



Vincotech

10-EY122PA010MS-LU37F78T

datasheet

flowDUAL E2 SiC

1200 V / 10 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: Al₂O₃
- 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

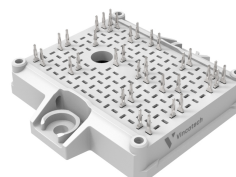
Target applications

- Charging Stations
- Energy Storage Systems
- General
- Industrial Drives
- Power Supply
- Servo Drives
- Solar Inverters
- UPS

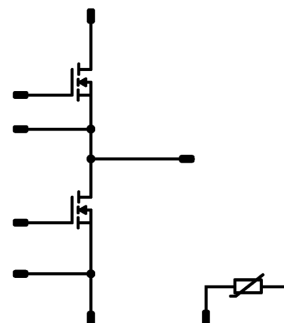
Types

- 10-EY122PA010MS-LU37F78T

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
Inverter Switch				
Drain-source voltage	V_{DS}		1200	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	123	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	480	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	232	W
Gate-source voltage	V_{GS}	static	-5 / 18	V
		dynamic	-10 / 22	V
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			9,34	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	

Inverter Switch

Static

Drain-source on-state resistance ⁽¹⁾	$r_{DS(on)}$		18		120	25 175		10 16,34	15	mΩ
Gate-source threshold voltage	$V_{GS(th)}$				0,012	25	1,7	2,25	2,75	V
Gate to Source Leakage Current	I_{GSS}		22	0		25			300	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25			30	μA
Internal gate resistance	r_g							0,667		Ω
Gate charge	Q_g		-5/18	800	120	25		324		nC
Short-circuit input capacitance	C_{iss}	$f = 500$ kHz	0	800	0	25		7800		pF
Short-circuit output capacitance	C_{oss}							405		
Reverse transfer capacitance	C_{rss}							18		
Diode forward voltage	V_{SD}		0		120	25		4,1		V

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						0,41		K/W
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10-EY122PA010MS-LU37F78T

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	$t_{d(on)}$	$R_{gon} = 0,5 \Omega$ $R_{goff} = 0,5 \Omega$	-5/18	600	100	25		19,78		ns	
						125		19,11			
						150		18,67			
Rise time	t_r					25		7,27		ns	
						125		6,72			
						150		6,88			
Turn-off delay time	$t_{d(off)}$					25		35,35		ns	
						125		39,36			
						150		40,12			
Fall time	t_f					25		5,66		ns	
						125		5,86			
						150		5,78			
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} =1,05 μ C Q_{rFWD} =2,12 μ C Q_{rFWD} =2,49 μ C	25		0,484		mWs				
			125		0,563						
			150		0,617						
Turn-off energy (per pulse)	E_{off}		25		0,148		mWs				
			125		0,15						
			150		0,166						
Peak recovery current	I_{RRM}	di/dt =21142 A/ μ s di/dt =19326 A/ μ s di/dt =18470 A/ μ s	25		144,38		A				
			125		226						
			150		250,13						
Reverse recovery time	t_{rr}		25		12,12		ns				
			125		15,64						
			150		16,7						
Recovered charge	Q_r		25		1,05		μ C				
			125		2,12						
			150		2,49						
Reverse recovered energy	E_{rec}		25		0,436		mWs				
			125		0,926						
			150		1,08						
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$	25		40132,45		A/ μ s					
		125		75934,62							
		150		85213,55							



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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	

Thermistor

Static

Rated resistance	R					25		5		kΩ
Deviation of R100	$\Delta_{R/R}$	$R_{100} = 499 \Omega$				100	3,2		3,3	%
Power dissipation	P					25		130		mW
Power dissipation constant	d					25		1,3		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 1 \%$						3380		K
Vincotech Thermistor Reference									V	

⁽¹⁾ Value at chip level

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



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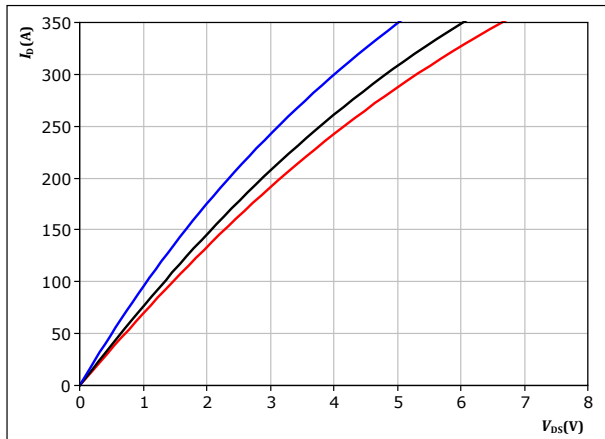
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Inverter Switch Characteristics

