10-PY126PA020MS-L227F08Y
datasheet

***flow*PACK 1 SiC** **1200 V / 20 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: Al_2O_3
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

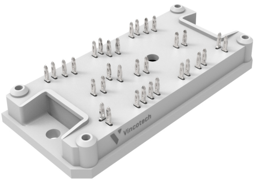
Target applications

- Charging Stations
- Elevator Drives
- Embedded Drives
- Industrial Drives

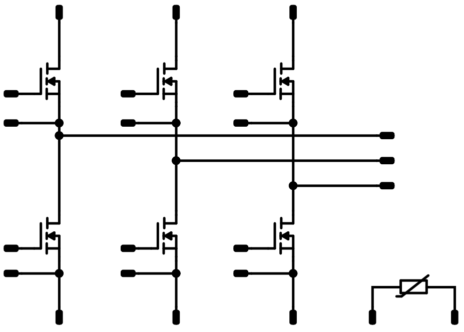
Types

- 10-PY126PA020MS-L227F08Y

flow 1 12 mm housing



Schematic



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	84	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 °C	137	W
Gate-source voltage	V_{GSS}			0 / 18	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 s	6000	V
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	3500	V
Creepage distance				>12,7	mm
Clearance				11,83	mm
Comparative Tracking Index	CTI			≥ 600	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions	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]	Values Min	Typ	Max	Unit
Inverter Switch										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		18		60	25 125 150		19 18,4 19,6	27,6(1)	mΩ
Gate-source threshold voltage	$V_{GS(th)}$				0,006	25	3,6	4,6	5,6	V
Gate to Source Leakage Current	I_{GSS}		22	0		25			400	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25			200	µA
Internal gate resistance	r_g							1,5		Ω
Gate charge	Q_g		0/18		60	25		370		nC
Short-circuit input capacitance	C_{iss}		0	10	0	25		8000		pF
Short-circuit output capacitance	C_{oss}							2600		
Reverse transfer capacitance	C_{rss}							220		
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,69		K/W

Characteristic Values

Parameter	Symbol	Conditions	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	Unit
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	0/18	600	64	25 125 150		16,75 14,2 13,72		ns
Rise time	t_r					25 125 150		11,55 10,37 10,18		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		44,8 51,68 54,25		ns
Fall time	t_f					25 125 150		15,45 14,36 16,16		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,744 µC Q_{rFWD}=1,14 µC Q_{rFWD}=1,4 µC				25 125 150		0,88 0,798 0,828		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,143 0,129 0,137		mWs
Peak recovery current	I_{RRM}	d*i*/d*t*=6224 A/µs d*i*/d*t*=7800 A/µs d*i*/d*t*=7610 A/µs				25 125 150		61,03 83,46 95,16		A
Reverse recovery time	t_{rr}					25 125 150		20,23 21,33 22,85		ns
Recovered charge	Q_r					25 125 150		0,744 1,14 1,4		µC
Reverse recovered energy	E_{rec}					25 125 150		0,153 0,319 0,421		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		8896,17 13710,77 20140,74		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 R100	$\Delta_{R/R}$	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	

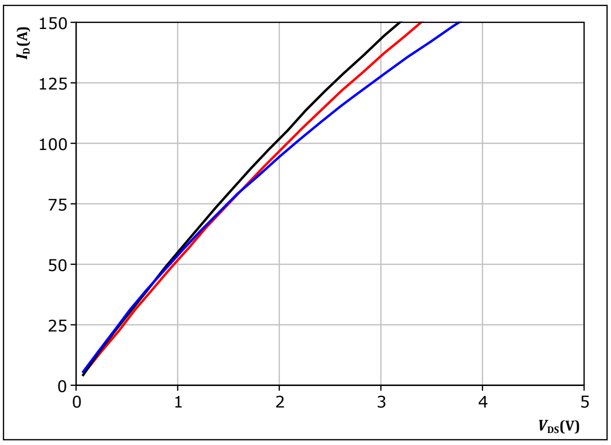
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

I_D = f(V_{DS})

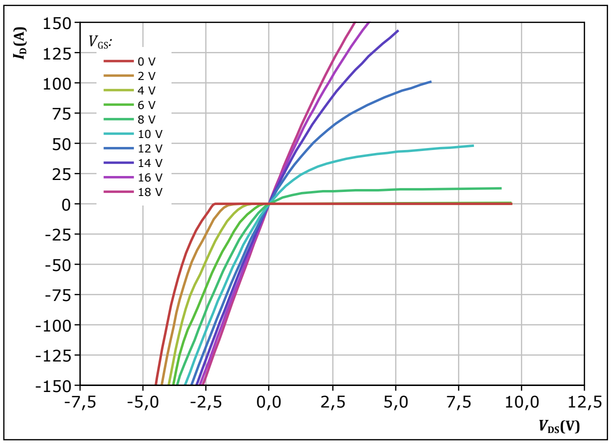


t_p = 250 µs
V_{GS} = 18 V
T_j: 25 °C, 125 °C, 150 °C

figure 2. **MOSFET**

Typical output characteristics

I_D = f(V_{DS})

