



flowPACK E1 SiC

1200 V / 40 mΩ

Topology features

- 3ph Inverter
- Low and high side Kelvin Emitter for improved switching performance
- MOSFET
- Open Emitter configuration
- Temperature sensor

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
- Industrial Drives
- Servo Drives

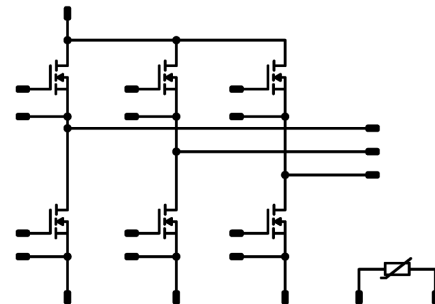
Types

- 10-EZ126PB040MS01-LS18F73T

flow E1 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_{DSS}		1200	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	45	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	120	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	81	W
Gate-source voltage	V_{GSS}		0 / 22	V
		dynamic	-5 / 22	
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			8,74	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	$r_{DS(on)}$	18		30	25 125 150		37,9 36,8 39,2	55,2 ⁽¹⁾	mΩ
Gate-source threshold voltage	$V_{GS(th)}$			0,003	25	3,6	4,6	5,6	V
Gate to Source Leakage Current	I_{GSS}	22	0		25			200	nA
Zero Gate Voltage Drain Current	I_{DSS}	0	1200		25			100	μA
Internal gate resistance	r_g						3		Ω
Gate charge	Q_g	0/18		30	25		185		nC
Short-circuit input capacitance	C_{iss}						4000		pF
Short-circuit output capacitance	C_{oss}	0	10	0	25		1300		
Reverse transfer capacitance	C_{rss}						110		

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					1,17		K/W
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10-EZ126PB040MS01-LS18F73T
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		19,08 16,7 16,58		ns
Rise time	t_r	$R_{gon} = 4 \Omega$ $R_{goff} = 4 \Omega$				25 125 150		9,24 7,8 7,31		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		46,37 54,06 56,76		ns
Fall time	t_f				25 125 150		15,72 21,09 19,9		ns	
Turn-on energy (per pulse)	E_{on}	$Q_{rFWD}=0,236 \mu C$ $Q_{rFWD}=0,485 \mu C$ $Q_{rFWD}=0,607 \mu C$				25 125 150		0,373 0,353 0,367		mWs
Turn-off energy (per pulse)	E_{off}		0/18	600	32	25 125 150		0,113 0,11 0,112		mWs
Peak recovery current	I_{RRM}					25 125 150		29,49 43,86 50,24		A
Reverse recovery time	t_{rr}					25 125 150		13,53 18,03 18,9		ns
Recovered charge	Q_r	$di/dt=3931 A/\mu s$ $di/dt=5128 A/\mu s$ $di/dt=5348 A/\mu s$				25 125 150		0,236 0,485 0,607		μC
Reverse recovered energy	E_{rec}					25 125 150		0,045 0,153 0,206		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		6355,59 4916,19 6488,35		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]	T_j [°C]	Min	Typ	Max	

Thermistor

Static

Rated resistance	R					25		5		kΩ
Deviation of R100	$A_{R/R}$	$R_{100} = 499 \Omega$				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.

