Vincotech

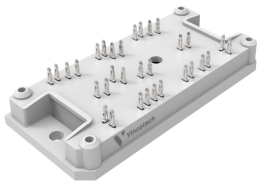
10-PY126PA016ME-L227F13Y
datasheet

***flow*PACK 1 SiC** **1200 V / 16 mΩ**

Features

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

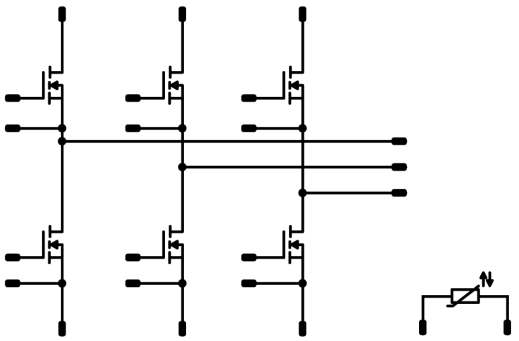
flow 1 12 mm housing



Target applications

- Charging Stations
- Power Supply
- Welding & Cutting

Schematic



Types

- 10-PY126PA016ME-L227F13Y

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	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 °C	130	W
Gate-source voltage	V_{GSS}		-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 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	$r_{DS(on)}$		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]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,73		K/W

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 Ω R_{goff} = 2 Ω	-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_{rFWD}=0,809 µC Q_{rFWD}=1,48 µC Q_{rFWD}=1,63 µC				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/µs di/dt=16593 A/µs di/dt=16559 A/µs				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	$(di_{rf}/dt)_{max}$					25 125 150		25921 42635 41962		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	

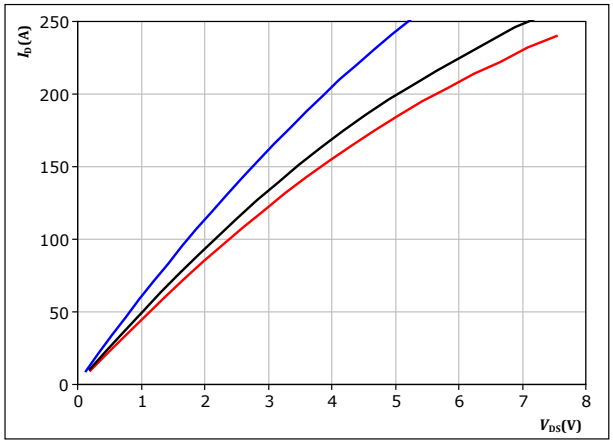
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

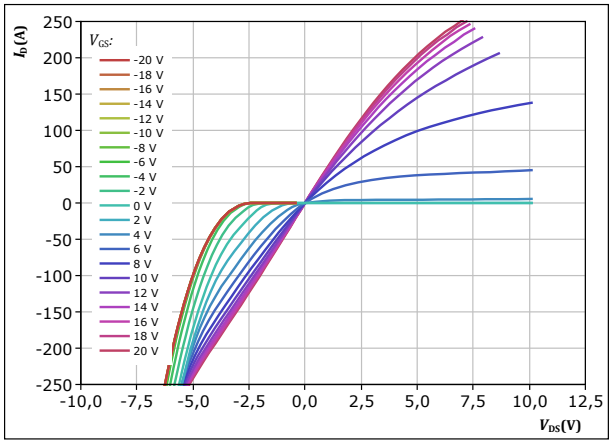


t_p =	250	µs		
V_{GS} =	14	V	T_j:	25 °C
				125 °C
				150 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