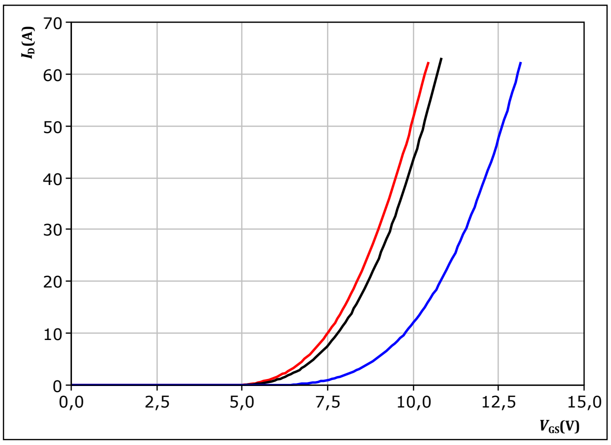


t_p = 250 µs
T_j = 150 °C
V_{GS} from 0 V to 18 V in steps of 2 V

figure 3. **MOSFET**

Typical transfer characteristics

I_D = f(V_{GS})

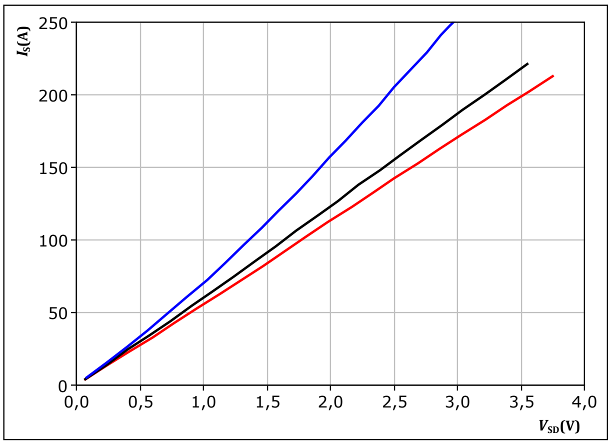


t_p = 250 µs
V_{DS} = 10 V
T_j: 25 °C, 125 °C, 150 °C

figure 4. **MOSFET**

Typical reverse drain current characteristics

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



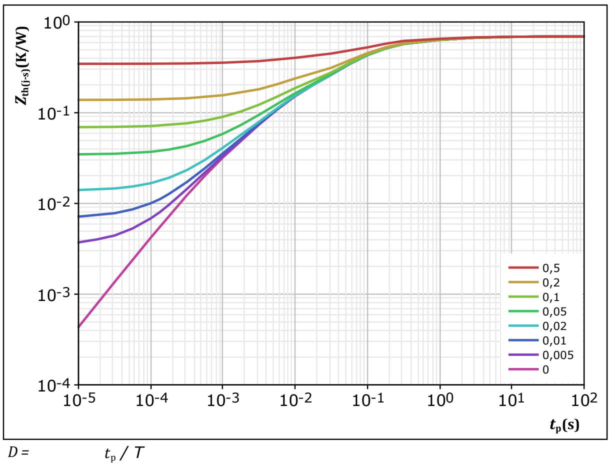
t_p = 250 µs
V_{GS} = 18 V
T_j: 25 °C, 125 °C, 150 °C

