



Vincotech

10-PY126PA016ME-L227F13Y

datasheet

flowPACK 1 SiC

1200 V / 16 mΩ

Features

- Sixpack configuration with open emitter
- Compact and low inductive design
- High frequency SiC MOSFET
- Integrated NTC

Target applications

- Charging Stations
- Power Supply
- Welding & Cutting

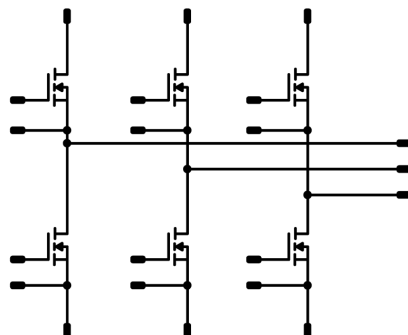
Types

- 10-PY126PA016ME-L227F13Y

flow 1 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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	74	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	240	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	130	W
Gate-source voltage	V_{GS}		-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
Isolation voltage	V_{isol}	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			>12,7	mm
Clearance			11,83	mm
Comparative Tracking Index	CTI		≥ 200	

*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	$r_{DS(on)}$		15		80	25 125 150	11,2	17 21 23	20,8 ⁽¹⁾	mΩ
Gate-source threshold voltage	$V_{GS(th)}$		0		0,023	25	1,8	2,5	3,6	V
Gate to Source Leakage Current	I_{GSS}		15	0		25		20	500	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25		2	38	μA
Internal gate resistance	r_g							0,85		Ω
Gate charge	Q_g		-4/15	800	80	25		236		nC
Short-circuit input capacitance	C_{iss}	$f = 100$ kHz	0	1000	0	25		6714		pF
Short-circuit output capacitance	C_{oss}							258		
Reverse transfer capacitance	C_{rss}							16		
Diode forward voltage	V_{SD}		0		40	25		4,6		V

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,73		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	65	25 125 150		21,12 20,32 20,64		ns	
Rise time	t_r					25 125 150		6,24 6,08 6,24		ns	
Turn-off delay time	$t_{d(off)}$					25 125 150		39,68 42,4 42,88		ns	
Fall time	t_f					25 125 150		8,06 7,83 8,58		ns	
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD}=0,809 \mu C$ $Q_{tFWD}=1,48 \mu C$ $Q_{tFWD}=1,63 \mu C$				25 125 150		0,152 0,161 0,184		mWs	
Turn-off energy (per pulse)	E_{off}					25 125 150		0,178 0,187 0,195		mWs	
Peak recovery current	I_{RRM}	$di/dt=15578 A/\mu s$ $di/dt=16593 A/\mu s$ $di/dt=16559 A/\mu s$				25 125 150		129,01 185,86 198,45		A	
Reverse recovery time	t_{rr}					25 125 150		14,1 16,91 18,13		ns	
Recovered charge	Q_r					25 125 150		0,809 1,48 1,63		μC	
Reverse recovered energy	E_{rec}					25 125 150		0,558 1,05 1,65		mWs	
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		25921 42635 41962		A/ μs	



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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		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$				100	-5		5	%
Power dissipation	P					25		130		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 1 \%$						3962		K
B-value	$B_{(25/100)}$	Tol. $\pm 1 \%$						4000		K
Vincotech Thermistor Reference									I	

⁽¹⁾ Value at chip level

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



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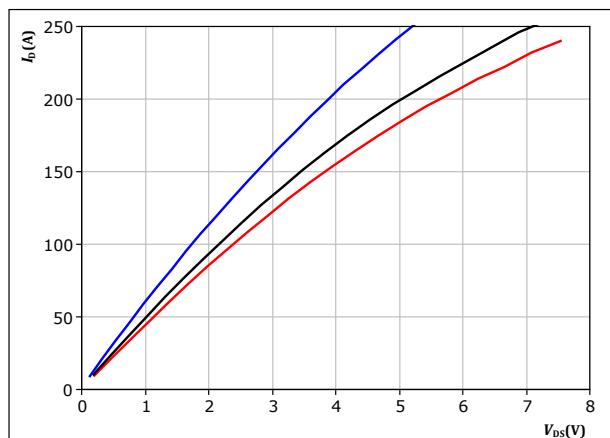
datasheet

