Vincotech

10-EY126PB020MS02-PJ17F78T
datasheet

***flow*PACK E2 SiC** **1200 V / 20 mΩ**

Topology features

- 3ph Inverter
- Low and high side Kelvin Emitter for improved switching performance
- MOSFET
- Open Emitter configuration
- 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: AlN
- Convex shaped substrate for superior thermal contact
- Compact housing
- CTI600 housing material
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

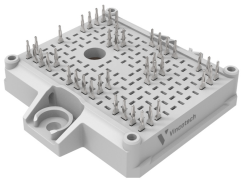
Target applications

- Charging Stations
- Servo Drives

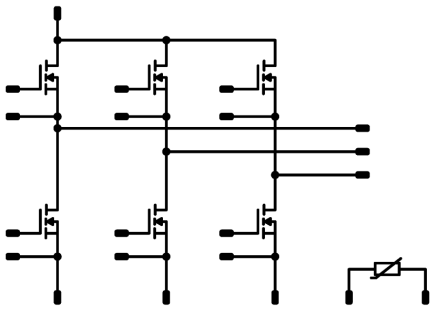
Types

- 10-EY126PB020MS02-PJ17F78T

flow E2 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	98	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	194	W
Gate-source voltage	V_{GSS}		0 / 22	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
Creepage distance			>12,7	mm
Clearance			9,11	mm
Comparative Tracking Index	CTI		≥ 600	

*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		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)						0,49		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} = 4 Ω R_{goff} = 4 Ω	0/18	600	64	25 125 150		26,87 22,74 22,16		ns
Rise time	t_r					25 125 150		18,84 14,93 14,23		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		68,01 82,16 86,4		ns
Fall time	t_f					25 125 150		18,41 23,16 23,02		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,389 µC Q_{rFWD}=0,947 µC Q_{rFWD}=1,18 µC				25 125 150		1,74 1,65 1,72		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,317 0,316 0,331		mWs
Peak recovery current	I_{RRM}	di/dt=3096 A/µs di/dt=3648 A/µs di/dt=3988 A/µs				25 125 150		29,42 42,38 47,37		A
Reverse recovery time	t_{rr}					25 125 150		22,81 41,99 42,19		ns
Recovered charge	Q_r					25 125 150		0,389 0,947 1,18		µC
Reverse recovered energy	E_{rec}					25 125 150		0,026 0,168 0,222		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		4015,76 2076,02 1016,99		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		5		kΩ
Deviation of R100	$\Delta_{R/R}$	R_{100} = 499 Ω				100	3,2		3,3	%
Power dissipation	P					25		130		mW
Power dissipation constant	d					25		1,3		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %						3380		K
Vincotech Thermistor Reference									V	

(1) Value at chip level

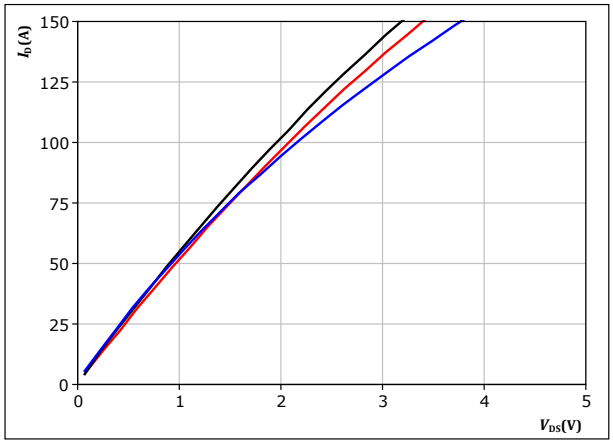
(2) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

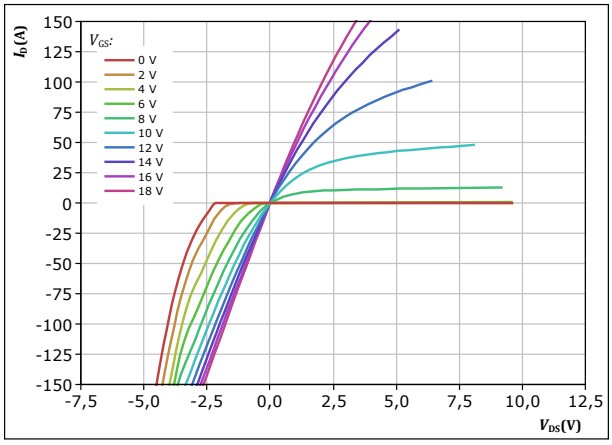


t_p =	250	µs	T_j:	25 °C
V_{GS} =	18	V		125 °C
				150 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



