



Vincotech

# 10-EY122PA009ME-LU37F18T

datasheet

flowDUAL E2 SiC

1200 V / 9 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: Al<sub>2</sub>O<sub>3</sub>
- 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

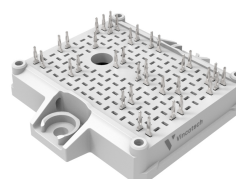
## Target applications

- Charging Stations
- General
- Power Supply
- UPS
- Welding & Cutting

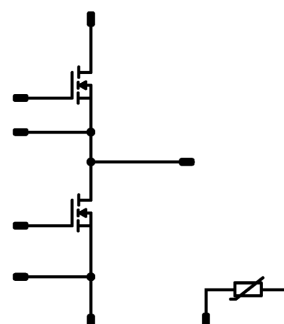
## Types

- 10-EY122PA009ME-LU37F18T

## 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
<b>Half-Bridge Switch</b>				
Drain-source voltage	$V_{DS}$		1200	V
Drain current (DC current)	$I_D$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	115	A
Peak drain current	$I_{DM}$	$t_p$ limited by $T_{jmax}$	456	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	203	W
Gate-source voltage	$V_{GS}$		-4 / 15	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	

### Half-Bridge Switch

#### Static

Drain-source on-state resistance	$r_{DS(on)}$		15		114	25 125 150	6,07	10 13,3 14,9	11,3 <sup>(1)</sup>	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$			0,0321	25	1,8	2,7	3,6	V
Gate to Source Leakage Current	$I_{GSS}$		15	0		25		30	750	nA
Zero Gate Voltage Drain Current	$I_{DSS}$		0	1200		25		3	150	μA
Internal gate resistance	$r_g$							1,37		Ω
Gate charge	$Q_g$		-4/15	800	114	25		408		nC
Short-circuit input capacitance	$C_{iss}$	$f = 100 \text{ kHz}$	0	1000	0	25		10410		pF
Short-circuit output capacitance	$C_{oss}$							330		
Reverse transfer capacitance	$C_{rss}$							27		
Diode forward voltage	$V_{SD}$		0		58,5	25		4,8		V

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{\text{paste}} = 3,4 \text{ W/mK}$ (PSX)						0,47		K/W
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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	
Dynamic										
Turn-on delay time	$t_{d(on)}$	$R_{gon} = 2 \Omega$ $R_{goff} = 2 \Omega$	-4/15	600	96	25		26,14		ns
						125		24,54		
						150		23,98		
Rise time	$t_r$					25		9,01		ns
						125		8,23		
						150		8,35		
Turn-off delay time	$t_{d(off)}$					25		67,8		ns
						125		74,18		
						150		76,23		
Fall time	$t_f$					25		17,95		ns
						125		19,4		
						150		18,31		
Turn-on energy (per pulse)	$E_{on}$	$Q_{rFWD}=1,2 \mu C$ $Q_{rFWD}=2,05 \mu C$ $Q_{rFWD}=2,57 \mu C$	25		1,23		mWs			
			125		1,22					
			150		1,3					
Turn-off energy (per pulse)	$E_{off}$		25		0,374		mWs			
			125		0,378					
			150		0,384					
Peak recovery current	$I_{RRM}$	$di/dt=12363 A/\mu s$ $di/dt=13096 A/\mu s$ $di/dt=13604 A/\mu s$	25		104,33		A			
			125		135,46					
			150		153,42					
Reverse recovery time	$t_{rr}$		25		20,02		ns			
			125		25,65					
			150		27,51					
Recovered charge	$Q_r$		25		1,2		$\mu C$			
			125		2,05					
			150		2,57					
Reverse recovered energy	$E_{rec}$		25		0,281		mWs			
			125		0,652					
			150		0,865					
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$	25		12850,94		A/ $\mu s$				
		125		10212,48						
		150		11409,23						



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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	

## Thermistor

### Static

Rated resistance	$R$					25		5		kΩ
Deviation of R100	$\Delta_{R/R}$	$R_{100} = 493 \Omega$				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.



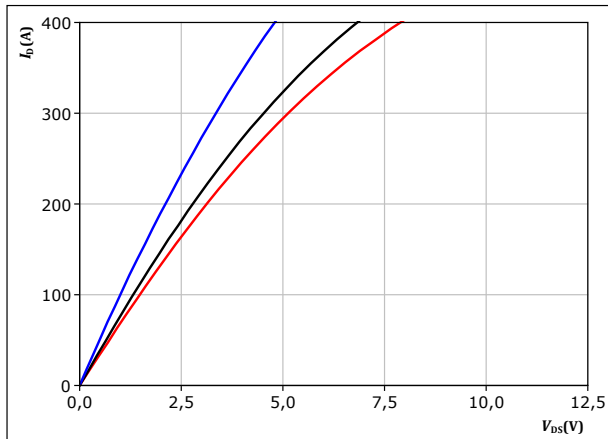
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## Half-Bridge Switch Characteristics

