



flowPACK 1 SiC

1200 V / 21 mΩ

Topology features

- 3xHalf Bridge
- Open Emitter configuration
- Kelvin Emitter for improved switching performance
- 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
- Thermo-mechanical push-and-pull force relief
- Solder pin

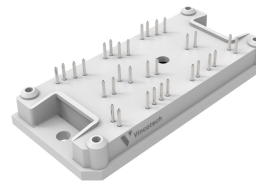
Target applications

- Elevator Drives

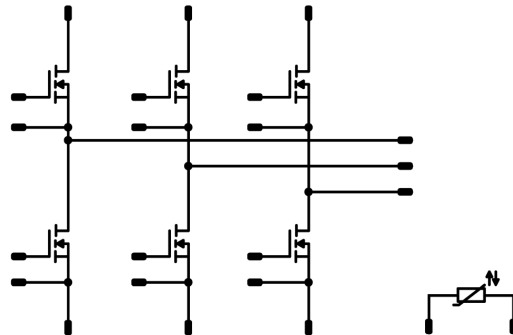
Types

- 10-FY126PA021ME-L227F68

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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	48	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	208	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	88	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
Creepage distance			>12,7	mm
Clearance			12,12	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	$r_{DS(on)}$		15		51,6	25 125 150	14,7	23 32,8 36,5	27,3 ⁽¹⁾	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$			0,01422	25	1,8	2,7	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	100	μA
Internal gate resistance	r_g							2,95		Ω
Gate charge	Q_g		-4/15	800	51,6	25		186		nC
Short-circuit input capacitance	C_{iss}	$f = 100$ kHz	0	1000	0	25		4740		pF
Short-circuit output capacitance	C_{oss}							170		
Reverse transfer capacitance	C_{rss}							16		
Diode forward voltage	V_{SD}		0		25,8	25		4,8		V

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,08		K/W
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10-FY126PA021ME-L227F68
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		71,28 62,4 61,15		ns
Rise time	t_r	$R_{gon} = 21,33 \Omega$ $R_{goff} = 21,33 \Omega$				25 125 150		41,54 36,82 35,79		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		205,18 223,22 227,8		ns
Fall time	t_f					25 125 150		14,54 14,88 15,48		ns
Turn-on energy (per pulse)	E_{on}	$Q_{rFWD}=0,2 \mu C$ $Q_{rFWD}=0,573 \mu C$ $Q_{rFWD}=1,16 \mu C$				25 125 150		2,41 2,28 2,36		mWs
Turn-off energy (per pulse)	E_{off}		-4/15	600	64	25 125 150		1,17 1,15 1,13		mWs
Peak recovery current	I_{RRM}					25 125 150		17,92 24,4 28,24		A
Reverse recovery time	t_{rr}					25 125 150		19,06 40,4 86,97		ns
Recovered charge	Q_r	$di/dt=1690 A/\mu s$ $di/dt=2188 A/\mu s$ $di/dt=2027 A/\mu s$				25 125 150		0,2 0,573 1,16		μC
Reverse recovered energy	E_{rec}					25 125 150		0,013 0,085 0,312		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		3125,15 1245,57 273,94		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		22		kΩ
Deviation of R100	$A_{R/R}$	$R_{100} = 1484 \Omega$				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.