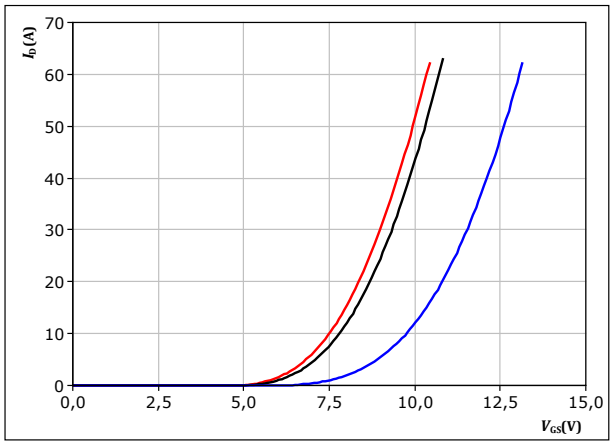
t_p =	250	µs
T_j =	150	°C

V_{GS} from 0 V to 18 V in steps of 2 V

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

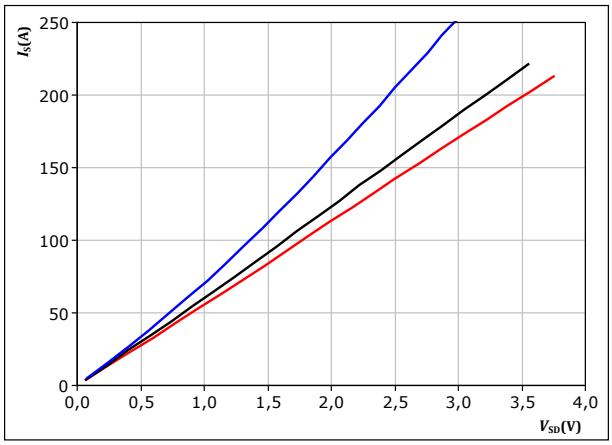


t_p =	250	µs	T_j:	25 °C
V_{DS} =	10	V		125 °C
				150 °C

figure 4. **MOSFET**

Typical reverse drain current characteristics

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



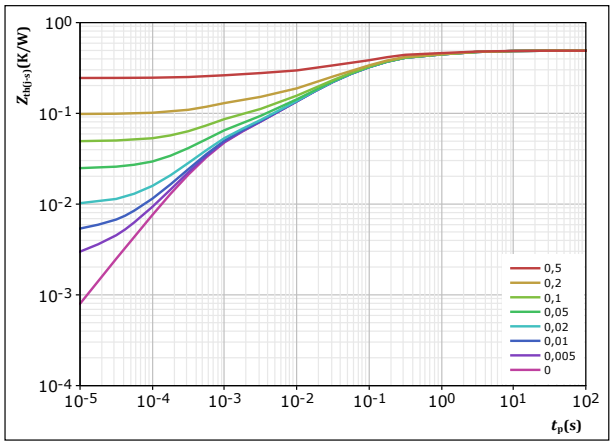
t_p =	250	µs	T_j:	25 °C
V_{GS} =	18	V		125 °C
				150 °C

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	
$R_{th(j-s)}$ =	0,49	K/W

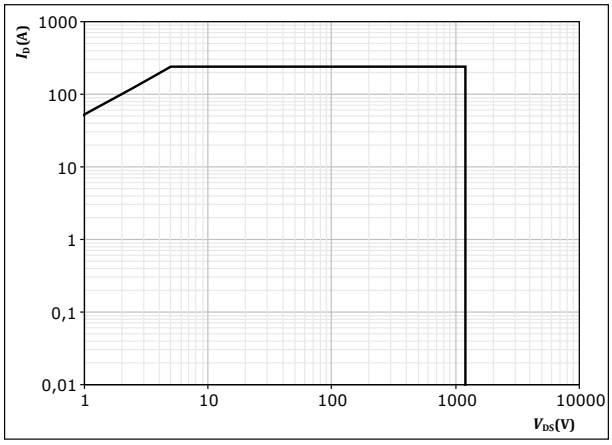
MOSFET thermal model values

R (K/W)	τ (s)
2,00E-02	6,02E+00
7,30E-02	1,00E+00
2,37E-01	9,43E-02
1,13E-01	1,23E-02
4,81E-02	7,00E-04

figure 6. **MOSFET**

Safe operating area

$I_D = f(V_{DS})$



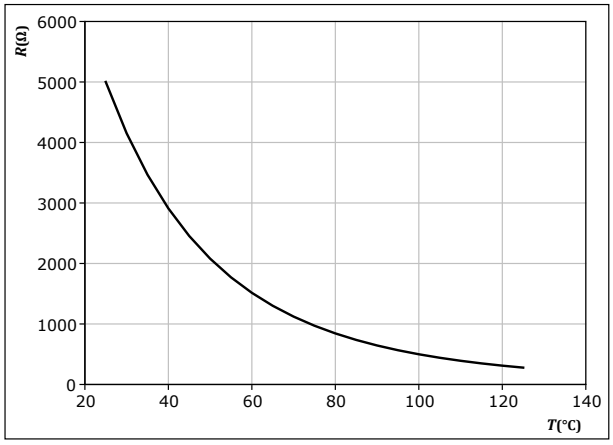
D =	single pulse	
T_s =	80	°C
V_{GS} =	18	V
T_j =	T_{jmax}	

