



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

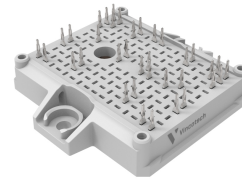
Target applications

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

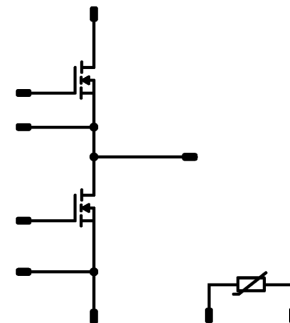
Types

- 10-EY122PA008ME01-LU38F06T

flow E2 12 mm housing



Schematic





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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
Half-Bridge Switch				
Drain-source voltage	V_{DSS}		1200	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	174	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	480	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	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* $t_p = 2\text{ s}$	6000	V
Creepage distance			>12,7	mm
Clearance			9,05	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		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⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,23		K/W
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10-EY122PA008ME01-LU38F06T
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		
Dynamic										
Turn-on delay time	$t_{d(on)}$					25 125 150		47,44 41,82 41		ns
Rise time	t_r	$R_{gon} = 4 \Omega$ $R_{goff} = 4 \Omega$				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}	$Q_{rFWD}=0,73 \mu C$ $Q_{tFWD}=2,01 \mu C$ $Q_{rFWD}=2,56 \mu C$				25 125 150		3,84 3,75 3,86		mWs
Turn-off energy (per pulse)	E_{off}		-4/15	600	160	25 125 150		1,39 1,34 1,34		mWs
Peak recovery current	I_{RRM}					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	$di/dt=7877 A/\mu s$ $di/dt=7976 A/\mu s$ $di/dt=9066 A/\mu s$				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	$(di_{rr}/dt)_{max}$					25 125 150		10743,09 7016,04 7213,8		A/ μs



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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	

⁽¹⁾ Value at chip level

⁽²⁾ Only valid with pre-applied Vincotech thermal interface material.

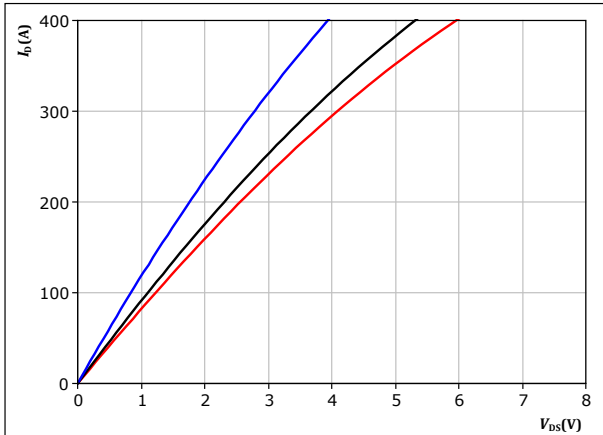


Half-Bridge Switch Characteristics

figure 1. MOSFET

Typical output characteristics

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

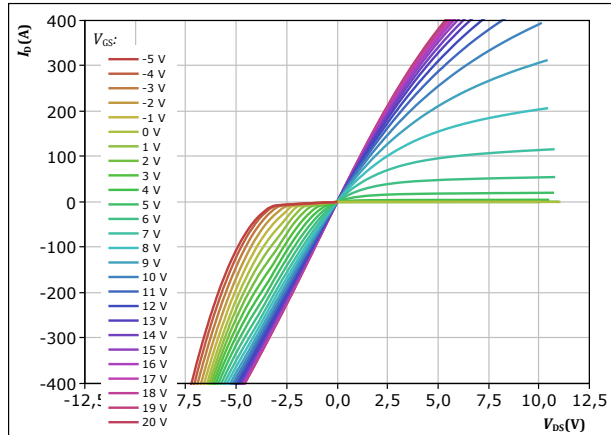


$t_p = 250 \mu s$
 $V_{GS} = 15 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 2. MOSFET