Inverter Switch Characteristics

figure 5. **MOSFET**

Transient thermal impedance as a function of pulse width

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



$D =$ t_p / T

$R_{th(j-s)} =$ 0,692 K/W

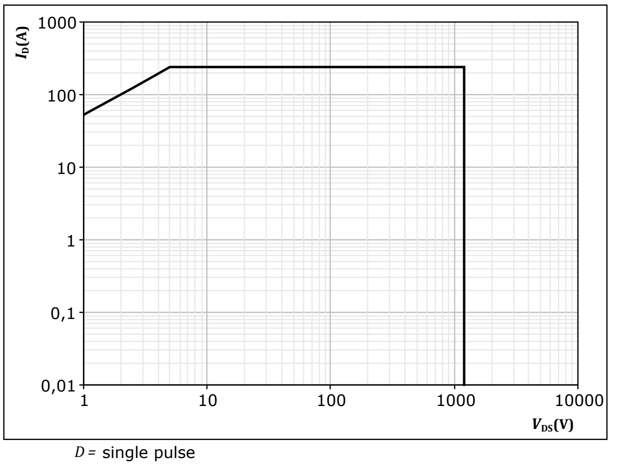
MOSFET thermal model values

R (K/W)	τ (s)
3,57E-02	5,20E+00
1,24E-01	6,65E-01
4,05E-01	8,14E-02
1,14E-01	6,28E-03
1,31E-02	6,45E-04

figure 6. **MOSFET**

Safe operating area

$I_D = f(V_{DS})$



$D =$ single pulse

$T_s =$ 80 °C

$V_{GS} =$ 18 V

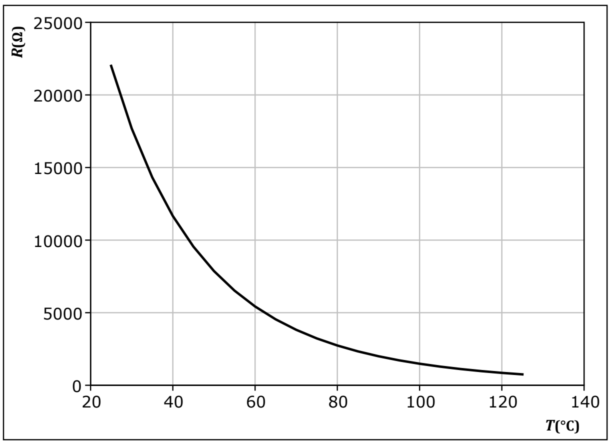
$T_j =$ T_{jmax}

Thermistor Characteristics

figure 7.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

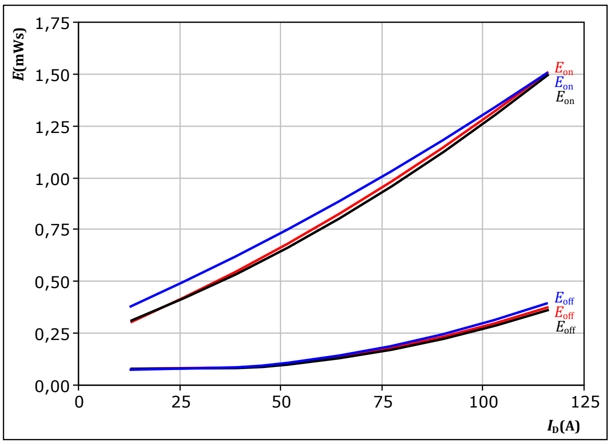


Inverter Switching Characteristics

figure 8. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



With an inductive load at

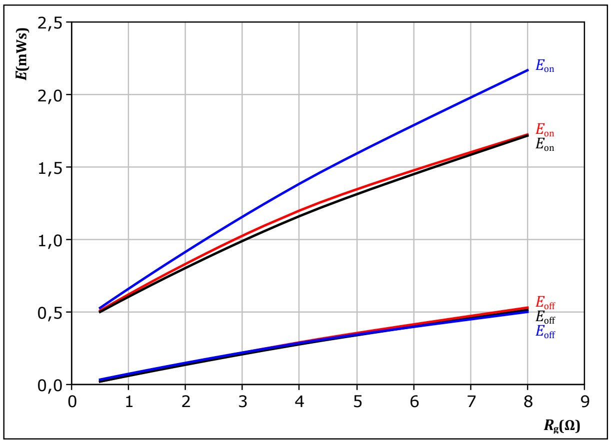
V_{DS} =	600	V	
V_{GS} =	0/18	V	
R_{gon} =	2	Ω	
R_{goff} =	2	Ω	

T_j: 25 °C, 125 °C, 150 °C

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

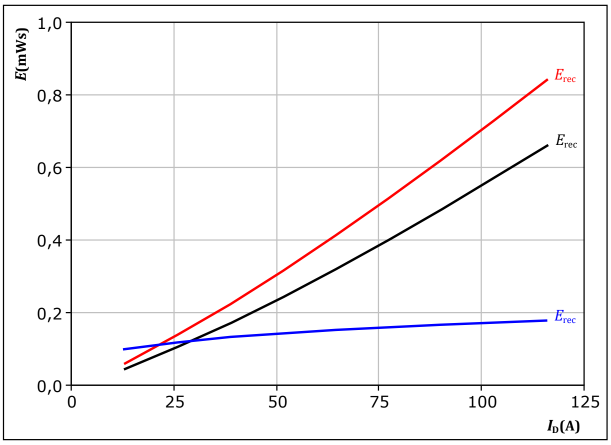
V_{DS} =	600	V	
V_{GS} =	0/18	V	
I_D =	64	A	

T_j: 25 °C, 125 °C, 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

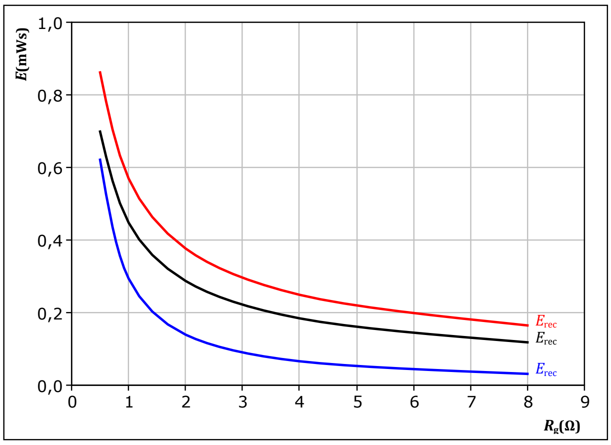
V_{DS} =	600	V	
V_{GS} =	0/18	V	
R_{gon} =	2	Ω	