Inverter Switch Characteristics

figure 1. MOSFET

Typical output characteristics

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

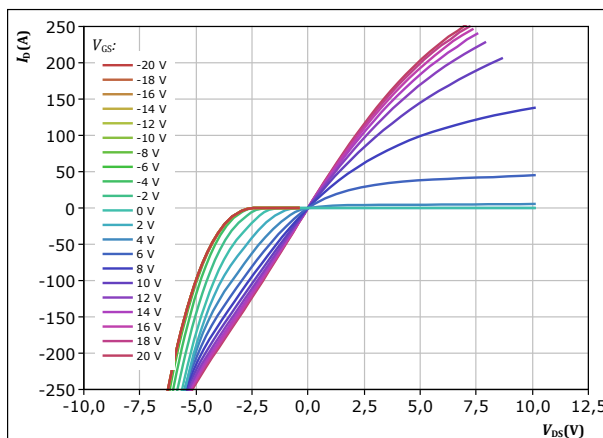


$t_p = 250 \mu s$
 $V_{GS} = 14 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 2. MOSFET

Typical output characteristics

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

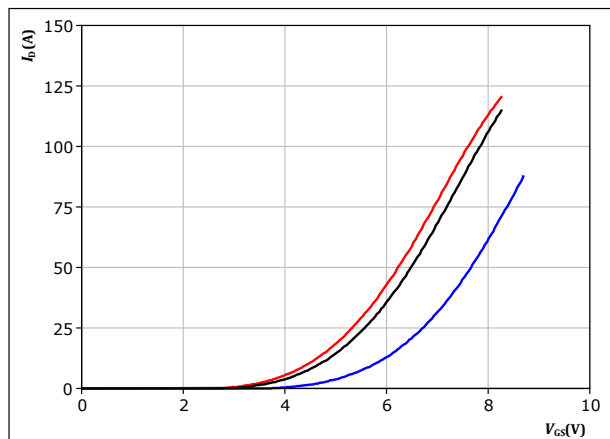


$t_p = 250 \mu s$
 $T_j = 150 ^\circ C$
 V_{GS} from -20 V to 20 V in steps of 2 V

figure 3. MOSFET

Typical transfer characteristics

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

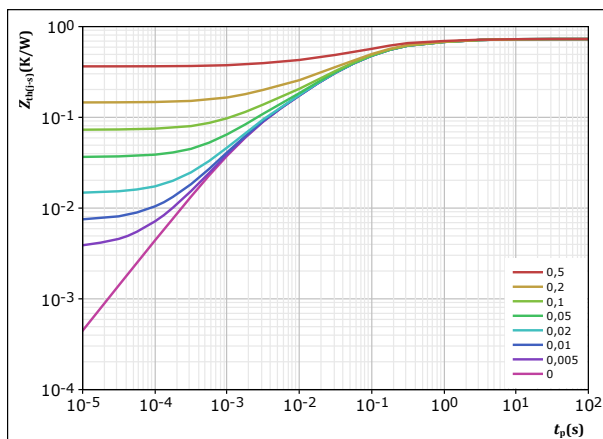


$t_p = 250 \mu s$
 $V_{DS} = 10 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 4. MOSFET

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,729 K/W$
MOSFET thermal model values

R (K/W)	τ (s)
3,61E-02	4,04E+00
1,11E-01	6,41E-01
3,61E-01	9,20E-02
1,61E-01	1,58E-02
5,95E-02	1,96E-03



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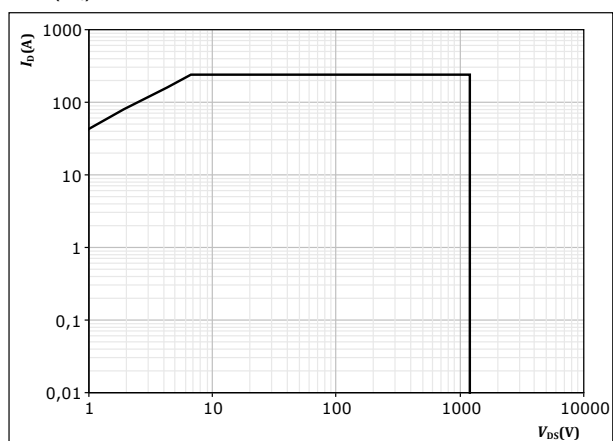
Inverter Switch Characteristics

figure 5.