Inverter Switch Characteristics

figure 1. MOSFET

Typical output characteristics
 $I_D = f(V_{DS})$

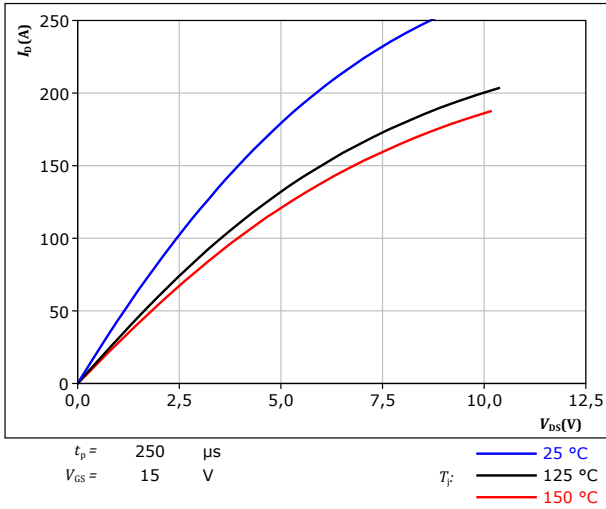


figure 2. MOSFET

Typical output characteristics
 $I_D = f(V_{DS})$

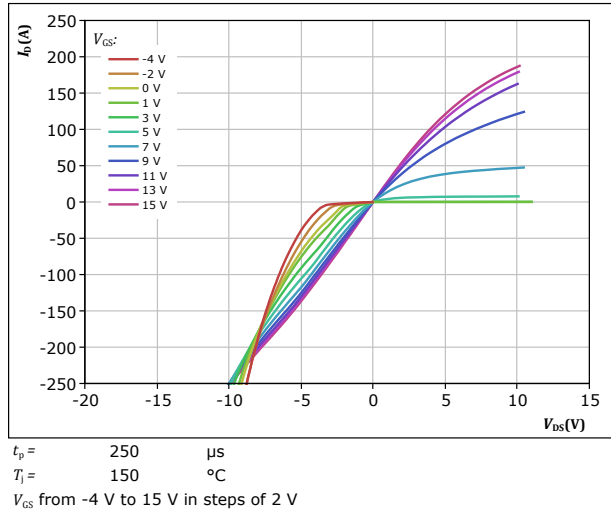


figure 3. MOSFET

Typical transfer characteristics
 $I_D = f(V_{GS})$

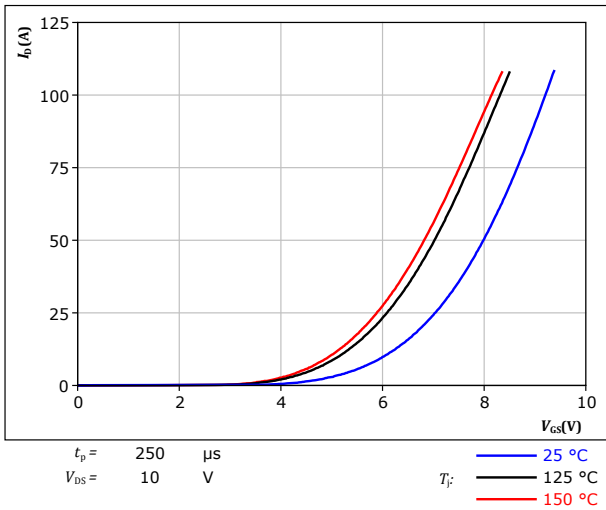
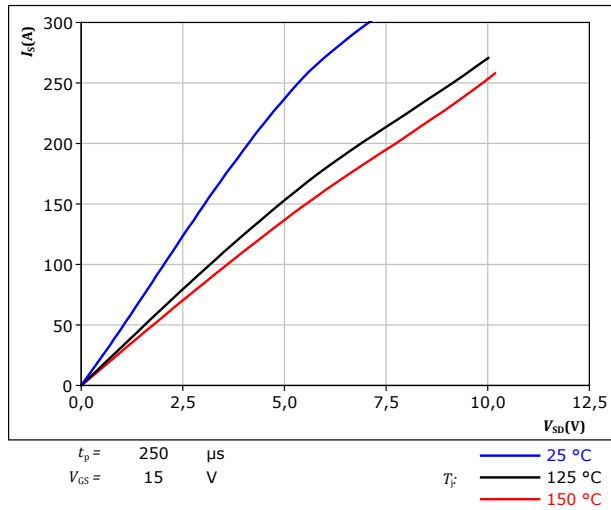