figure 1. MOSFET

Typical output characteristics including $R_{DD'} + R_{SS'}$

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

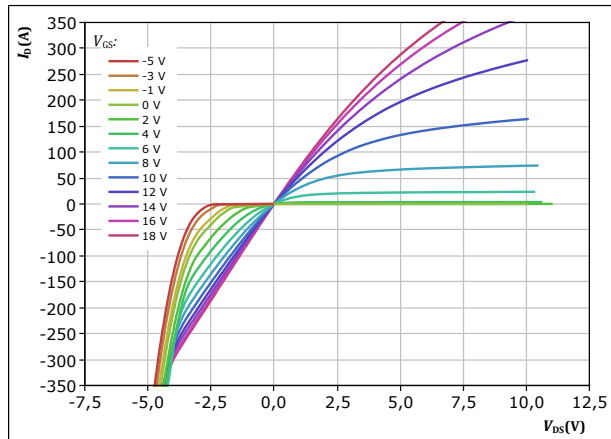


$t_p = 250 \mu s$
 $V_{GS} = 18 V$
 $T_j:$ — 25 °C
— 125 °C
— 150 °C

figure 2. MOSFET

Typical output characteristics including $R_{DD'} + R_{SS'}$

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

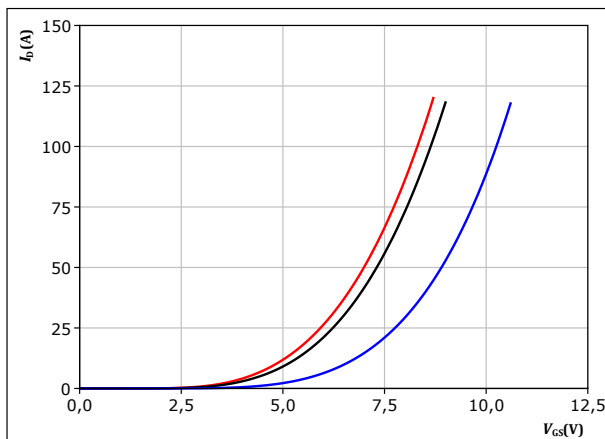


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GS} from -5 V to 18 V in steps of 2 V

figure 3. MOSFET

Typical transfer characteristics

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

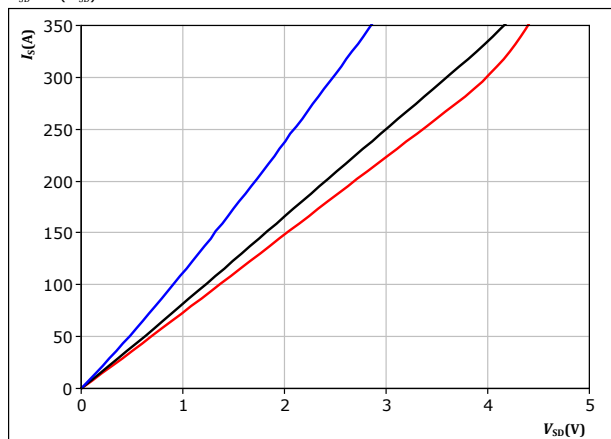


$t_p = 250 \mu s$
 $V_{DS} = 23 V$
 $T_j:$ — 25 °C
— 125 °C
— 150 °C

figure 4. MOSFET

Typical reverse drain current characteristics including $R_{DD'} + R_{SS'}$

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



$t_p = 250 \mu s$
 $V_{GS} = 18 V$
 $T_j:$ — 25 °C
— 125 °C
— 150 °C



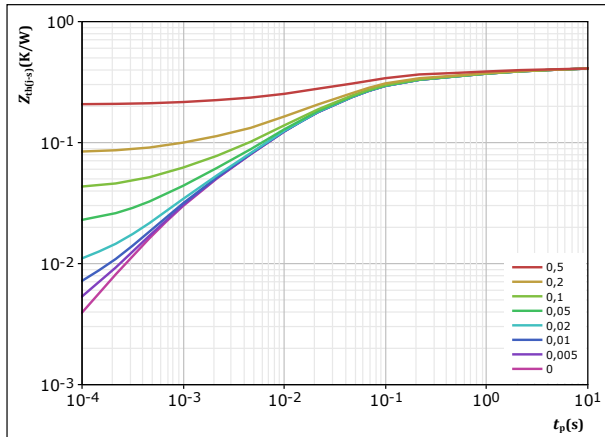
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Inverter Switch Characteristics