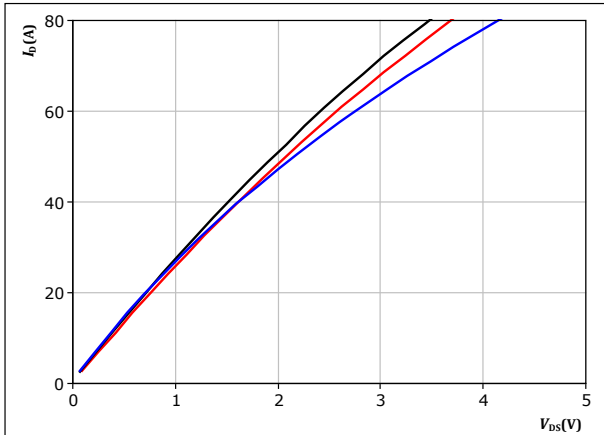


Inverter Switch Characteristics

figure 1. MOSFET

Typical output characteristics

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

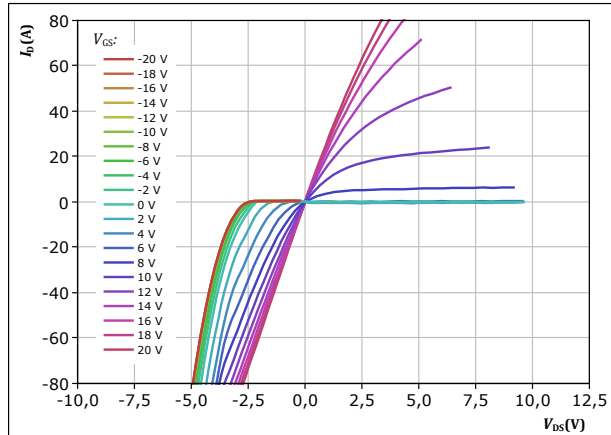


$t_p = 250 \mu s$
 $V_{GS} = 18 V$
 $T_j:$ — 25 °C
 — 125 °C
 — 150 °C

figure 2. MOSFET

Typical output characteristics

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

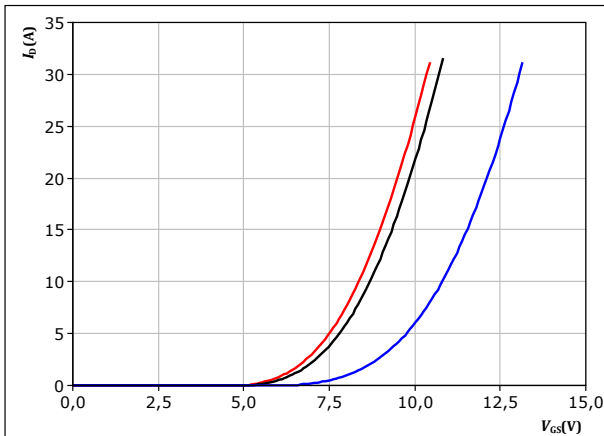


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GS} from -20 V to 20 V in steps of 2 V

figure 3. MOSFET

Typical transfer characteristics

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

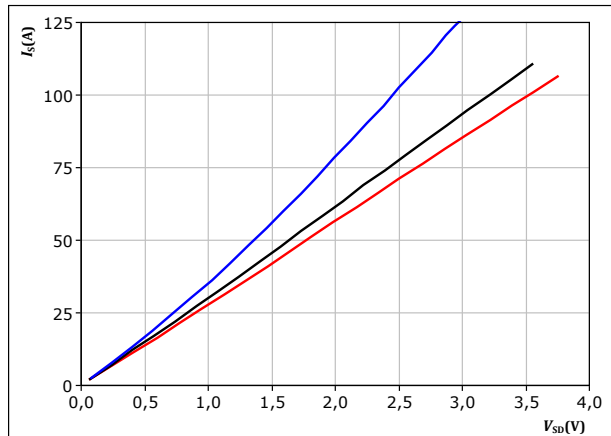


$t_p = 250 \mu s$
 $V_{DS} = 10 V$
 $T_j:$ — 25 °C
 — 125 °C
 — 150 °C

figure 4. MOSFET

Typical reverse drain current characteristics

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



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

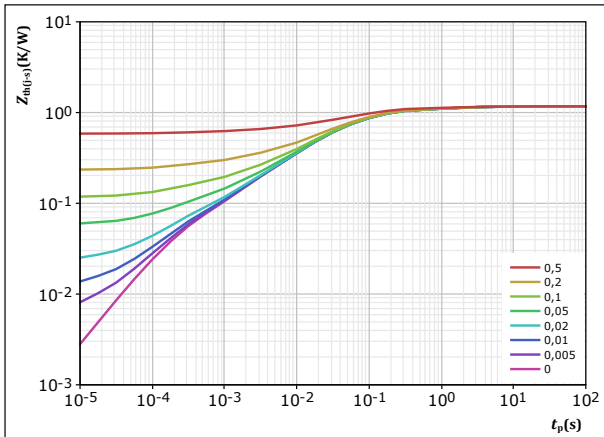


Inverter Switch Characteristics

figure 5. MOSFET

Transient thermal impedance as a function of pulse width

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



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

$$R_{th(j-c)} = 1,171 \text{ K/W}$$

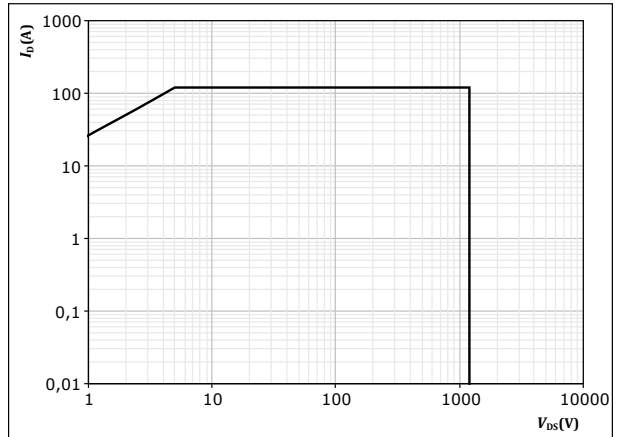
MOSFET thermal model values

R (K/W)	τ (s)
2,35E-02	7,28E+00
1,06E-01	1,23E+00
4,75E-01	1,01E-01
4,14E-01	2,05E-02
1,08E-01	2,42E-03
4,49E-02	2,08E-04