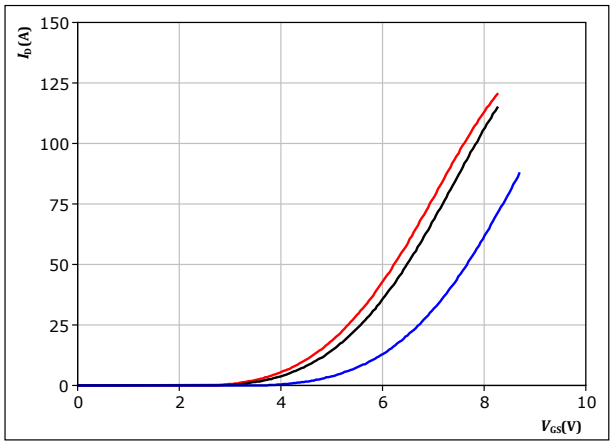
t_p =	250	µs
T_j =	150	°C

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

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

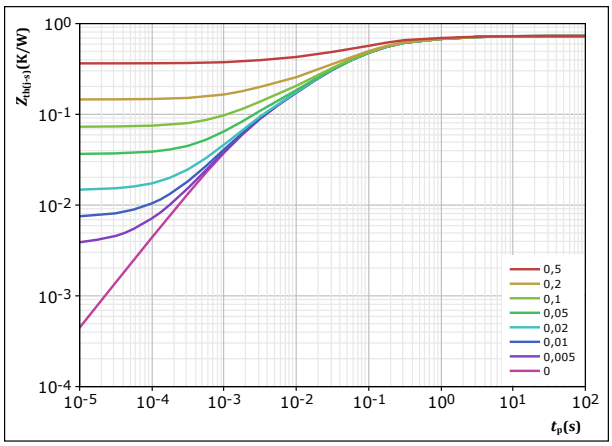


t_p =	250	µs		
V_{DS} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 4. **MOSFET**

Transient thermal impedance as a function of pulse width

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



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

MOSFET thermal model values

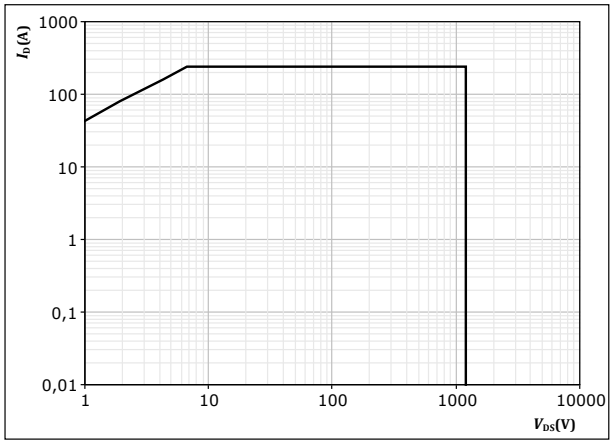
R (K/W)	τ (s)
3,61E-02	4,04E+00
1,11E-01	6,41E-01
3,61E-01	9,20E-02
1,61E-01	1,58E-02
5,95E-02	1,96E-03

Inverter Switch Characteristics

figure 5. **MOSFET**

Safe operating area

$I_D = f(V_{DS})$



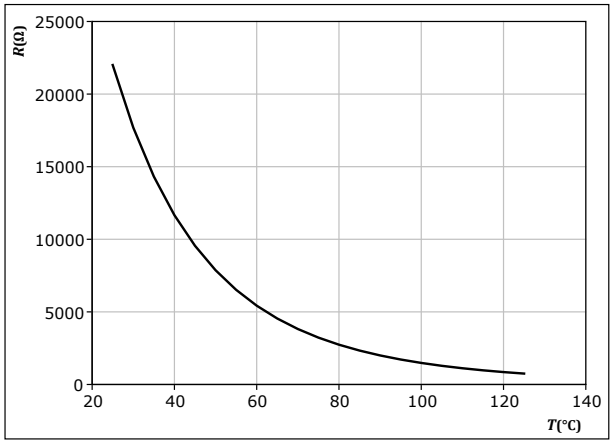
D = single pulse
T_s = 80 °C
V_{GS} = 14 V
T_j = T_{jmax}