figure 5. MOSFET

Transient thermal impedance as a function of pulse width

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



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

$$R_{th(j-a)} = 0,41 \text{ K/W}$$

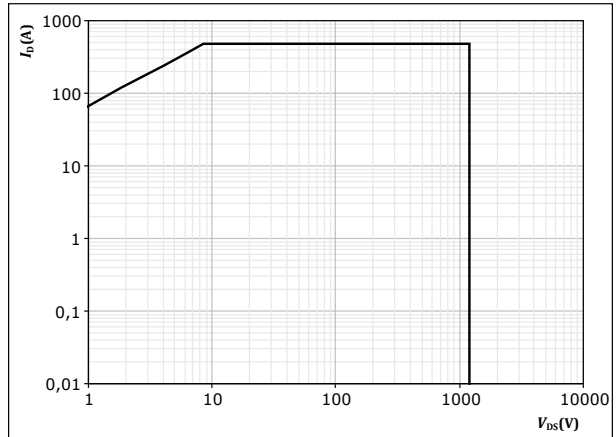
MOSFET thermal model values

R (K/W)	τ (s)
3,86E-02	4,51E+00
6,38E-02	5,66E-01
1,94E-01	5,19E-02
9,39E-02	8,58E-03
2,38E-02	9,15E-04

figure 6. MOSFET

Safe operating area

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



$D = \text{single pulse}$

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

$$V_{GS} = 18 \text{ V}$$

$$T_j = T_{jmax}$$



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10-EY122PA010MS-LU37F78T
datasheet

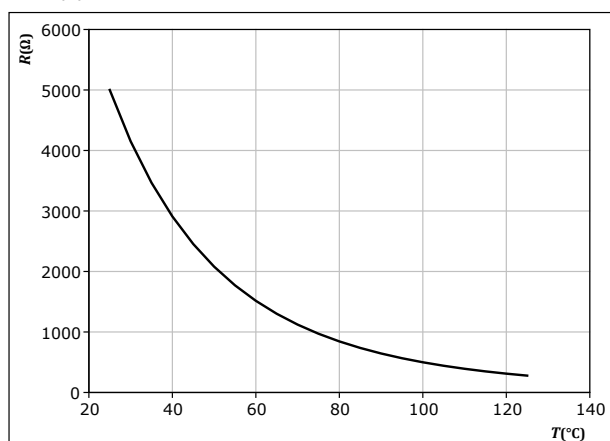
Thermistor Characteristics

figure 7.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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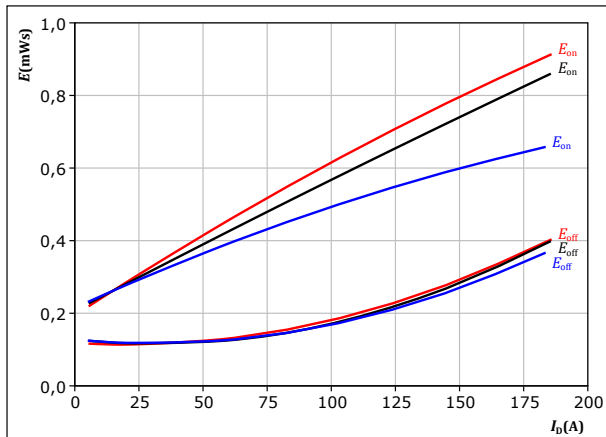
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Inverter Switching Characteristics

figure 8. MOSFET

Typical switching energy losses as a function of drain current

$$E = f(I_D)$$



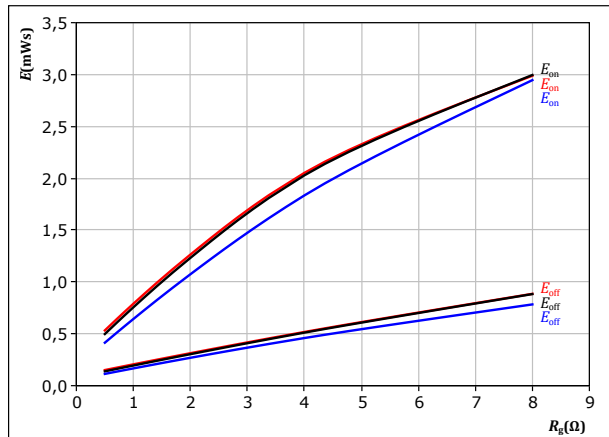
With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/18 \text{ V}$
 $R_{gon} = 0,5 \text{ } \Omega$
 $R_{goff} = 0,5 \text{ } \Omega$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 9. MOSFET