figure 4. MOSFET

Typical reverse drain current characteristics
 $I_{SD} = f(V_{SD})$



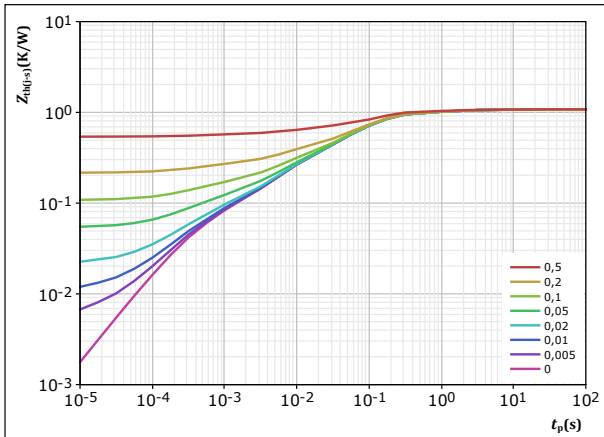


Inverter Switch Characteristics

figure 5. MOSFET

Transient thermal impedance as a function of pulse width

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



$$D = t_p / T$$

$$R_{th(j-c)} = 1,079 \text{ K/W}$$

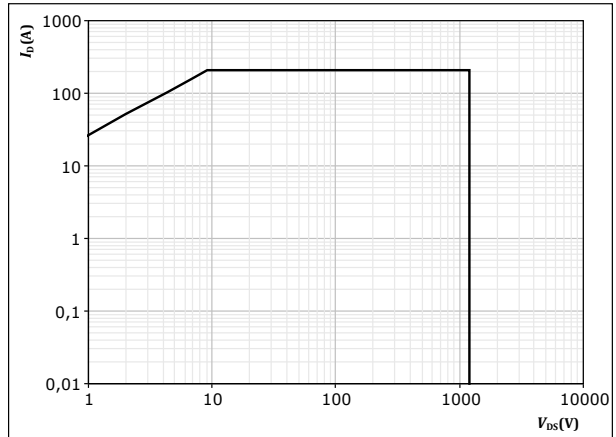
MOSFET thermal model values

R (K/W)	τ (s)
1,68E-02	1,34E+01
1,21E-01	1,08E+00
7,02E-01	9,29E-02
1,83E-01	7,23E-03
5,64E-02	3,86E-04

figure 6. MOSFET

Safe operating area

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



D = single pulse

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

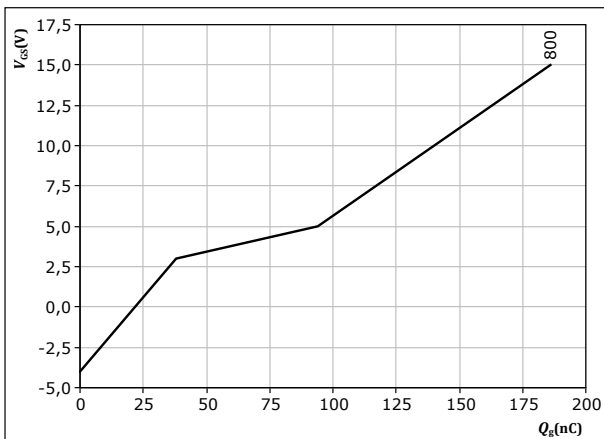
$$V_{GS} = 15 \text{ V}$$

$$T_j = T_{jmax}$$

figure 7. MOSFET

Gate voltage vs gate charge

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



$$I_D = 25.8 \text{ A}$$

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

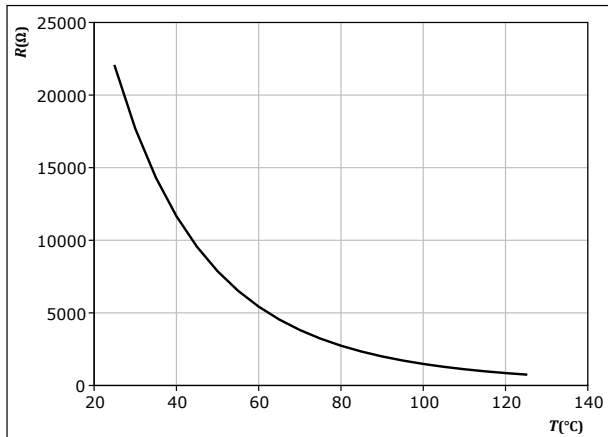


Thermistor Characteristics

figure 8. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

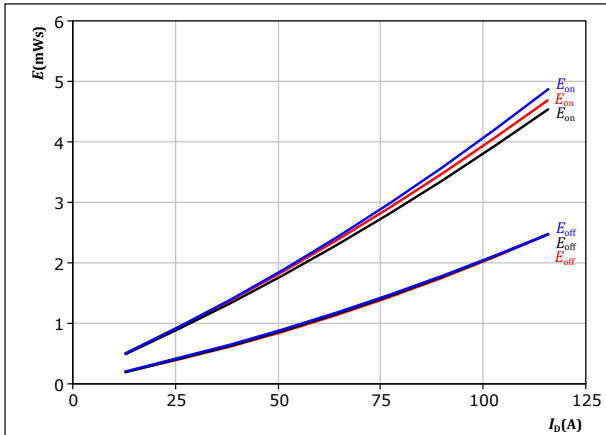




Inverter Switching Characteristics

figure 9. MOSFET

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

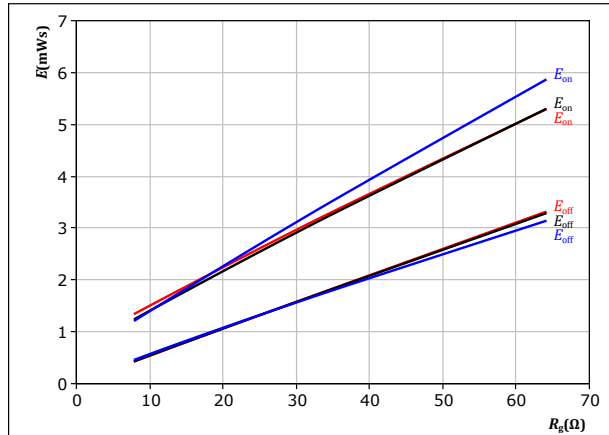


With an inductive load at

$V_{DS} =$	600 V	$T_j:$	25 °C
$V_{GS} =$	-4/15 V		125 °C
$R_{gon} =$	21,33 Ω		150 °C
$R_{goff} =$	21,33 Ω		