Thermistor Characteristics

figure 7. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

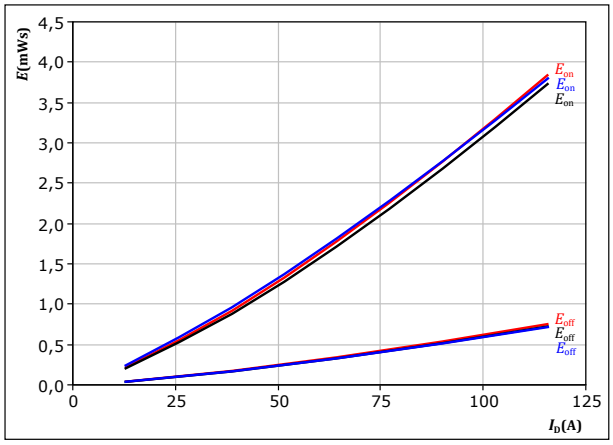


Inverter Switching Characteristics

figure 8. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



With an inductive load at

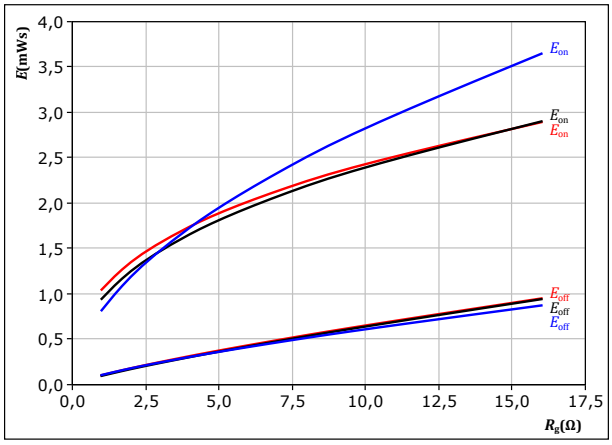
V_{DS} =	600	V
V_{GS} =	0/18	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

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

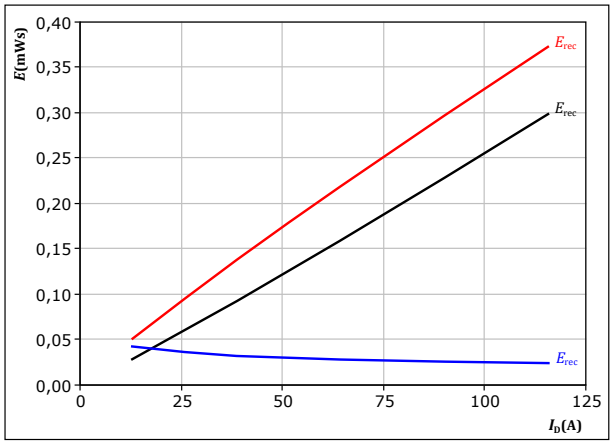
V_{DS} =	600	V
V_{GS} =	0/18	V
I_D =	64	A

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

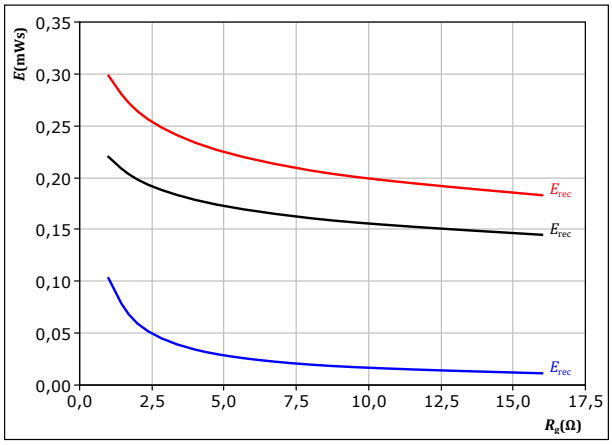
V_{DS} =	600	V
V_{GS} =	0/18	V
R_{gon} =	4	Ω