Typical switching energy losses as a function of MOSFET turn on gate resistor

$$E = f(R_g)$$



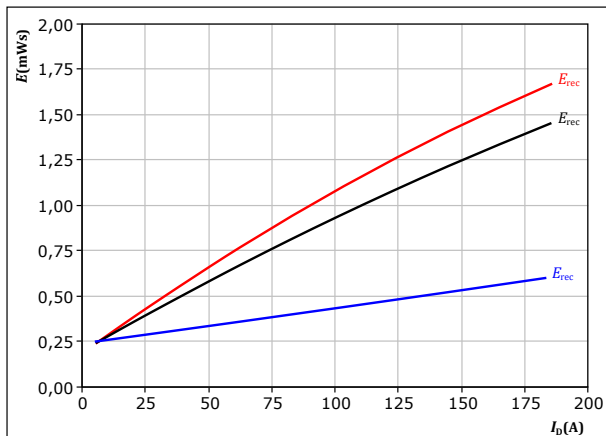
With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/18 \text{ V}$
 $I_D = 100 \text{ A}$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 10. MOSFET

Typical reverse recovered energy loss as a function of drain current

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



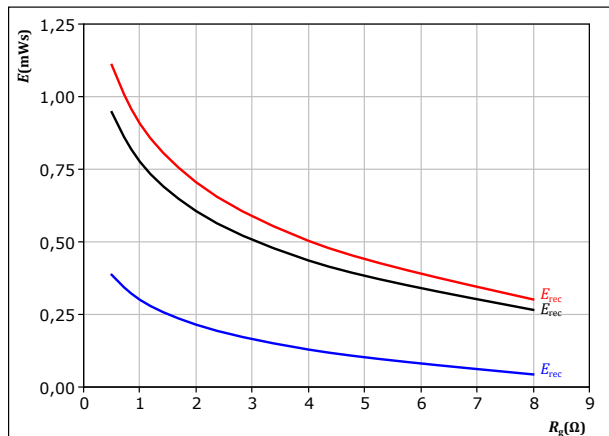
With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/18 \text{ V}$
 $R_{gon} = 0,5 \text{ } \Omega$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

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

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/18 \text{ V}$
 $I_D = 100 \text{ A}$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$



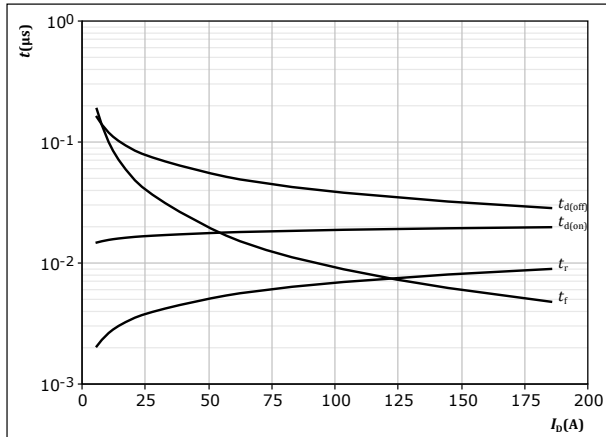
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Inverter Switching Characteristics

figure 12. MOSFET

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

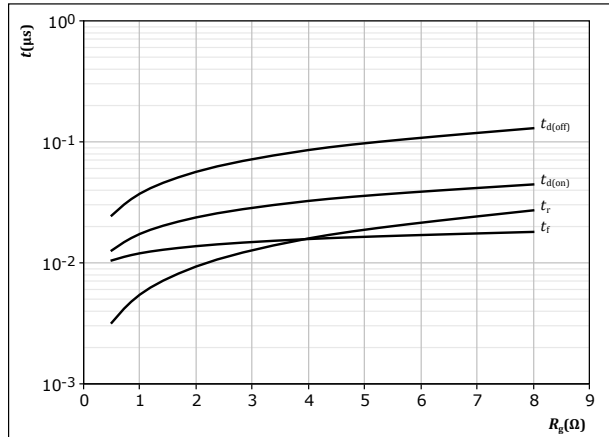


With an inductive load at

$T_j = 150$ °C
 $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $R_{gon} = 0,5$ Ω
 $R_{goff} = 0,5$ Ω

figure 13. MOSFET

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

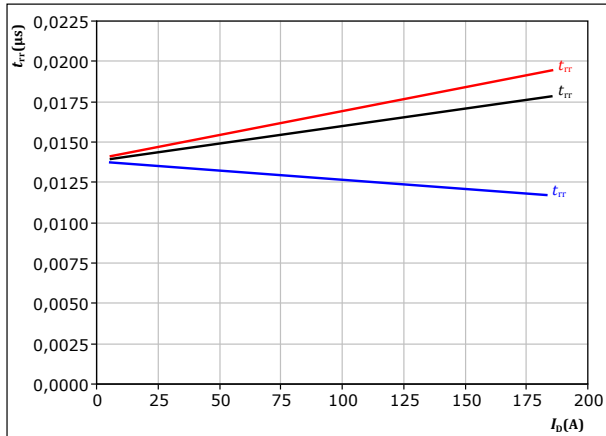


With an inductive load at

$T_j = 150$ °C
 $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $I_D = 100$ A