Typical output characteristics

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

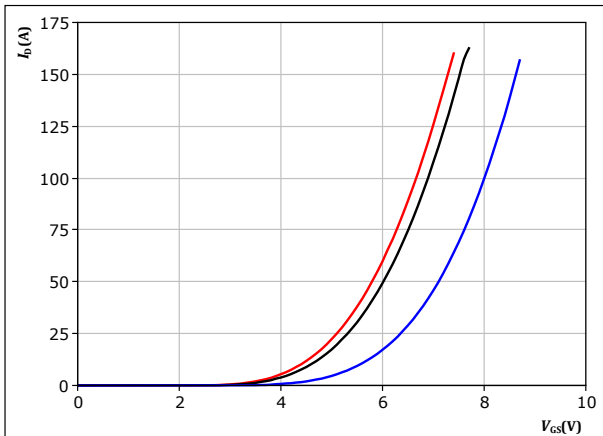


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GS} from -5 V to 20 V in steps of 1 V

figure 3. MOSFET

Typical transfer characteristics

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

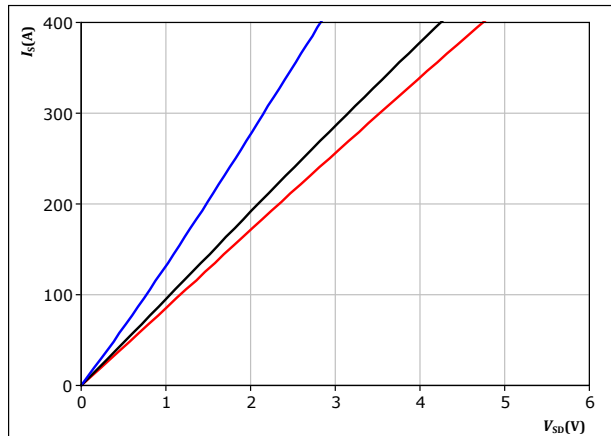


$t_p = 250 \mu s$
 $V_{DS} = 10 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 4. MOSFET

Typical reverse drain current characteristics

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



$t_p = 250 \mu s$
 $V_{GS} = 15 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