figure 1. MOSFET

Typical output characteristics

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

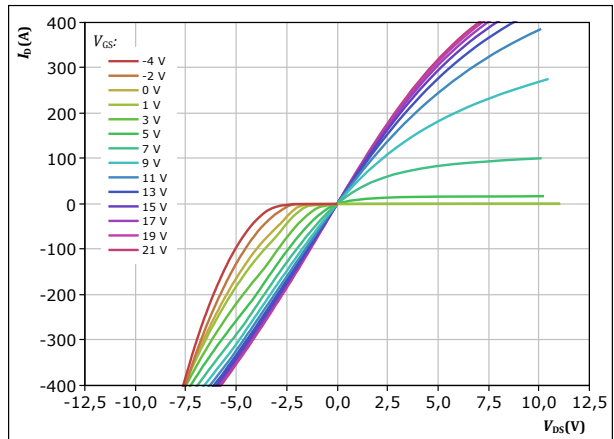


$t_p = 250 \mu s$   
 $V_{GS} = 15 V$   
 $T_j: 25^\circ C$   
 $125^\circ C$   
 $150^\circ C$

figure 2. MOSFET

Typical output characteristics

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

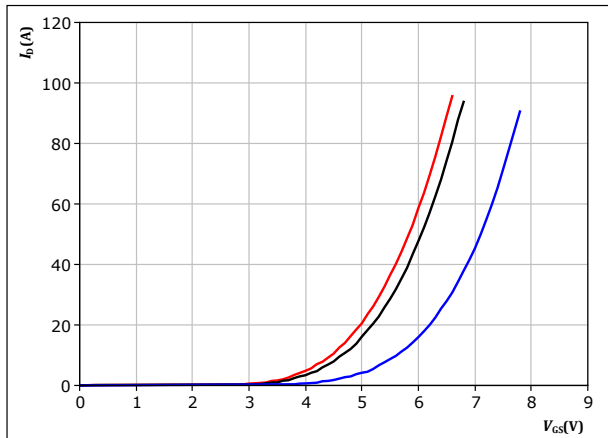


$t_p = 250 \mu s$   
 $T_j = 150^\circ C$   
 $V_{GS}$  from -4 V to 21 V in steps of 2 V

figure 3. MOSFET

Typical transfer characteristics

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

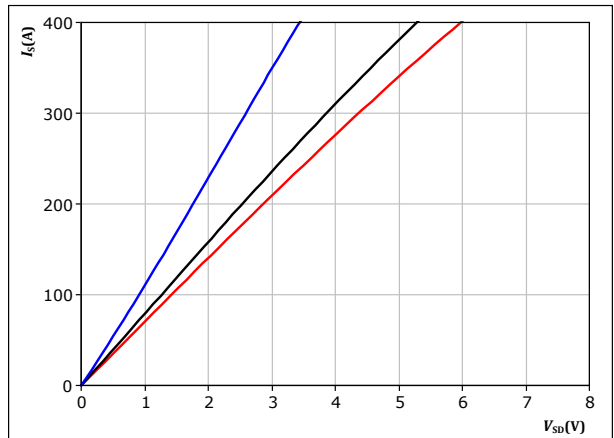


$t_p = 250 \mu s$   
 $V_{DS} = 20 V$   
 $T_j: 25^\circ C$   
 $125^\circ C$   
 $150^\circ C$

figure 4. MOSFET

Typical reverse drain current characteristics

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



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



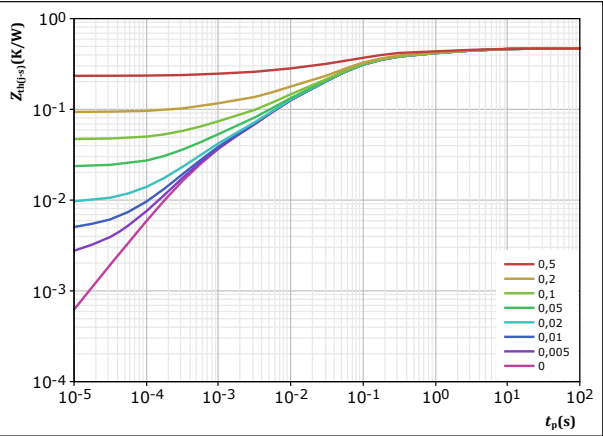
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Half-Bridge Switch Characteristics

figure 5. MOSFET

Transient thermal impedance as a function of pulse width

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



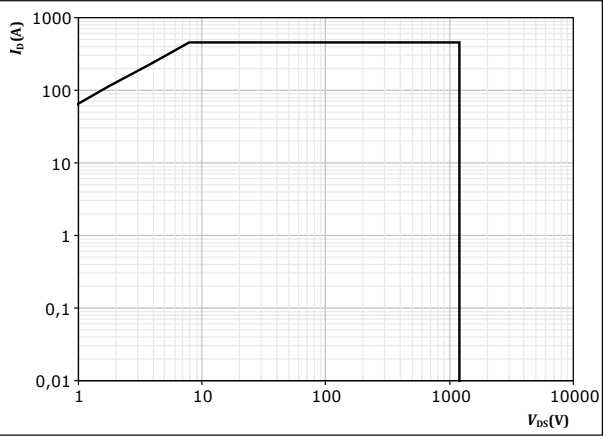
$D = t_p / T$   
 $R_{th(j-a)} = 0,468 \text{ K/W}$   
MOSFET thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
4,20E-02	5,05E+00
6,91E-02	7,11E-01
2,44E-01	6,77E-02
8,67E-02	7,07E-03
2,61E-02	5,59E-04