figure 14. MOSFET

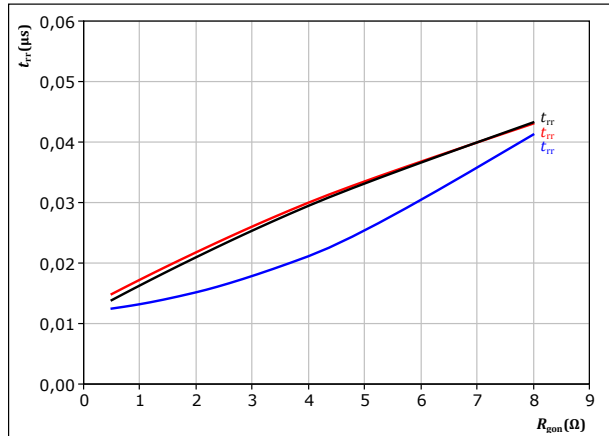
Typical reverse recovery time as a function of drain current
 $t_{rr} = f(I_D)$



At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $R_{gon} = 0,5$ Ω
 $T_j: 25$ °C (blue)
 125 °C (black)
 150 °C (red)

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
 $V_{GS} = -5/18$ V
 $I_D = 100$ A
 $T_j: 25$ °C (blue)
 125 °C (black)
 150 °C (red)



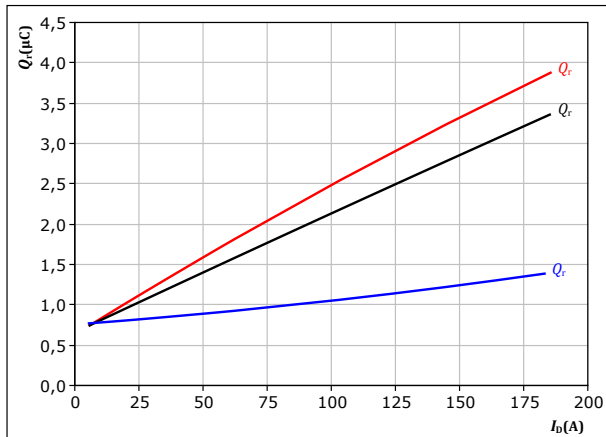
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Inverter Switching Characteristics

figure 16. MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$

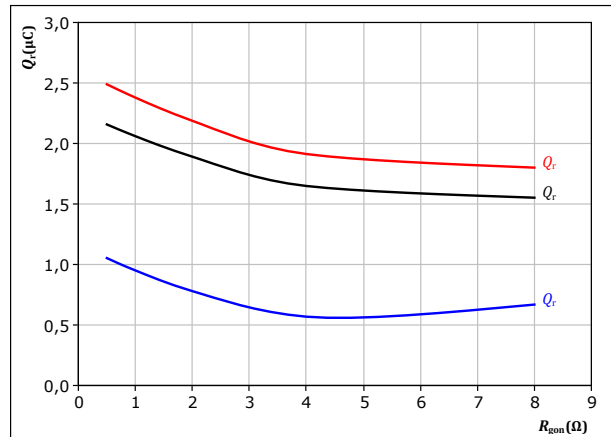


At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $R_{gon} = 0,5$ Ω
 T_j : 25 °C
125 °C
150 °C

figure 17. MOSFET

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

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

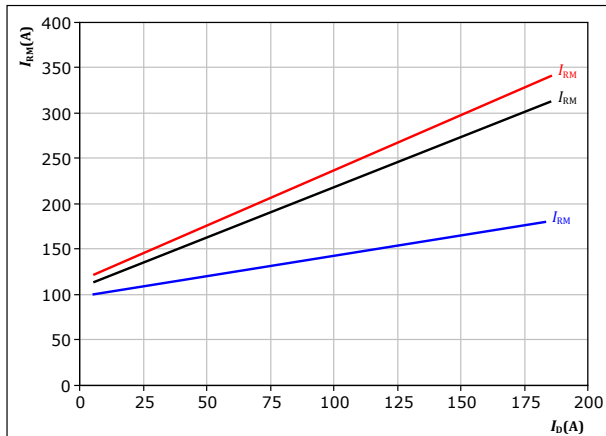


At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $I_D = 100$ A
 T_j : 25 °C
125 °C
150 °C

figure 18. MOSFET

Typical peak reverse recovery current as a function of drain current

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

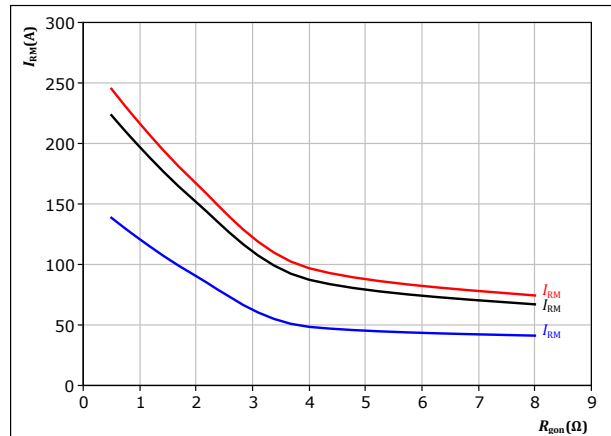


At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $R_{gon} = 0,5$ Ω
 T_j : 25 °C
125 °C
150 °C

