



Vincotech

10-EY124PA009ME-LP40F08T

datasheet

fastPACK E2 SiC

1200 V / 8,67 mΩ

Topology features

- Kelvin Emitter for improved switching performance
- Open Emitter configuration
- Temperature sensor

Component features

- Fast intrinsic diode with low reverse recovery
- High blocking voltage with low on-resistance
- High speed switching with low capacitance

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

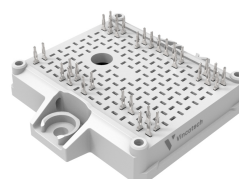
Target applications

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

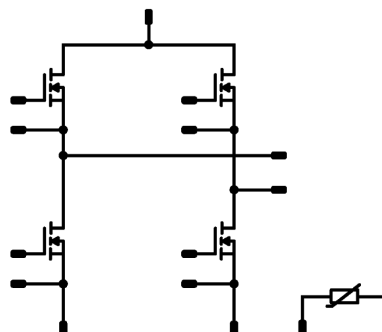
Types

- 10-EY124PA009ME-LP40F08T

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
H-Bridge Switch				
Drain-source voltage	V_{DS}		1200	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	105	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	456	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	191	W
Gate-source voltage	V_{GSS}	static	-4 / 15	V
		dynamic	-8 / 19	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			9,14	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	

H-Bridge Switch

Static

Drain-source on-state resistance ⁽¹⁾	$r_{DS(on)}$		15		114	25 175	6,07	8,67 16,34	11,3	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}	$f = 100$ 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 ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						0,5		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	$t_{d(on)}$	$R_{gon} = 4\ \Omega$ $R_{goff} = 4\ \Omega$	-4/15	600	100	25		43,22		ns	
						125		40,39			
						150		39,81			
Rise time	t_r					25		17,46		ns	
						125		16,06			
						150		15,52			
Turn-off delay time	$t_{d(off)}$					25		114,57		ns	
						125		123,74			
						150		127,34			
Fall time	t_f					25		15		ns	
						125		12,87			
						150		15,33			
Turn-on energy (per pulse)	E_{on}	$Q_{rFWD}=1,31\ \mu C$ $Q_{rFWD}=1,6\ \mu C$ $Q_{rFWD}=1,79\ \mu C$	25		1,83		mWs				
			125		1,68						
			150		1,65						
Turn-off energy (per pulse)	E_{off}		25		0,927		mWs				
			125		0,895						
			150		0,854						
Peak recovery current	I_{RRM}	$di/dt=6205\ A/\mu s$ $di/dt=7358\ A/\mu s$ $di/dt=7973\ A/\mu s$	25		81,81		A				
			125		91,96						
			150		96,67						
Reverse recovery time	t_{rr}		25		26,38		ns				
			125		28,64						
			150		30,15						
Recovered charge	Q_r		25		1,31		μC				
			125		1,6						
			150		1,79						
Reverse recovered energy	E_{tec}		25		0,319		mWs				
			125		0,471						
			150		0,552						
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$	25		9438,68		A/ μs					
		125		8090,6							
		150		8008,93							



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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		k Ω
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	

⁽¹⁾ Value at chip level

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



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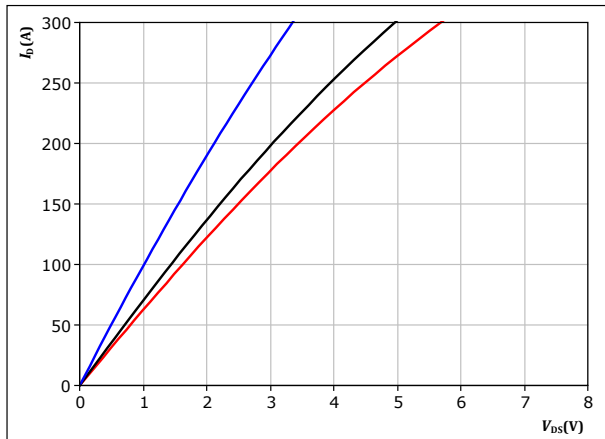
datasheet