figure 6. MOSFET

Safe operating area

$I_D = f(V_{DS})$



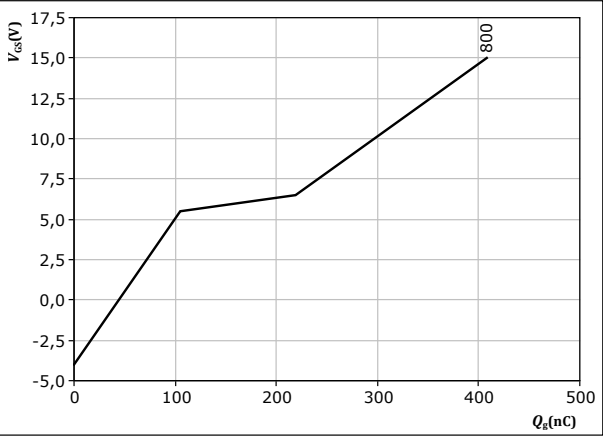
$D = \text{single pulse}$

$T_s =$	80	°C
$V_{GS} =$	15	V
$T_j =$	$T_{jmax}$	

figure 7. MOSFET

Gate voltage vs gate charge

$V_{GS} = f(Q_g)$



$I_D = 38 \text{ A}$   
 $T_j = 25 \text{ °C}$



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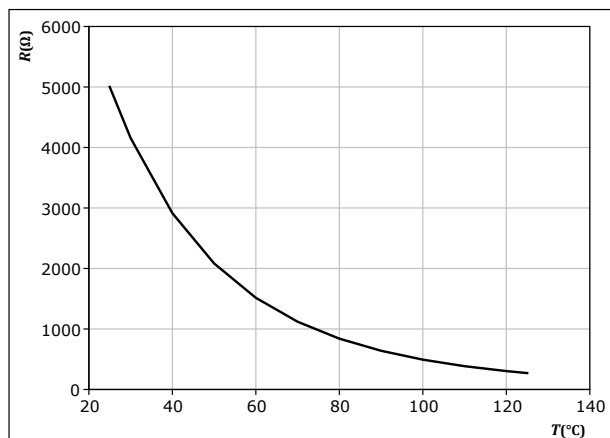
## Thermistor Characteristics

figure 8.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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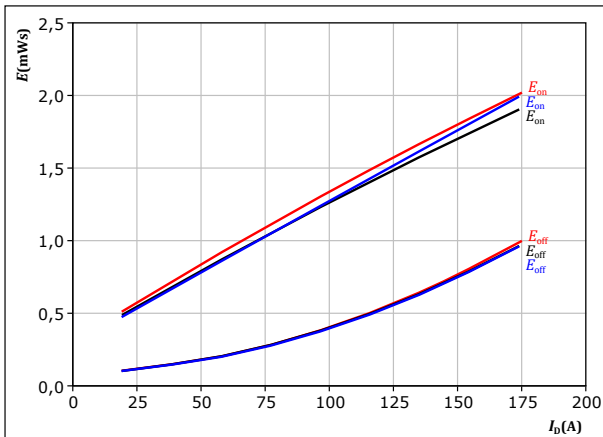
## Half-Bridge Switching Characteristics

figure 9.

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  
 $R_{gon} = 2$   $\Omega$   
 $R_{goff} = 2$   $\Omega$

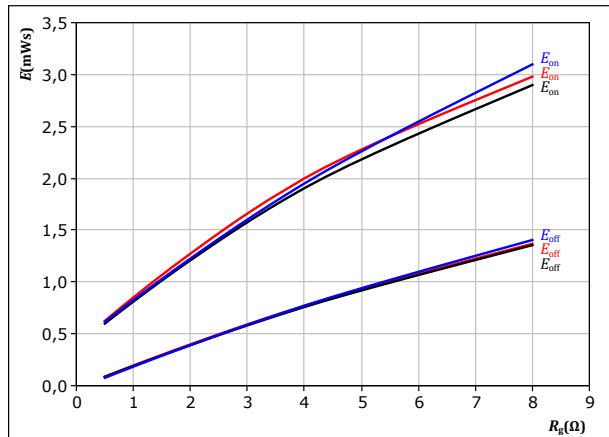
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 10.