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

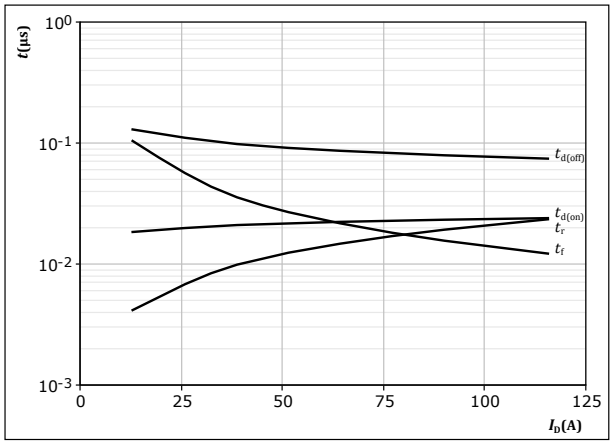
T_j: 25 °C, 125 °C, 150 °C

Inverter Switching Characteristics

figure 12. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



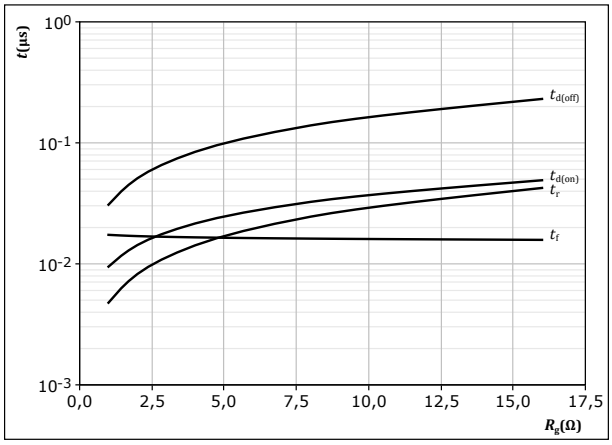
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	0/18	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 13. **MOSFET**

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

$t = f(R_g)$



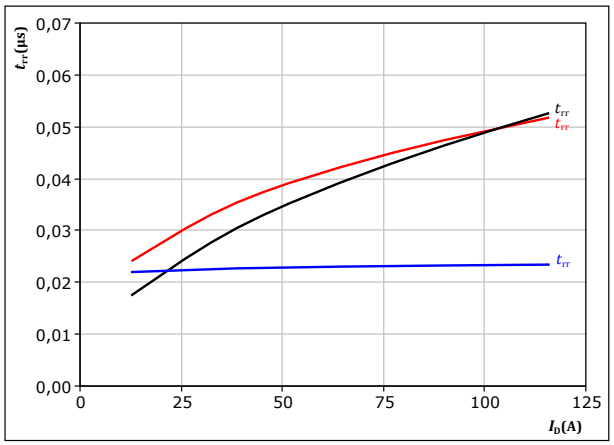
With an inductive load at

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

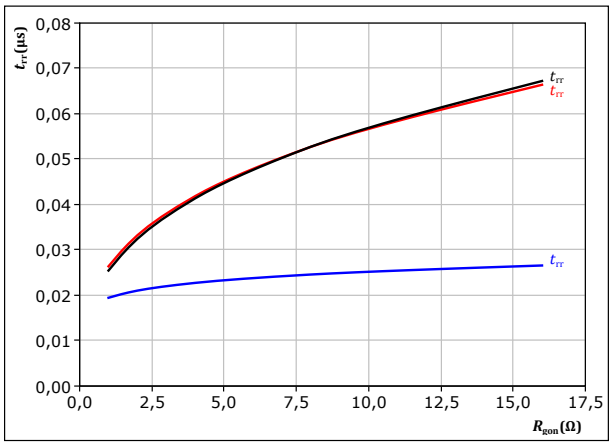
V_{DS} =	600	V
V_{GS} =	0/18	V
R_{gon} =	4	Ω

