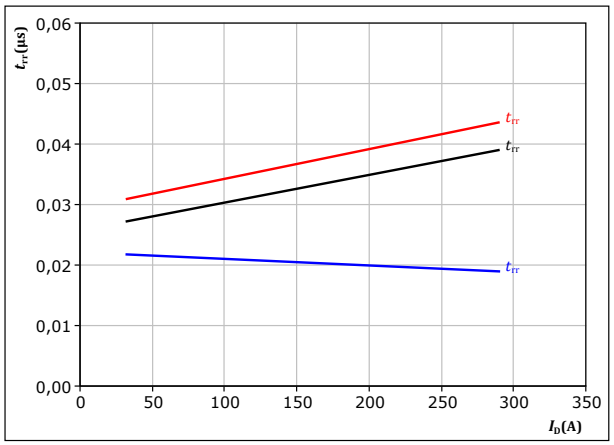
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	-4/15	V
I_D =	160	A

figure 14. **MOSFET**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



At

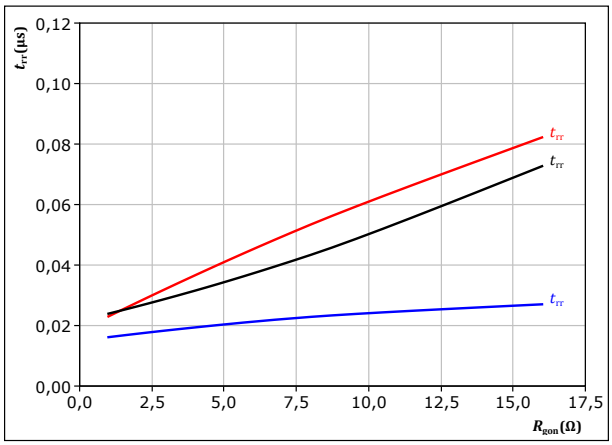
V_{DS} =	600	V
V_{GS} =	-4/15	V
R_{gon} =	4	Ω

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	V
V_{GS} =	-4/15	V
I_D =	160	A

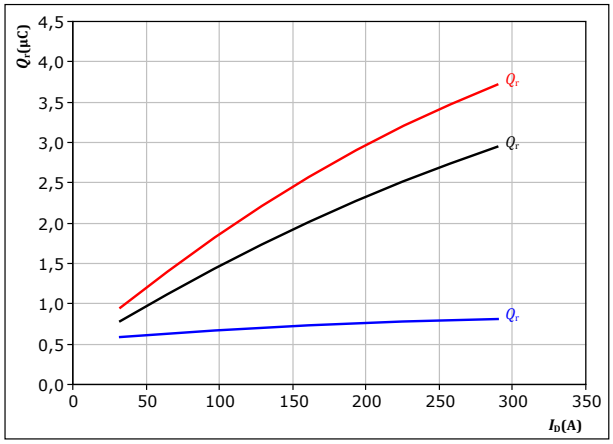
T_j: 25 °C, 125 °C, 150 °C

Half-Bridge Switching Characteristics

figure 16. **MOSFET**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

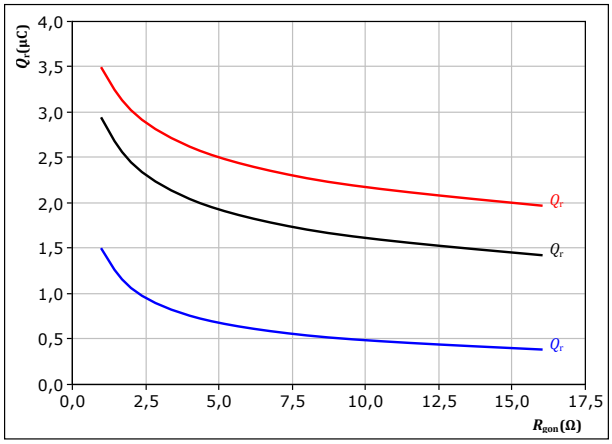


At					
	V_{DS} =	600	V		
	V_{GS} =	-4/15	V	T_j:	25 °C
	R_{gon} =	4	Ω		125 °C
					150 °C