MOSFET

Safe operating area

$I_D = f(V_{DS})$



$D = \text{single pulse}$

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

$V_{GS} = 14 \text{ V}$

$T_j = T_{jmax}$



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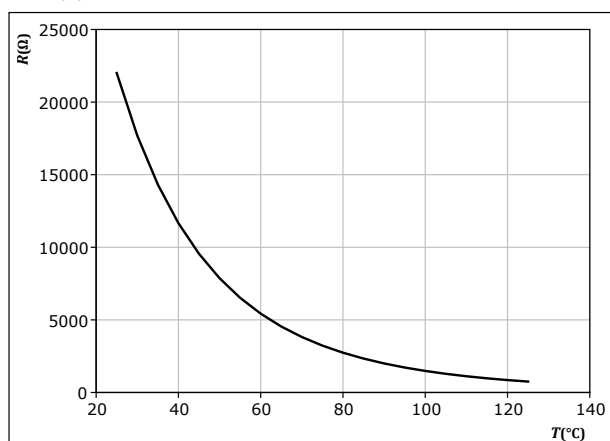
Thermistor Characteristics

figure 6.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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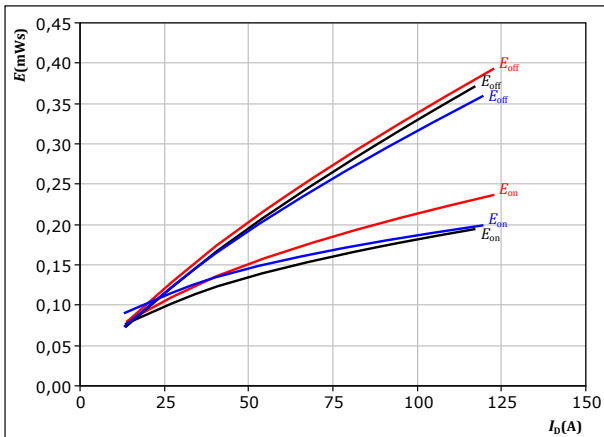
Inverter Switching Characteristics

figure 7.

MOSFET

Typical switching energy losses as a function of drain current

$$E = f(I_D)$$



With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$
 $R_{goff} = 2 \text{ } \Omega$

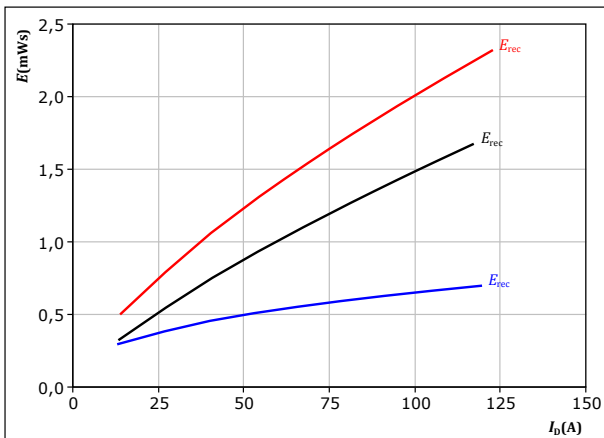
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 9.

MOSFET

Typical reverse recovered energy loss as a function of drain current

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



With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

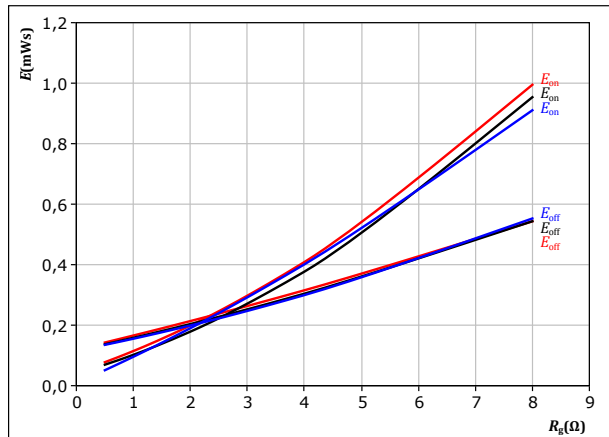
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 8.

MOSFET

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $I_D = 65 \text{ A}$

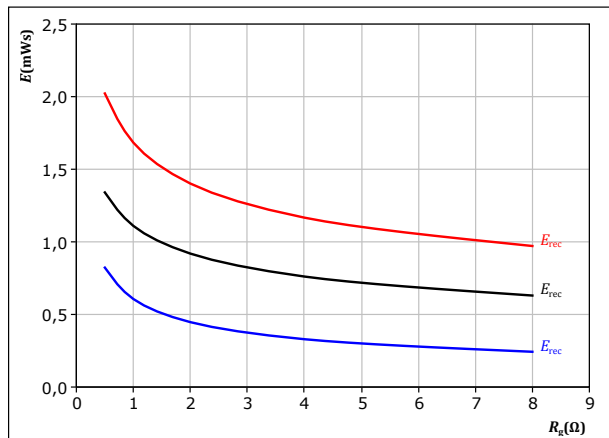
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 10.