Thermistor Characteristics

figure 6. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

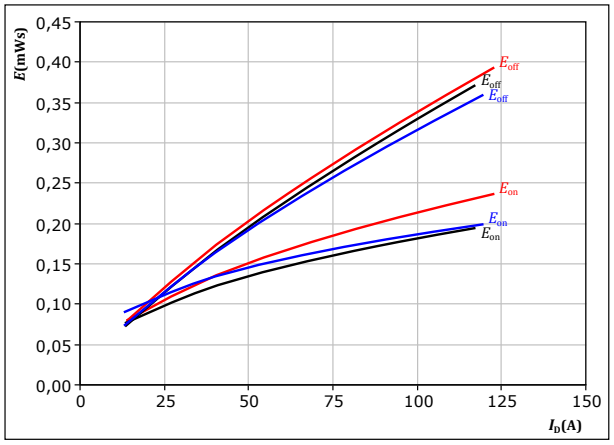


Inverter Switching Characteristics

figure 7. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



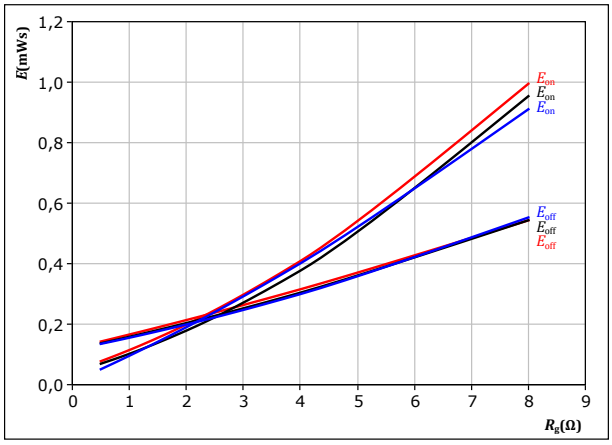
With an inductive load at

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

figure 8. **MOSFET**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



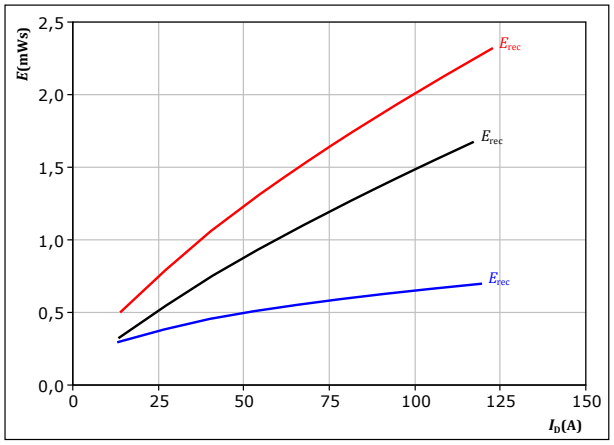
With an inductive load at

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

figure 9. **MOSFET**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



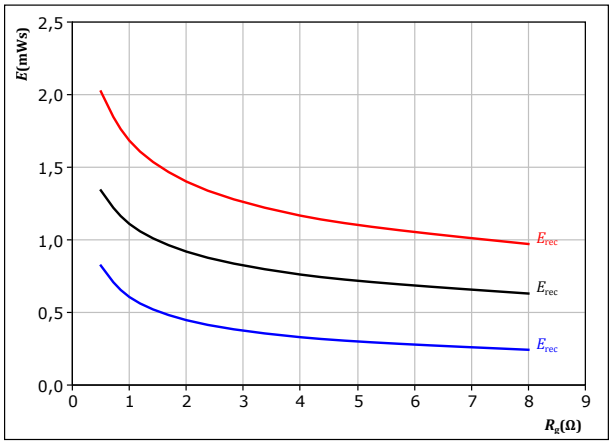
With an inductive load at

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

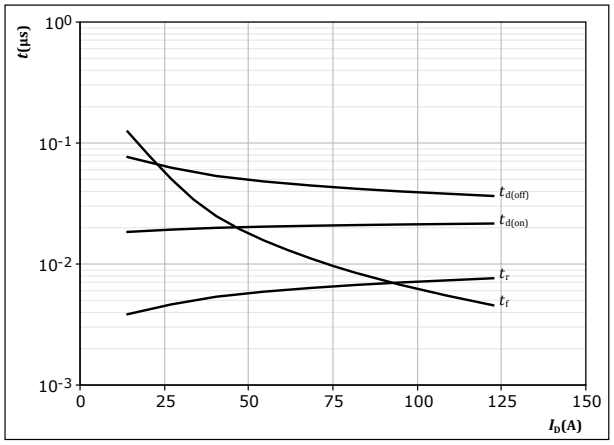
V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-4/15	V		125 °C
I_D =	65	A		150 °C