figure 17. **MOSFET**

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

$Q_r = f(R_{gon})$

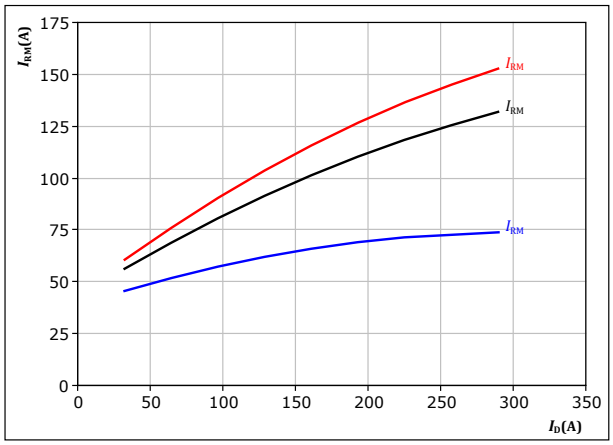


At					
	V_{DS} =	600	V		
	V_{GS} =	-4/15	V	T_j:	25 °C
	I_D =	160	A		125 °C
					150 °C

figure 18. **MOSFET**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

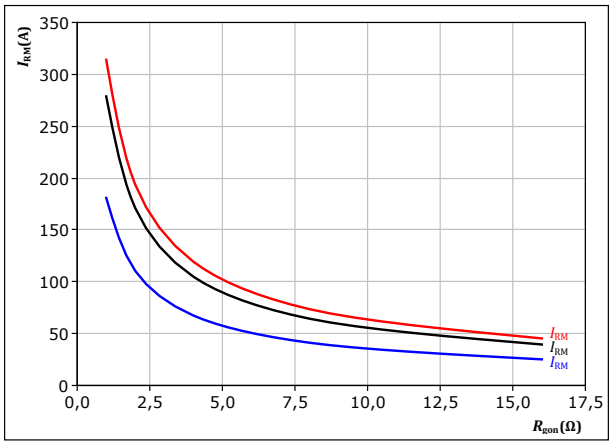


At					
	V_{DS} =	600	V		
	V_{GS} =	-4/15	V	T_j:	25 °C
	R_{gon} =	4	Ω		125 °C
					150 °C

figure 19. **MOSFET**

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

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



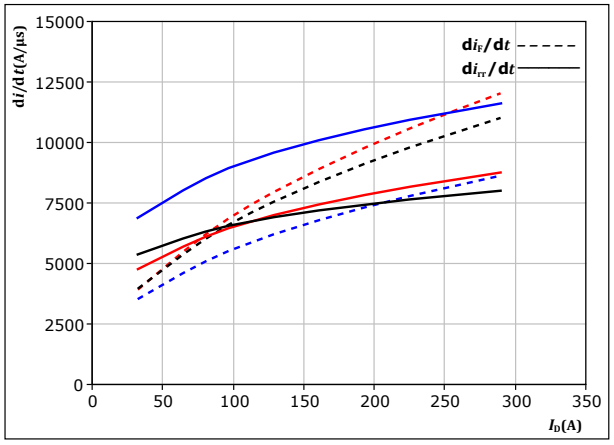
At					
	V_{DS} =	600	V		
	V_{GS} =	-4/15	V	T_j:	25 °C
	I_D =	160	A		125 °C
					150 °C

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)

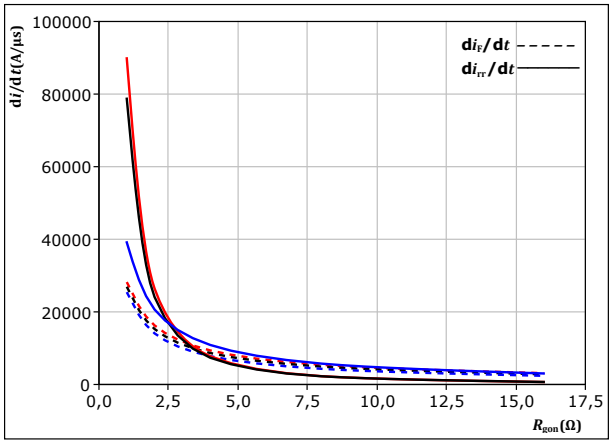


At	V_{DS} =	600	V		
	V_{GS} =	-4/15	V	T_j:	25 °C, 125 °C, 150 °C
	R_{gon} =	4	Ω		

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})