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
 $V_{GS} = -5/18$ V
 $I_D = 100$ A
 T_j : 25 °C
125 °C
150 °C



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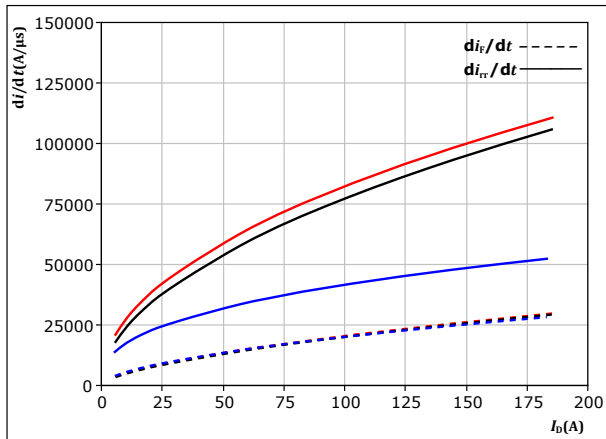
10-EY122PA010MS-LU37F78T

datasheet

Inverter Switching Characteristics

figure 20. MOSFET

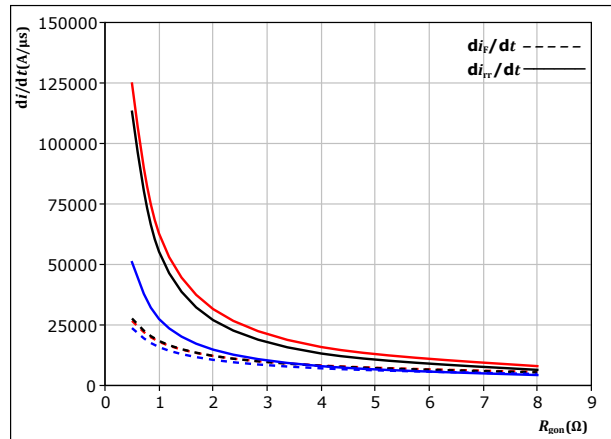
Typical rate of fall of forward and reverse recovery current as a function of drain current
 $di_f/dt, di_{rr}/dt = f(I_D)$



At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $R_{gon} = 0,5$ Ω
 T_j : 25 °C
125 °C
150 °C

figure 21. MOSFET

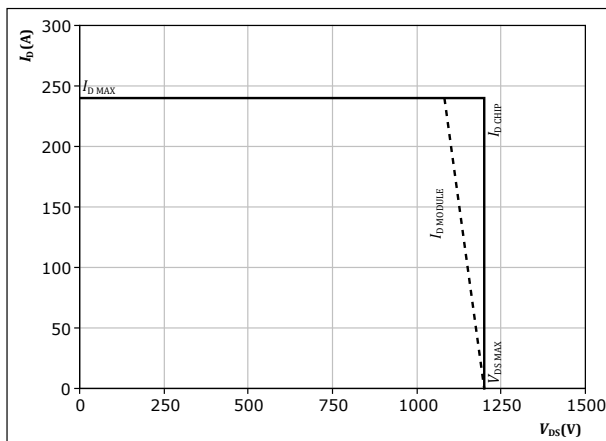
Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{gon})$



At $V_{DS} = 600$ V
 $V_{GS} = -5/18$ V
 $I_D = 100$ A
 T_j : 25 °C
125 °C
150 °C

figure 22. MOSFET

Reverse bias safe operating area
 $I_D = f(V_{DS})$



At $T_j = 150$ °C
 $R_{gon} = 0,5$ Ω
 $R_{goff} = 0,5$ Ω



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Inverter 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})