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

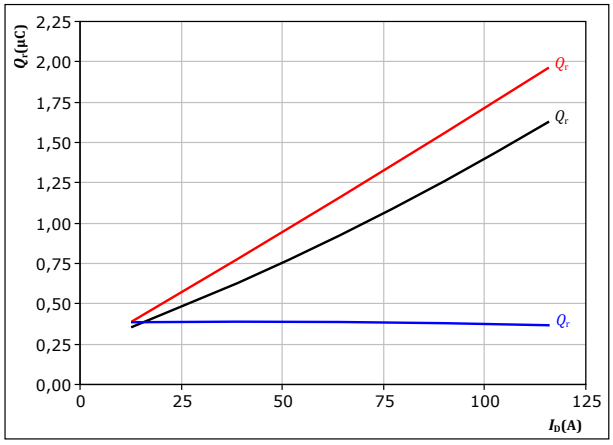
T_j: 25 °C, 125 °C, 150 °C

Inverter Switching Characteristics

figure 16. **MOSFET**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

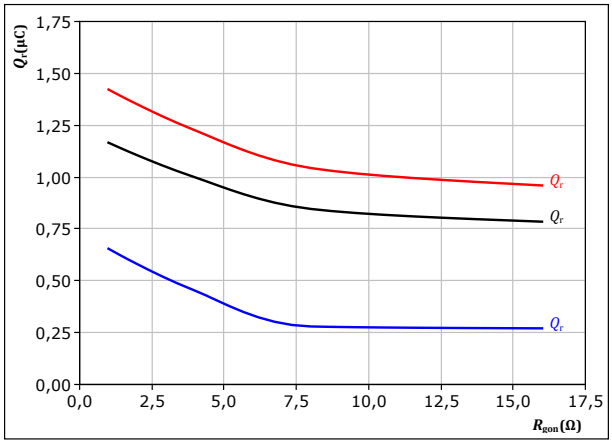


At					
	V_{DS} =	600	V		
	V_{GS} =	0/18	V	T_j:	25 °C
	R_{gon} =	4	Ω		125 °C
					150 °C

figure 17. **MOSFET**

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

$Q_r = f(R_{gon})$

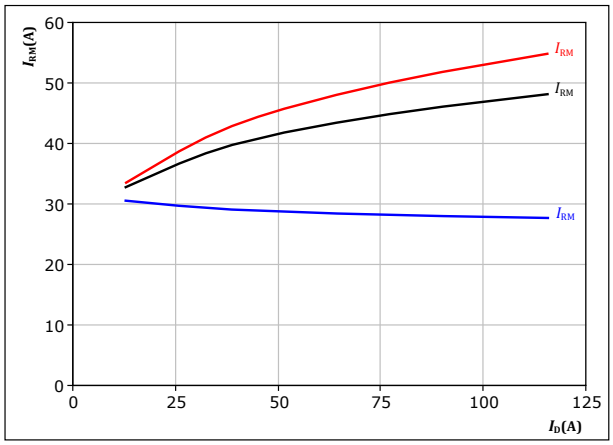


At					
	V_{DS} =	600	V		
	V_{GS} =	0/18	V	T_j:	25 °C
	I_D =	64	A		125 °C
					150 °C

figure 18. **MOSFET**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

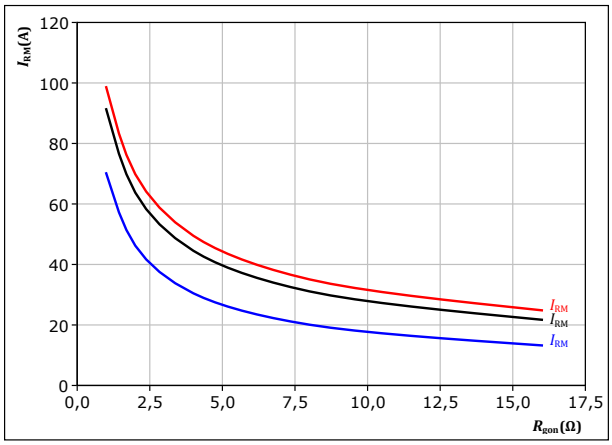


At					
	V_{DS} =	600	V		
	V_{GS} =	0/18	V	T_j:	25 °C
	R_{gon} =	4	Ω		125 °C
					150 °C

figure 19. **MOSFET**

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

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



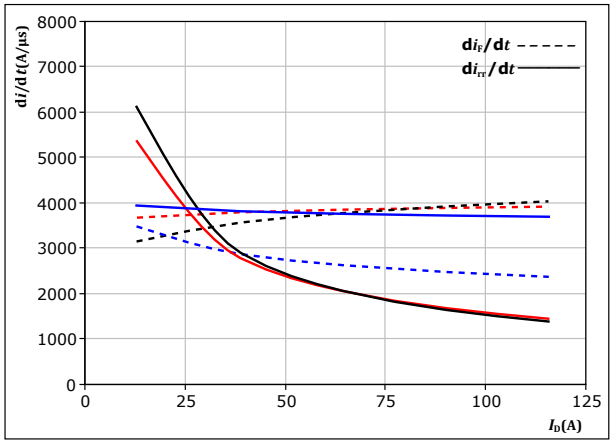
At					
	V_{DS} =	600	V		
	V_{GS} =	0/18	V	T_j:	25 °C
	I_D =	64	A		125 °C
					150 °C

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)