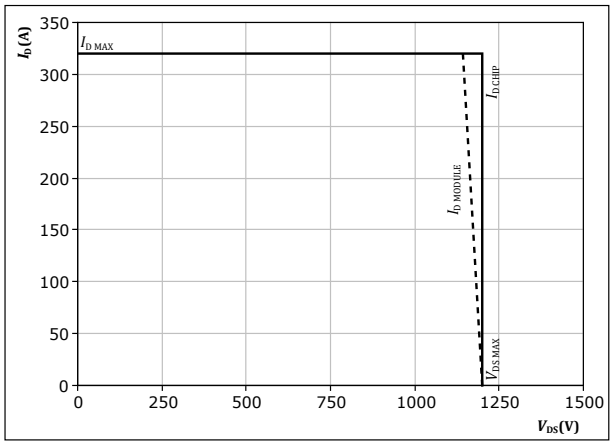


At	V_{DS} =	600	V		
	V_{GS} =	-4/15	V	T_j:	25 °C, 125 °C, 150 °C
	I_D =	160	A		

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})

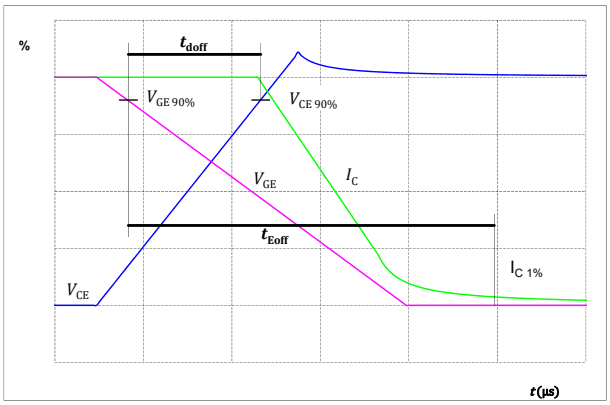


figure 24. **MOSFET**

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

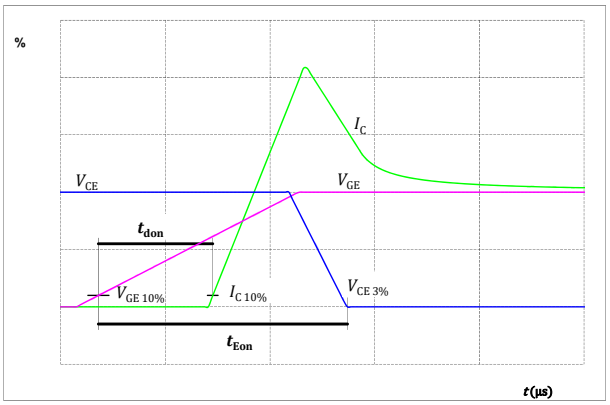


figure 25. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

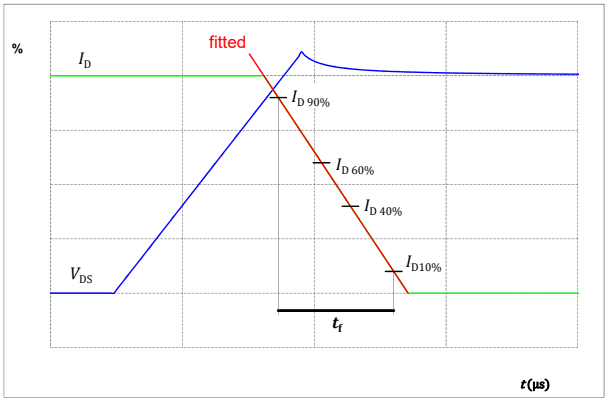
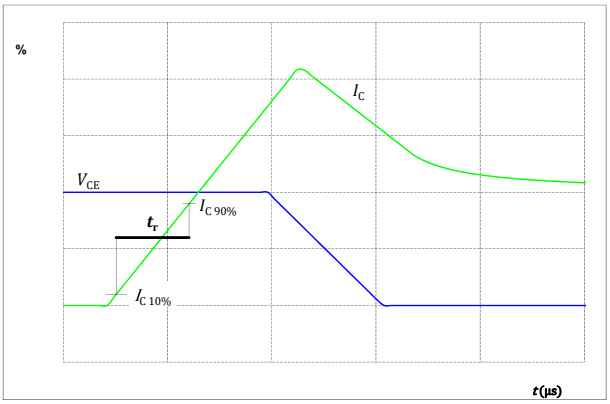