H-Bridge Switch Characteristics

figure 1. MOSFET

Typical output characteristics including $R_{DS(on)} + R_{DS}$

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



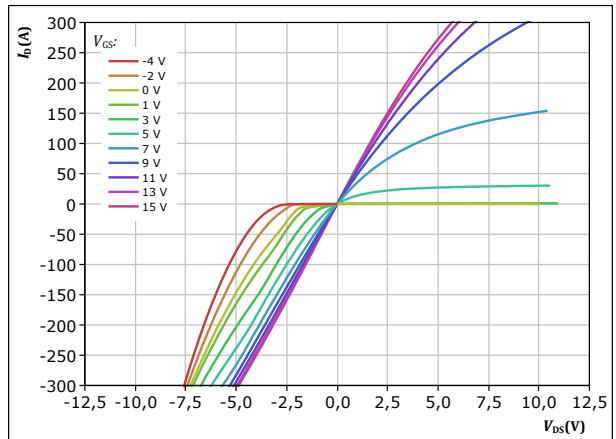
$t_p = 250 \mu s$
 $V_{GS} = 15 V$

$T_j:$
— 25 °C
— 125 °C
— 150 °C

figure 2. MOSFET

Typical output characteristics including $R_{DS(on)} + R_{DS}$

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

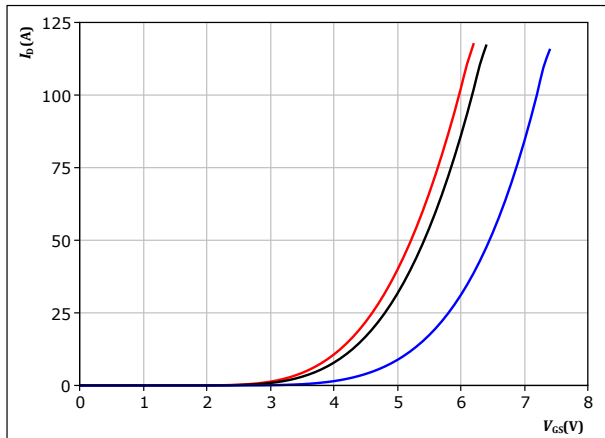


$t_p = 250 \mu s$
 $T_j = 150 ^\circ C$
 V_{GS} from -4 V to 15 V in steps of 2 V

figure 3. MOSFET

Typical transfer characteristics

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



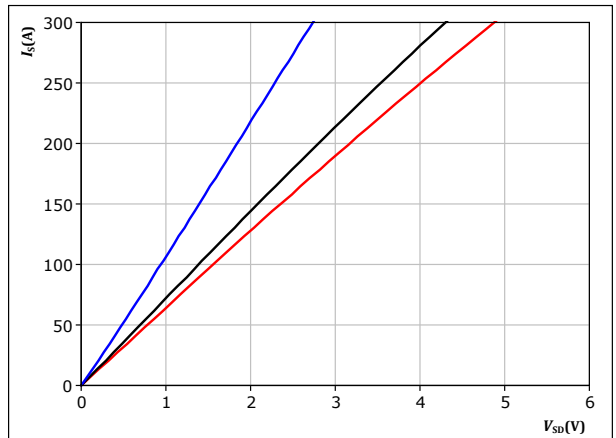
$t_p = 250 \mu s$
 $V_{DS} = 20 V$

$T_j:$
— 25 °C
— 125 °C
— 150 °C

figure 4. MOSFET

Typical reverse drain current characteristics including $R_{DS(on)} + R_{DS}$

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



$t_p = 250 \mu s$
 $V_{GS} = 15 V$

$T_j:$
— 25 °C
— 125 °C
— 150 °C



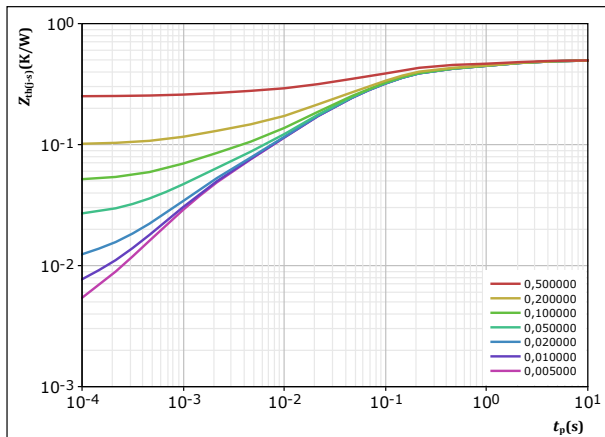
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H-Bridge Switch Characteristics