T_j: 25 °C, 125 °C, 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	
V_{GS} =	0/18	V	
I_D =	64	A	

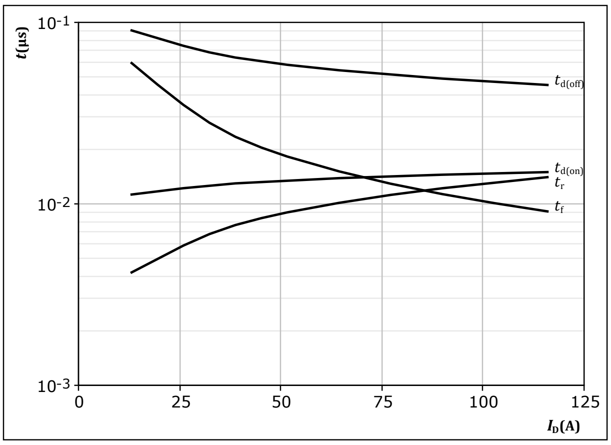
T_j: 25 °C, 125 °C, 150 °C

Inverter Switching Characteristics

figure 12. **MOSFET**

Typical switching times as a function of drain current

t = f(I_D)



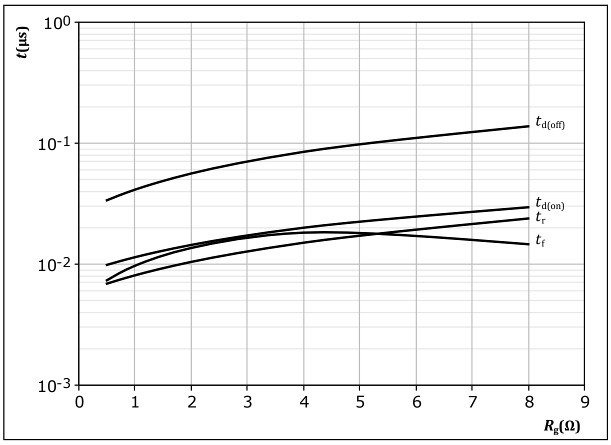
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	0/18	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 13. **MOSFET**

Typical switching times as a function of MOSFET turn on gate resistor

t = f(R_g)



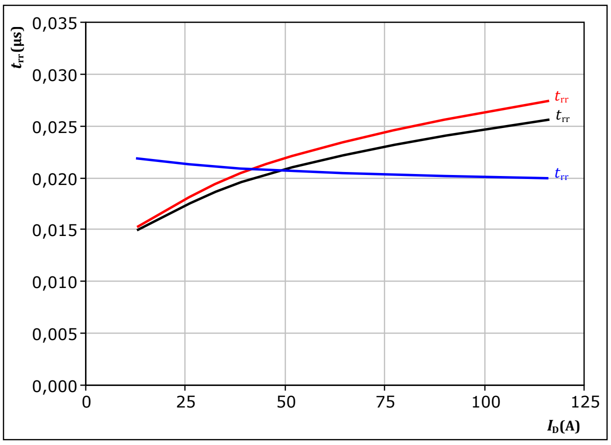
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	0/18	V
I_D =	64	A

figure 14. **MOSFET**

Typical reverse recovery time as a function of drain current

t_{rr} = f(I_D)



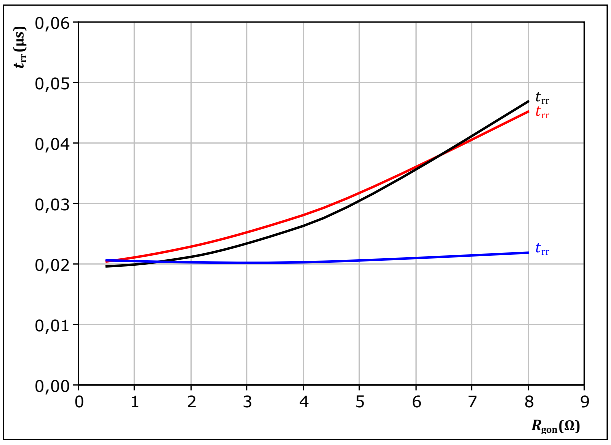
At V_{DS} = 600 V, V_{GS} = 0/18 V, R_{gon} = 2 Ω

T_j: 25 °C, 125 °C, 150 °C

figure 15. **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} = 0/18 V, I_D = 64 A