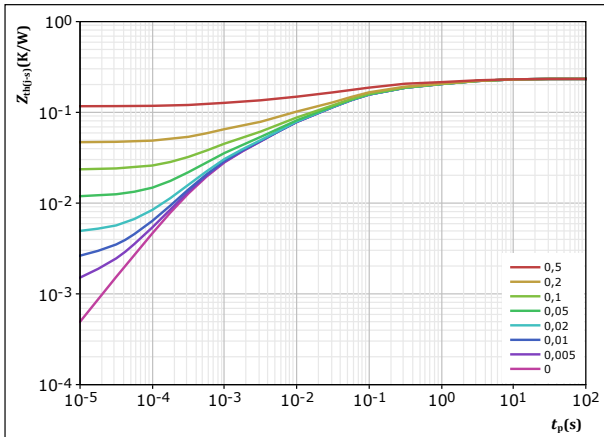


Half-Bridge Switch Characteristics

figure 5. MOSFET

Transient thermal impedance as a function of pulse width

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



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

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

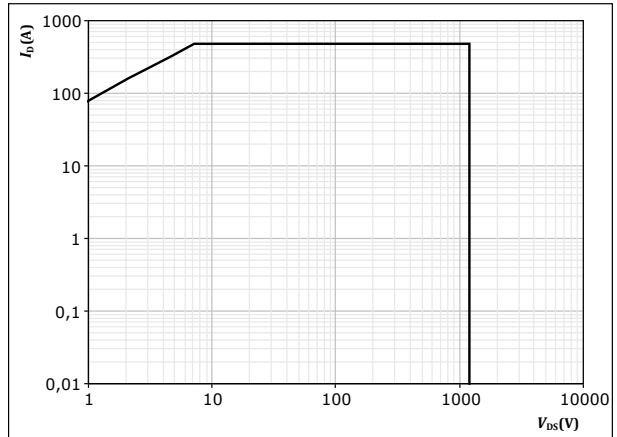
MOSFET thermal model values

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

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

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

$$T_i = T_{jmax}$$

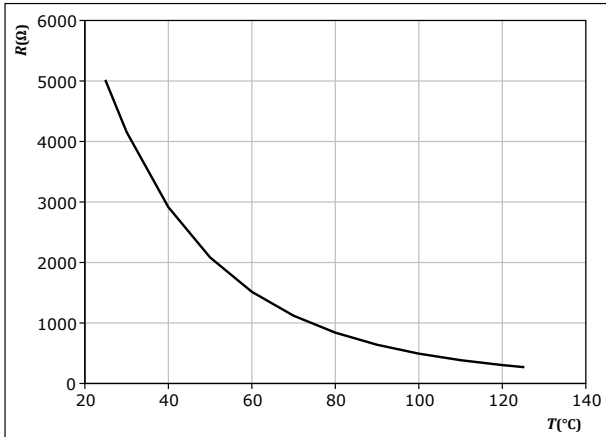


Thermistor Characteristics

figure 7. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

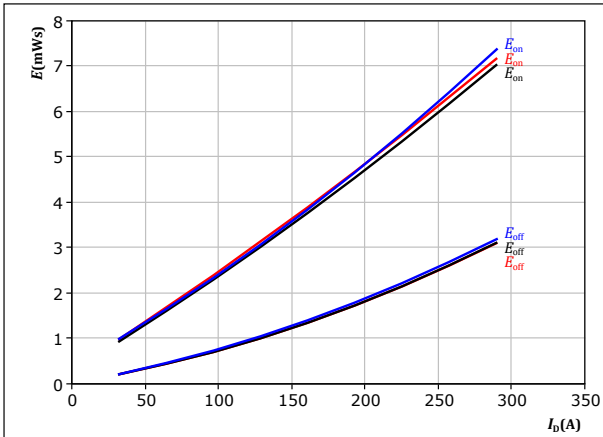




Half-Bridge Switching Characteristics

figure 8. MOSFET

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

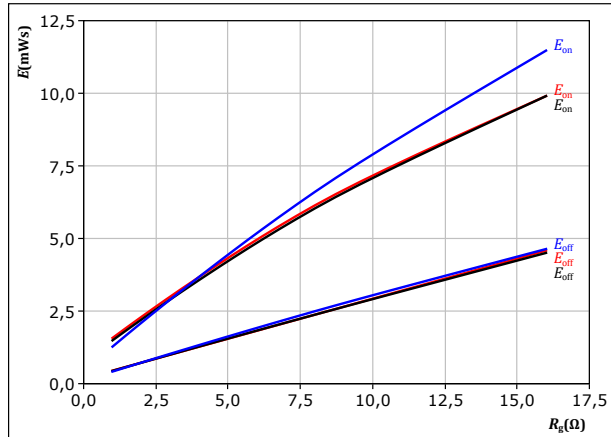


With an inductive load at

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

figure 9. MOSFET

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

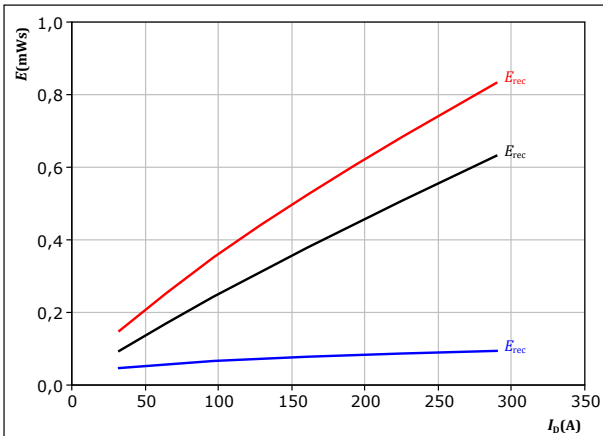


With an inductive load at

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

figure 10. MOSFET

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

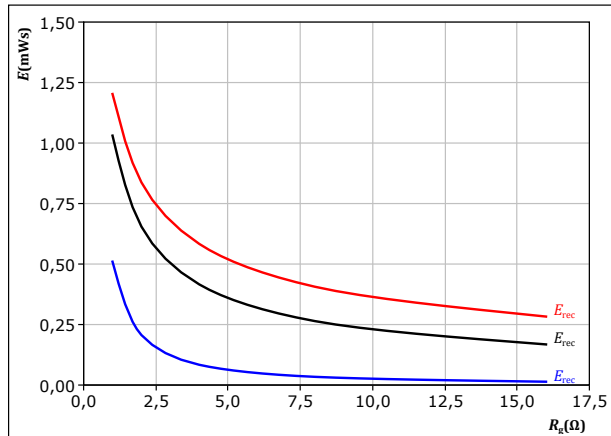


With an inductive load at

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

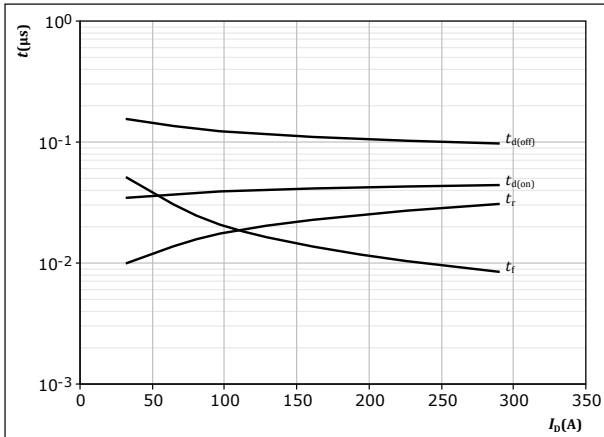
$V_{DS} = 600$ V	$T_j = 25$ °C
$V_{GS} = -4/15$ V	$T_j = 125$ °C
$I_D = 160$ A	$T_j = 150$ °C