MOSFET

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $I_D = 65 \text{ A}$

T_j :
— 25 °C
— 125 °C
— 150 °C



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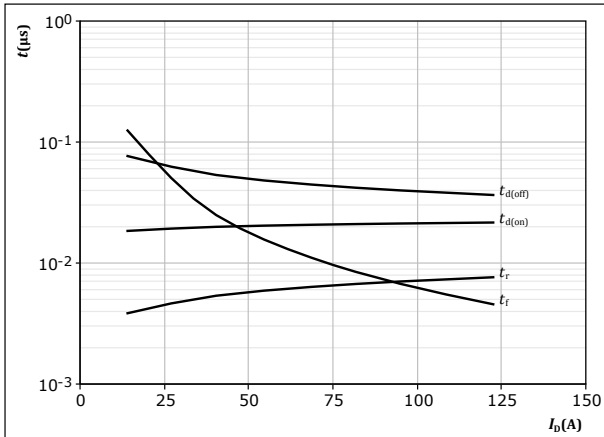
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Inverter Switching Characteristics

figure 11.

MOSFET

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



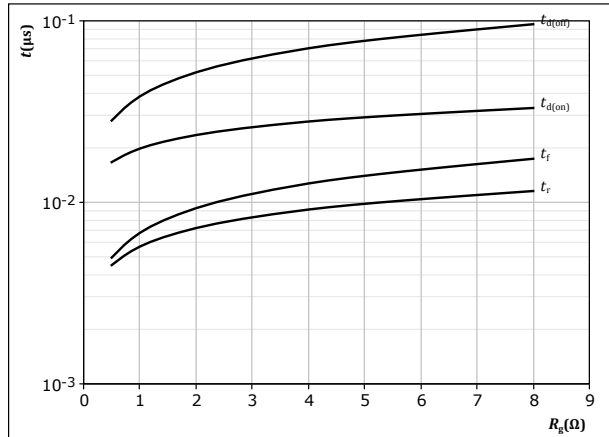
With an inductive load at

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

figure 12.

MOSFET

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



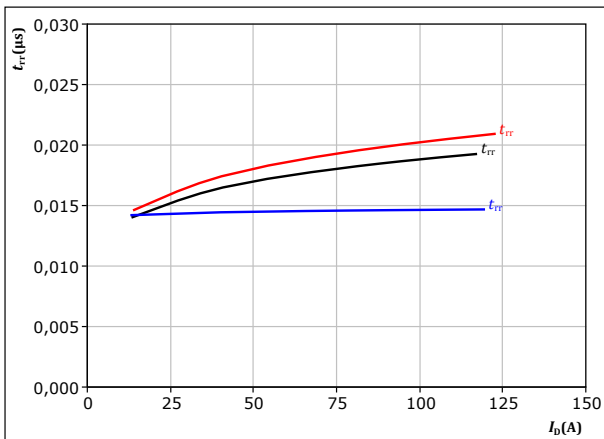
With an inductive load at

$T_j = 150$ °C
 $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $I_D = 65$ A

figure 13.

MOSFET

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

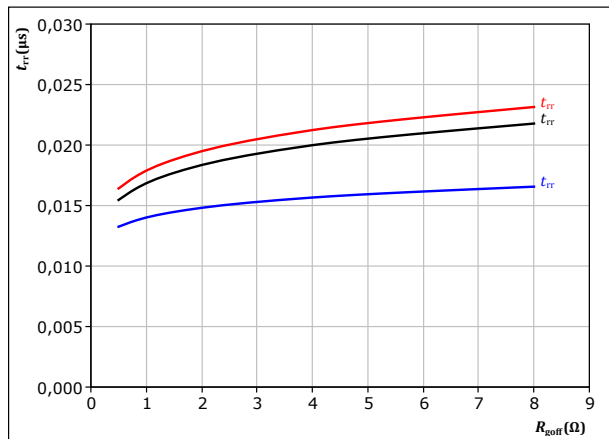


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{gon} = 2$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 14.