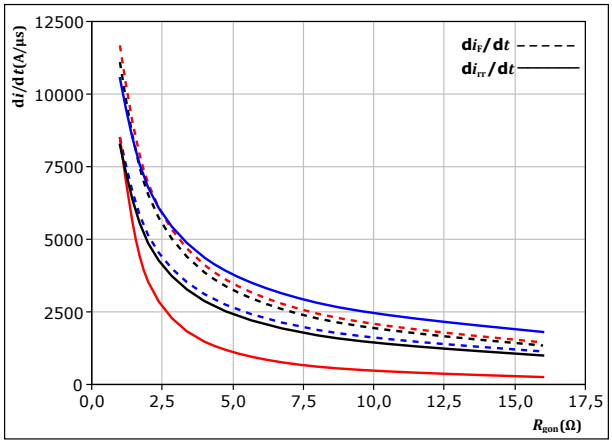


At	V_{DS} =	600	V		
	V_{GS} =	0/18	V	T_j:	25 °C, 125 °C, 150 °C
	R_{gon} =	4	Ω		

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})

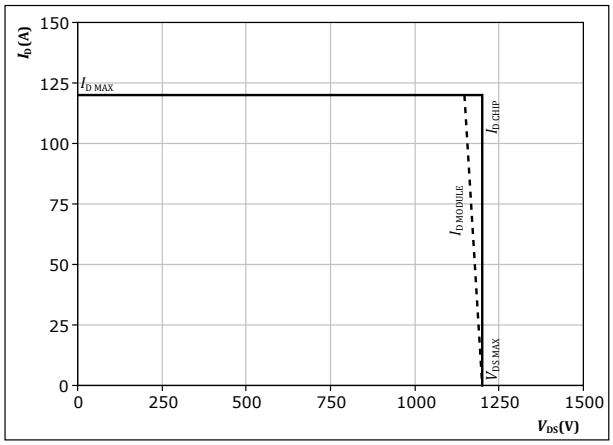


At	V_{DS} =	600	V		
	V_{GS} =	0/18	V	T_j:	25 °C, 125 °C, 150 °C
	I_D =	64	A		

figure 22. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



At	T_j =	150	°C
	R_{gon} =	4	Ω
	R_{goff} =	4	Ω

Inverter Switching Definitions

figure 23. **MOSFET**

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

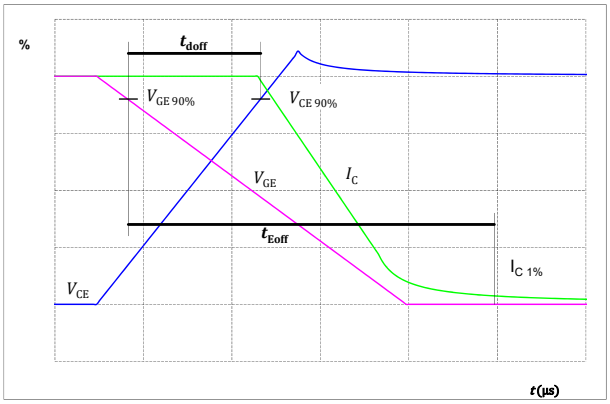


figure 24. **MOSFET**

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

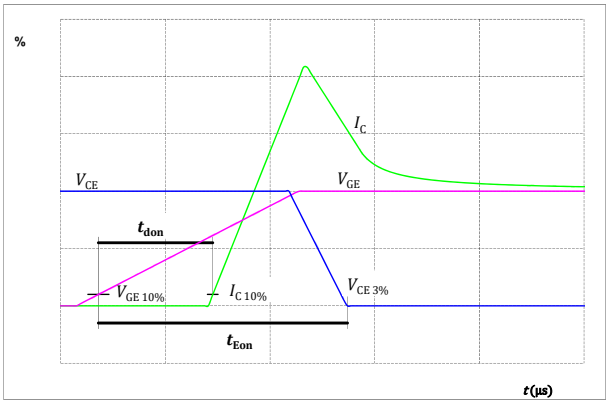


figure 25. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