Half-Bridge Switching Characteristics

figure 12. MOSFET

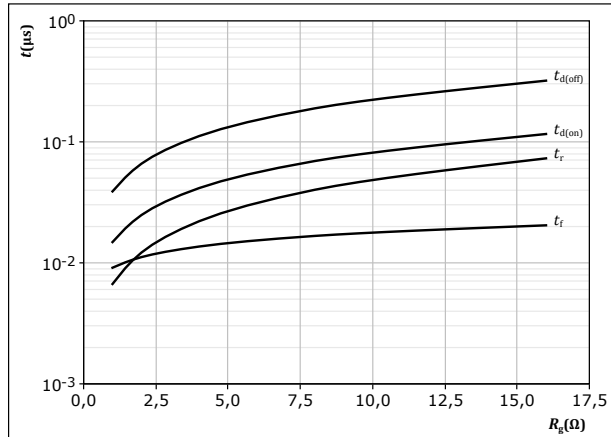
Typical switching times as a function of drain current
 $t = f(I_D)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $R_{g(on)} = 4 \text{ } \Omega$
 $R_{g(off)} = 4 \text{ } \Omega$

figure 13. MOSFET

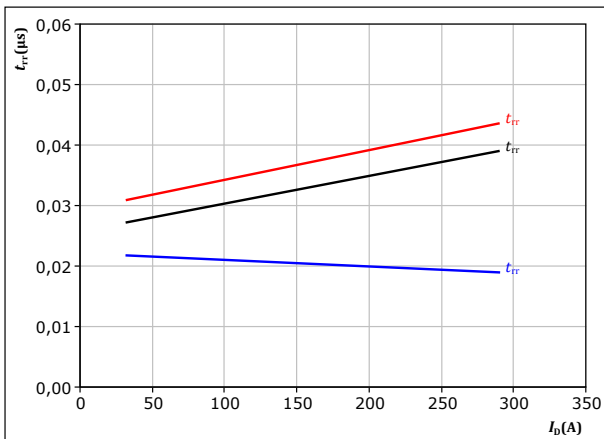
Typical switching times as a function of MOSFET turn on gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $I_D = 160 \text{ A}$

figure 14. MOSFET

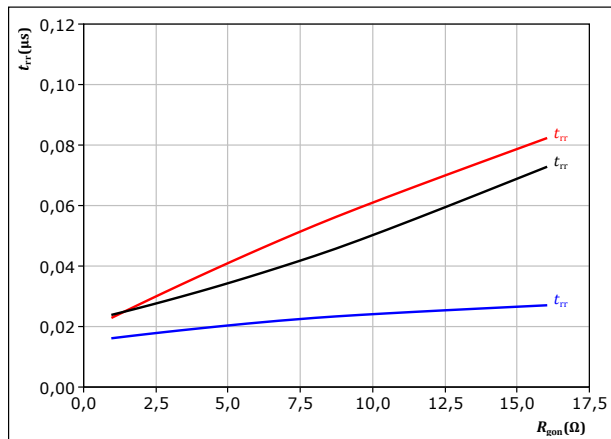
Typical reverse recovery time as a function of drain current
 $t_{rr} = f(I_D)$