figure 6. MOSFET

Safe operating area

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



D = single pulse

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

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

$$T_j = T_{jmax}$$

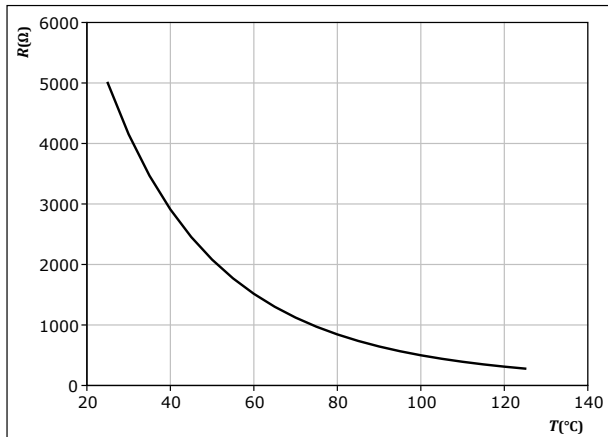


Thermistor Characteristics

figure 7. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

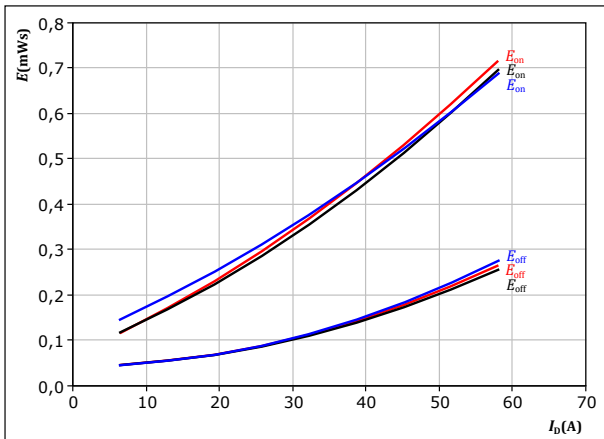




Inverter Switching Characteristics

figure 8. MOSFET

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

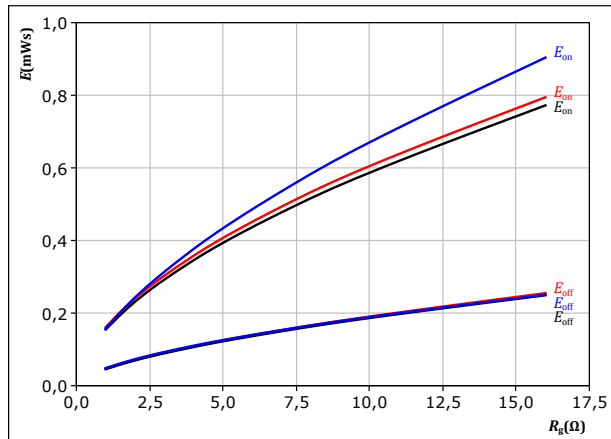


With an inductive load at

$V_{DS} =$	600	V	$T_j:$	— 25 °C
$V_{GS} =$	0/18	V		— 125 °C
$R_{gon} =$	4	Ω		— 150 °C
$R_{goff} =$	4	Ω		

figure 9. MOSFET

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

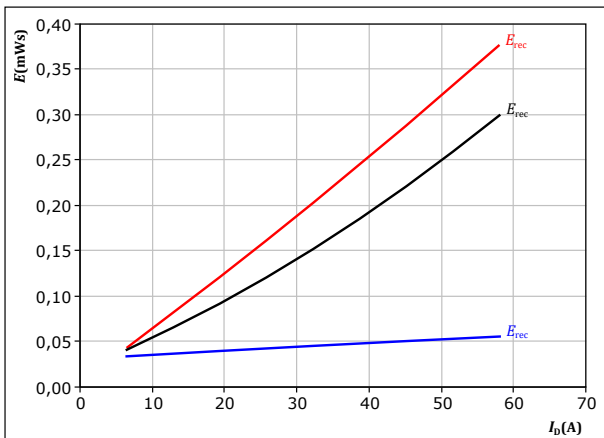


With an inductive load at

$V_{DS} =$	600	V	$T_j:$	— 25 °C
$V_{GS} =$	0/18	V		— 125 °C
$I_D =$	32	A		— 150 °C

figure 10. MOSFET

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

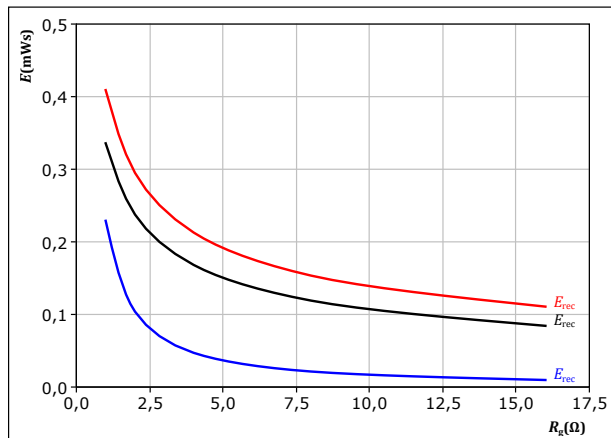


With an inductive load at

$V_{DS} =$	600	V	$T_j:$	— 25 °C
$V_{GS} =$	0/18	V		— 125 °C
$R_{gon} =$	4	Ω		— 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