figure 26. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



Half-Bridge Switching Definitions

figure 27. **FWD**

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

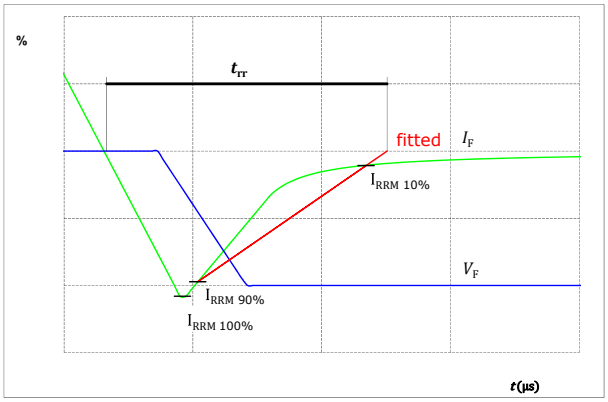


figure 28. **FWD**

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

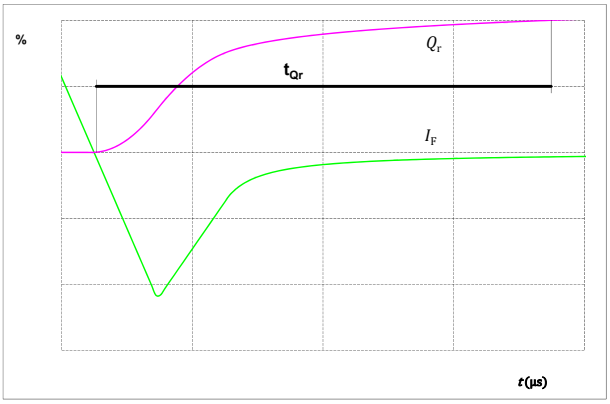
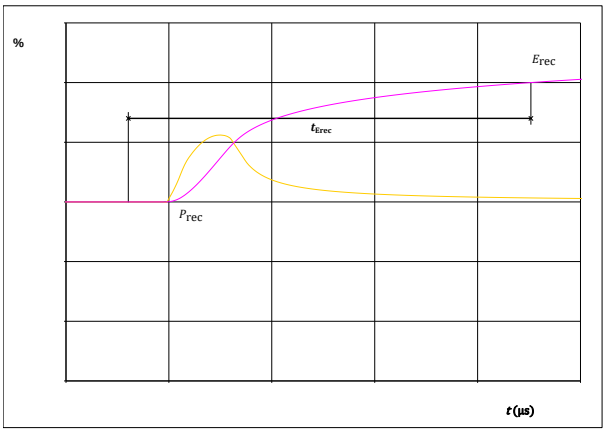


figure 29. **FWD**

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



Ordering Code

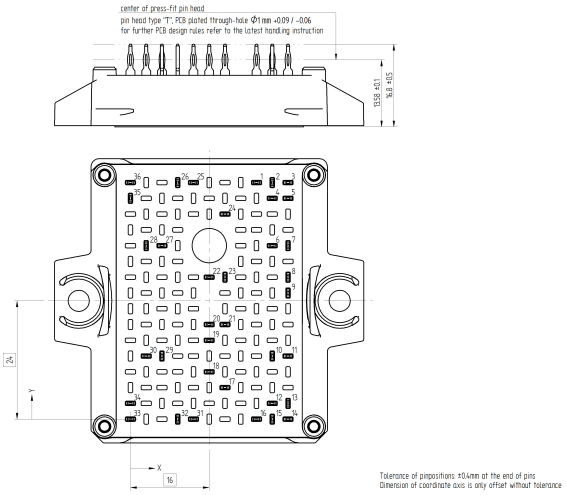
Version	Ordering Code
Without thermal paste	10-EY122PA008ME01-LU38F06T
With thermal paste (3,4 W/mK, PSX-P7)	10-EY122PA008ME01-LU38F06T-/3/