At $V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $R_{g(on)} = 4 \text{ } \Omega$
 T_j : — 25 °C
— 125 °C
— 150 °C

figure 15. MOSFET

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



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

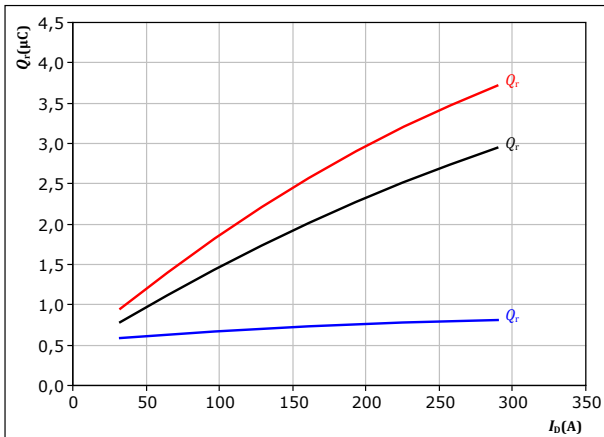


Half-Bridge Switching Characteristics

figure 16. MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$

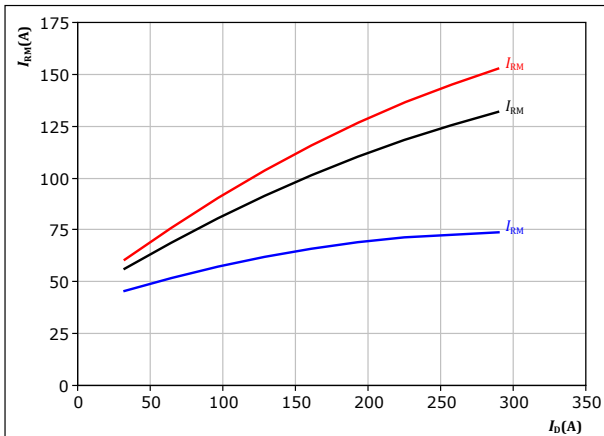


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{gon} = 4$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 18. MOSFET

Typical peak reverse recovery current as a function of drain current

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

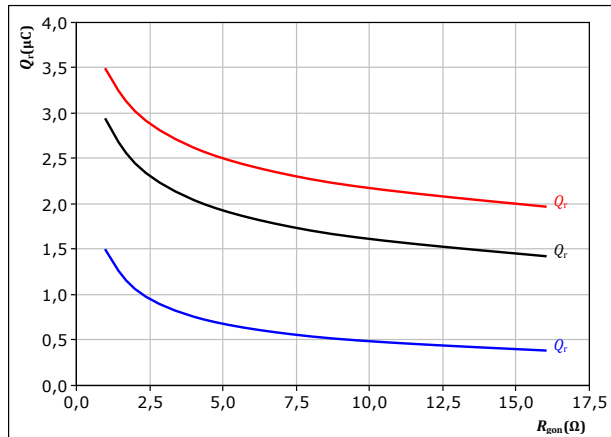


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{gon} = 4$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 17. MOSFET

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

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

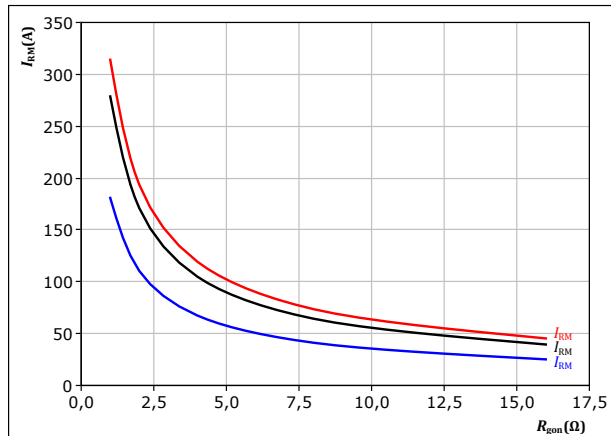


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $I_D = 160$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 19. MOSFET

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

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



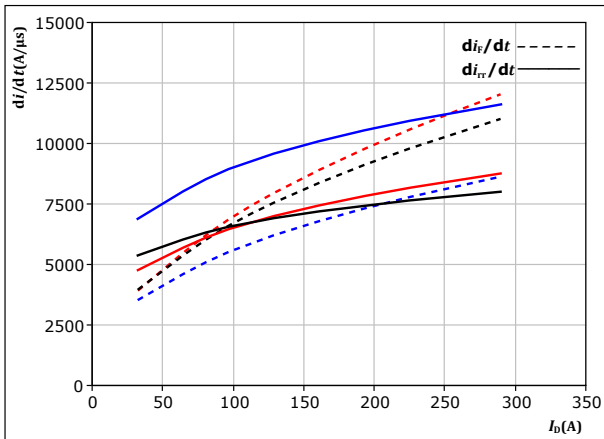
At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $I_D = 160$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)