figure 5. MOSFET

Transient thermal impedance as a function of pulse width

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



$$D = t_p / T$$

$$R_{th(j-a)} = 0,496 \text{ K/W}$$

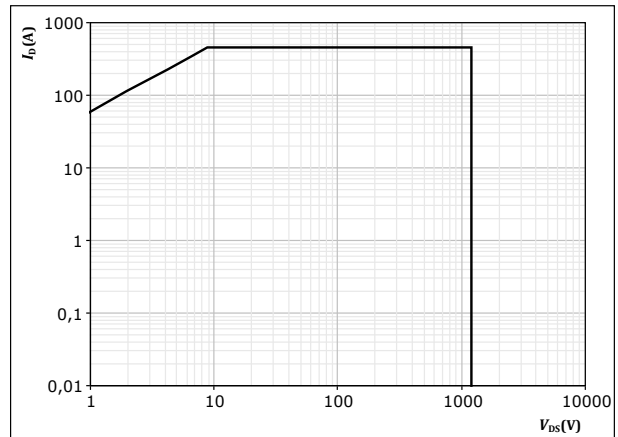
MOSFET thermal model values

R (K/W)	τ (s)
1,94E-02	7,88E+00
8,62E-02	1,12E+00
2,55E-01	8,89E-02
1,06E-01	1,49E-02
3,46E-02	1,33E-03

figure 6. MOSFET

Safe operating area

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



D = single pulse

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

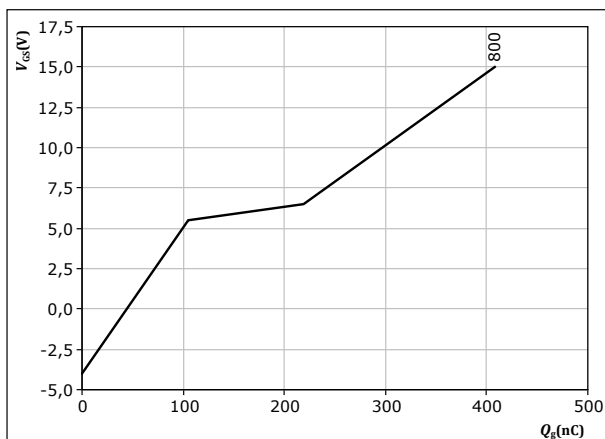
$$V_{GS} = 15 \text{ V}$$

$$T_j = T_{jmax}$$

figure 7. MOSFET

Gate voltage vs gate charge

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



$$I_D = 114 \text{ A}$$

$$T_j = 25 \text{ } ^\circ\text{C}$$



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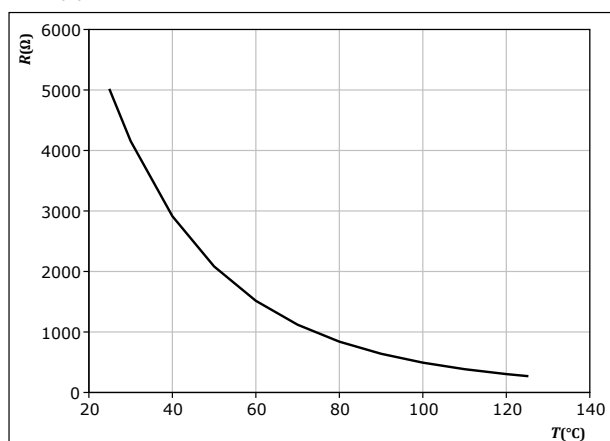
Thermistor Characteristics

figure 8.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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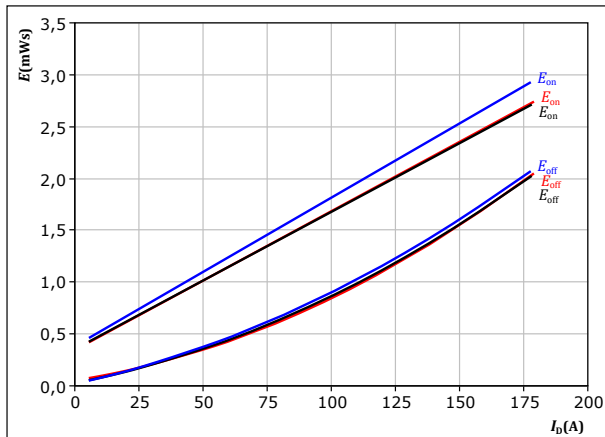
H-Bridge Switching Characteristics

figure 9.

MOSFET

Typical switching energy losses as a function of drain current

$$E = f(I_D)$$



With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $R_{gon} = 4 \text{ } \Omega$
 $R_{goff} = 4 \text{ } \Omega$