Inverter Switching Characteristics

figure 11. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



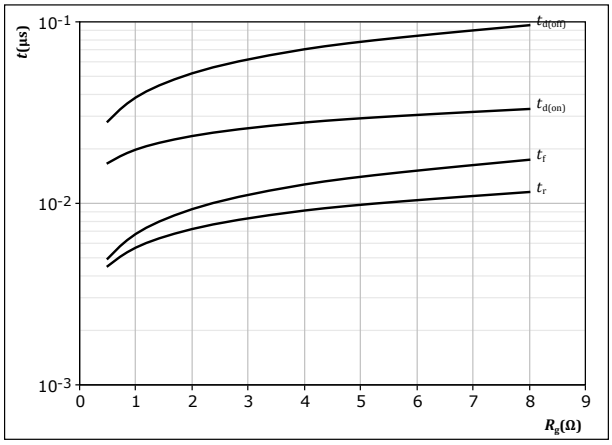
With an inductive load at

$T_j =$	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

$t = f(R_g)$



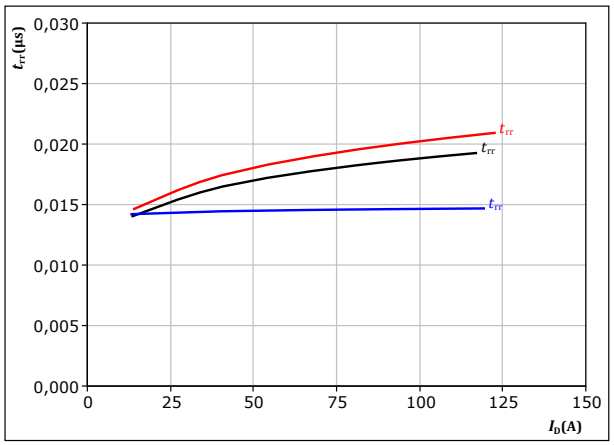
With an inductive load at

$T_j =$	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

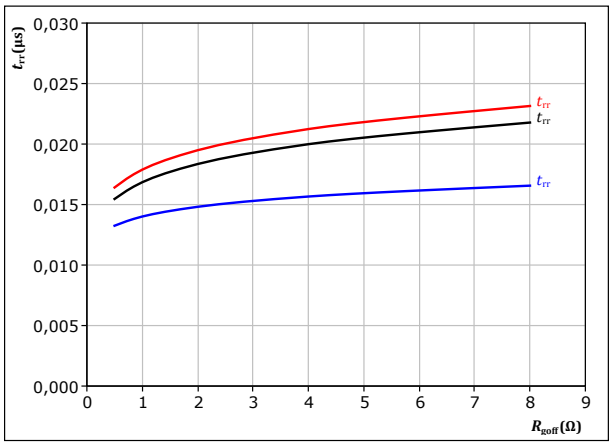
$V_{DS} =$	600	V
$V_{GS} =$	-4/15	V
$R_{gon} =$	2	Ω

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

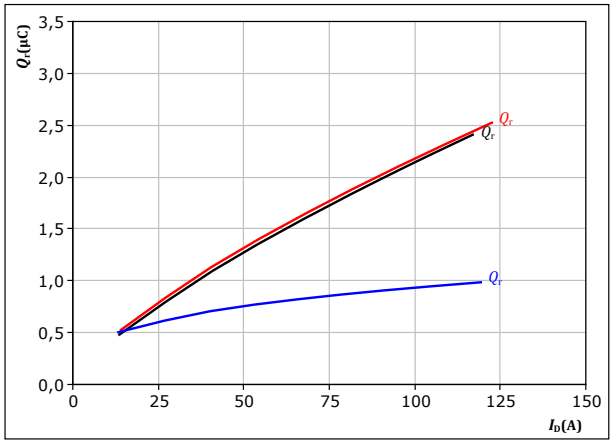
T_j: 25 °C, 125 °C, 150 °C

Inverter Switching Characteristics

figure 15. **MOSFET**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

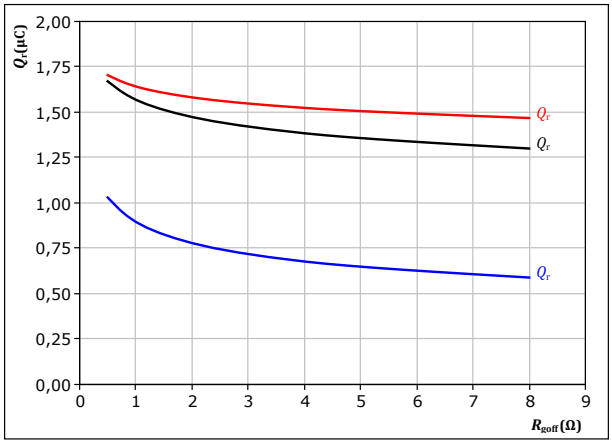


At					
	V_{DS} =	600	V		
	V_{GS} =	-4/15	V	T_j:	25 °C
	R_{gon} =	2	Ω		125 °C
					150 °C

