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
- 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

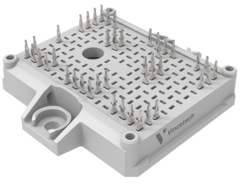
Target applications

- Charging Stations
- Servo Drives

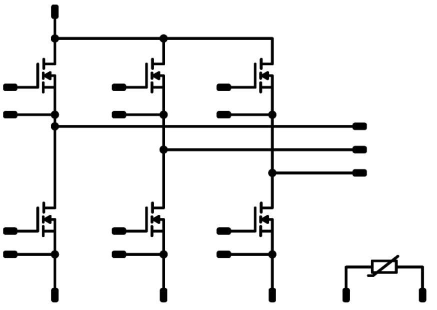
Types

- 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	85	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	140	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
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	2500	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)						0,68		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}	d*i*/d*t*=3096 A/µs d*i*/d*t*=3648 A/µs d*i*/d*t*=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

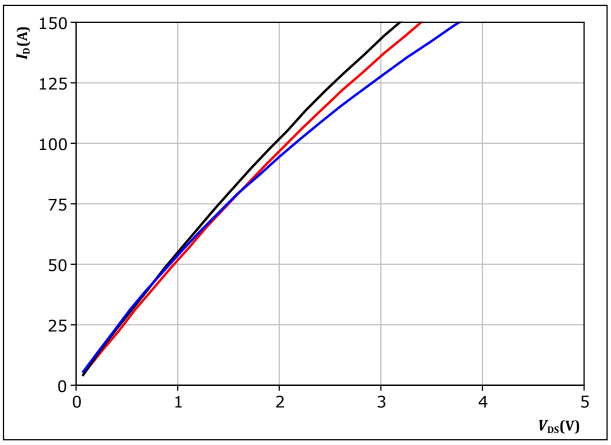
(2) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

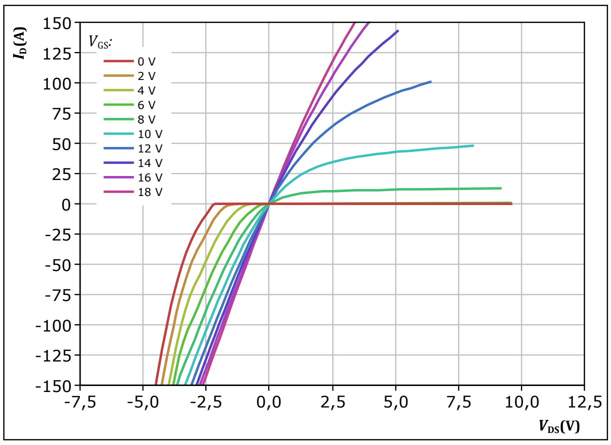


t_p = 250 µs
V_{GS} = 18 V
T_j: 25 °C, 125 °C, 150 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