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  
 $I_D = 96$  A

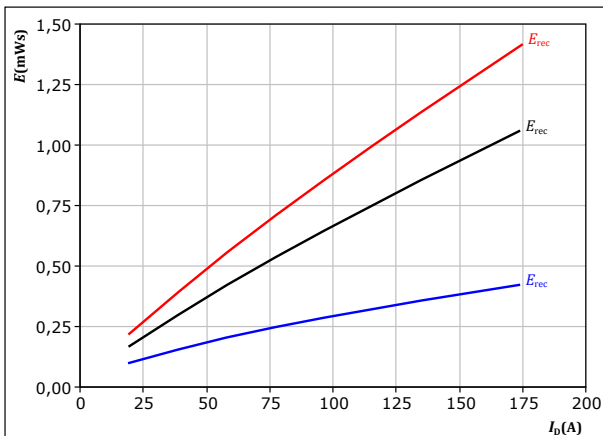
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 11.

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  
 $R_{gon} = 2$   $\Omega$

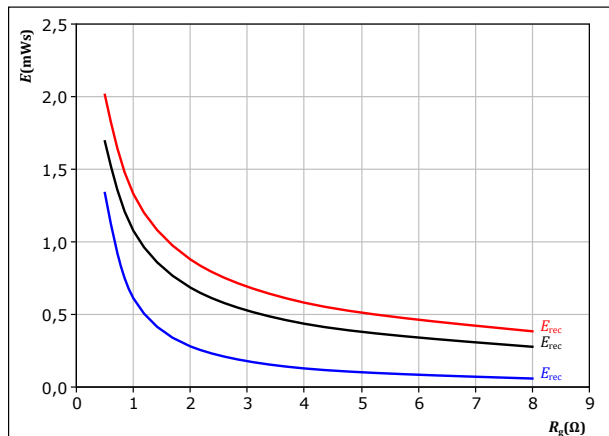
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 12.

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  
 $I_D = 96$  A

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



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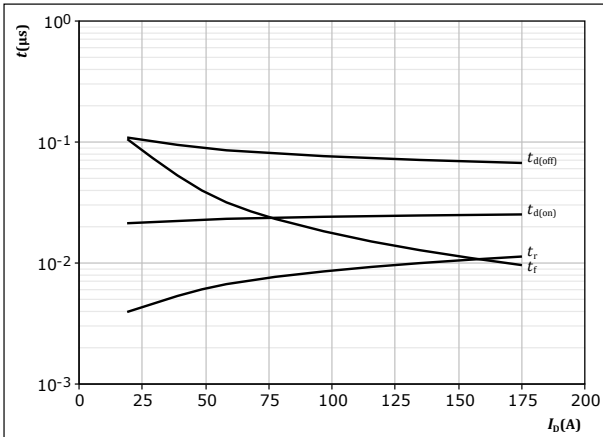
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## Half-Bridge Switching Characteristics

figure 13.

MOSFET

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



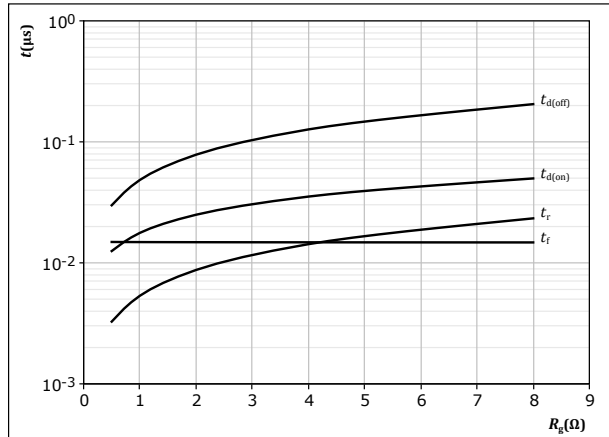
With an inductive load at

$T_j = 150$  °C  
 $V_{DS} = 600$  V  
 $V_{GS} = -4/15$  V  
 $R_{gon} = 2$  Ω  
 $R_{goff} = 2$  Ω

figure 14.

MOSFET

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



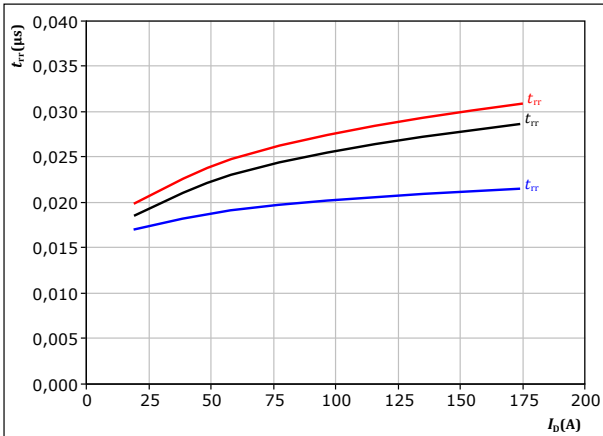
With an inductive load at

$T_j = 150$  °C  
 $V_{DS} = 600$  V  
 $V_{GS} = -4/15$  V  
 $I_D = 96$  A

figure 15.