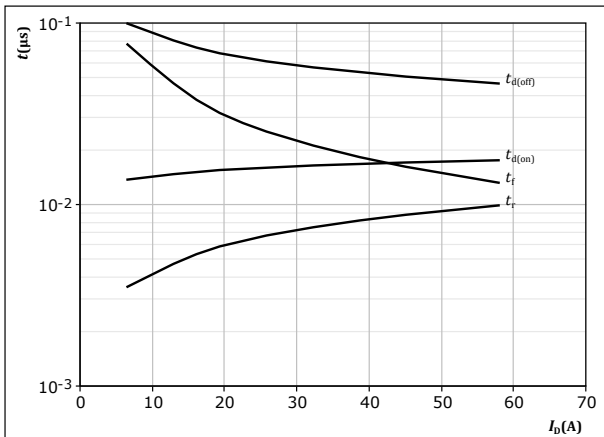
$V_{DS} =$	600	V	$T_j:$	— 25 °C
$V_{GS} =$	0/18	V		— 125 °C
$I_D =$	32	A		— 150 °C



Inverter Switching Characteristics

figure 12. MOSFET

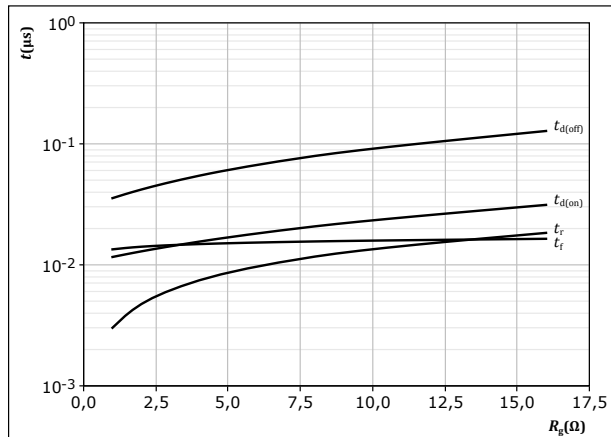
Typical switching times as a function of drain current
 $t = f(I_D)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{DS} = 600 \text{ V}$
 $V_{GS} = 0/18 \text{ V}$
 $R_{g(on)} = 4 \text{ } \Omega$
 $R_{g(off)} = 4 \text{ } \Omega$

figure 13. MOSFET

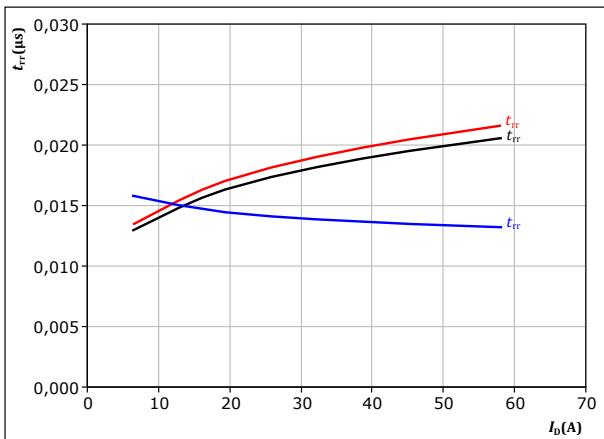
Typical switching times as a function of MOSFET turn on gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{DS} = 600 \text{ V}$
 $V_{GS} = 0/18 \text{ V}$
 $I_D = 32 \text{ A}$

figure 14. MOSFET

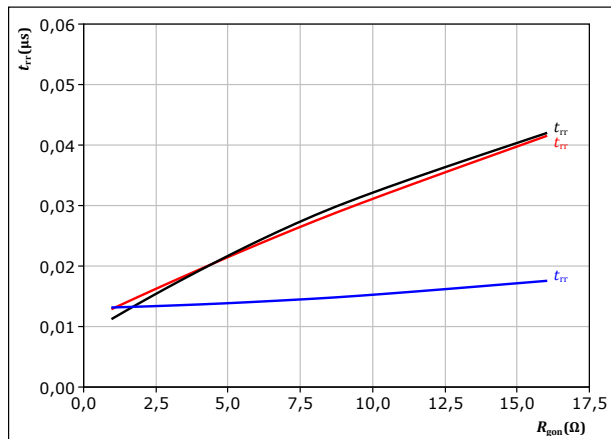
Typical reverse recovery time as a function of drain current
 $t_{rr} = f(I_D)$