figure 10. MOSFET

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

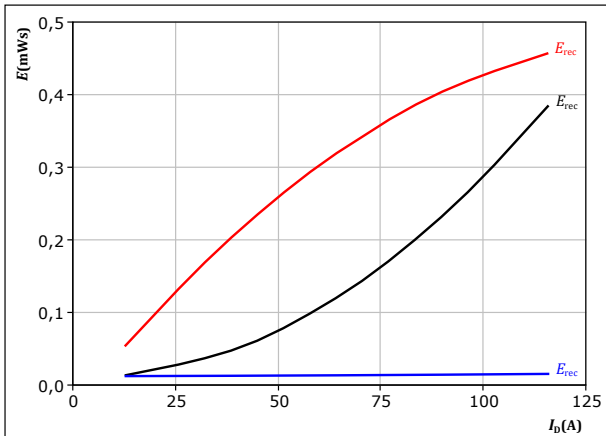


With an inductive load at

$V_{DS} =$	600 V	$T_j:$	25 °C
$V_{GS} =$	-4/15 V		125 °C
$I_D =$	64 A		150 °C

figure 11. MOSFET

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

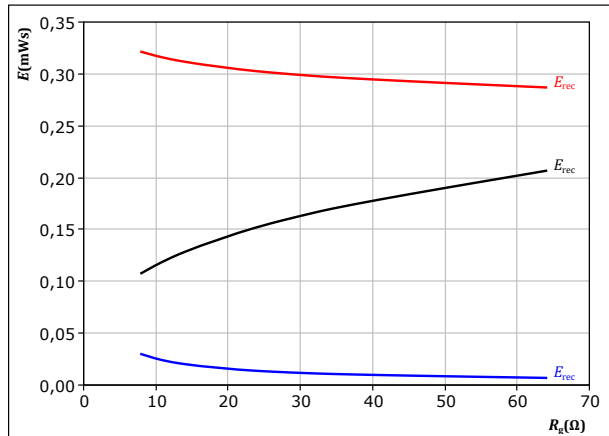


With an inductive load at

$V_{DS} =$	600 V	$T_j:$	25 °C
$V_{GS} =$	-4/15 V		125 °C
$R_{gon} =$	21,33 Ω		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

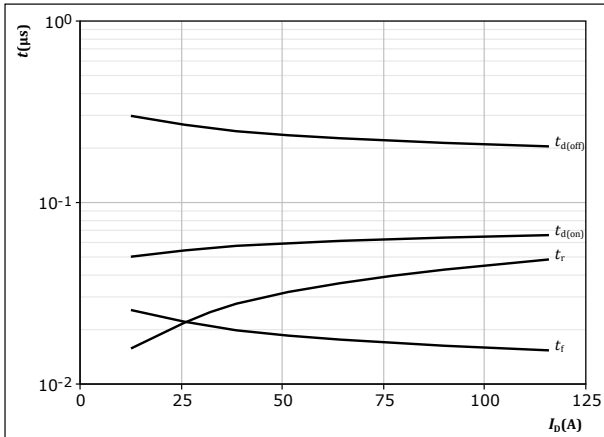
$V_{DS} =$	600 V	$T_j:$	25 °C
$V_{GS} =$	-4/15 V		125 °C
$I_D =$	64 A		150 °C



Inverter Switching Characteristics

figure 13. MOSFET

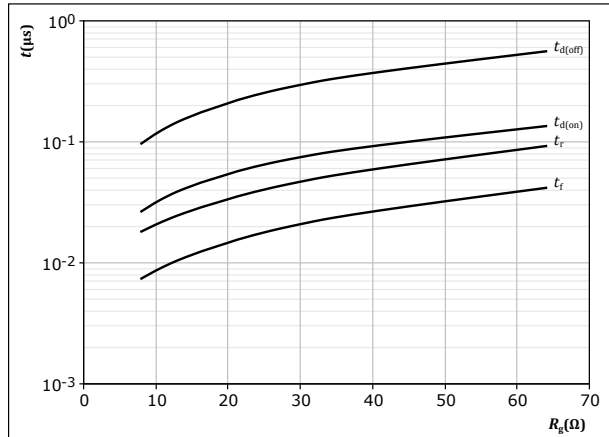
Typical switching times as a function of drain current
 $t = f(I_D)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $R_{gon} = 21,33 \text{ } \Omega$
 $R_{goff} = 21,33 \text{ } \Omega$

figure 14. MOSFET

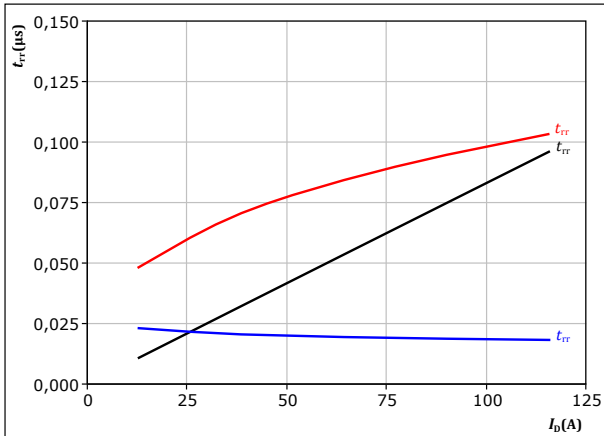
Typical switching times as a function of MOSFET turn on gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $I_D = 64 \text{ A}$