MOSFET

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

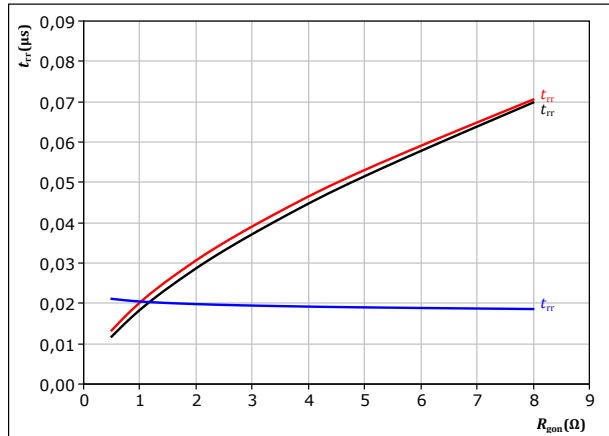


At  $V_{DS} = 600$  V  
 $V_{GS} = -4/15$  V  
 $R_{gon} = 2$  Ω  
 $T_j$ : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 16.

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  
 $I_D = 96$  A  
 $T_j$ : 25 °C (blue), 125 °C (black), 150 °C (red)



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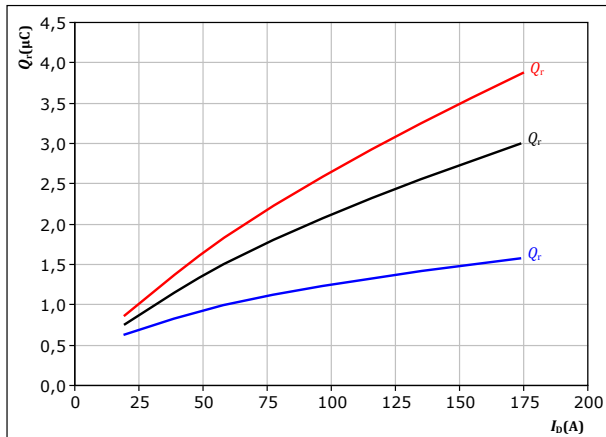
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datasheet

## Half-Bridge Switching Characteristics

figure 17. MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$

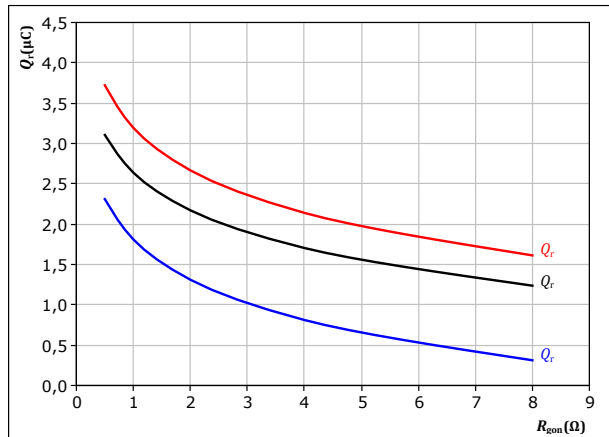


At  $V_{DS} = 600$  V  
 $V_{GS} = -4/15$  V  
 $R_{gon} = 2$   $\Omega$   
 $T_j$ : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 18. MOSFET

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

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

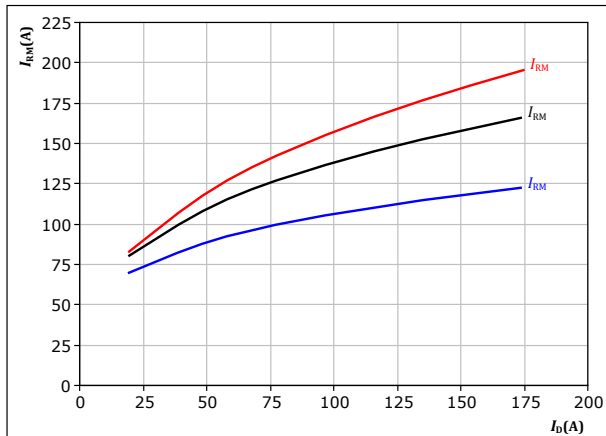


At  $V_{DS} = 600$  V  
 $V_{GS} = -4/15$  V  
 $I_D = 96$  A  
 $T_j$ : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 19. MOSFET

Typical peak reverse recovery current as a function of drain current

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

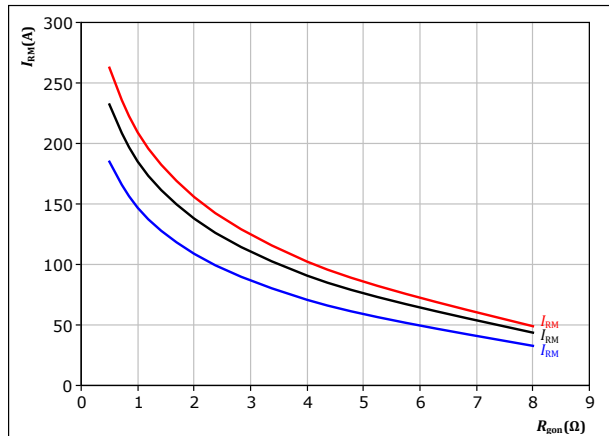


At  $V_{DS} = 600$  V  
 $V_{GS} = -4/15$  V  
 $R_{gon} = 2$   $\Omega$   
 $T_j$ : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 20. 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  
 $I_D = 96$  A  
 $T_j$ : 25 °C (blue), 125 °C (black), 150 °C (red)