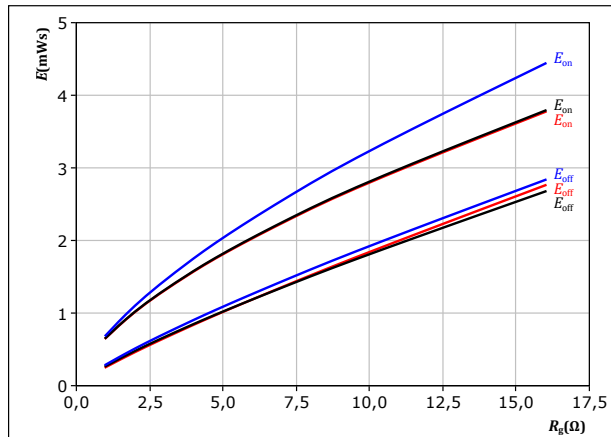
T_j :
— 25 °C
— 125 °C
— 150 °C

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

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $I_D = 100 \text{ A}$

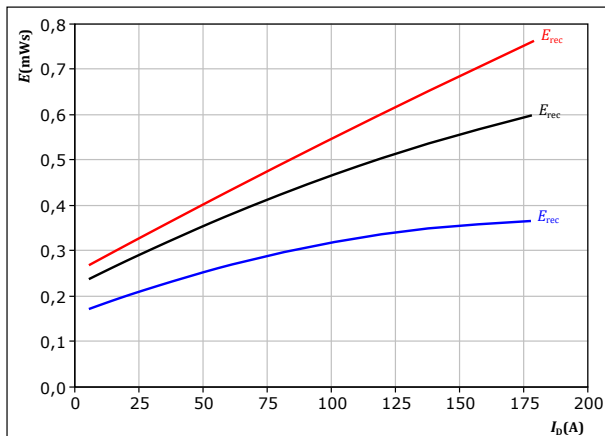
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 11.

MOSFET

Typical reverse recovered energy loss as a function of drain current

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



With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $R_{gon} = 4 \text{ } \Omega$

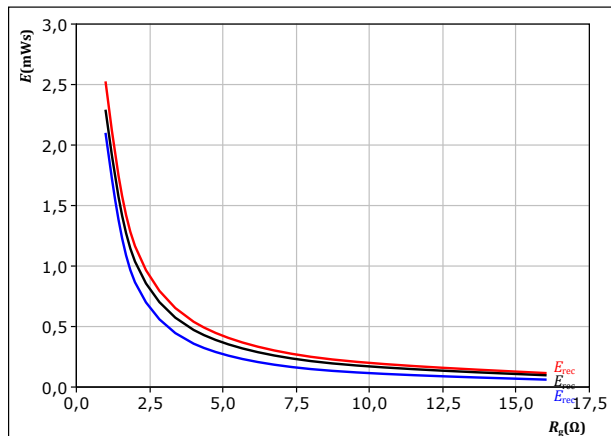
T_j :
— 25 °C
— 125 °C
— 150 °C

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

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $I_D = 100 \text{ A}$

T_j :
— 25 °C
— 125 °C
— 150 °C



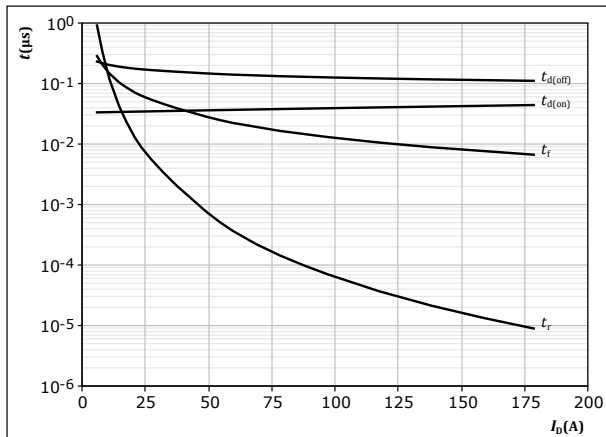
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H-Bridge Switching Characteristics

figure 13. MOSFET

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

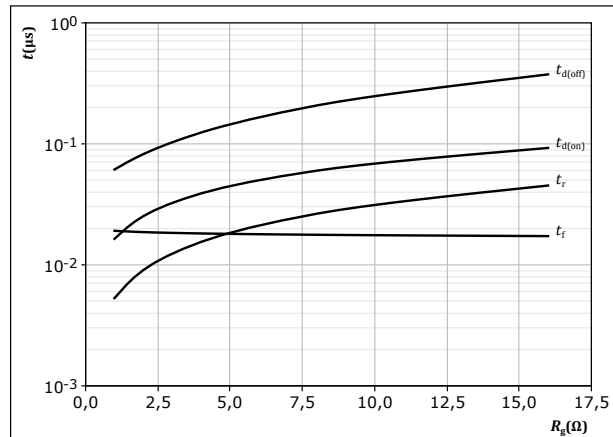


With an inductive load at

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

figure 14. MOSFET

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

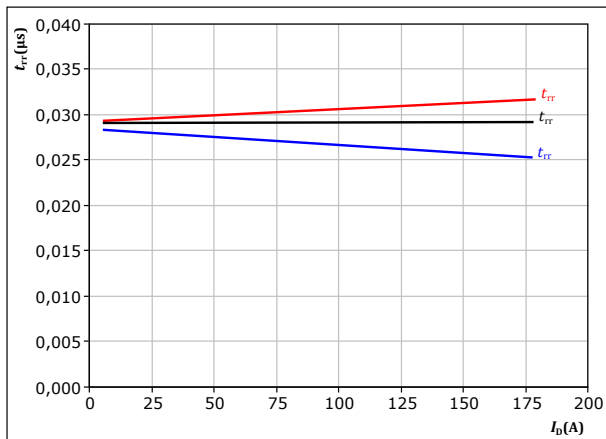


With an inductive load at

$T_j = 150$ °C
 $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $I_D = 100$ A