figure 15. MOSFET

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

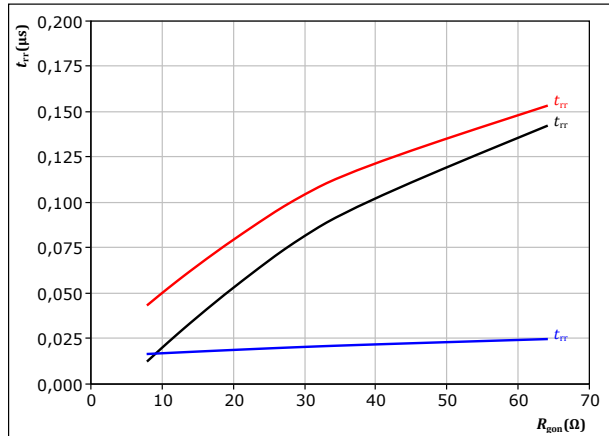


At $V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $R_{gon} = 21,33 \text{ } \Omega$

T_j : — 25 $^\circ\text{C}$
 — 125 $^\circ\text{C}$
 — 150 $^\circ\text{C}$

figure 16. MOSFET

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



At $V_{DS} = 600 \text{ V}$
 $V_{GS} = -4/15 \text{ V}$
 $I_D = 64 \text{ A}$

T_j : — 25 $^\circ\text{C}$
 — 125 $^\circ\text{C}$
 — 150 $^\circ\text{C}$

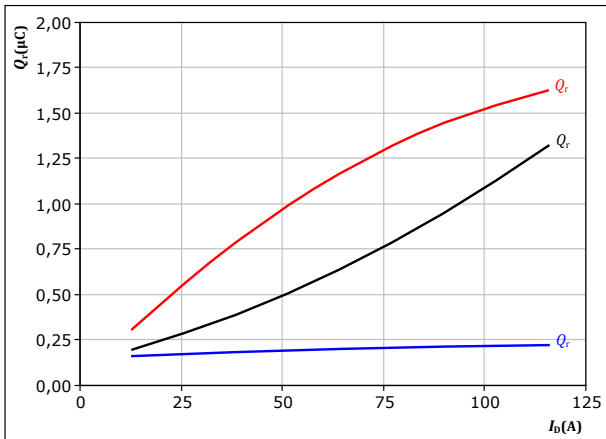


Inverter Switching Characteristics

figure 17. MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$



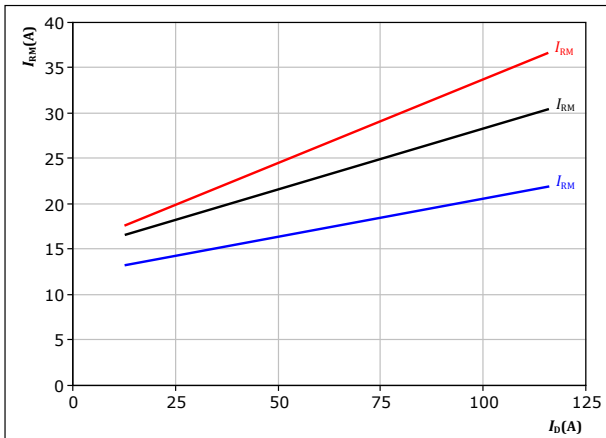
At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{gon} = 21,33$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 19. MOSFET

Typical peak reverse recovery current as a function of drain current

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



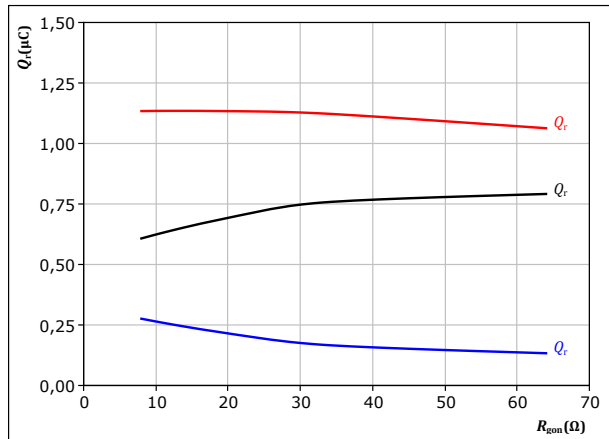
At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{gon} = 21,33$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 18. MOSFET

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

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



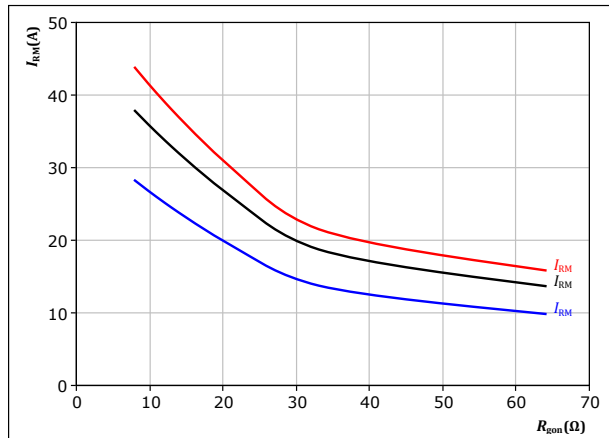
At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $I_D = 64$ A