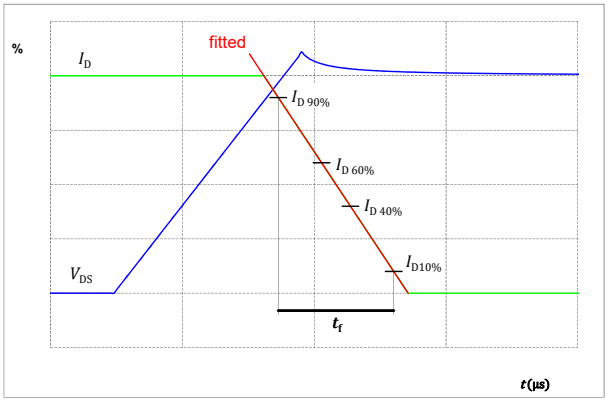
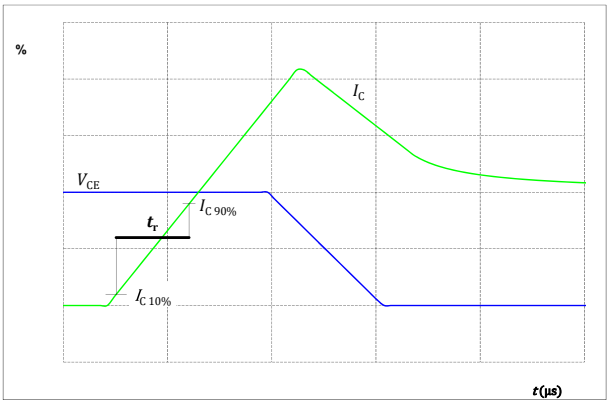


figure 26. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



Inverter Switching Definitions

figure 27. **FWD**

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

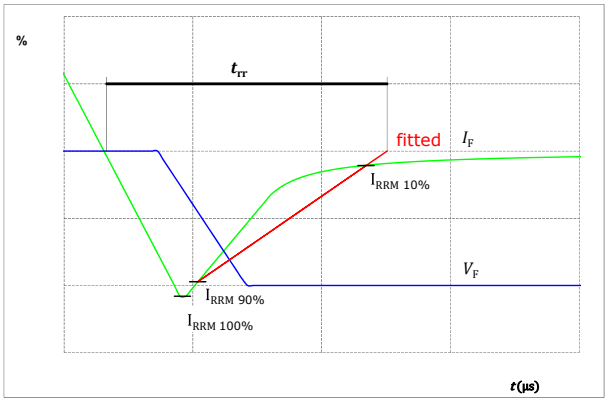


figure 28. **FWD**

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

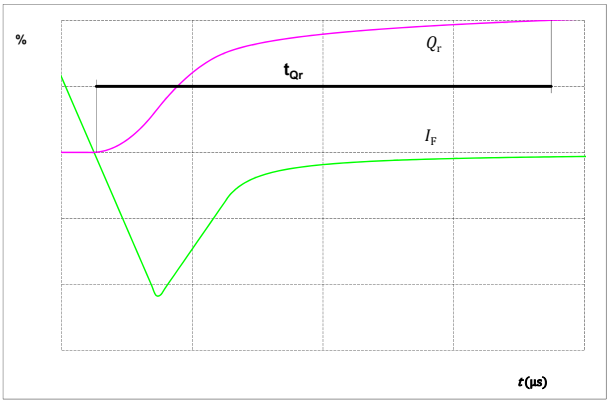
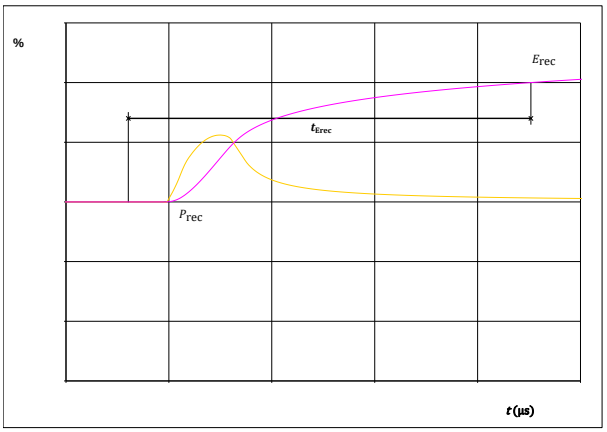


figure 29. **FWD**

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



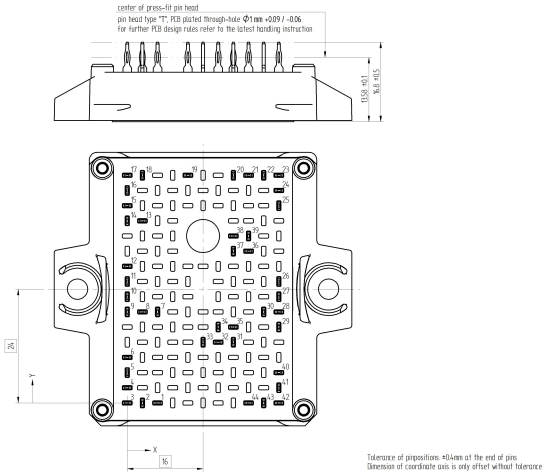
Ordering Code	
Version	**Ordering Code**
Without thermal paste	10-EY126PB020MS02-PJ17F78T
With thermal paste (5,2 W/mK, PTM6000HV)	10-EY126PB020MS02-PJ17F78T-/7/