MOSFET

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



At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $I_D = 65$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)



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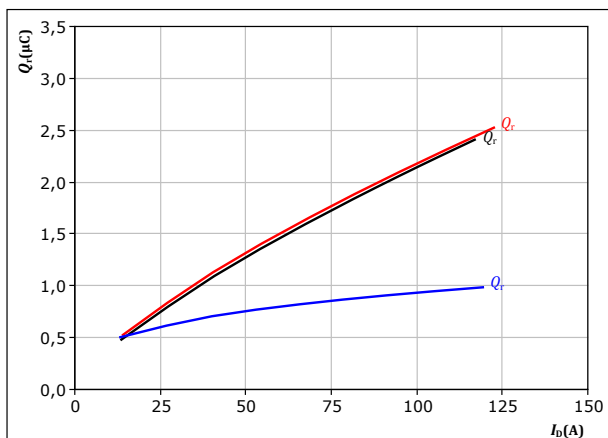
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Inverter Switching Characteristics

figure 15. MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$

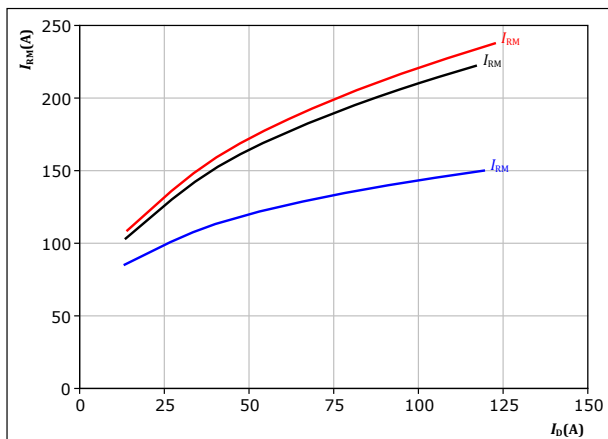


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{gon} = 2$ Ω
 T_j : 25 °C
125 °C
150 °C

figure 17. MOSFET

Typical peak reverse recovery current as a function of drain current

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

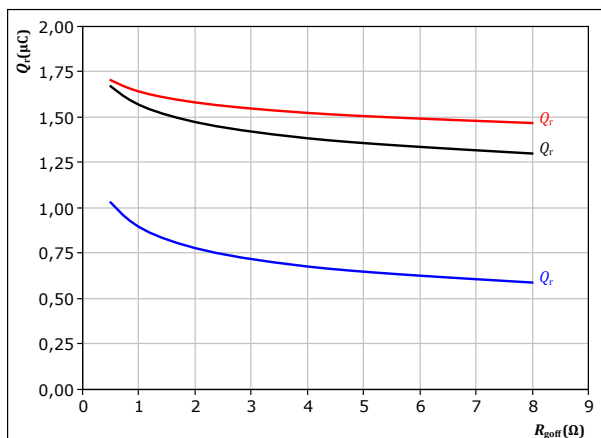


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{gon} = 2$ Ω
 T_j : 25 °C
125 °C
150 °C

figure 16. MOSFET

Typical recovered charge as a function of turn off gate resistor

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

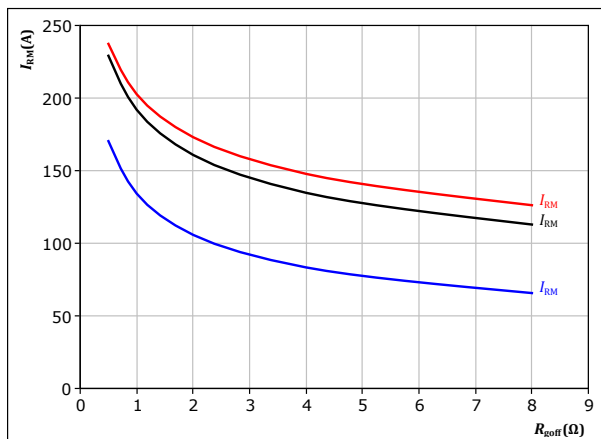


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $I_D = 65$ A
 T_j : 25 °C
125 °C
150 °C

figure 18. MOSFET

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

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



At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $I_D = 65$ A
 T_j : 25 °C
125 °C
150 °C