At $V_{DS} = 600 \text{ V}$
 $V_{GS} = 0/18 \text{ V}$
 $R_{g(on)} = 4 \text{ } \Omega$
 $T_j: 25 \text{ }^\circ\text{C}$
 $125 \text{ }^\circ\text{C}$
 $150 \text{ }^\circ\text{C}$

figure 15. MOSFET

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



At $V_{DS} = 600 \text{ V}$
 $V_{GS} = 0/18 \text{ V}$
 $I_D = 32 \text{ A}$
 $T_j: 25 \text{ }^\circ\text{C}$
 $125 \text{ }^\circ\text{C}$
 $150 \text{ }^\circ\text{C}$

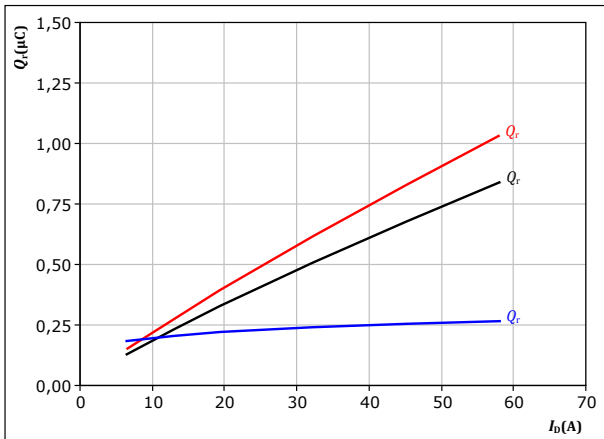


Inverter Switching Characteristics

figure 16. MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$



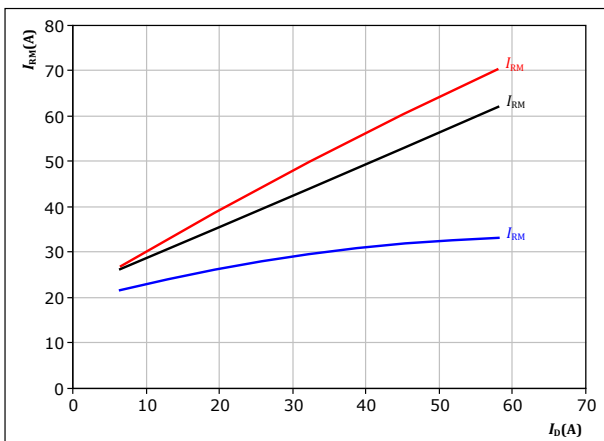
At $V_{DS} = 600$ V
 $V_{GS} = 0/18$ V
 $R_{gon} = 4$ Ω

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

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



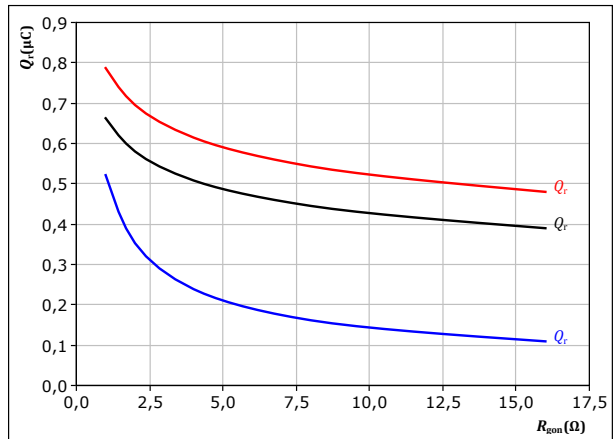
At $V_{DS} = 600$ V
 $V_{GS} = 0/18$ V
 $R_{gon} = 4$ Ω

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

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



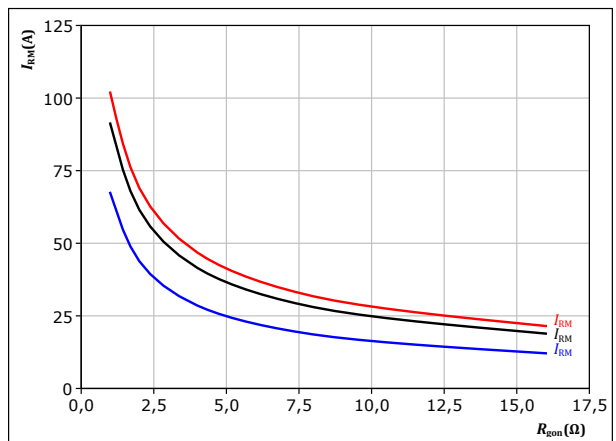
At $V_{DS} = 600$ V
 $V_{GS} = 0/18$ V
 $I_D = 32$ A

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
 $V_{GS} = 0/18$ V
 $I_D = 32$ A