figure 15. MOSFET

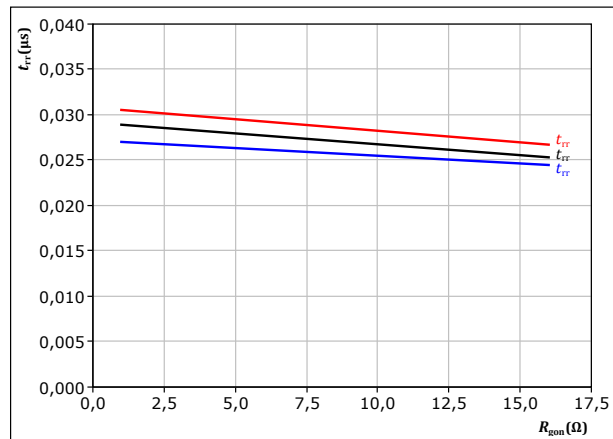
Typical reverse recovery time as a function of drain current
 $t_{rr} = f(I_D)$



At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{gon} = 4$ 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
 $I_D = 100$ A
 $T_j: 25$ °C (blue)
 125 °C (black)
 150 °C (red)



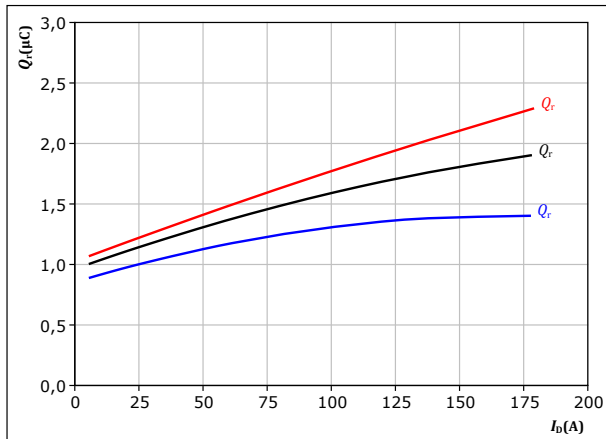
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H-Bridge Switching Characteristics

figure 17. MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$

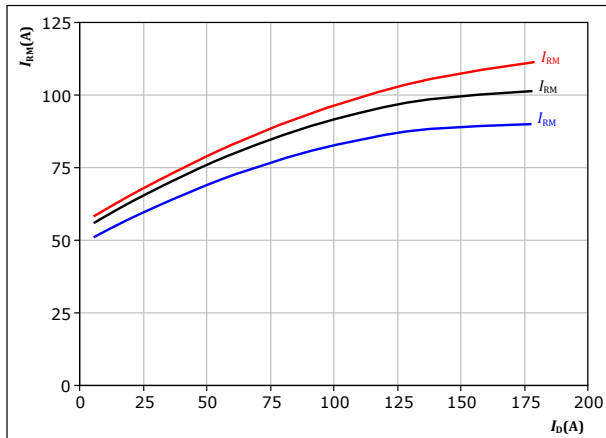


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{gon} = 4$ Ω
 T_j : 25 °C
125 °C
150 °C

figure 19. MOSFET

Typical peak reverse recovery current as a function of drain current

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

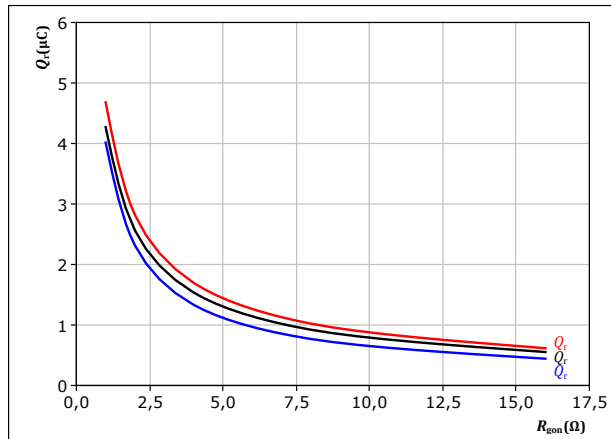


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{gon} = 4$ Ω
 T_j : 25 °C
125 °C
150 °C