figure 16. **MOSFET**

Typical recovered charge as a function of turn off gate resistor

$Q_r = f(R_{goff})$

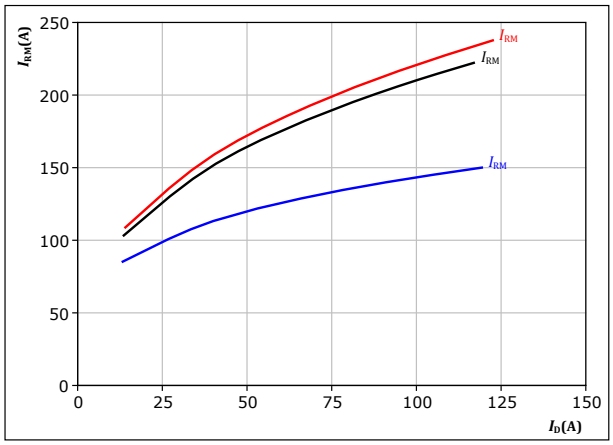


At					
	V_{DS} =	600	V		
	V_{GS} =	-4/15	V	T_j:	25 °C
	I_D =	65	A		125 °C
					150 °C

figure 17. **MOSFET**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

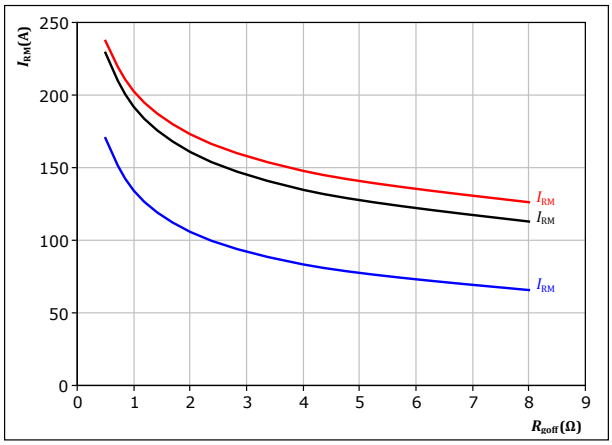


At					
	V_{DS} =	600	V		
	V_{GS} =	-4/15	V	T_j:	25 °C
	R_{gon} =	2	Ω		125 °C
					150 °C

figure 18. **MOSFET**

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

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



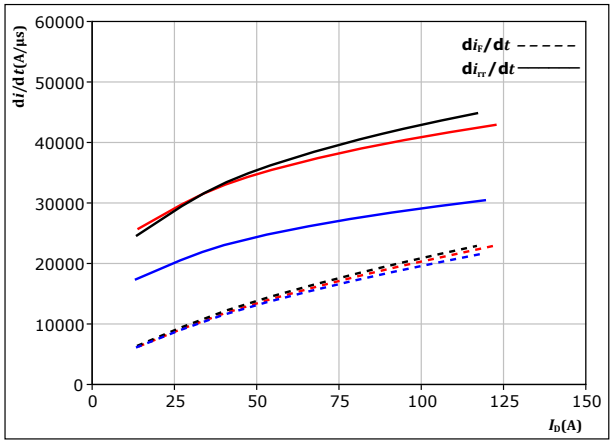
At					
	V_{DS} =	600	V		
	V_{GS} =	-4/15	V	T_j:	25 °C
	I_D =	65	A		125 °C
					150 °C

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)