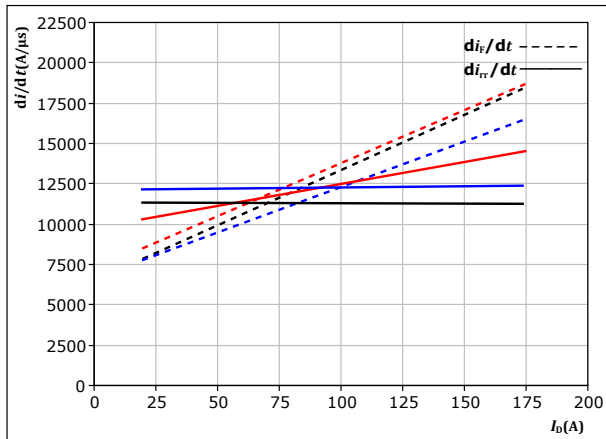


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## Half-Bridge Switching Characteristics

figure 21. MOSFET

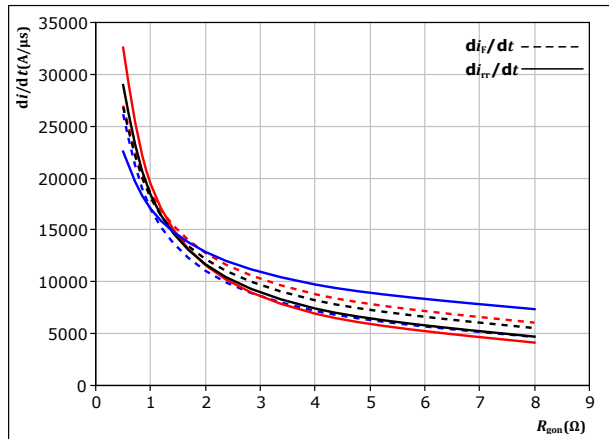
Typical rate of fall of forward and reverse recovery current as a function of drain current  
 $di_f/dt, di_r/dt = f(I_D)$



At  $V_{DS} = 600$  V  
 $V_{GS} = -4/15$  V  
 $R_{gon} = 2$   $\Omega$   
 $T_j = 25$  °C  
 $125$  °C  
 $150$  °C

figure 22. MOSFET

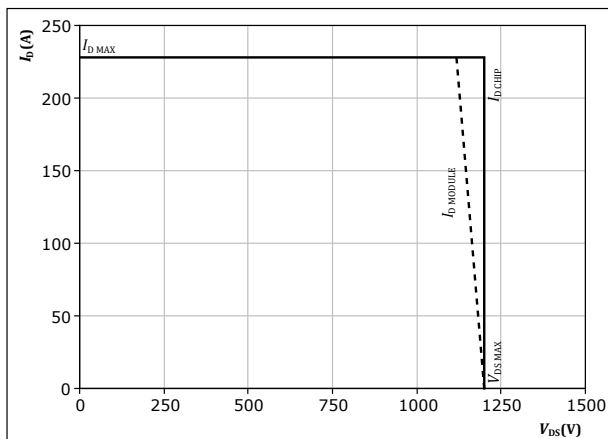
Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor  
 $di_f/dt, di_r/dt = f(R_{gon})$



At  $V_{DS} = 600$  V  
 $V_{GS} = -4/15$  V  
 $I_D = 96$  A  
 $T_j = 25$  °C  
 $125$  °C  
 $150$  °C

figure 23. MOSFET

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



At  $T_j = 150$  °C  
 $R_{gon} = 2$   $\Omega$   
 $R_{goff} = 2$   $\Omega$



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## Half-Bridge Switching Definitions