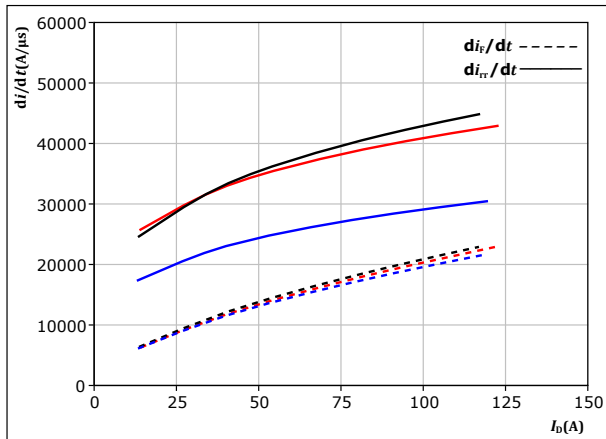
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datasheet

Inverter Switching Characteristics

figure 19. MOSFET

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

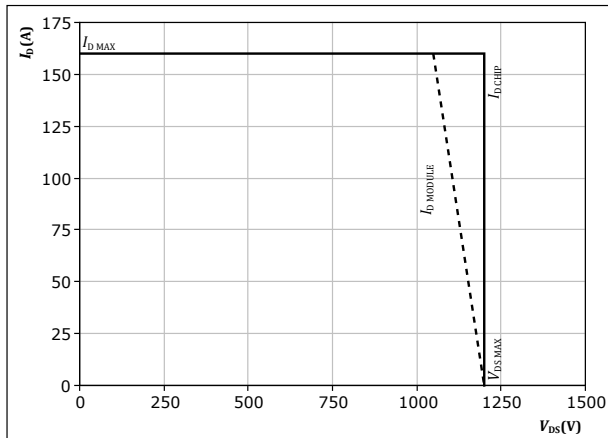


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{g(on)} = 2$ Ω
 $T_j = 25$ °C
 125 °C
 150 °C

figure 21. MOSFET

Reverse bias safe operating area

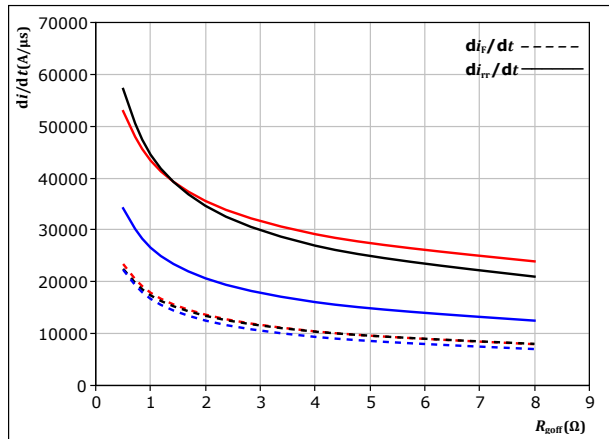
$I_D = f(V_{DS})$



At $T_j = 150$ °C
 $R_{g(on)} = 2$ Ω
 $R_{g(off)} = 2$ Ω

figure 20. MOSFET

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



At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $I_D = 65$ A
 $T_j = 25$ °C
 125 °C
 150 °C



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Inverter Switching Definitions