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
 $I_D = 64$ A

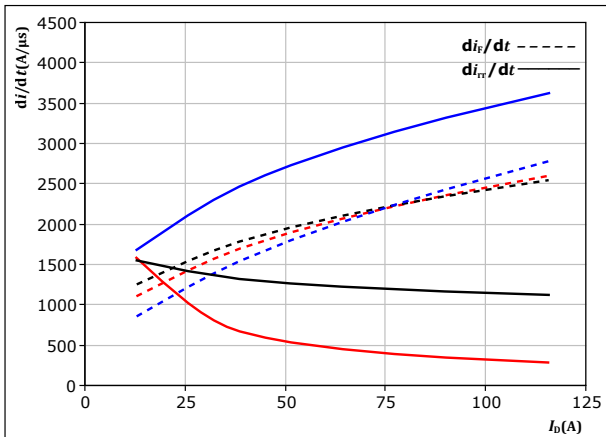
T_j : — 25 °C
 — 125 °C
 — 150 °C



Inverter Switching Characteristics

figure 21. MOSFET

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

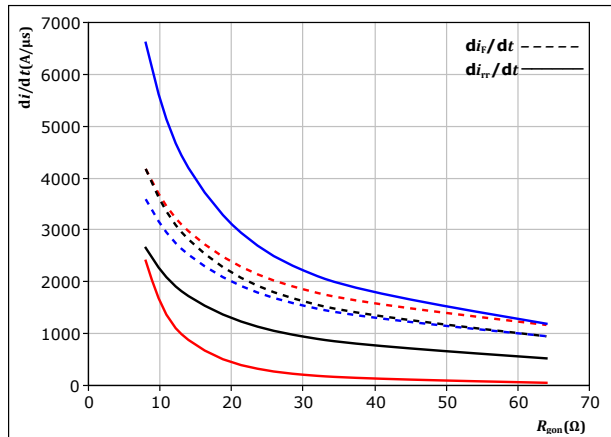


At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $R_{g(on)} = 21,33$ Ω

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

figure 22. MOSFET

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



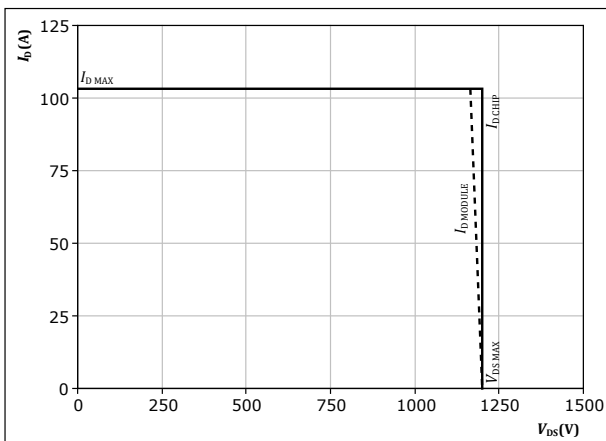
At $V_{DS} = 600$ V
 $V_{GS} = -4/15$ V
 $I_D = 64$ A

$T_j = 25$ °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
 $R_{g(on)} = 21,33$ Ω
 $R_{g(off)} = 21,33$ Ω