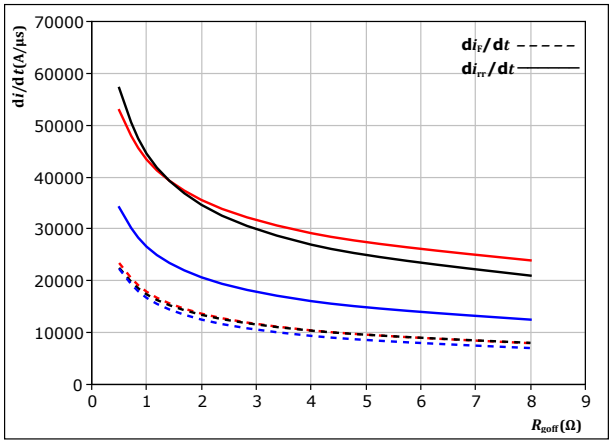


At					
V_{DS} =	600	V			
V_{GS} =	-4/15	V	T_j:	25 °C	
R_{gon} =	2	Ω		125 °C	
				150 °C	

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})

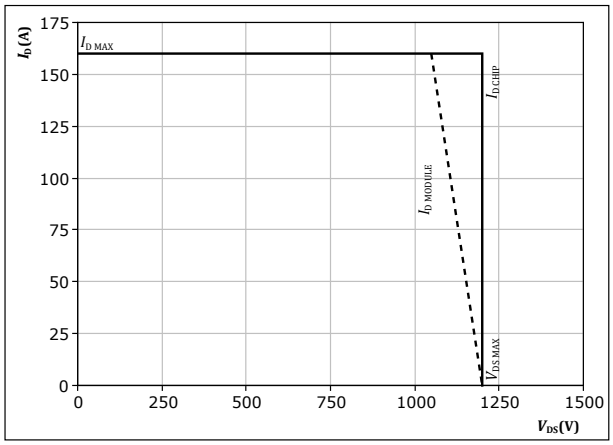


At					
V_{DS} =	600	V			
V_{GS} =	-4/15	V	T_j:	25 °C	
I_D =	65	A		125 °C	
				150 °C	

figure 21. **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 22. **MOSFET**