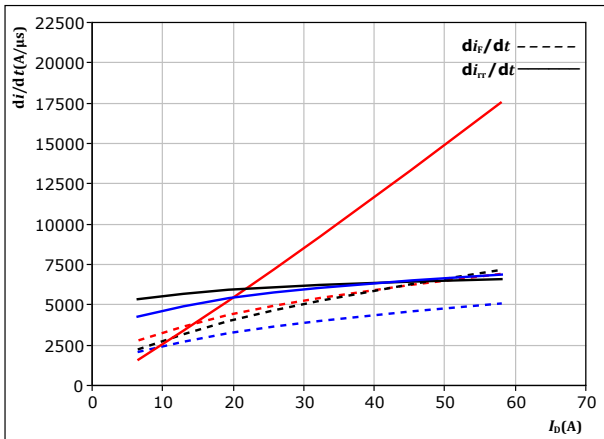
T_j : 25 °C (blue)
 125 °C (black)
 150 °C (red)



Inverter Switching Characteristics

figure 20. MOSFET

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

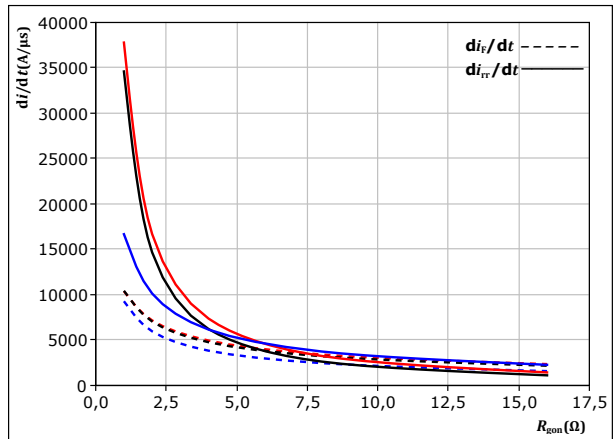


At $V_{DS} = 600$ V
 $V_{GS} = 0/18$ V
 $R_{g(on)} = 4$ Ω

$T_j = 25$ °C
 $T_j = 125$ °C
 $T_j = 150$ °C

figure 21. MOSFET

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



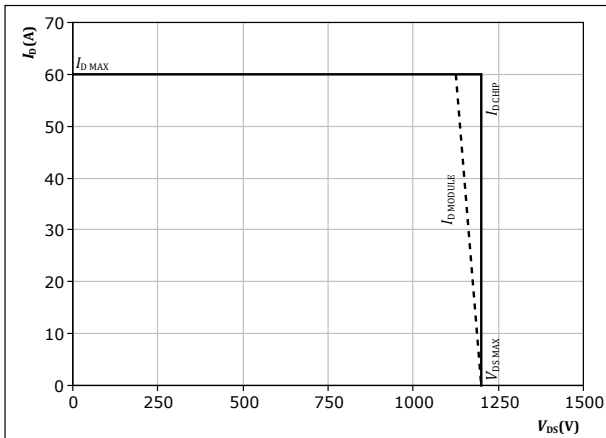
At $V_{DS} = 600$ V
 $V_{GS} = 0/18$ V
 $I_D = 32$ A