Inverter Switching Definitions

figure 24. MOSFET

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

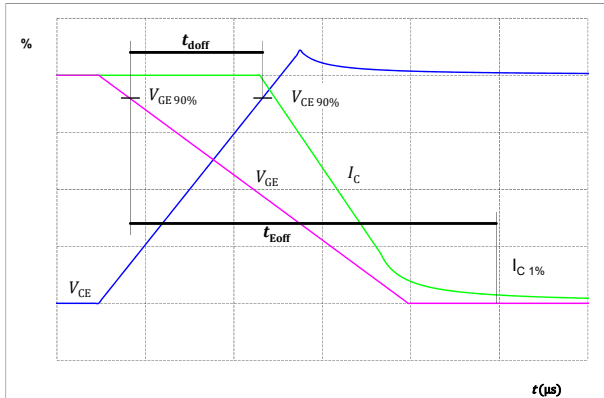


figure 25. MOSFET

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

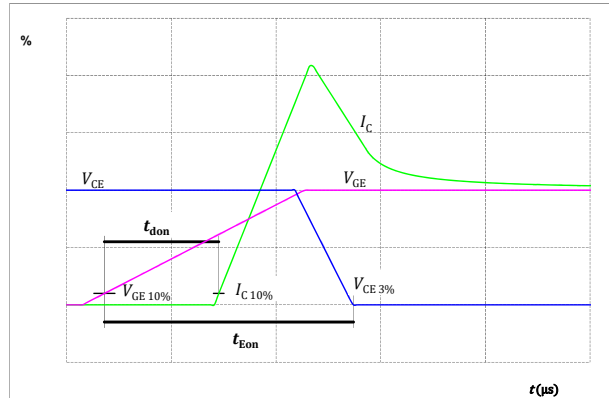


figure 26. MOSFET

Turn-off Switching Waveforms & definition of t_f

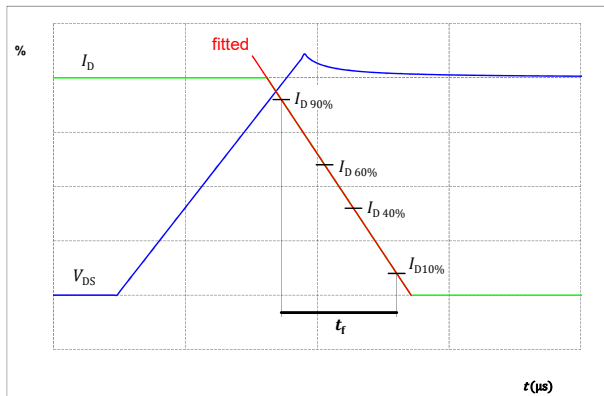
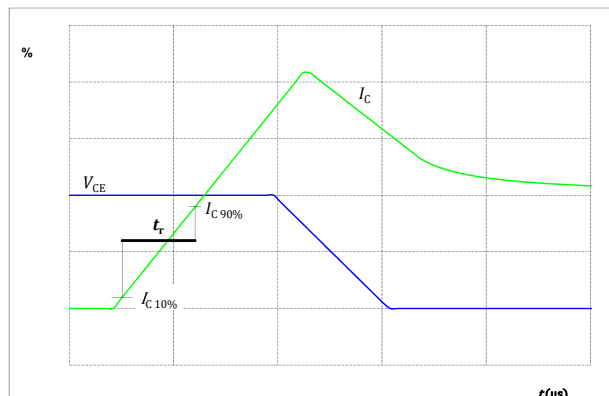


figure 27. MOSFET

Turn-on Switching Waveforms & definition of t_r





Inverter Switching Definitions

figure 28. FWD

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

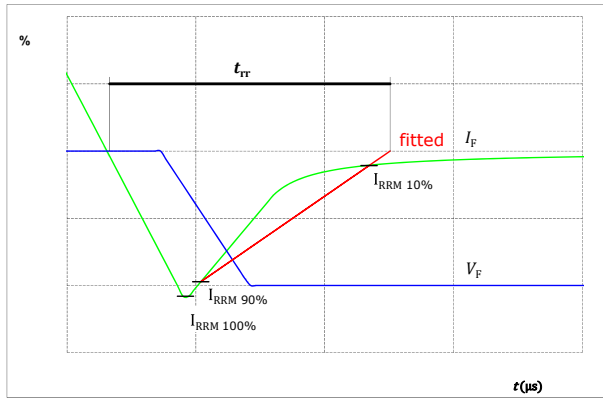


figure 29. FWD

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

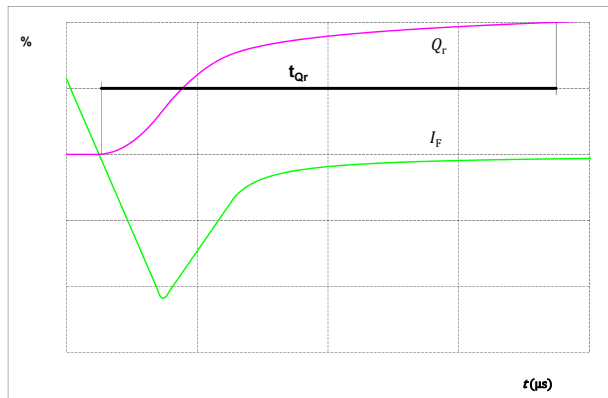
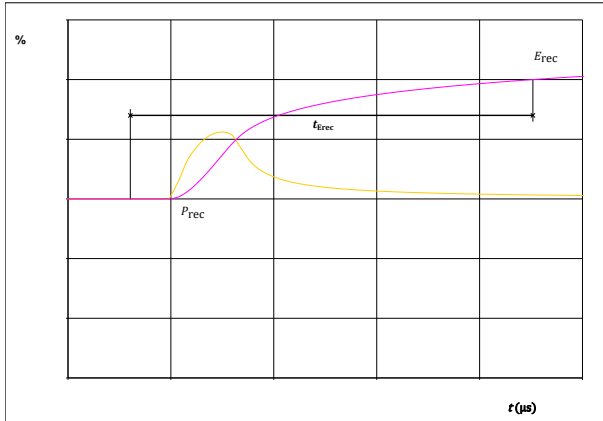


figure 30. FWD

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





Vincotech

10-FY126PA021ME-L227F68
datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	10-FY126PA021ME-L227F68
With thermal paste (5,2 W/mK, PTM6000HV)	10-FY126PA021ME-L227F68-/-7/
With thermal paste (3,4 W/mK, PSX-P7)	10-FY126PA021ME-L227F68-/-3/