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

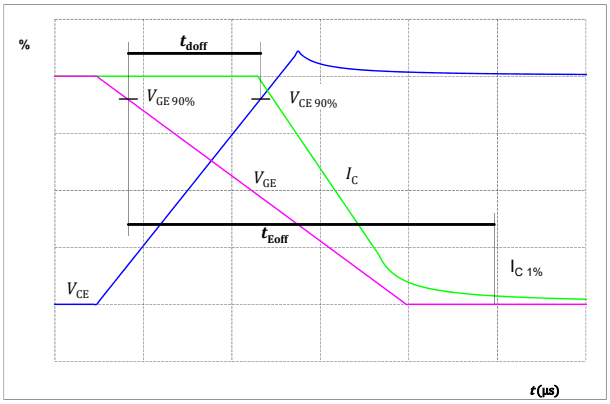


figure 23. **MOSFET**

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

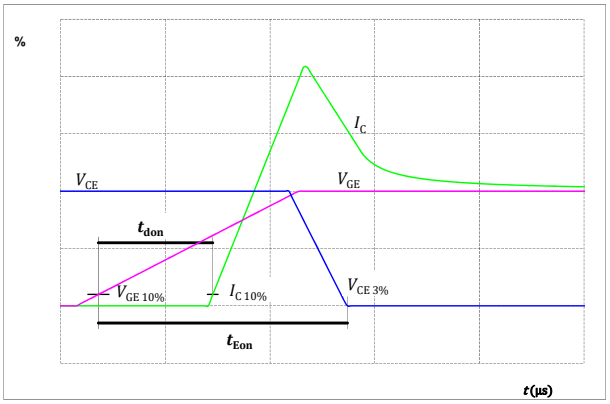


figure 24. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

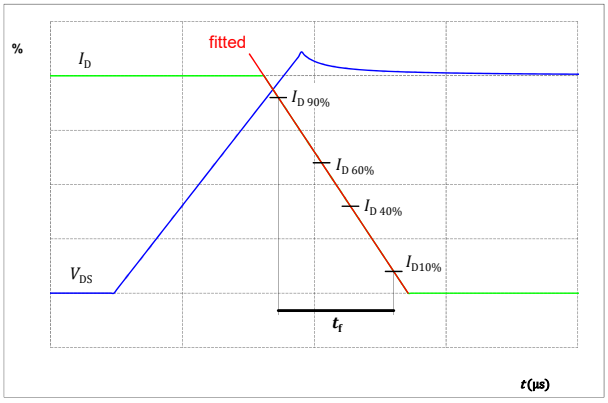
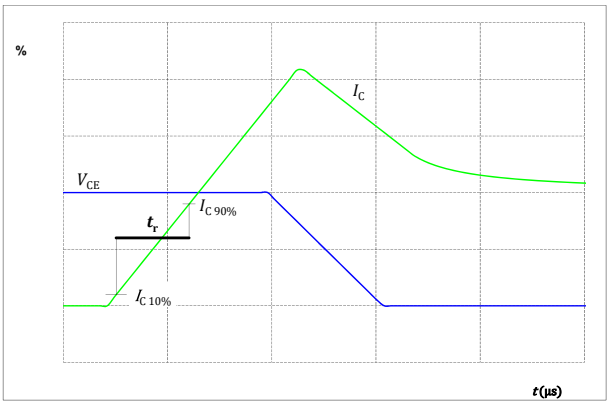


figure 25. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



Inverter Switching Definitions

figure 26. **FWD**

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

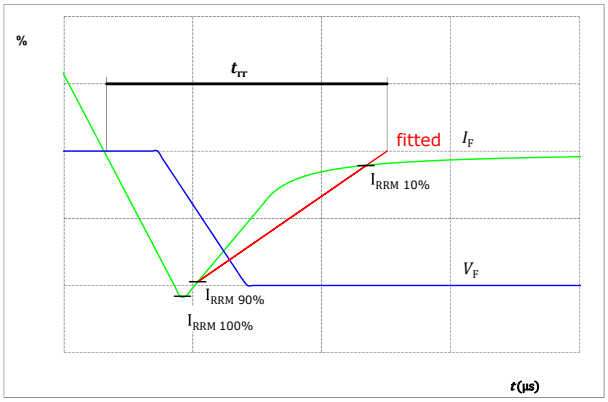


figure 27. **FWD**

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

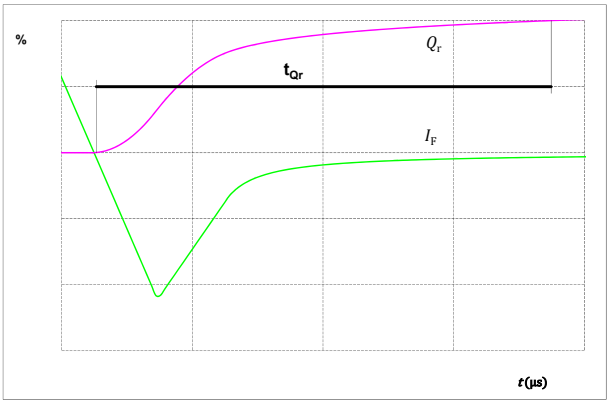
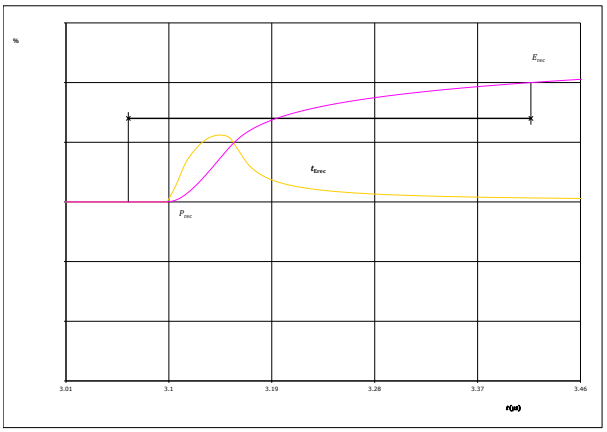


figure 28. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	10-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/