Marking

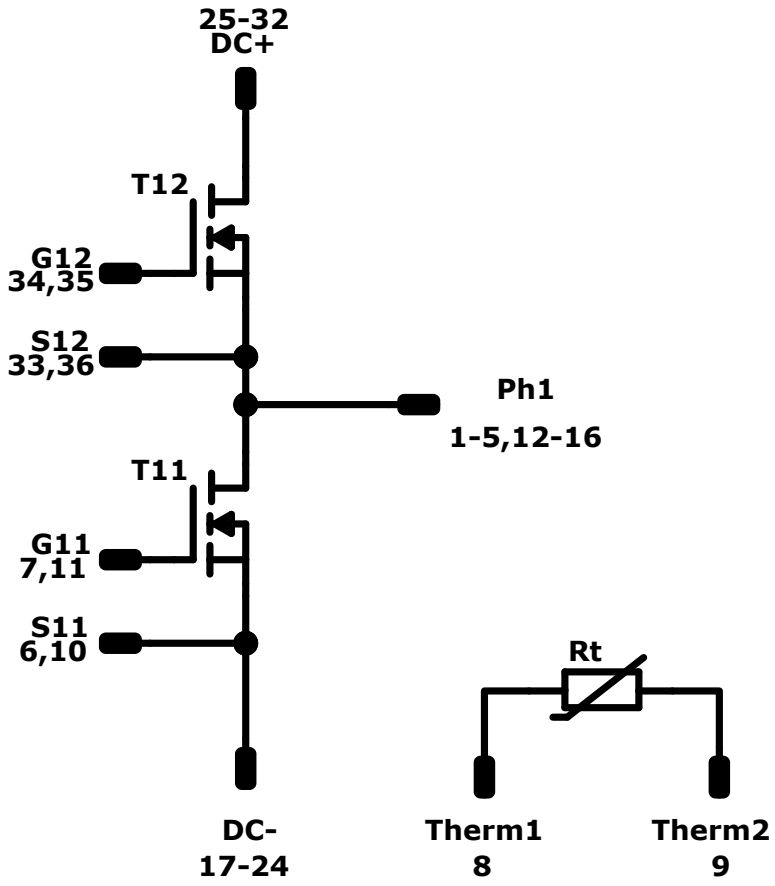
	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	25,6	48	Ph1
2	28,8	48	Ph1
3	32	48	Ph1
4	28,8	44,8	Ph1
5	32	44,8	Ph1
6	28,8	35,2	S11
7	32	35,2	G11
8	32	28,8	Therm1
9	32	25,6	Therm2
10	28,8	12,8	S11
11	32	12,8	G11
12	28,8	3,2	Ph1
13	32	3,2	Ph1
14	32	0	Ph1
15	28,8	0	Ph1
16	25,6	0	Ph1
17	19,2	6,4	DC-
18	16	9,6	DC-
19	16	16	DC-
20	16	19,2	DC-
21	19,2	19,2	DC-
22	16	28,8	DC-
23	19,2	28,8	DC-
24	19,2	41,6	DC-
25	12,8	48	DC+
26	9,6	48	DC+
27	6,4	35,2	DC+
28	3,2	35,2	DC+
29	6,4	12,8	DC+
30	3,2	12,8	DC+
31	12,8	0	DC+
32	9,6	0	DC+
33	0	0	S12
34	0	3,2	G12
35	0	44,8	G12
36	0	48	S12



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12	MOSFET	1200 V	8 mΩ	Half-Bridge Switch	
Rt	Thermistor			Thermistor	

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

Handling instruction
Handling instructions for *flow* E2 packages see vincotech.com website.

Package data
Package data for *flow* E2 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 UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}$=175°C and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-EY122PA008ME01-LU38F06T-D1-14	13 Sep. 2023		
10-EY122PA008ME01-LU38F06T-D2-14	29 May. 2024	Update static characteristic of Inverter Switch	