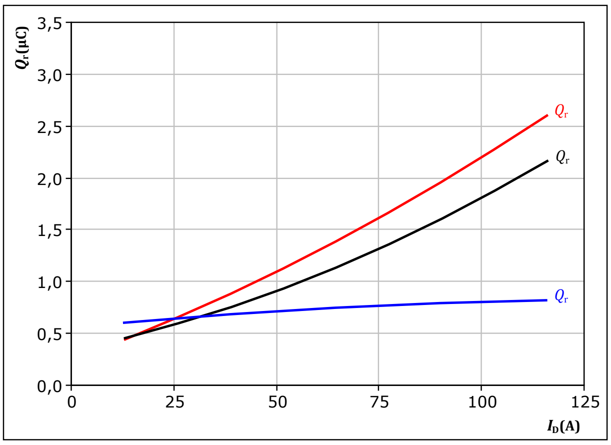
T_j: 25 °C, 125 °C, 150 °C

Inverter Switching Characteristics

figure 16. **MOSFET**

Typical recovered charge as a function of drain current

Q_r = f(I_D)

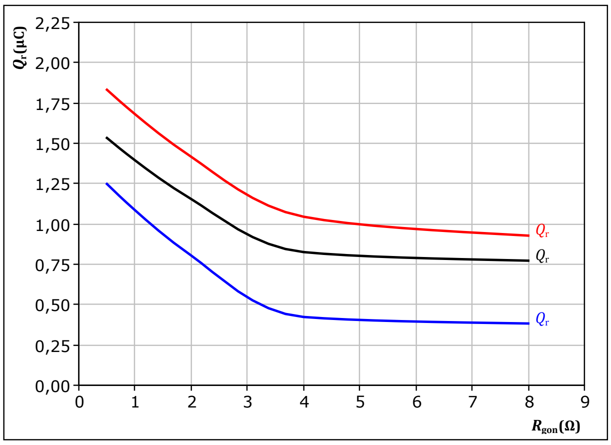


At					
	V_{DS} =	600	V		25 °C
	V_{GS} =	0/18	V	T_j:	125 °C
	R_{gon} =	2	Ω		150 °C

figure 17. **MOSFET**

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

Q_r = f(R_{gon})

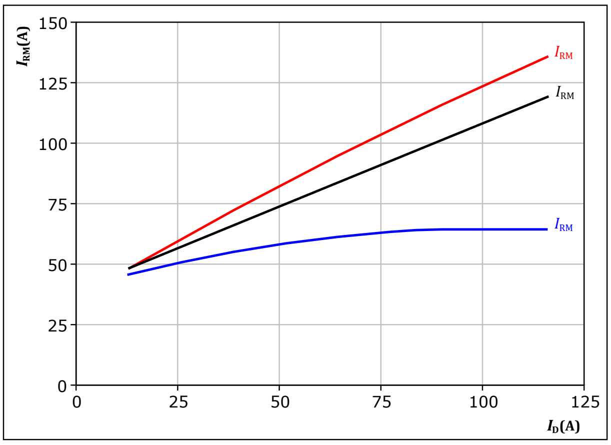


At					
	V_{DS} =	600	V		25 °C
	V_{GS} =	0/18	V	T_j:	125 °C
	I_D =	64	A		150 °C

figure 18. **MOSFET**

Typical peak reverse recovery current as a function of drain current

I_{RM} = f(I_D)

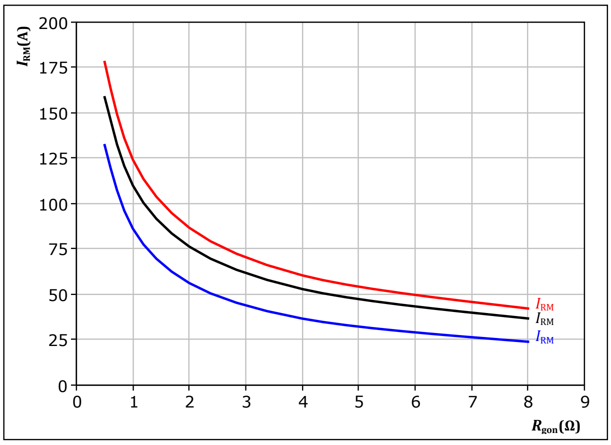


At					
	V_{DS} =	600	V		25 °C
	V_{GS} =	0/18	V	T_j:	125 °C
	R_{gon} =	2	Ω		150 °C

figure 19. **MOSFET**

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

I_{RM} = f(R_{gon})



