Vincotech

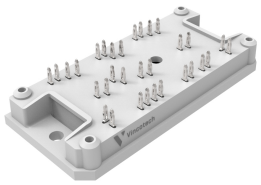
10-PY126PA020MR-L227F28Y
datasheet

***flow*PACK 1 SiC** **1200 V / 20 mΩ**

Features

- Rohm Silicon Carbide Power MOSFET, Trench Technology
- Sixpack with three separated legs
- Solderless Press-fit Mounting Technology

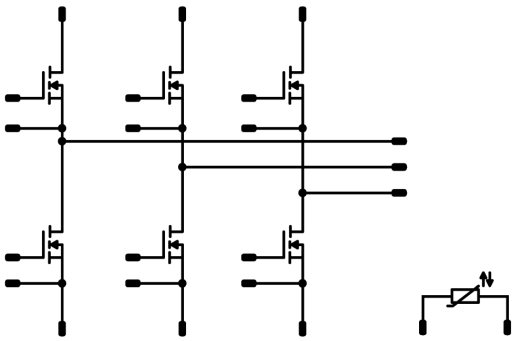
flow 1 12 mm housing



Target applications

- Battery Charger

Schematic



Types

- 10-PY126PA020MR-L227F28Y

Maximum Ratings

T_j = 25 °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 °C	59	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	274	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	122	W
Gate-source voltage	V_{GSS}		-4 / 22	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 s	6000	V
Isolation voltage	V_{isol}	AC Voltage t_p = 1 min	2500	V
Creepage distance			>12,7	mm
Clearance			11,83	mm
Comparative Tracking Index	CTI		≥ 200	

*100 % tested in production

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		40	25 125 150		20 29 32	25(1)	mΩ
Gate-source threshold voltage	$V_{GS(th)}$		0		0,02	25	2,7	3,9	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		2	20	µA
Internal gate resistance	r_g							3,5		Ω
Gate charge	Q_g	V_{DD} = 600 V	18		40	25		214		nC
Short-circuit input capacitance	C_{iss}	f = 1 Mhz	0	800	0	25		2674		pF
Short-circuit output capacitance	C_{oss}							152		
Reverse transfer capacitance	C_{rss}							54		
Diode forward voltage	V_{SD}		0		40	25		3,2		V
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,78		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	-5/16	600	60	25 125		21,4 20,6		ns
Rise time	t_r					25 125		8,6 8,8		ns
Turn-off delay time	$t_{d(off)}$					25 125		74 81		ns
Fall time	t_f					25 125		11,35 13,21		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=2,65 µC Q_{rFWD}=2,34 µC				25 125		0,837 0,821		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,438 0,437		mWs
Peak recovery current	I_{RRM}	di/dt=8533 A/µs di/dt=9060 A/µs				25 125		158,88 143,45		A
Reverse recovery time	t_{rr}					25 125		29,68 29,24		ns
Recovered charge	Q_r					25 125		2,65 2,34		µC
Reverse recovered energy	E_{rec}					25 125		0,965 0,843		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		18333 16364		A/µs

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 Ω				100	-5		5	%
Power dissipation	P					25		130		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %						3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %						4000		K
Vincotech Thermistor Reference									I	

(1) Value at chip level

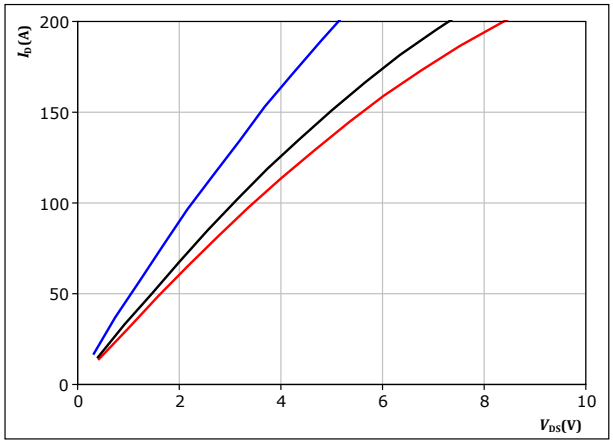
(2) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