figure 18. MOSFET

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

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

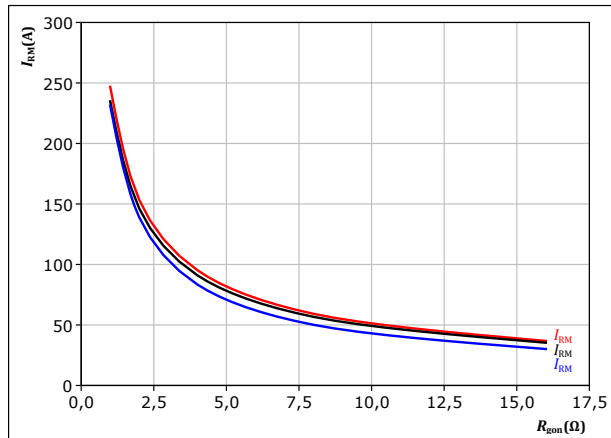


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $I_D = 100$ A
 T_j : 25 °C
125 °C
150 °C

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
 $I_D = 100$ A
 T_j : 25 °C
125 °C
150 °C

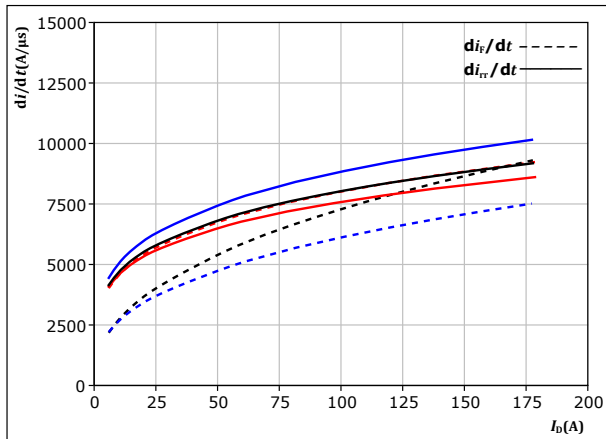


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H-Bridge Switching Characteristics

figure 21. MOSFET

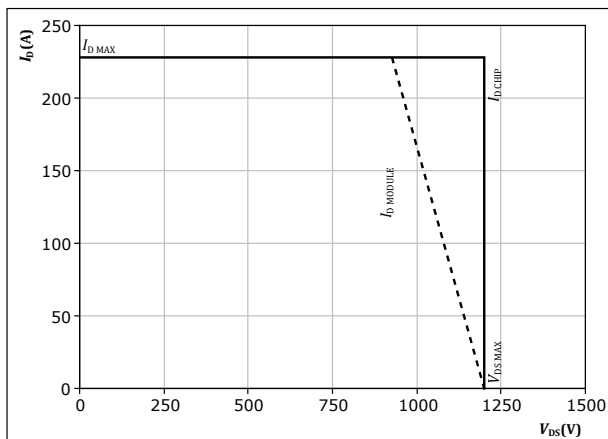
Typical rate of fall of forward and reverse recovery current as a function of drain current
 $di_f/dt, di_r/dt = f(I_D)$



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

figure 23. MOSFET

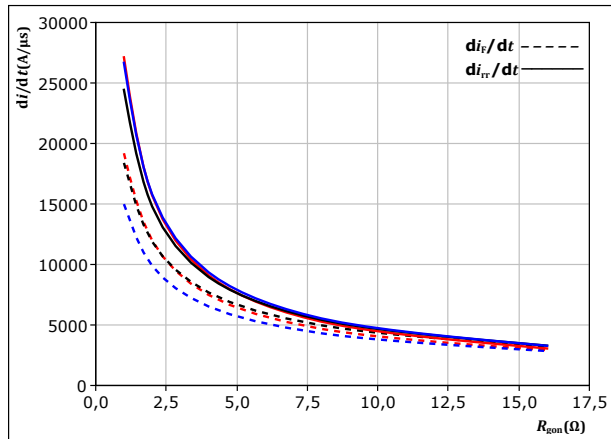
Reverse bias safe operating area
 $I_D = f(V_{DS})$



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

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
 $I_D = 100$ A
 $T_j = 25$ °C
 $T_j = 125$ °C
 $T_j = 150$ °C



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H-Bridge Switching Definitions