figure 22. MOSFET

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

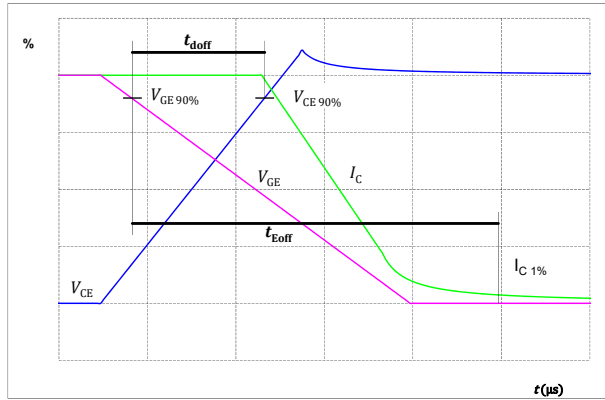


figure 23. MOSFET

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



figure 24. MOSFET

Turn-off Switching Waveforms & definition of t_f

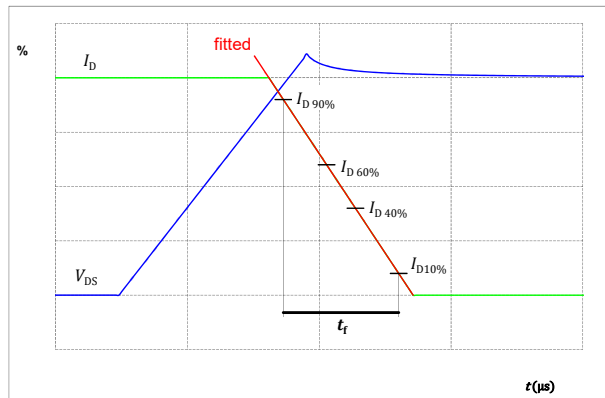
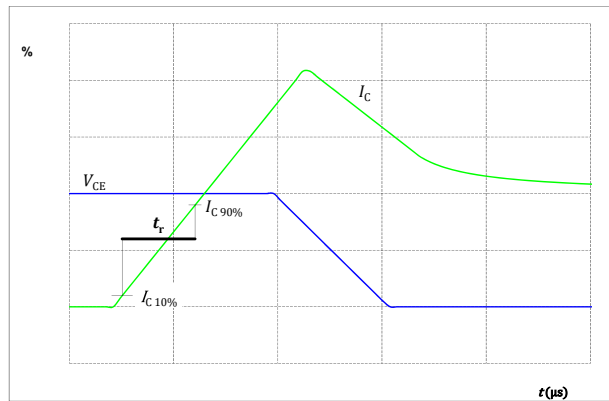


figure 25. MOSFET

Turn-on Switching Waveforms & definition of t_r





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Inverter Switching Definitions

figure 26.

FWD

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



figure 27.

FWD

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

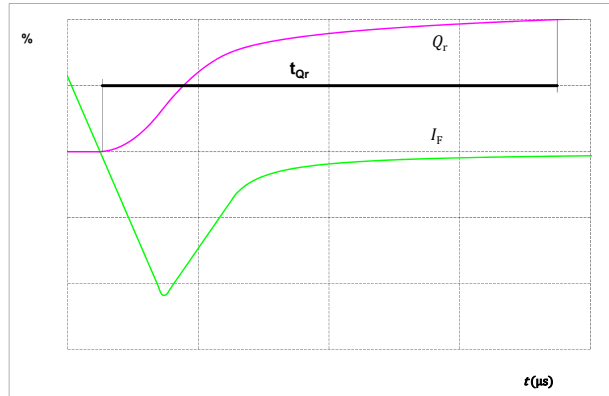
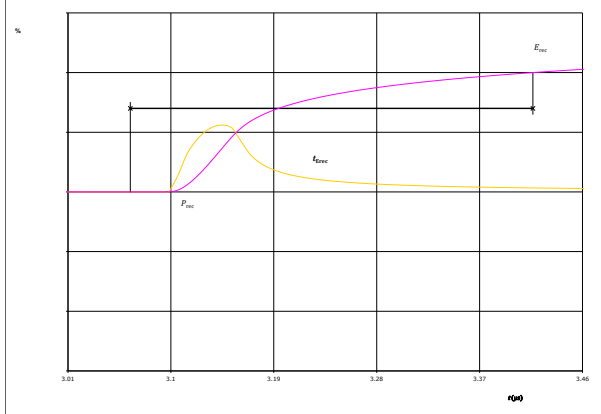


figure 28.

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-PY126PA016ME-L227F13Y
With thermal paste (5,2 W/mK, PTM6000HV)	10-PY126PA016ME-L227F13Y-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-PY126PA016ME-L227F13Y-/3/

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

Outline			
Pin table [mm]			
Pin	X	Y	Function
1	52,2	2,7	DC-3
2	52,2	0	DC-3
3	45,5	12	G15
4	42,5	13	S15
5	41,2	0	DC+3
6	38,5	0	DC+3
7	33,1	0	DC+2
8	30,4	0	DC+2
9	25	10	G13
10	22	11	S13
11	19,4	0	DC-2
12	16,7	0	DC-2
13	13,7	0	DC-1
14	11	0	DC-1
15	8,7	12	G11
16	5,7	13	S11
17	0	0	DC+1
18	0	2,7	DC+1
19	14,3	15,6	THERM2
20	16,1	12,6	THERM1
21	0	28,2	PH1
22	2,7	28,2	PH1
23	5,7	26,7	S12
24	8,7	25,7	G12
25	19,4	28,2	PH2
26	22,1	28,2	PH2
27	23,1	25,2	S14
28	26,1	24,2	G14
29	36,3	28,2	PH3
30	39	28,2	PH3
31	42	26,7	S16
32	45	25,7	G16

center of press-fit pinhead
for connection parameter see the handling instruction