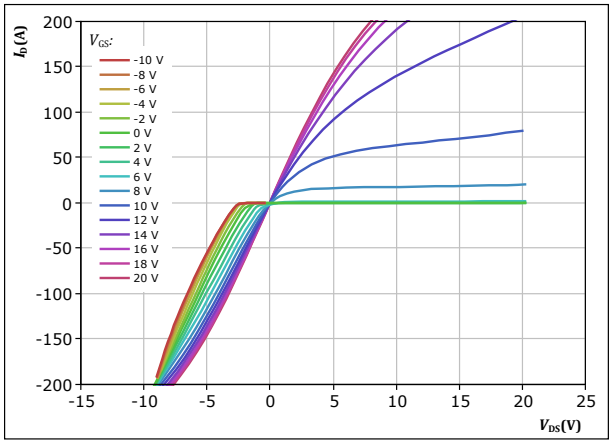


t_p =	250	µs		
V_{GS} =	18	V	T_j:	25 °C
				125 °C
				150 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



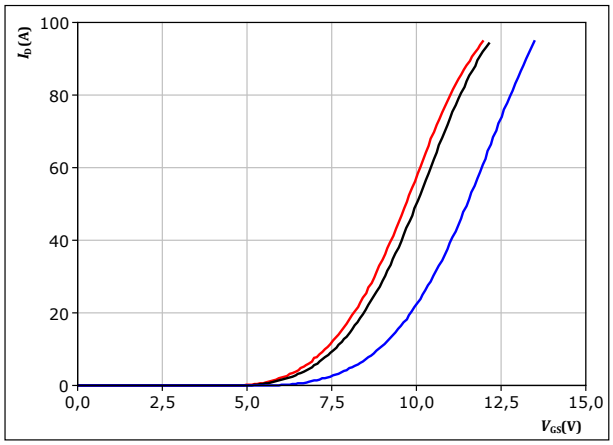
t_p =	250	µs
T_j =	150	°C

V_{GS} from -10 V to 20 V in steps of 2 V

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

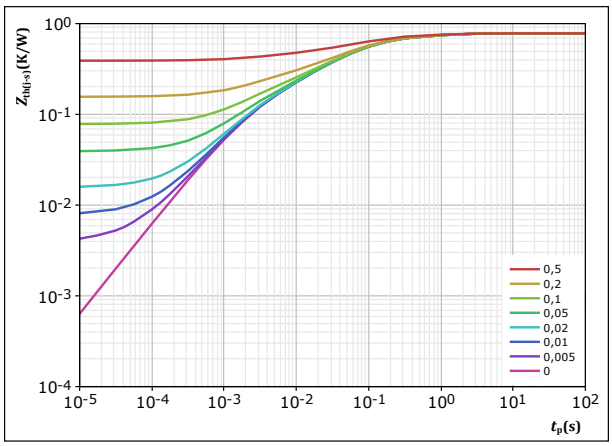


t_p =	250	µs		
V_{DS} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 4. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,78	K/W

MOSFET thermal model values

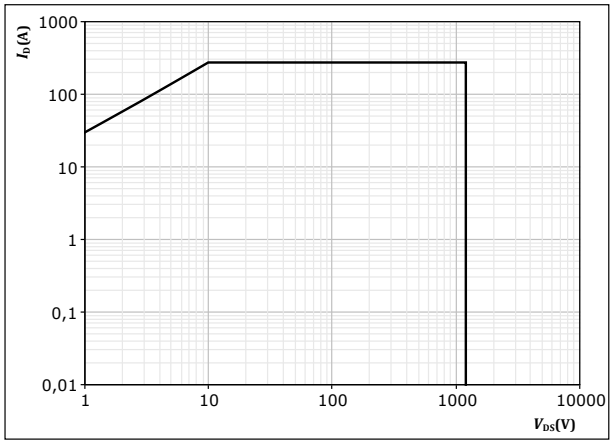
R (K/W)	τ (s)
8,97E-02	1,04E+00
2,29E-01	1,44E-01
2,67E-01	4,34E-02
1,19E-01	8,88E-03
7,47E-02	1,76E-03

Inverter Switch Characteristics

figure 5. **MOSFET**

Safe operating area

$I_D = f(V_{DS})$



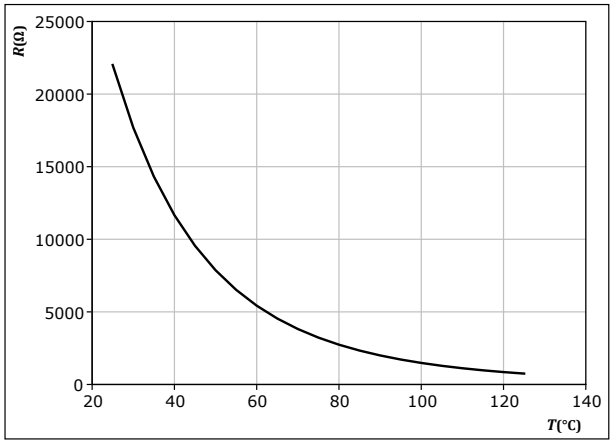
D = single pulse
T_s = 80 °C
V_{GS} = 18 V
T_j = T_{jmax}