figure 24. MOSFET

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

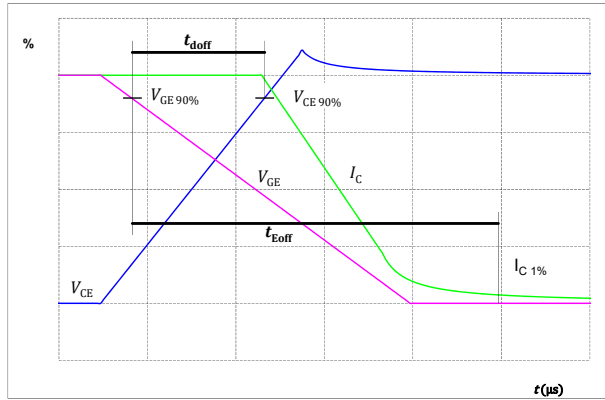


figure 25. MOSFET

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

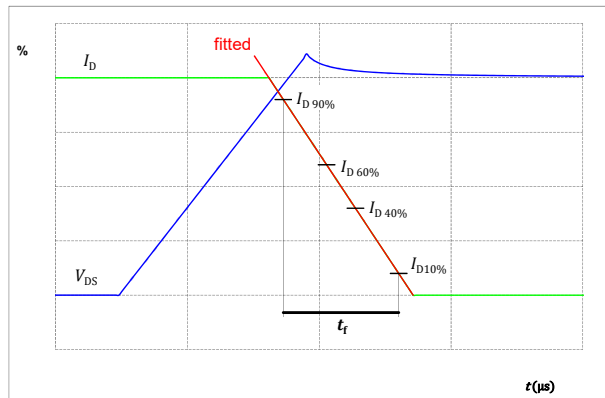
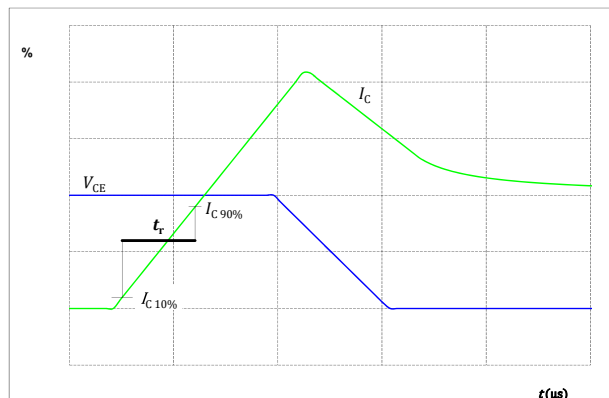


figure 27. MOSFET

Turn-on Switching Waveforms & definition of t_r





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H-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)

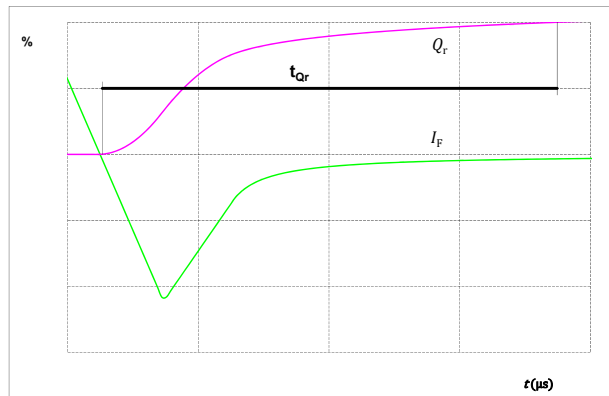
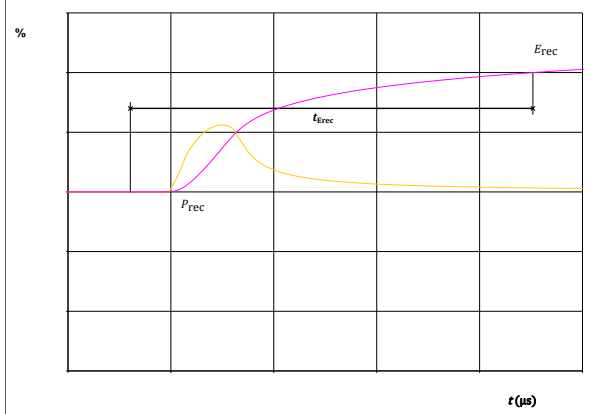


figure 30.

FWD

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





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datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	10-EY124PA009ME-LP40F08T
With thermal paste (5,2 W/mK, PTM6000HV)	10-EY124PA009ME-LP40F08T-/7/

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

Outline

Pin table [mm]

Pin	X	Y	Function
1	3,2	0	AC2
2	0	0	AC2
3	3,2	3,2	AC2
4	0	3,2	AC2
5	3,2	9,6	S3
6	3,2	12,8	G3
7	3,2	25,6	S1
8	0	25,6	G1
9	3,2	32	AC1
10	0	32	AC1
11	3,2	35,2	AC1
12	0	35,2	AC1
13	3,2	48	T1
14	0	48	T2
15	32	48	DC-1
16	32	44,8	DC-1
17	32	41,6	DC-1
18	28,8	41,6	DC-1
19	28,8	48	G2
20	28,8	44,8	S2
21	32	32	DC+
22	28,8	32	DC+
23	32	28,8	DC+
24	32	25,6	DC+
25	32	22,4	DC+
26	32	19,2	DC+
27	32	16	DC+
28	28,8	16	DC+
29	32	6,4	DC-2
30	28,8	6,4	DC-2
31	32	3,2	DC-2
32	32	0	DC-2
33	28,8	3,2	S4
34	28,8	0	G4

center of press-fit pin head
pin head type 'T': PCB pushed through hole \varnothing 1mm \pm 0.09 / -0.06
for further PCB design rules refer to the latest handling instruction