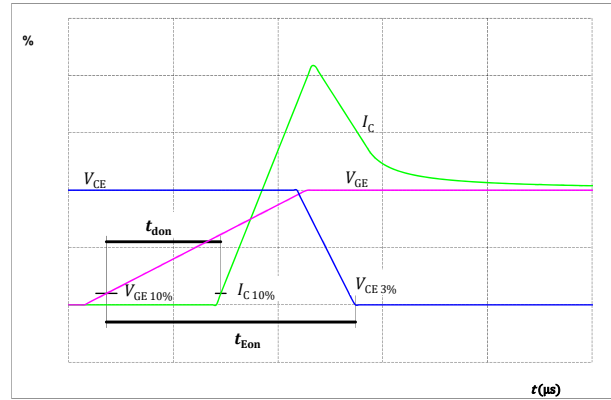


figure 25. MOSFET

Turn-off Switching Waveforms & definition of t_f

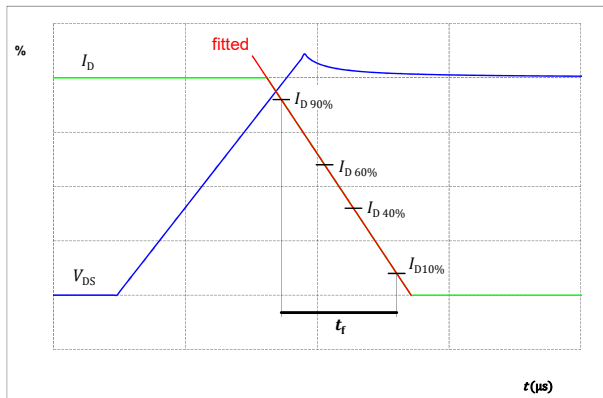
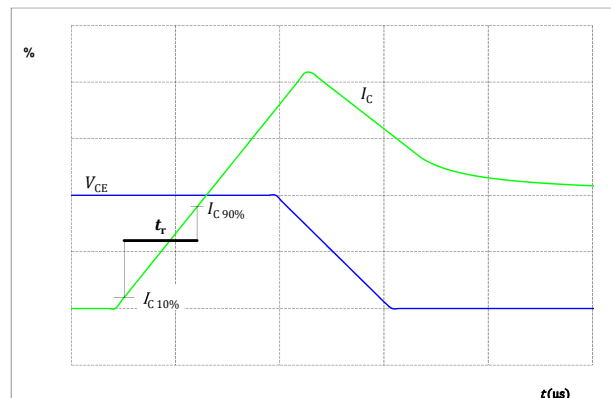


figure 26. MOSFET

Turn-on Switching Waveforms & definition of t_r





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Inverter Switching Definitions

figure 27. FWD

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

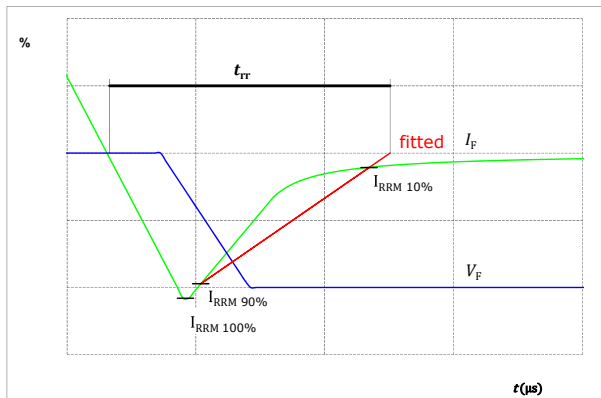


figure 28. FWD

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

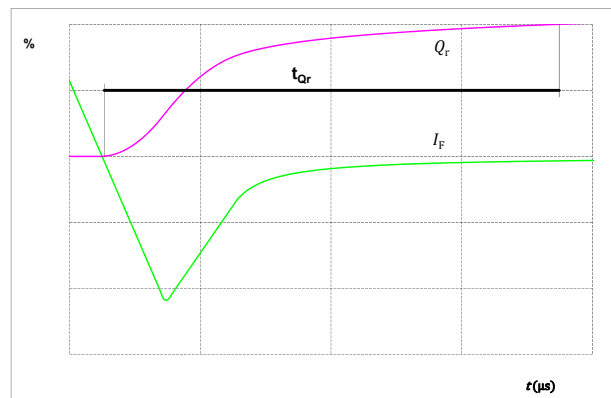
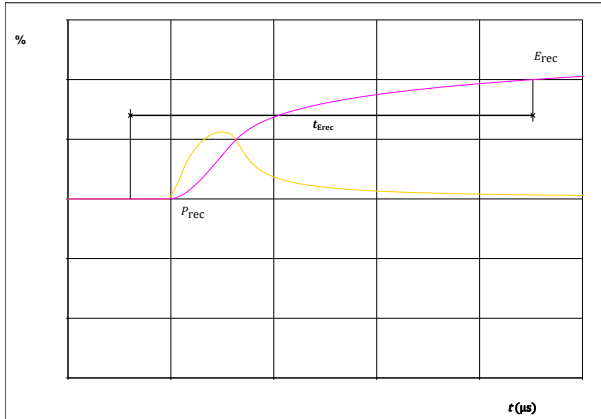


figure 29. FWD


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





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Ordering Code	
Version	Ordering Code
Without thermal paste	10-EY122PA010MS-LU37F78T
With thermal paste (5.2 W/mK. PTM6000HV)	10-EY122PA010MS-LU37F78T-/7/