Thermistor Characteristics

figure 6. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

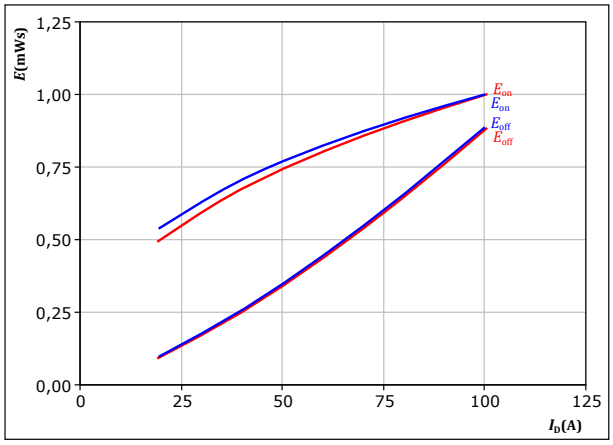


Inverter Switching Characteristics

figure 7. MOSFET

Typical switching energy losses as a function of drain current

$E = f(I_D)$



With an inductive load at

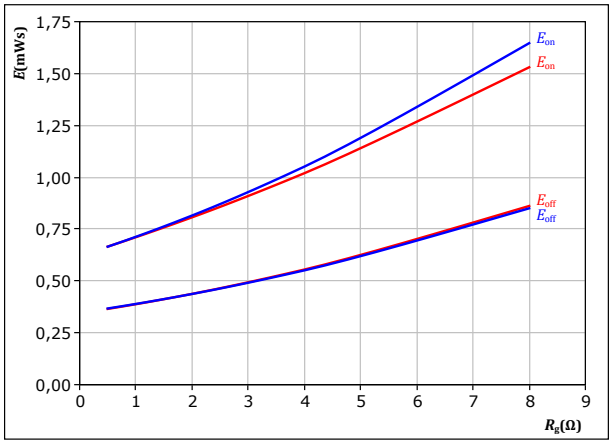
V_{DS} =	600	V
V_{GS} =	-5/16	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

T_j: 25 °C, 125 °C

figure 8. MOSFET

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



With an inductive load at

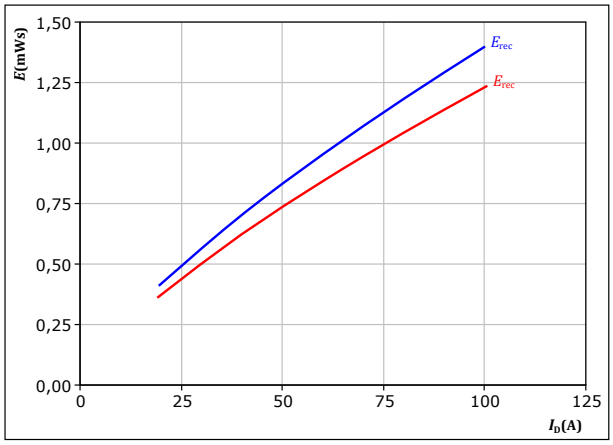
V_{DS} =	600	V
V_{GS} =	-5/16	V
I_D =	60	A

T_j: 25 °C, 125 °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

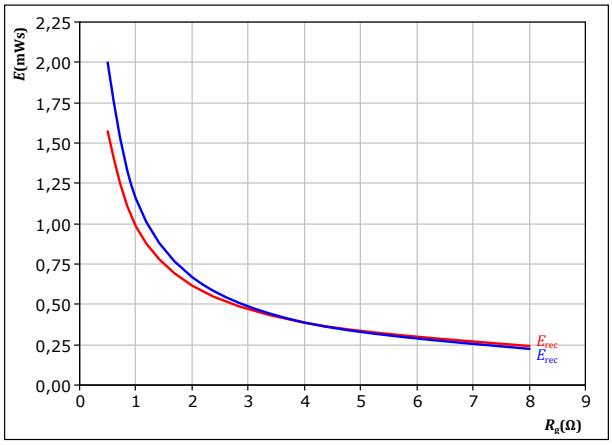
V_{DS} =	600	V
V_{GS} =	-5/16	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °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	V
V_{GS} =	-5/16	V
I_D =	60	A