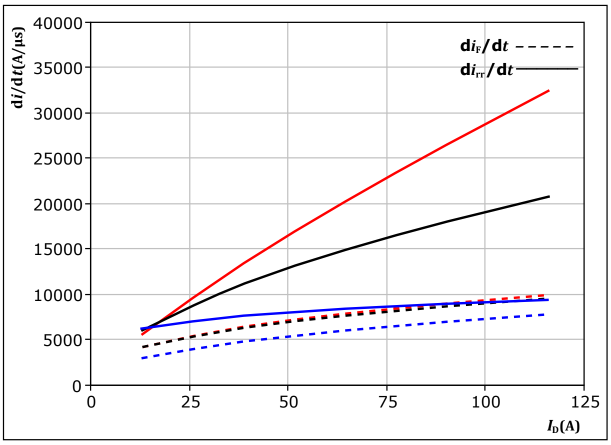
At					
	V_{DS} =	600	V		25 °C
	V_{GS} =	0/18	V	T_j:	125 °C
	I_D =	64	A		150 °C

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)

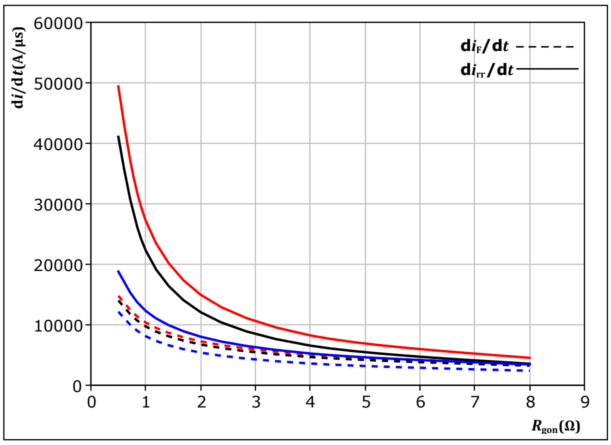


At				
V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	0/18	V		125 °C
R_{gon} =	2	Ω		150 °C

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_{gon})

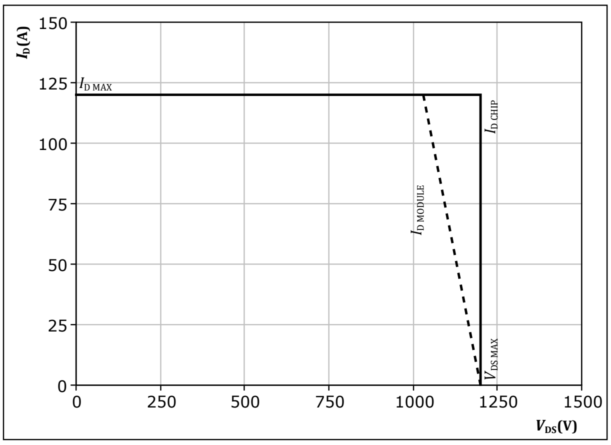


At				
V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	0/18	V		125 °C
I_D =	64	A		150 °C

figure 22. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



At		
T_j =	150	°C
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Inverter Switching Definitions