Half-Bridge Switching Characteristics

figure 20. MOSFET

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

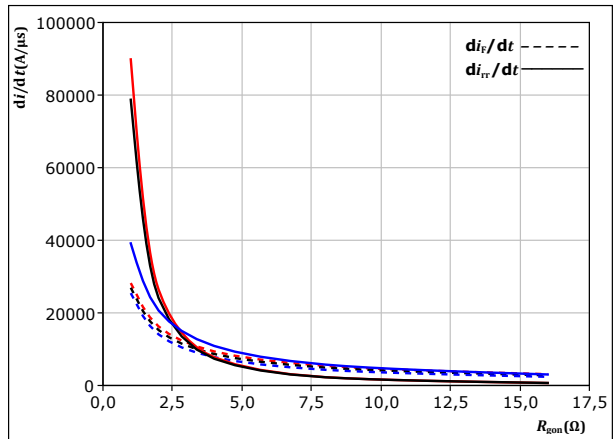


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{g(on)} = 4$ Ω

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
 $di_f/dt, di_{rr}/dt = f(R_{g(on)})$



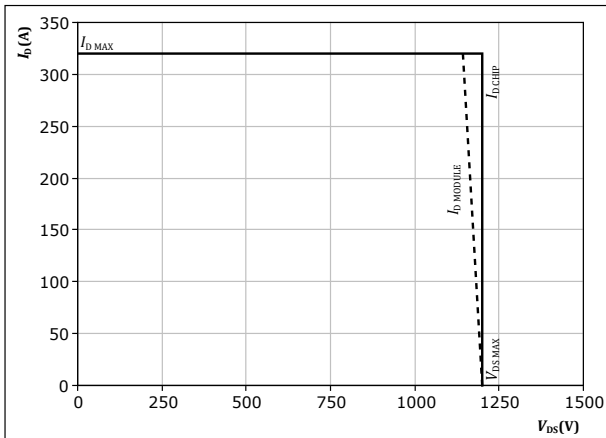
At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $I_D = 160$ A

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})