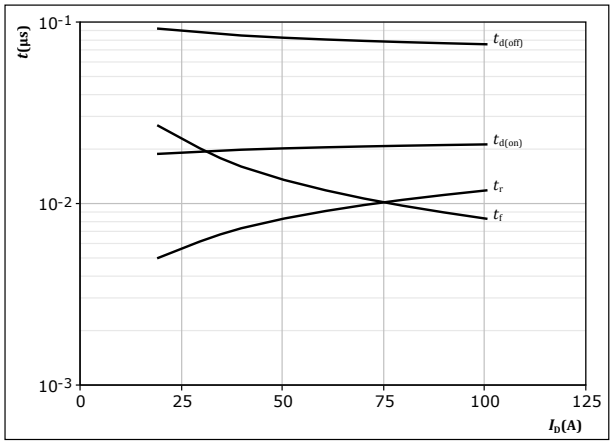
T_j: 25 °C, 125 °C

Inverter Switching Characteristics

figure 11. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



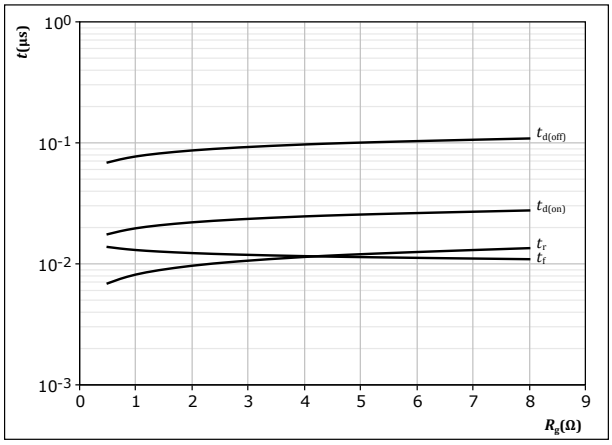
With an inductive load at

T_j =	125	°C
V_{DS} =	600	V
V_{GS} =	-5/16	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 12. **MOSFET**

Typical switching times as a function of gate resistor

$t = f(R_g)$



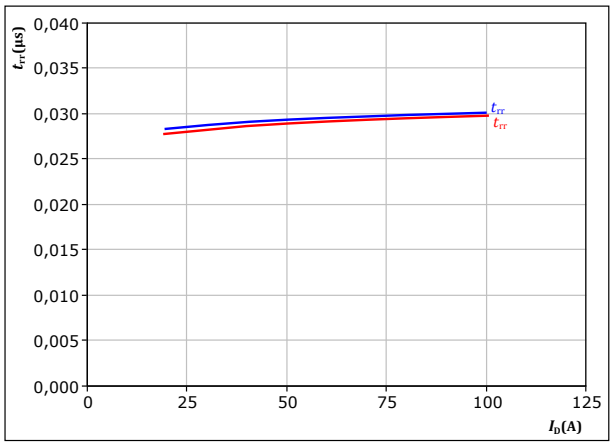
With an inductive load at

T_j =	125	°C
V_{DS} =	600	V
V_{GS} =	-5/16	V
I_D =	60	A

figure 13. **MOSFET**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



At

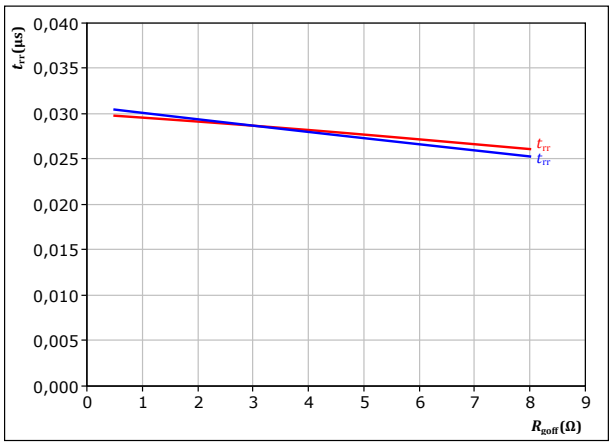
V_{DS} =	600	V
V_{GS} =	-5/16	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C