1008 ±0.1
8.4 ±0.5

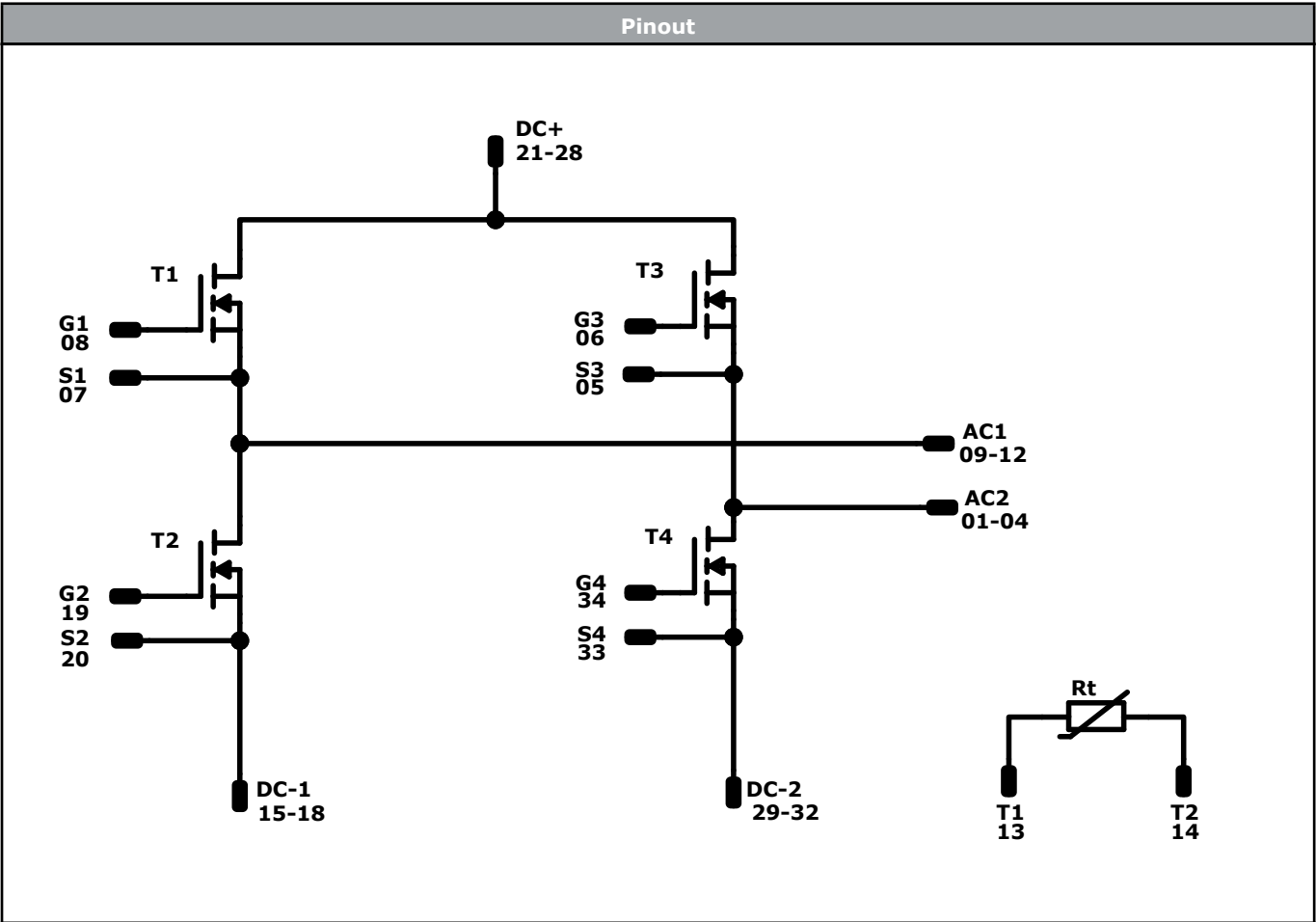
10
16

10
16

Tolerance of pinposition: +0.4mm at the end of pins
Dimension of coordinate axis is only offset without tolerance



Vincotech




Identification					
ID	Component	Voltage	Current	Function	Comment
T2, T1, T4, T3	MOSFET	1200 V	8,67 mΩ	H-Bridge Switch	
Rt	Thermistor			Thermistor	



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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.				

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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.