figure 24. MOSFET

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

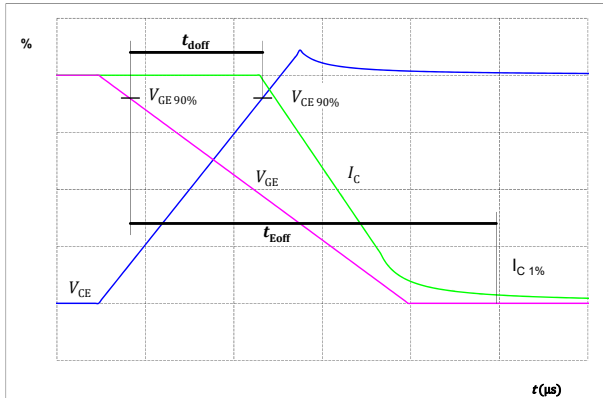


figure 25. MOSFET

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

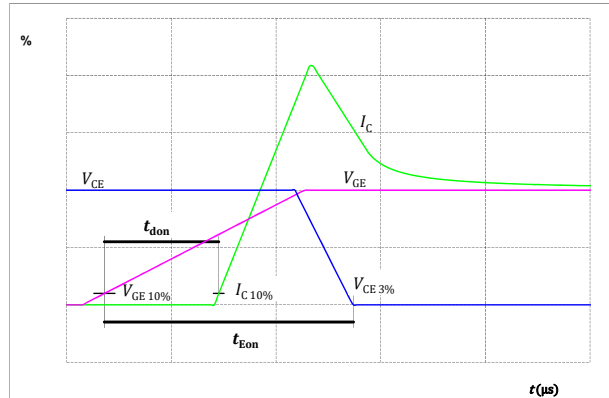


figure 26. MOSFET

Turn-off Switching Waveforms & definition of  $t_f$

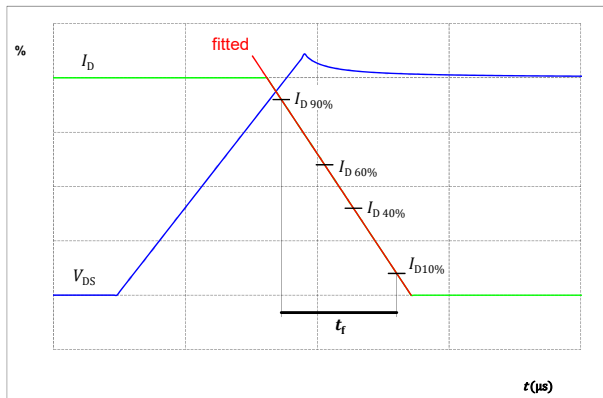
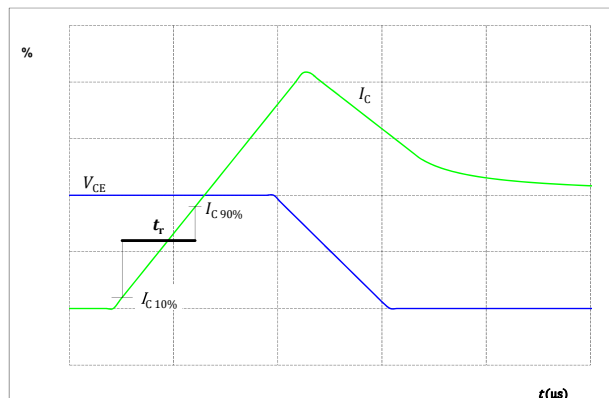


figure 27. MOSFET

Turn-on Switching Waveforms & definition of  $t_r$





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## Half-Bridge Switching Definitions

figure 28. FWD

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

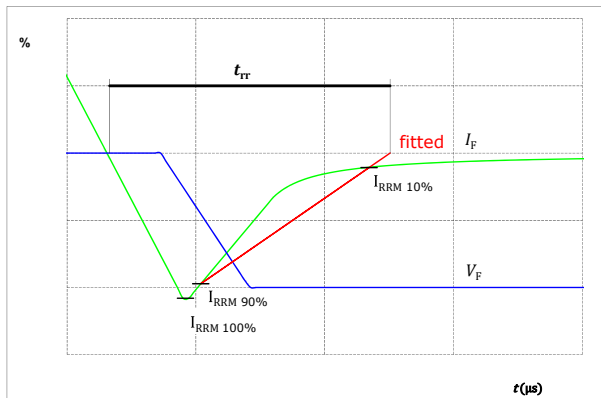


figure 29. FWD

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

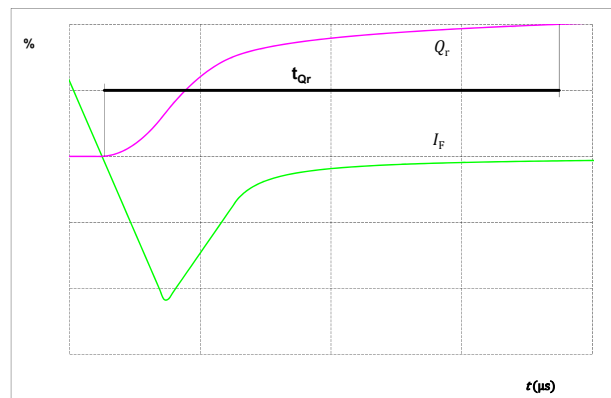
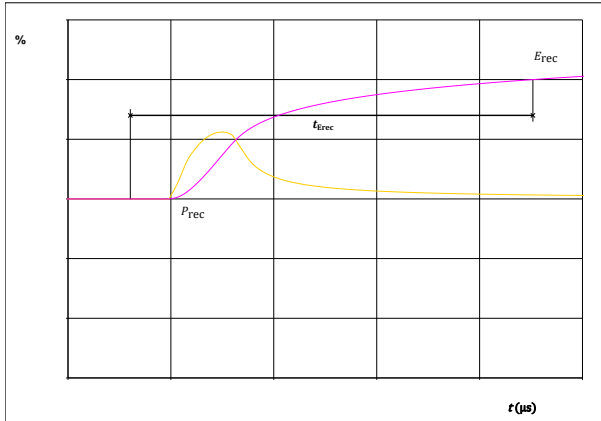


figure 30. FWD


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-EY122PA009ME-LU37F18T
With thermal paste (5,2 W/mK, PTM6000HV)	10-EY122PA009ME-LU37F18T-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-EY122PA009ME-LU37F18T-/3/