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} =	-5/16	V
I_D =	60	A

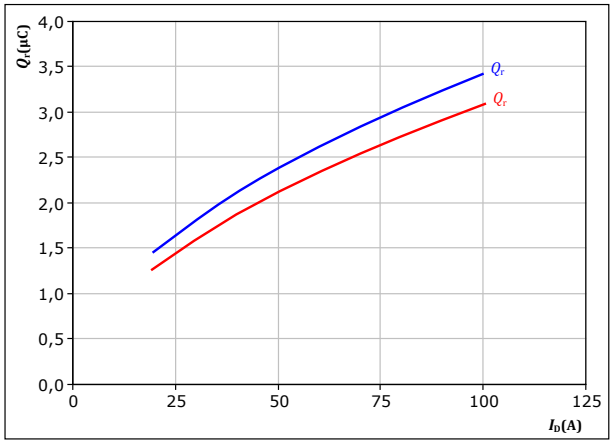
T_j: 25 °C, 125 °C

Inverter Switching Characteristics

figure 15. **MOSFET**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

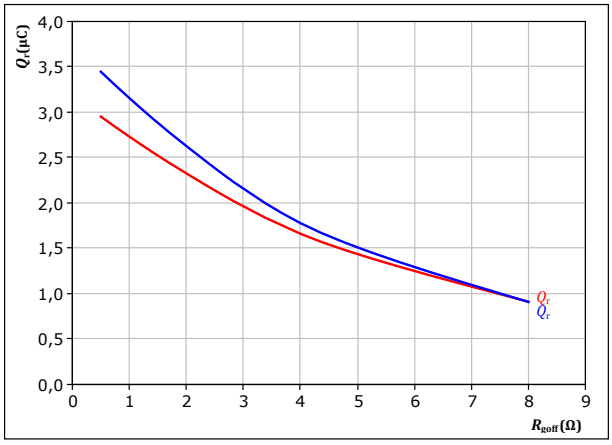


At				T_j:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	-5/16	V		125 °C
	R_{gon} =	2	Ω		

figure 16. **MOSFET**

Typical recovered charge as a function of turn off gate resistor

$Q_r = f(R_{goff})$

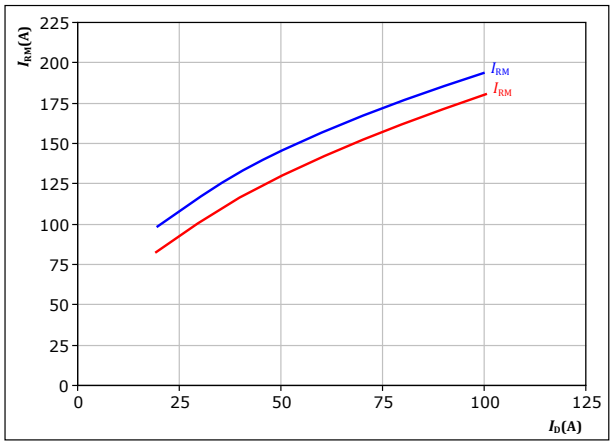


At				T_j:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	-5/16	V		125 °C
	I_D =	60	A		

figure 17. **MOSFET**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

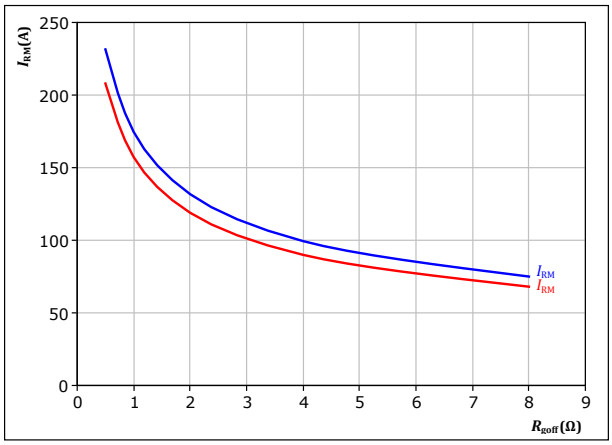


At				T_j:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	-5/16	V		125 °C
	R_{gon} =	2	Ω		

figure 18. **MOSFET**

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

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



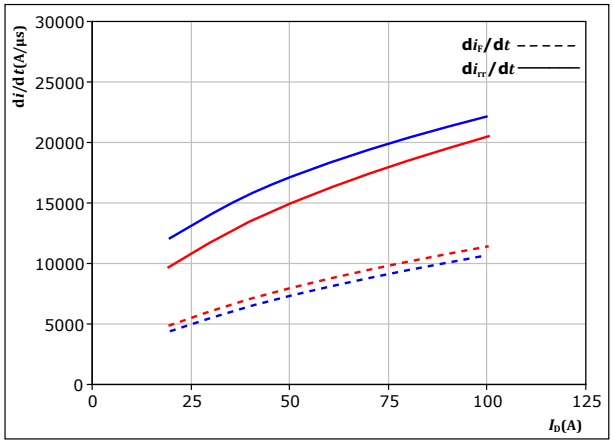
At				T_j:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	-5/16	V		125 °C
	I_D =	60	A		

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_{rr}/dt = f(I_D)