26.1

14.1

2.7

1.25

0.5

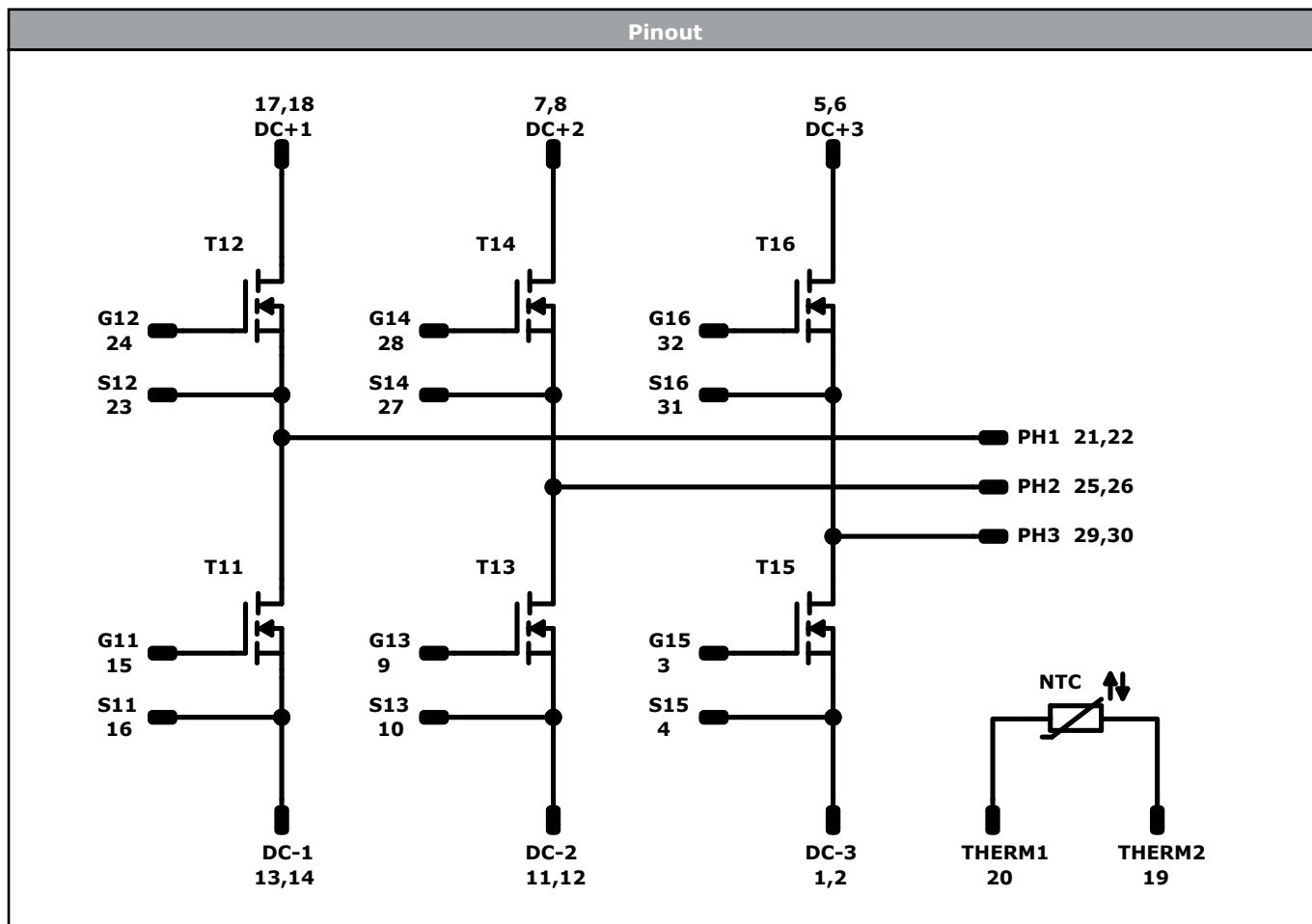
Tolerance of pinpositions: ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance



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datasheet



Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	MOSFET	1200 V	16 mΩ	Inverter Switch	
NTC	NTC			Thermistor	



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

Handling instruction
Handling instructions for <i>flow 1</i> packages see vincotech.com website.

Package data
Package data for <i>flow 1</i> 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 certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.



Document No.:	Date:	Modification:	Pages
10-PY126PA016ME-L227F13Y-D3-14	30 Nov. 2021	Dynamic characteristics are updated New datasheet format, module is unchanged	

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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.