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

center of press-fit pin head  
pin head type "T", PCB drilled through-hole  $\varnothing 1 \text{ mm} \pm 0.09 / -0.06$   
for further PCB design rules refer to the latest working instruction

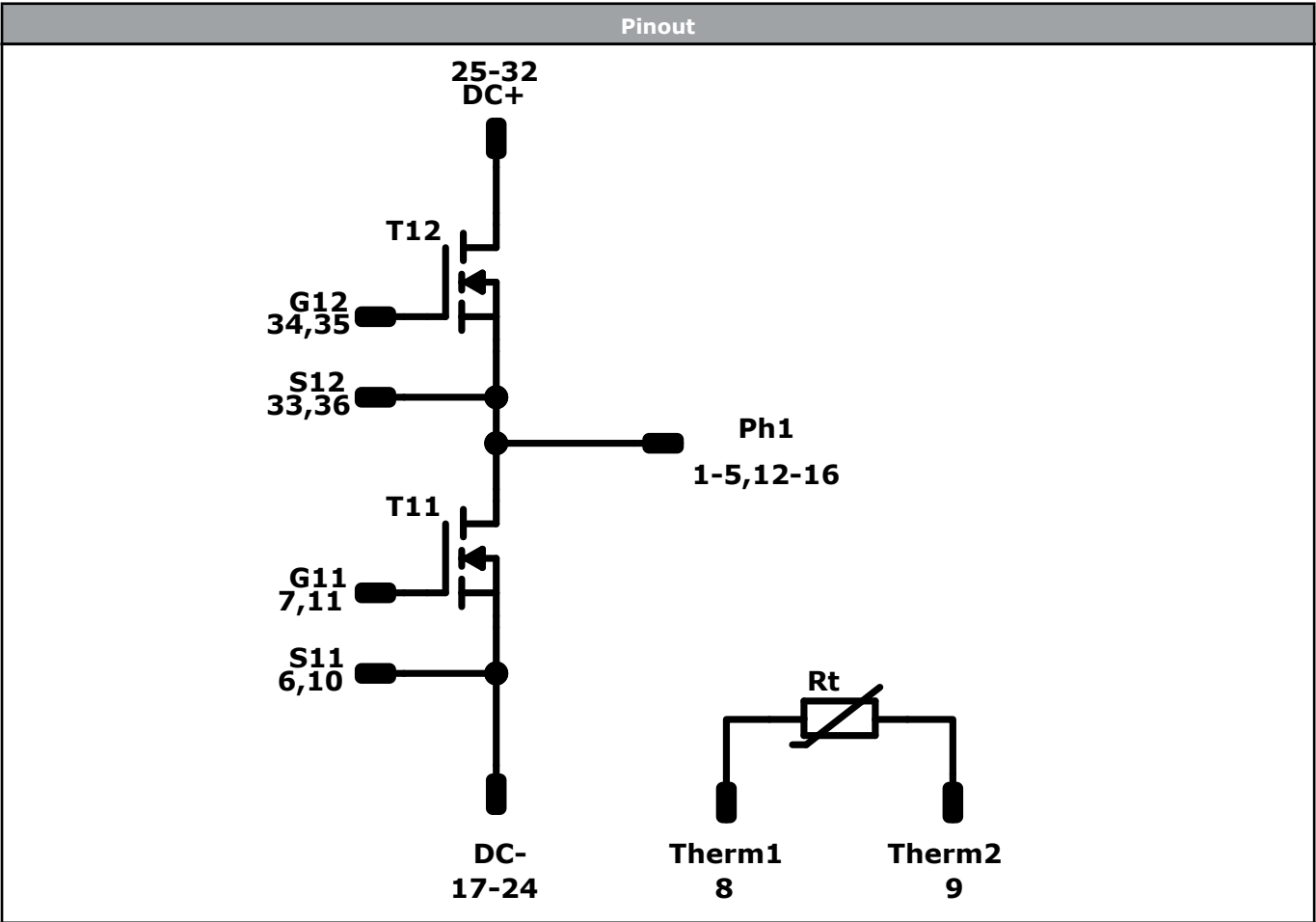
10.0 ±0.1  
36.0 ±0.5

10.0 ±0.1  
36.0 ±0.5

Tolerance of pin positions:  $\pm 0.1 \text{ mm}$  at the end of pins  
Dimension of coordinate axis is only offset without tolerance



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Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12	MOSFET	1200 V	8,67 mΩ	Half-Bridge Switch	
Rt	Thermistor			Thermistor	



Vincotech

10-EY122PA009ME-LU37F18T  
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-EY122PA009ME-LU37F18T-D1-14	19 Apr. 2024		

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