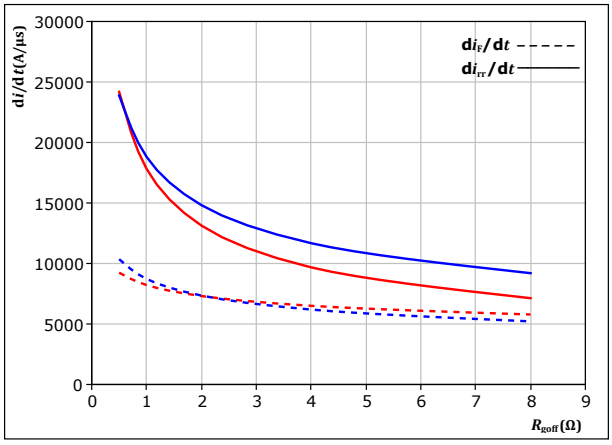
At			
	V_{DS} =	600	V
	V_{GS} =	-5/16	V
	R_{gon} =	2	Ω

T_j: 25 °C, 125 °C

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_{rr}/dt = f(R_{goff})



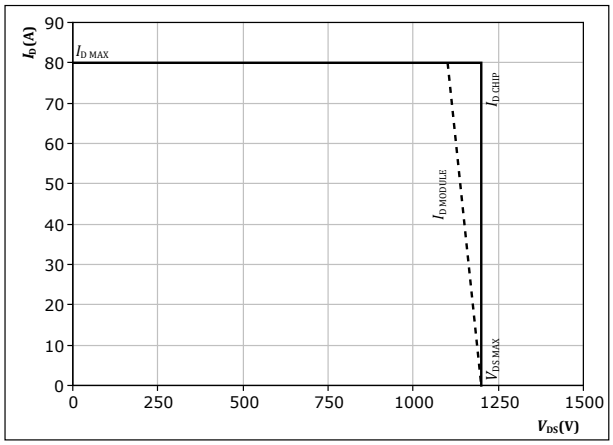
At			
	V_{DS} =	600	V
	V_{GS} =	-5/16	V
	I_D =	60	A