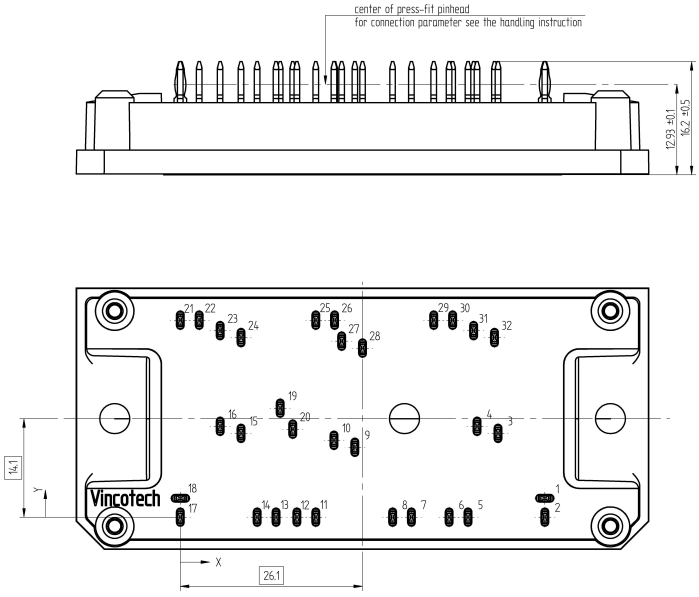
Marking

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

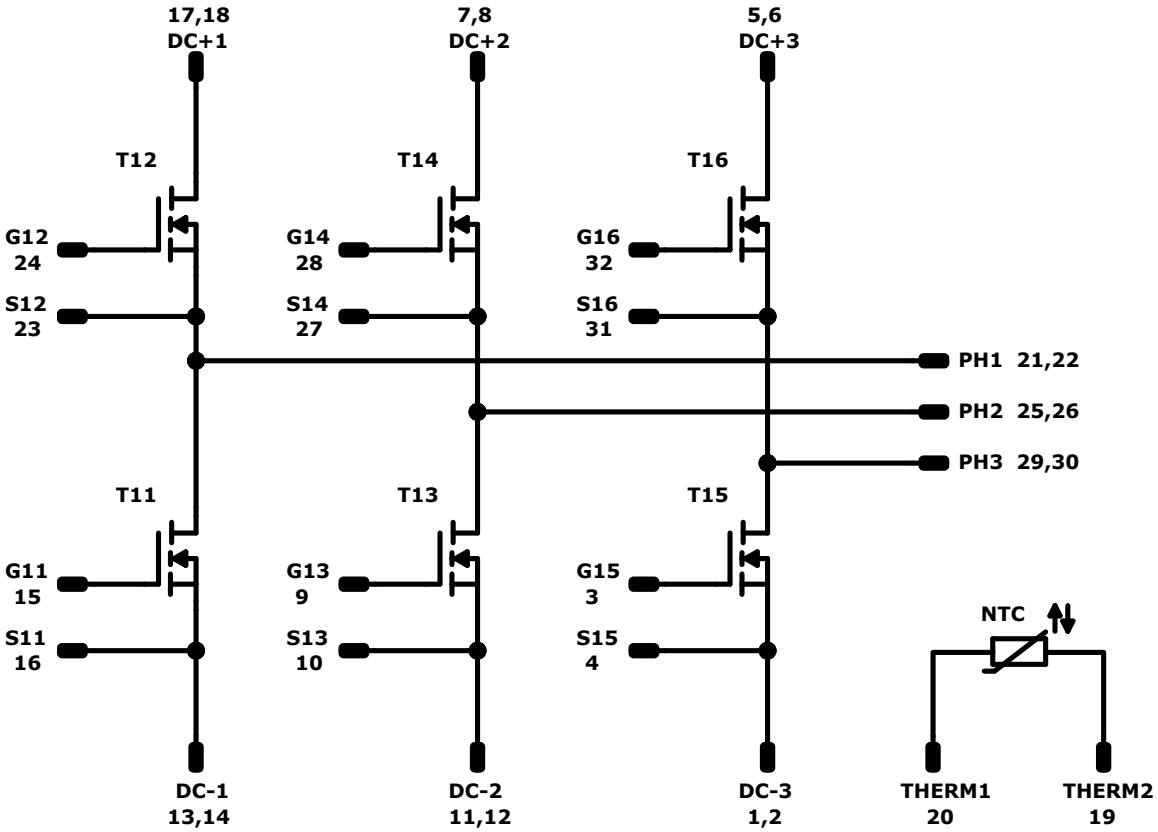
Outline

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	16 mΩ	Inverter Switch	
NTC	NTC			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-PY126PA016ME-L227F13Y-D3-14	30 Nov. 2021	Dynamic characteristics are updated New datasheet format, module is unchanged	