$T_j = 25$ °C
 $T_j = 125$ °C
 $T_j = 150$ °C

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



Inverter Switching Definitions

figure 23. MOSFET

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

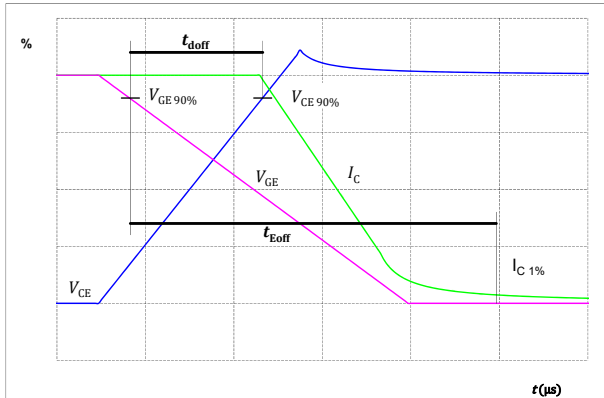


figure 24. MOSFET

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

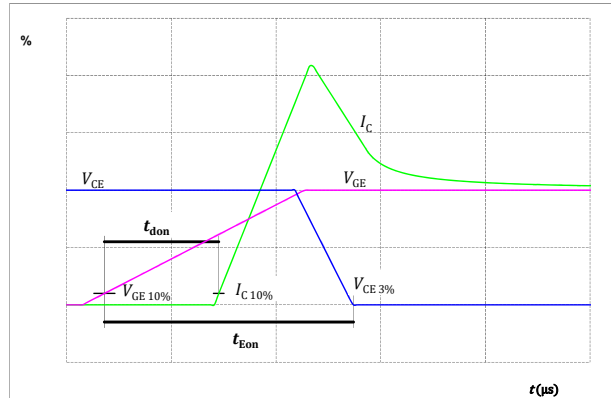


figure 25. MOSFET

Turn-off Switching Waveforms & definition of t_f

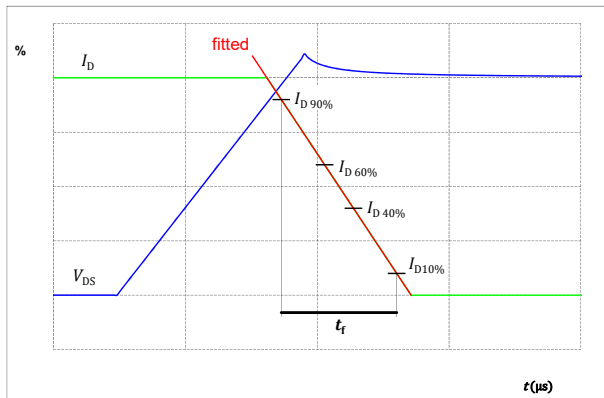
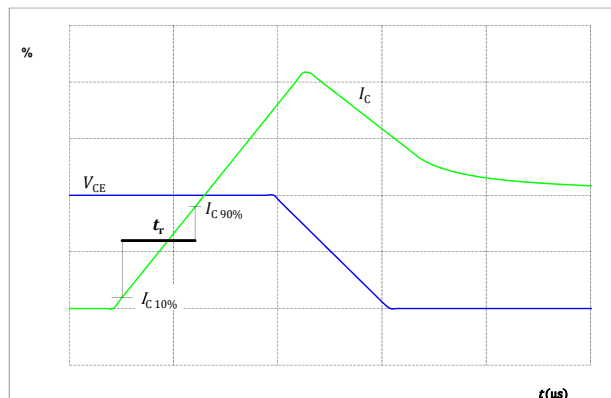


figure 26. MOSFET

Turn-on Switching Waveforms & definition of t_r





Inverter Switching Definitions

figure 27. FWD

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

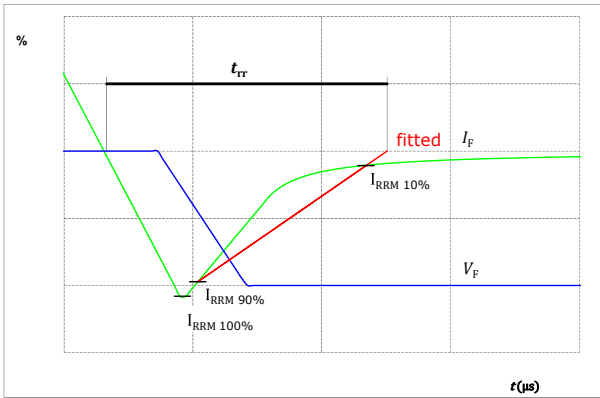


figure 28. FWD

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

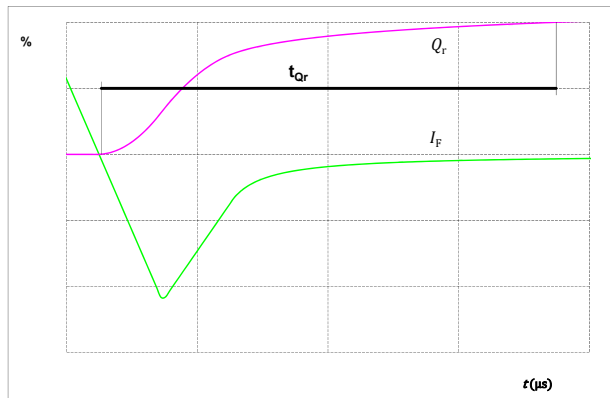
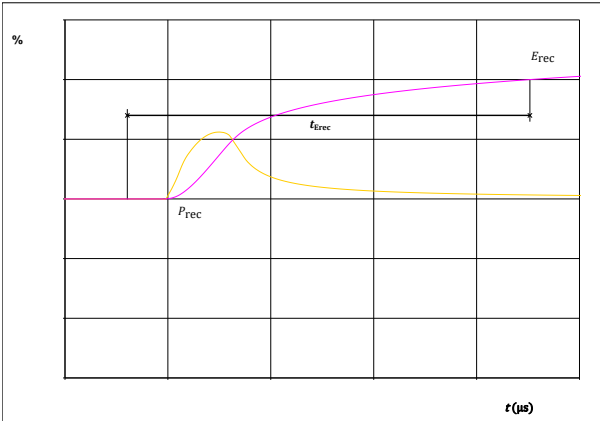


figure 29. FWD

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-EZ126PB040MS01-LS18F73T
With thermal paste (5,2 W/mK, PTM6000HV)	10-EZ126PB040MS01-LS18F73T-/7/

Marking						
	Text	Name	Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNNNN- TTTTTVV	WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code	
		TTTTTTTVV	LLLLL	SSSS	WWYY	