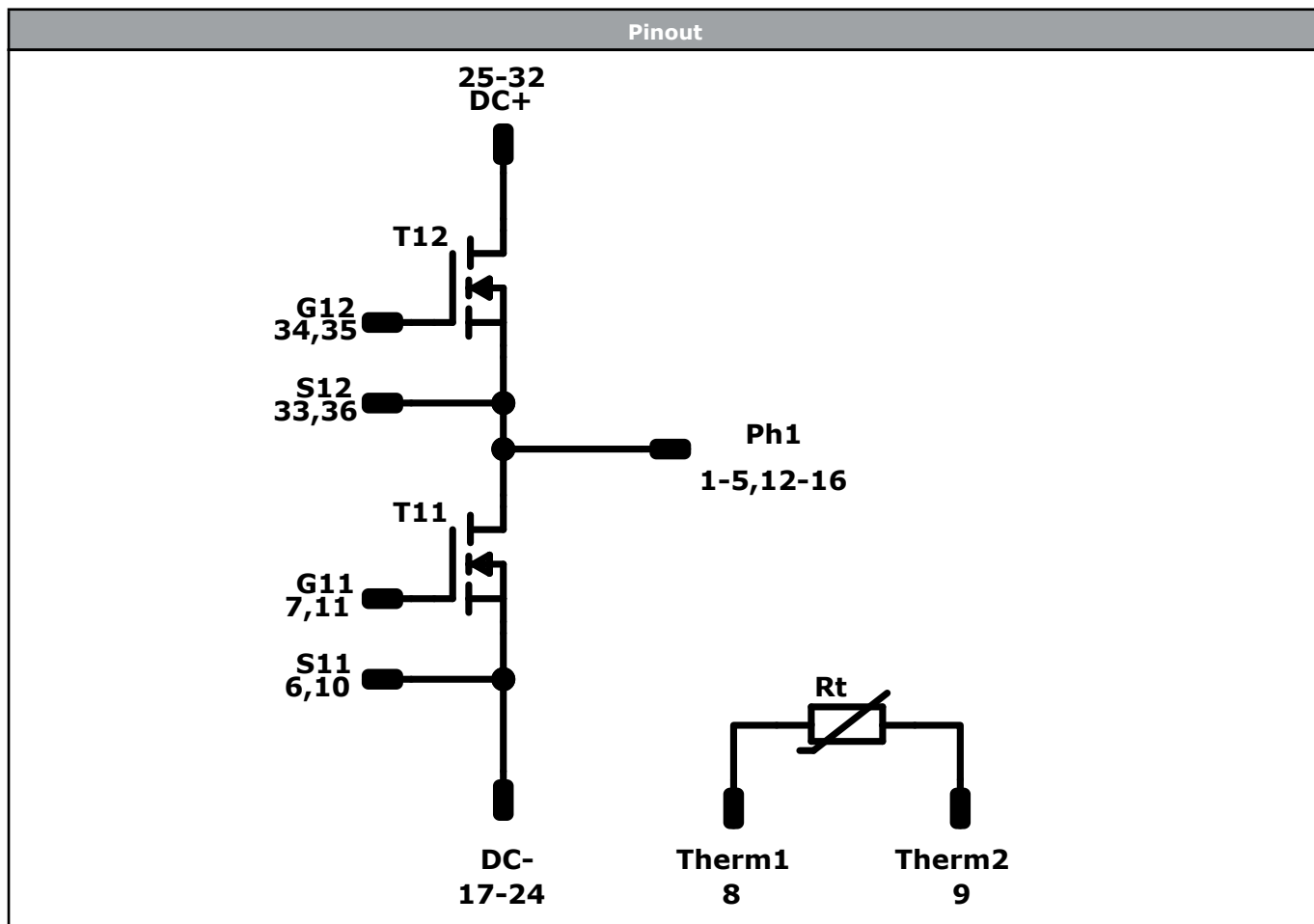
Marking							
	Text	Name		Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNN- TTTTTV		WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTV	LLLLL	SSSS	WWYY			

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



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10-EY122PA010MS-LU37F78T
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Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12	MOSFET	1200 V	10 mΩ	Inverter Switch	
Rt	Thermistor			Thermistor	



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10-EY122PA010MS-LU37F78T
datasheet

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 $T_{j,sp}=175^{\circ}\text{C}$ and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.



Document No.:	Date:	Modification:	Pages
10-EY122PA010MS-LU37F78T-D2-14	13 May. 2026	Change Inverter Switch	

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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.