T_j: 25 °C, 125 °C

figure 21. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



At			
	T_j =	125	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

Inverter Switching Definitions

figure 22. **MOSFET**

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

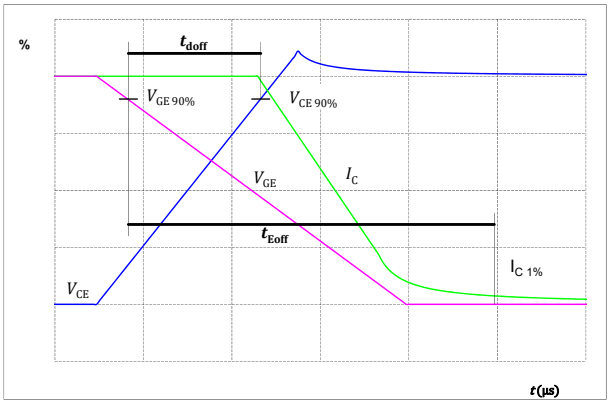


figure 23. **MOSFET**

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

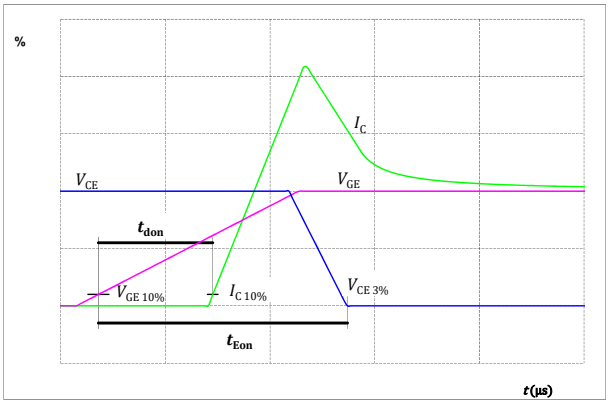


figure 24. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

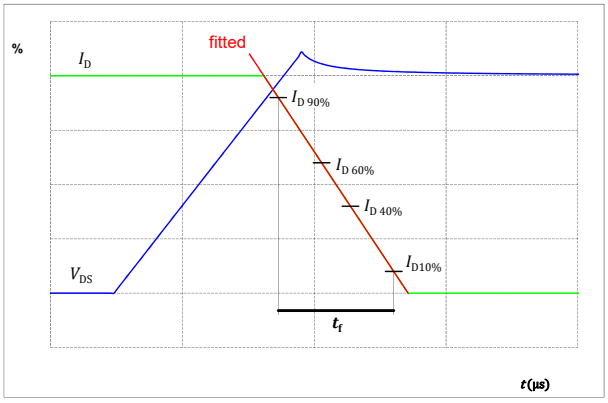
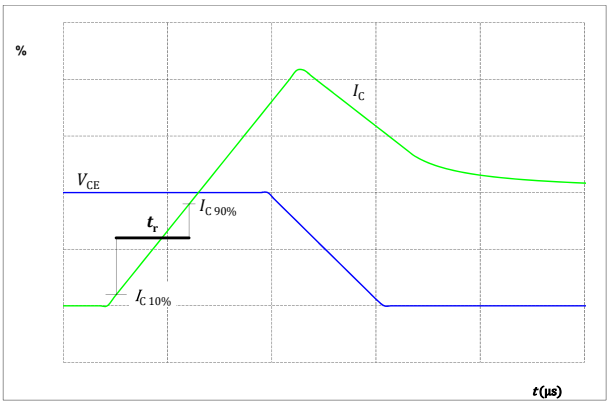


figure 25. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



Inverter Switching Definitions

figure 26. **FWD**

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

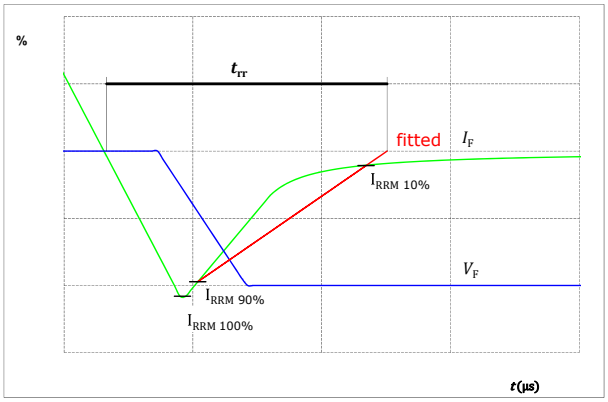


figure 27. **FWD**

Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})

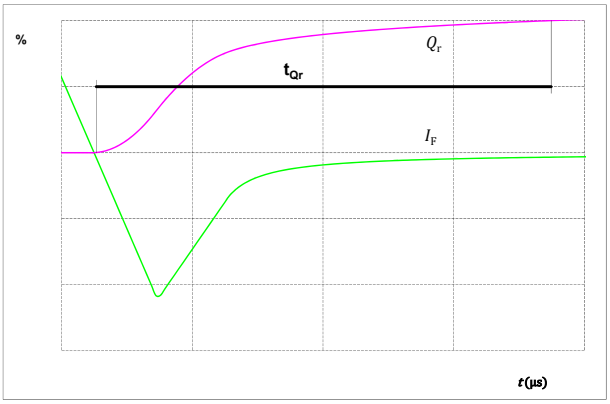
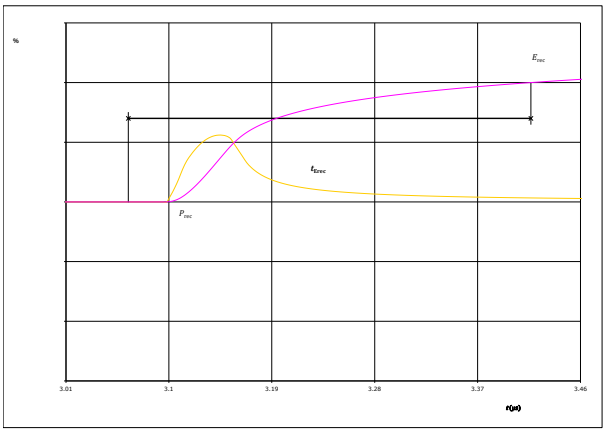


figure 28. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	10-PY126PA020MR-L227F28Y
With thermal paste (5,2 W/mK, PTM6000HV)	10-PY126PA020MR-L227F28Y-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-PY126PA020MR-L227F28Y-/3/