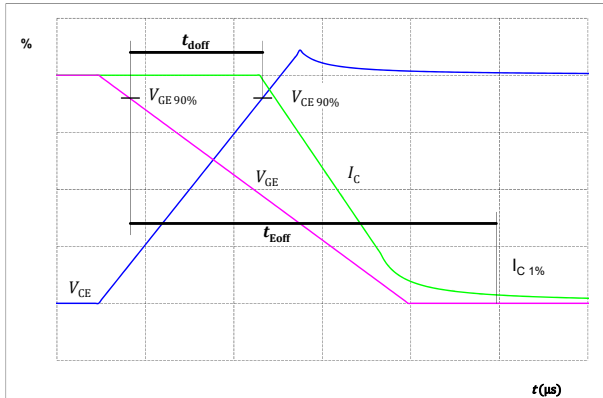


figure 24. MOSFET

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

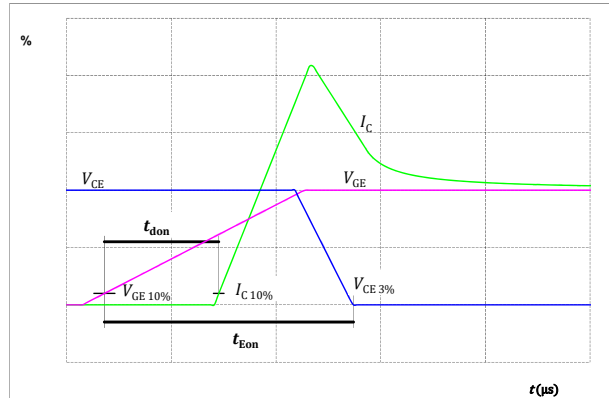


figure 25. MOSFET

Turn-off Switching Waveforms & definition of t_f

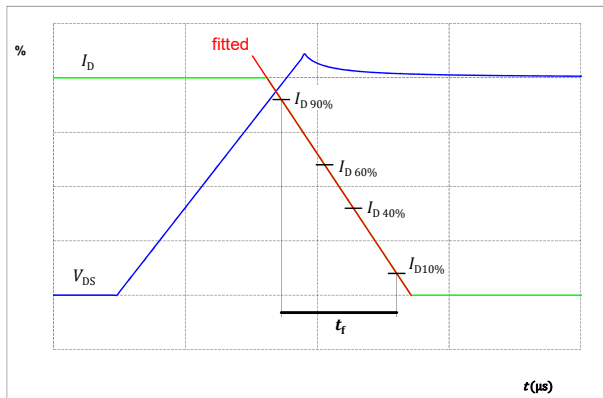
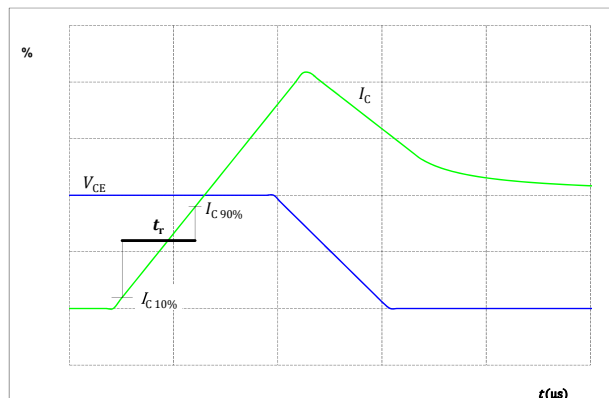


figure 26. MOSFET

Turn-on Switching Waveforms & definition of t_r





Half-Bridge Switching Definitions

figure 27. FWD

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

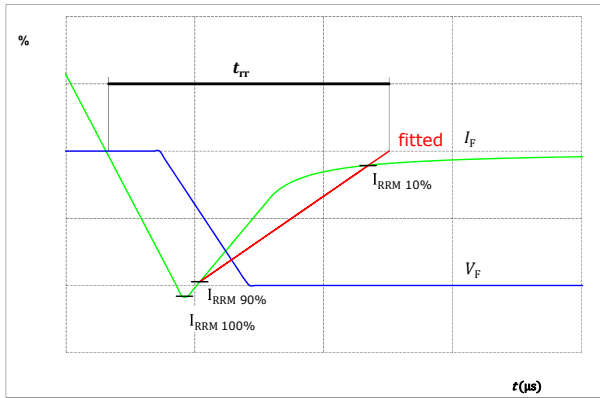


figure 28. FWD

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

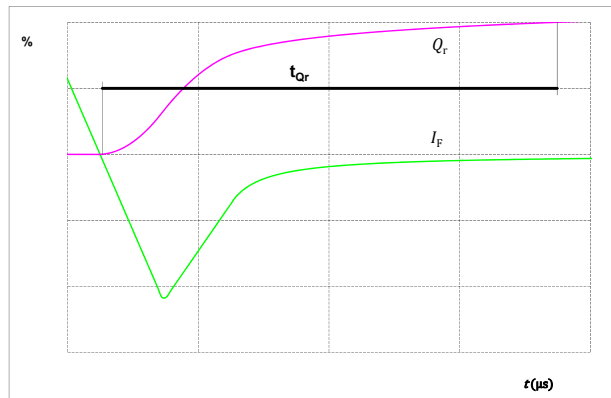
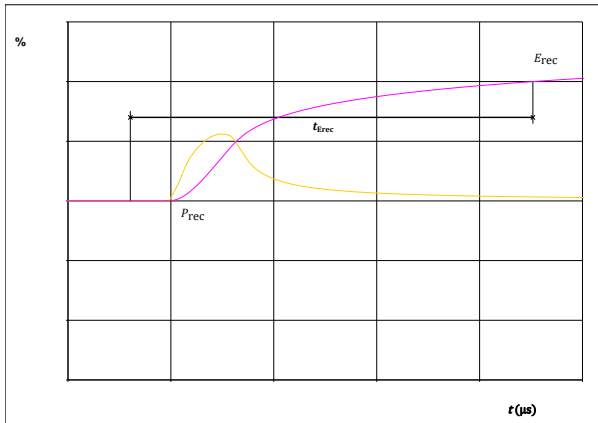