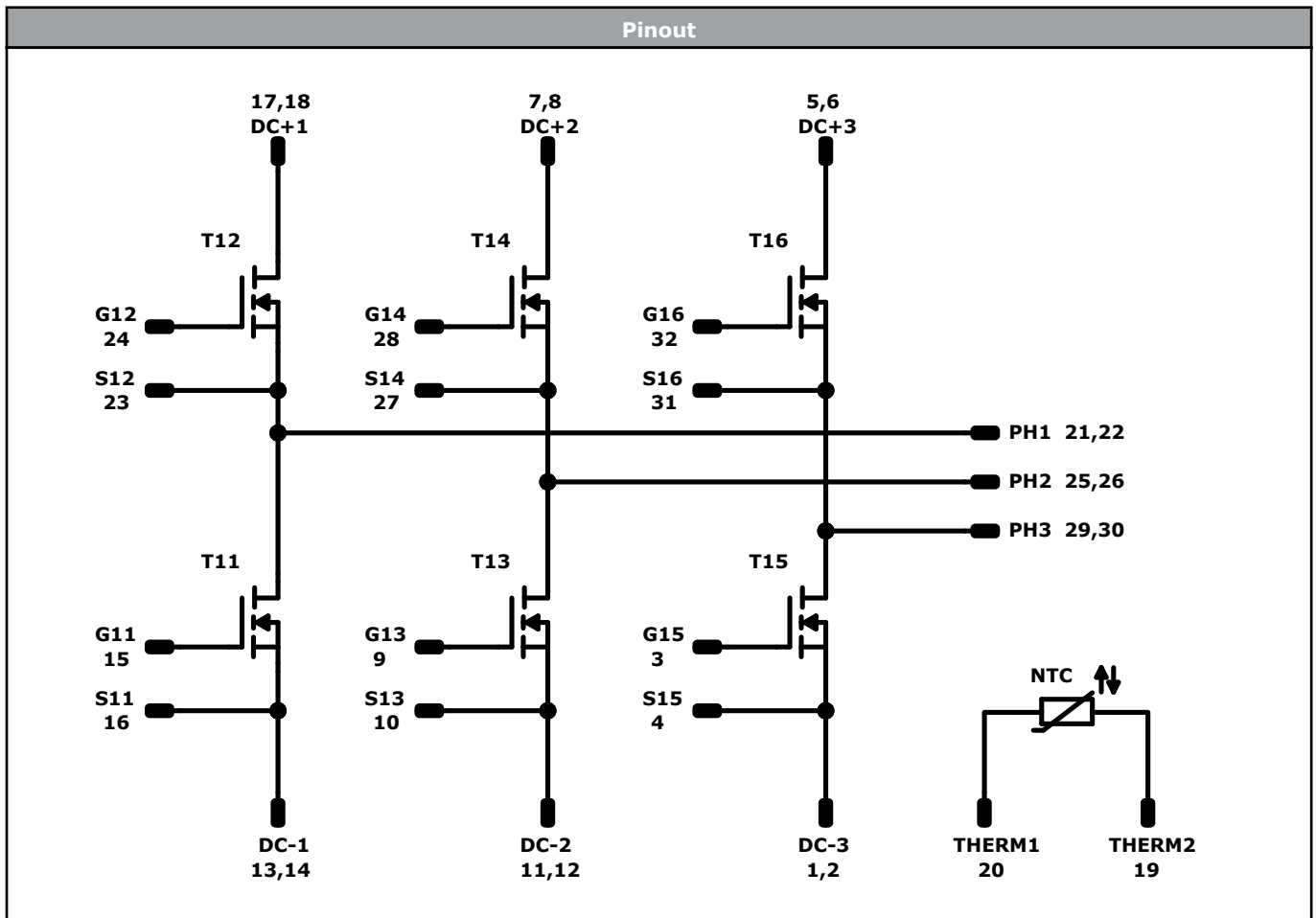
Marking						
	Text	Name NN-NNNNNNNNNNNNNNNN- TTTTIVV	Date code WWYY	UL & VIN UL VIN	Lot LLLLL	Serial SSSS
	Datamatrix	Type&Ver TTTTIVV	Lot number LLLLL	Serial SSSS	Date code WWYY	

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

Tolerance of pinposition: $\pm 0,5\text{mm}$ 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	21 mΩ	Inverter Switch	
Rt	Thermistor			Thermistor	



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

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

Package data
Package data for <i>flow</i> 1 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 $T_{j,op}=175^{\circ}C$ and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.



Document No.:	Date:	Modification:	Pages
10-FY126PA021ME-L227F68-D1-14	30 Apr. 2024		

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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.