figure 23. **MOSFET**

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

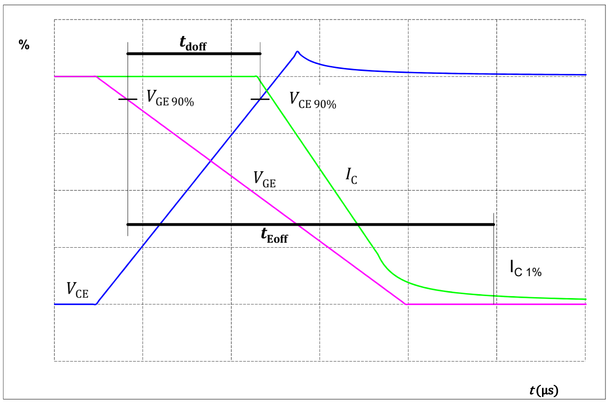


figure 24. **MOSFET**

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

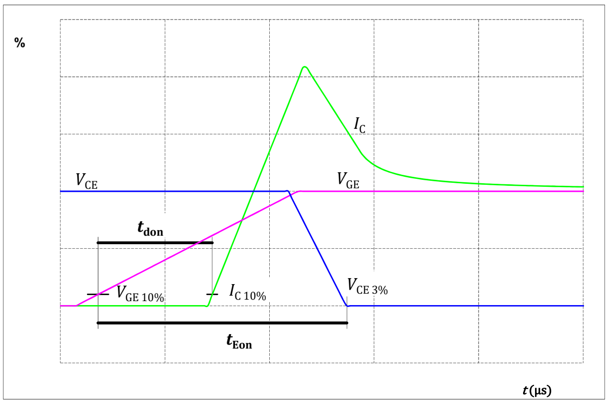


figure 25. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

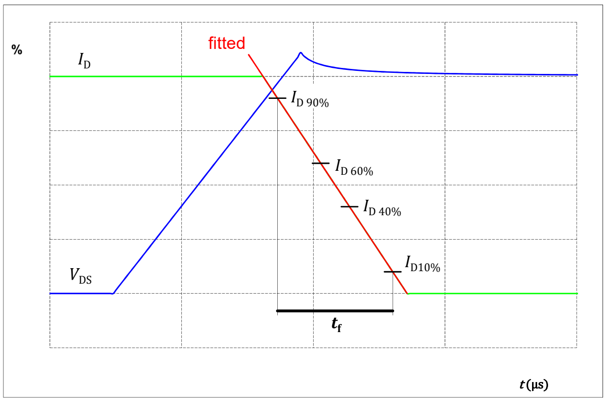
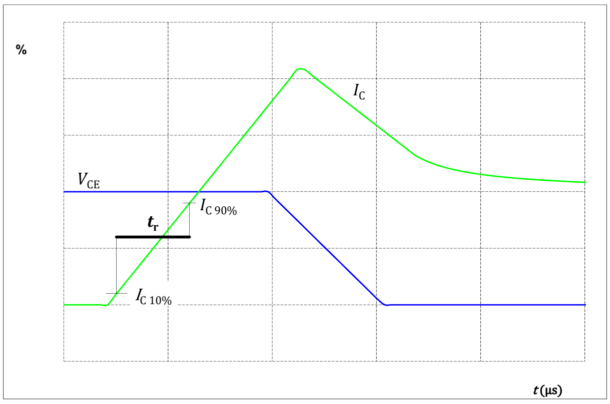


figure 26. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



Inverter Switching Definitions

figure 27. FWD

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

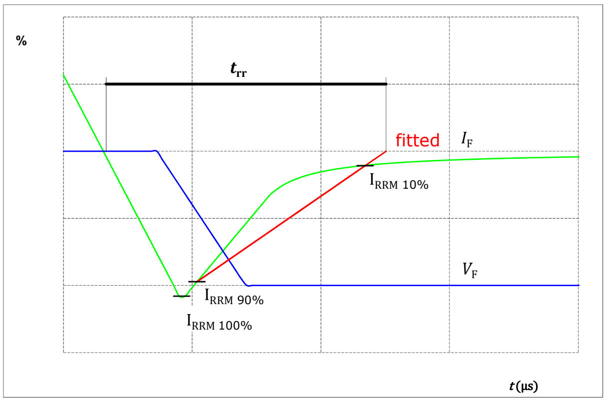


figure 28. FWD

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

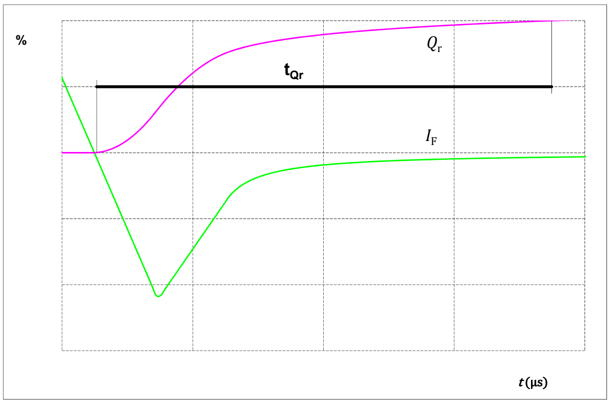
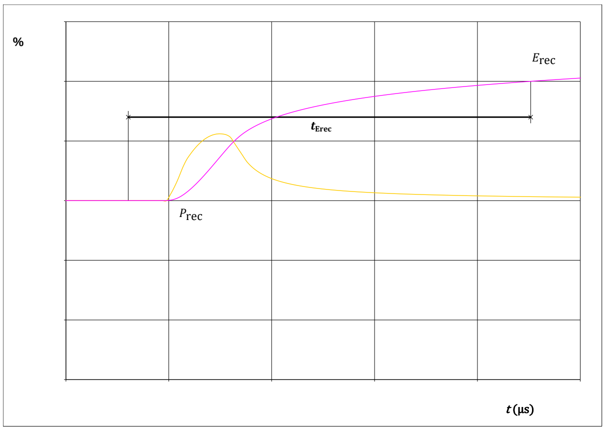