Marking

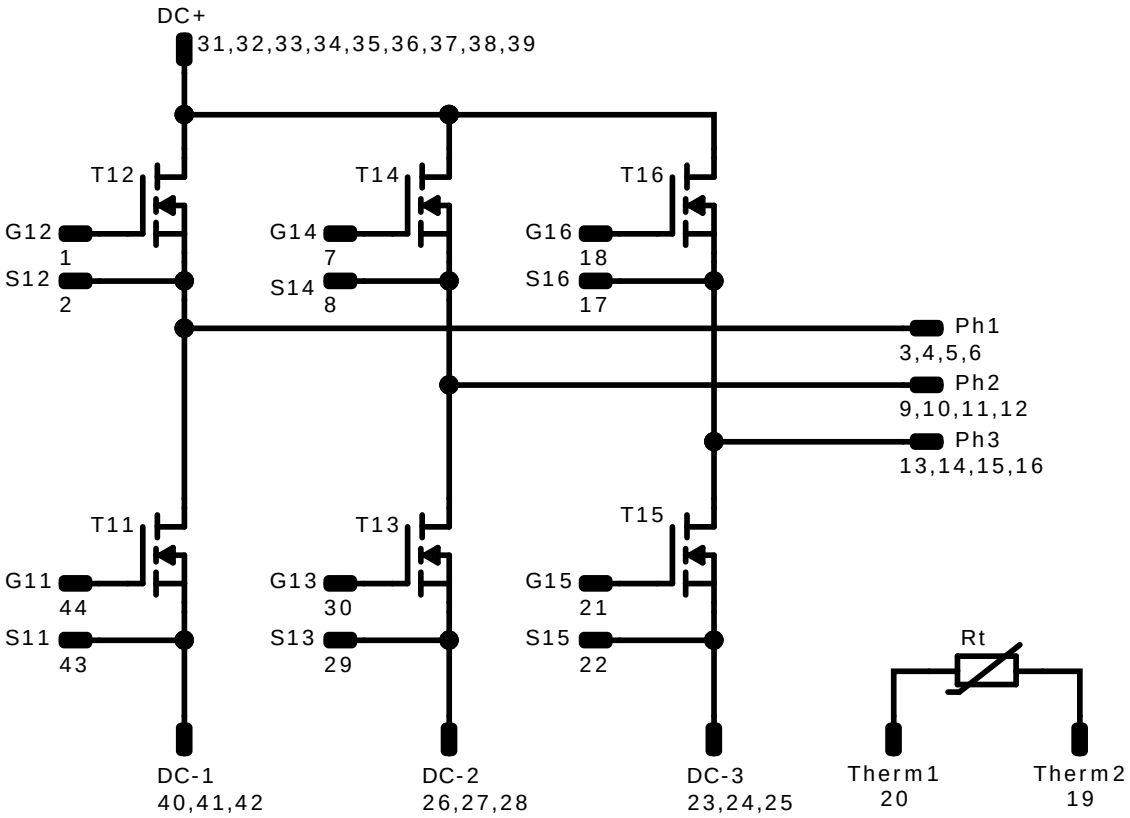
	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	6,4	0	G12
2	3,2	0	S12
3	0	0	Ph1
4	0	3,2	Ph1
5	0	6,4	Ph1
6	0	9,6	Ph1
7	6,4	19,2	G14
8	3,2	19,2	S14
9	0	19,2	Ph2
10	0	22,4	Ph2
11	0	25,6	Ph2
12	0	28,8	Ph2
13	3,2	38,4	Ph3
14	0	38,4	Ph3
15	0	41,6	Ph3
16	0	44,8	Ph3
17	0	48	S16
18	3,2	48	G16
19	12,8	48	Therm2
20	22,4	48	Therm1
21	25,6	48	G15
22	28,8	48	S15
23	32	48	DC-3
24	32	44,8	DC-3
25	32	41,6	DC-3
26	32	25,6	DC-2
27	32	22,4	DC-2
28	32	19,2	DC-2
29	32	16	S13
30	28,8	19,2	G13
31	22,4	12,8	DC+
32	19,2	12,8	DC+
33	16	12,8	DC+
34	19,2	16	DC+
35	22,4	16	DC+
36	25,6	32	DC+
37	22,4	32	DC+
38	22,4	35,2	DC+
39	25,6	35,2	DC+
40	32	6,4	DC-1
41	32	3,2	DC-1
42	32	0	DC-1
43	28,8	0	S11
44	25,6	0	G11



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* E2 packages see vincotech.com website.

Package data
Package data for *flow* E2 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°C and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-EY126PB020MS02-PJ17F78T-D2-14	12 Aug. 2024	Correct Rth (AlN)	