figure 29. FWD


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



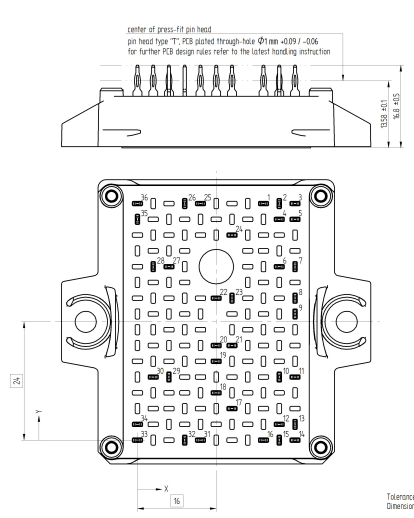


Vincotech

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

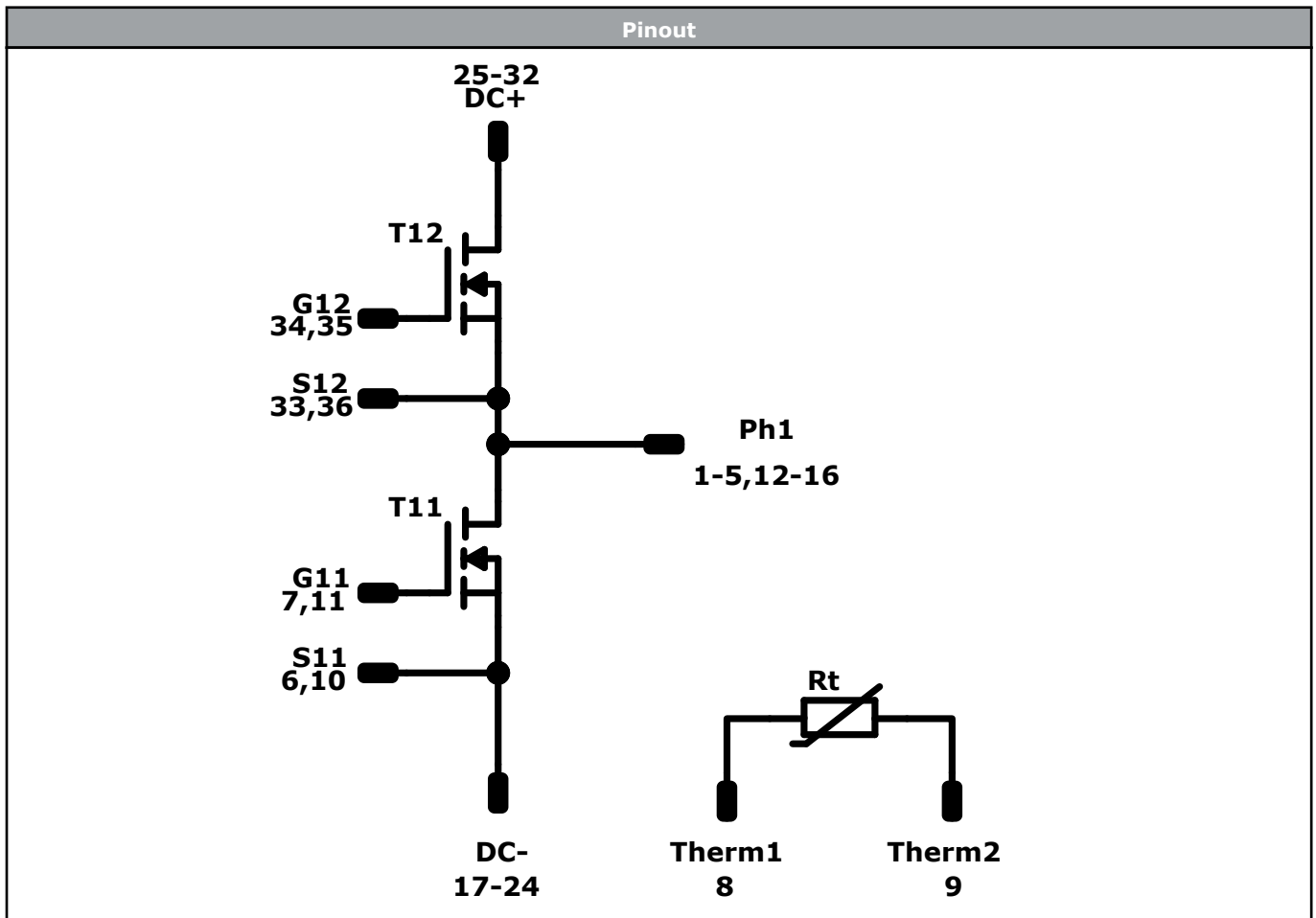


center of press-fit pin head
pin head type "T", PCB plated through-hole $\Phi_{min} +0.09 -0.06$
for further PCB design rules refer to the latest handling instruction

Tolerance of pinpositions: $\pm 0.1mm$ at the end of pins
Dimension of coordinate axis is only offset without tolerance



Vincotech



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



Vincotech

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.

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 $T_{j,op}=175^{\circ}\text{C}$ 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	

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