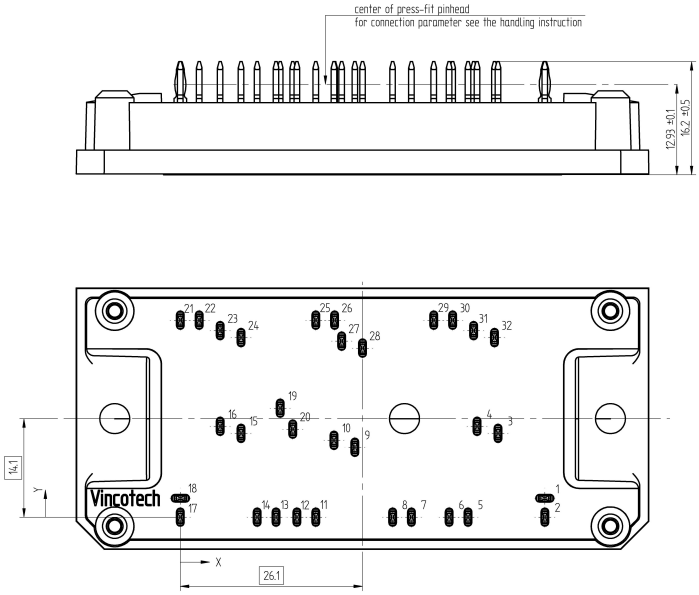
Marking

	Name	Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTVV	WWYY	UL VIN	LLLLL	SSSS

Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTVV	LLLLL	SSSS	WWYY		

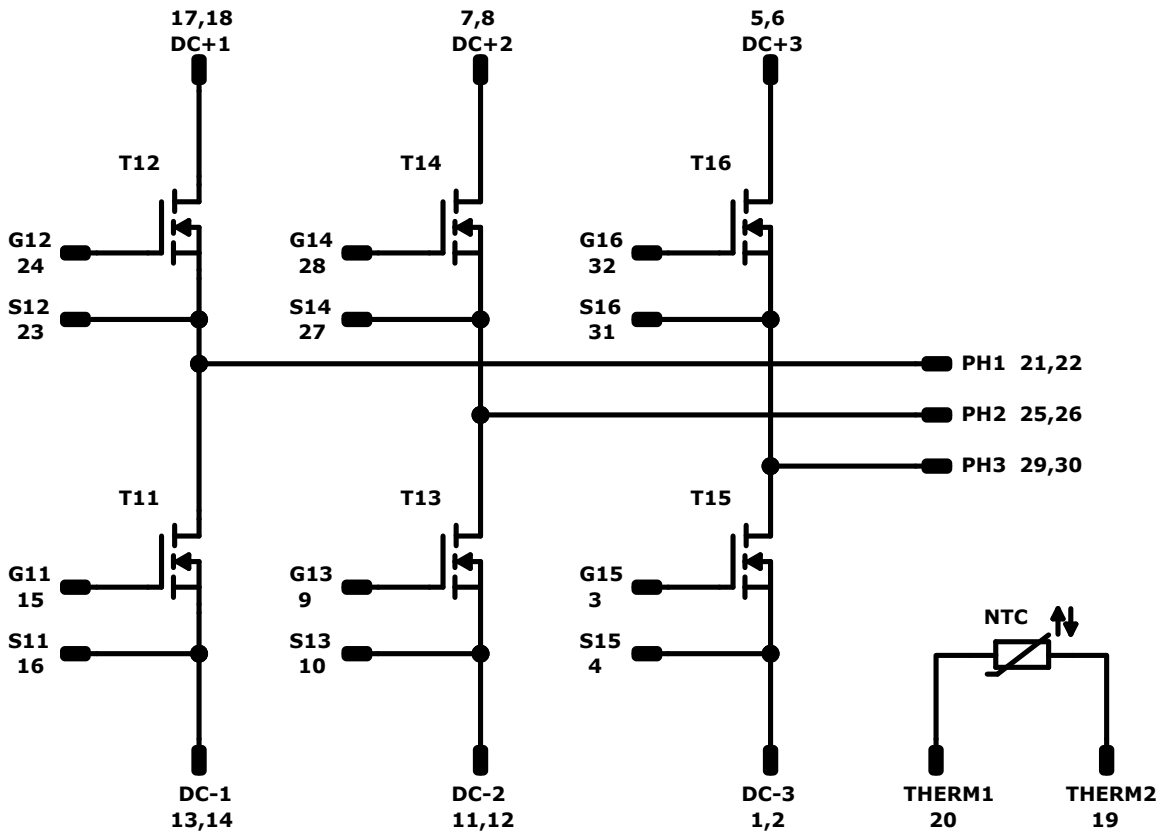
Outline

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



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

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	MOSFET	1200 V	20 mΩ	Inverter Switch	
NTC	Thermistor			Thermistor	

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

Handling instruction
Handling instructions for *flow* 1 packages see vincotech.com website.

Package data
Package data for *flow* 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 certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-PY126PA020MR-L227F28Y-D4-14	30 Nov. 2021	Corrected tau values of thermal characteristics Updated Thermistor characteristics New datasheet format, module is unchanged	