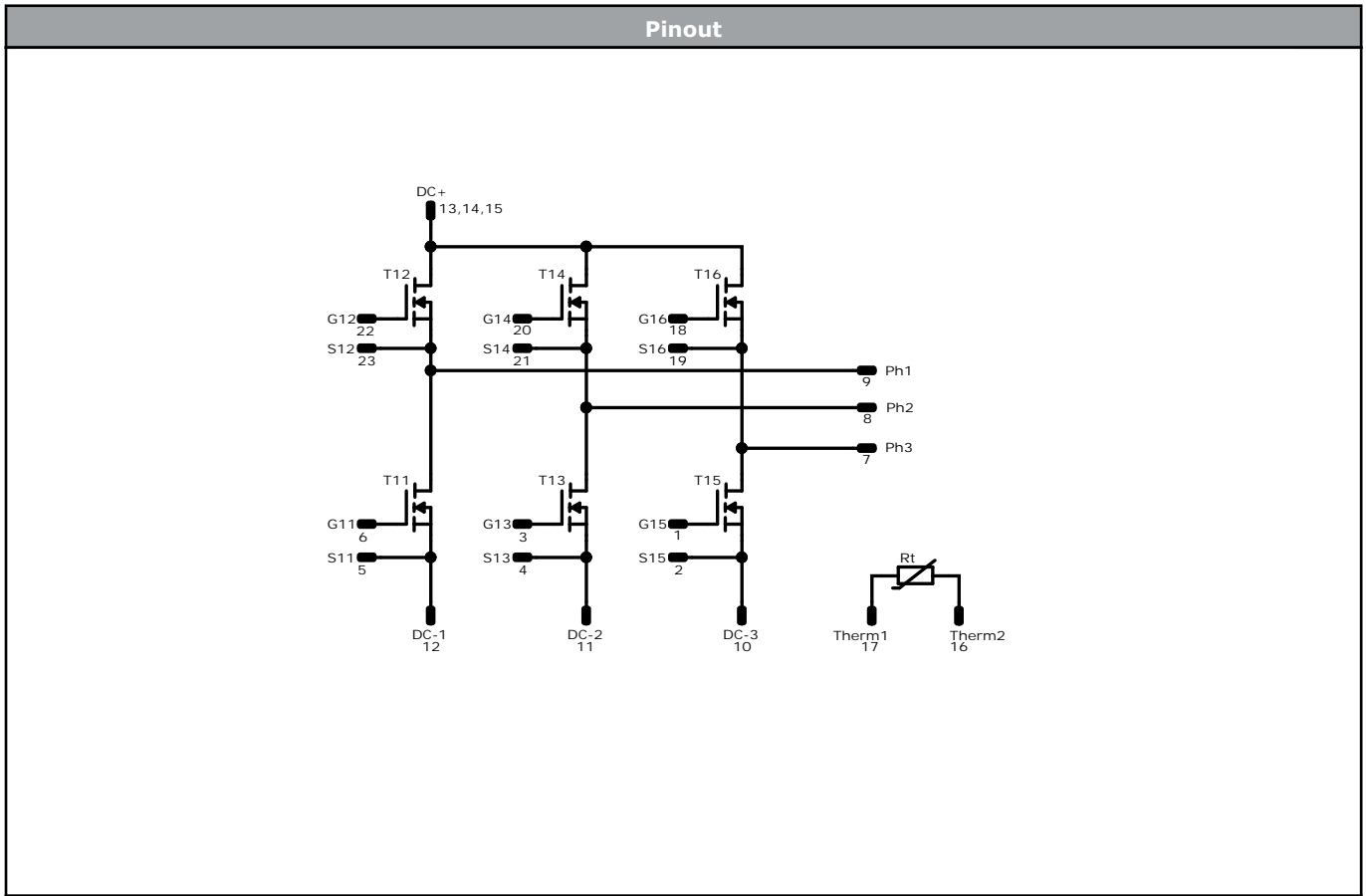
Pin table [mm]			
Pin	X	Y	Function
1	32	0	G15
2	28,8	0	S15
3	19,2	0	G13
4	16	0	S13
5	3,2	0	S11
6	0	0	G11
7	32	6,4	Ph3
8	19,2	6,4	Ph2
9	0	6,4	Ph1
10	32	12,8	DC-3
11	19,2	12,8	DC-2
12	0	12,8	DC-1
13	28,8	19,2	DC+
14	19,2	19,2	DC+
15	9,6	19,2	DC+
16	32	25,6	Therm2
17	28,8	25,6	Therm1
18	22,4	25,6	G16
19	19,2	25,6	S16
20	12,8	25,6	G14
21	9,6	25,6	S14
22	3,2	25,6	G12
23	0	25,6	S12

center of press-fit pin head
pin head type "T" PCB plated through-hole $\phi 1 \text{ mm } +0,09 / -0,06$
for further PCB design rules refer to the latest handling instruction

Tolerance of positions: $\pm 0,4 \text{ mm}$ at the end of pins
Dimension of coordinate axis is only offset without tolerance



Vincotech



Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	MOSFET	1200 V	40 mΩ	Inverter Switch	
Rt	Thermistor			Thermistor	



Vincotech

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

Handling instruction
Handling instructions for <i>flow</i> E1 packages see vincotech.com website.

Package data
Package data for <i>flow</i> E1 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-EZ126PB040MS01-LS18F73T-D1-14	12 Aug. 2024	Initial Release	

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As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
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.