figure 29. FWD

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



10-PY126PA020MS-L227F08Y
datasheet

Ordering Code

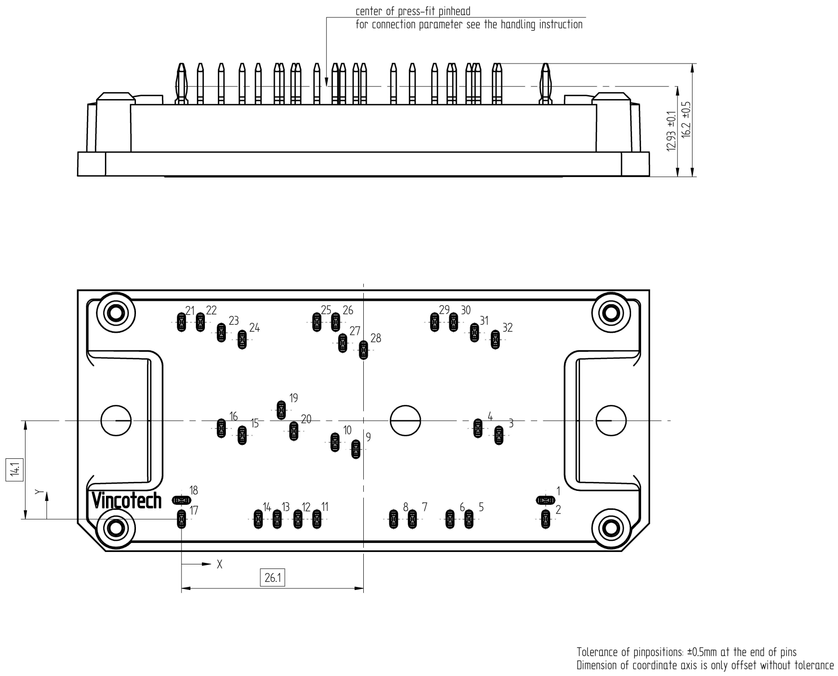
Version	Ordering Code
Without thermal paste	10-PY126PA020MS-L227F08Y
With thermal paste (5,2 W/mK, PTM6000HV)	10-PY126PA020MS-L227F08Y-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-PY126PA020MS-L227F08Y-/3/

Marking

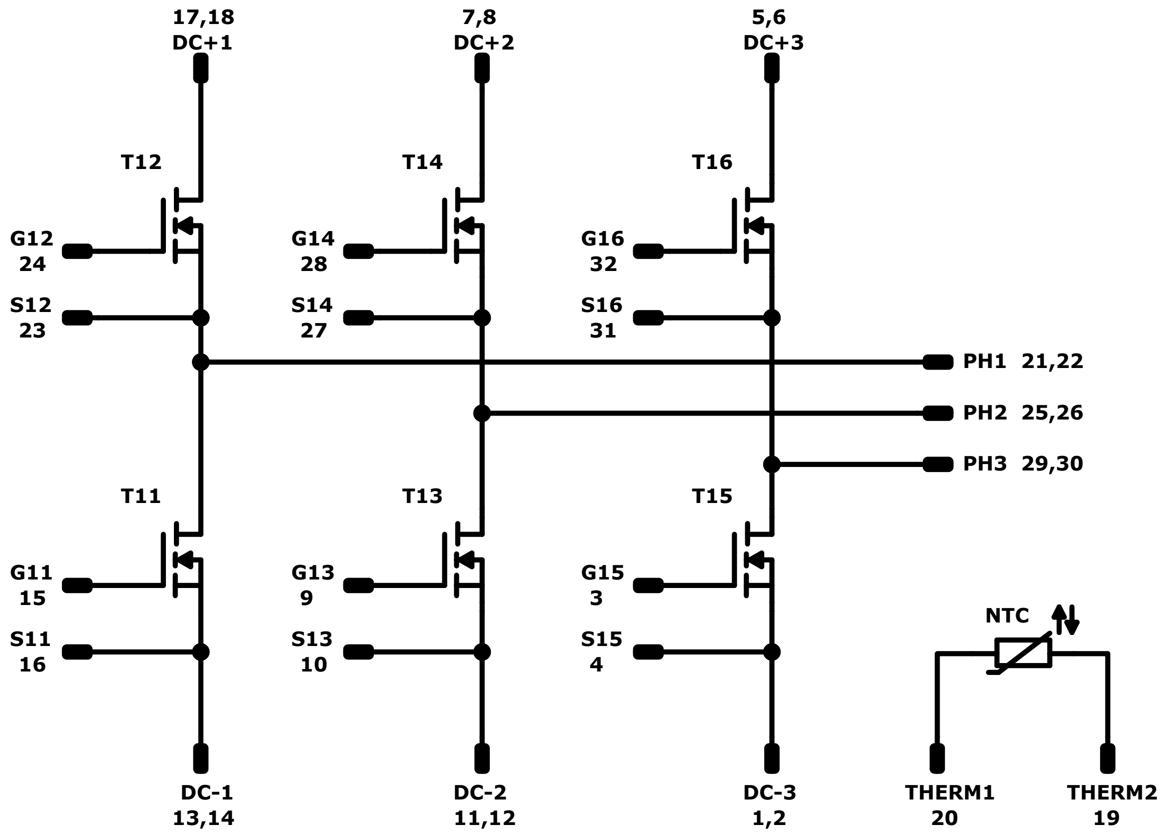
	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
	Type&Ver	Lot number	Serial	Date code		
Datamatrix	TTTTTTTVV	LLLLL	SSSS	WWYY		

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



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	MOSFET	1200 V	20 mΩ	Inverter Switch	
Rt	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-PY126PA020MS-L227F08Y-D1-14	29 Nov. 2023		