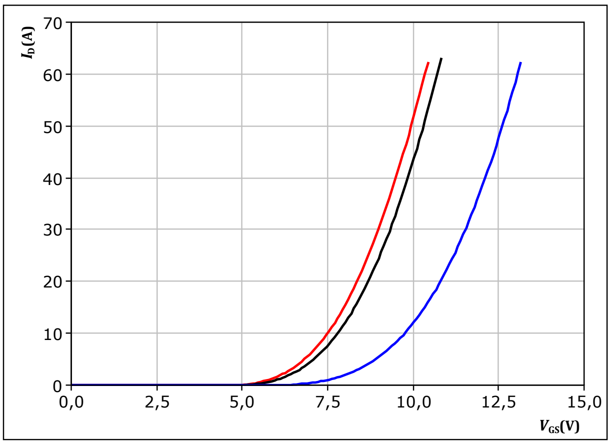


t_p = 250 µs
T_j = 150 °C
V_{GS} from 0 V to 18 V in steps of 2 V

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

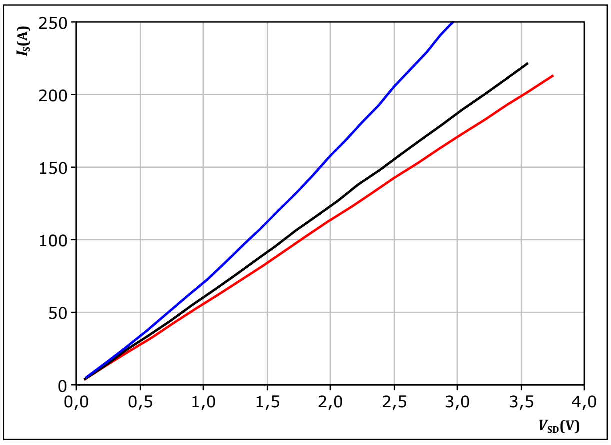


t_p = 250 µs
V_{DS} = 10 V
T_j: 25 °C, 125 °C, 150 °C

figure 4. **MOSFET**

Typical reverse drain current characteristics

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



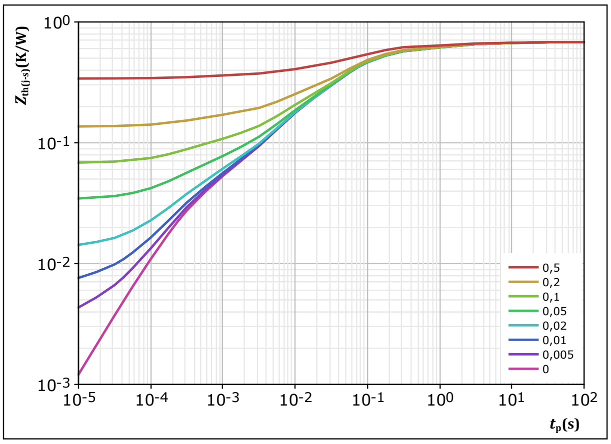
t_p = 250 µs
V_{GS} = 18 V
T_j: 25 °C, 125 °C, 150 °C

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

$R_{th(j-s)}$ = 0,68 K/W

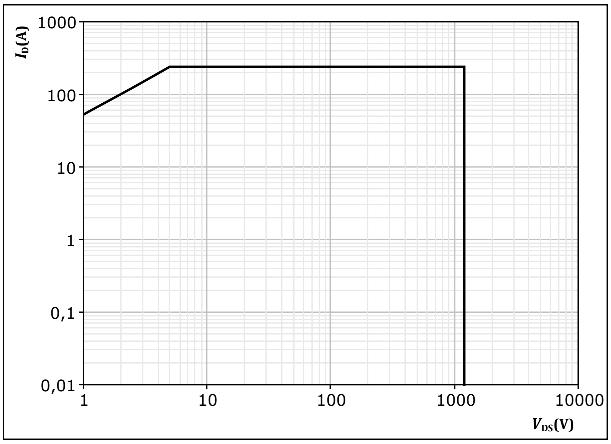
MOSFET thermal model values

R (K/W)	τ (s)
3,10E-02	8,51E+00
1,01E-01	9,77E-01
3,95E-01	7,01E-02
1,20E-01	7,26E-03
3,40E-02	3,39E-04

figure 6. **MOSFET**

Safe operating area

I_D = f(V_{DS})



D = single pulse

T_s = 80 °C

V_{GS} = 18 V

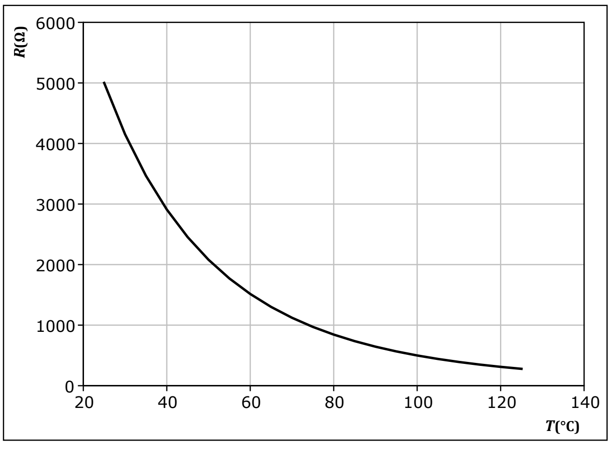
T_j = T_{jmax}

Thermistor Characteristics

figure 7. **Thermistor**

Typical NTC characteristic as function of temperature

R_T = f(T)

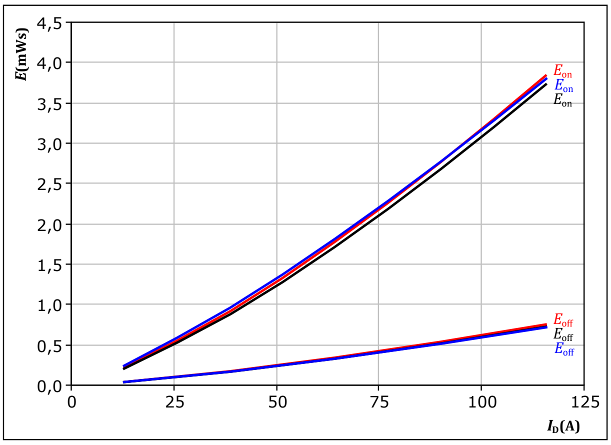


Inverter Switching Characteristics

figure 8. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



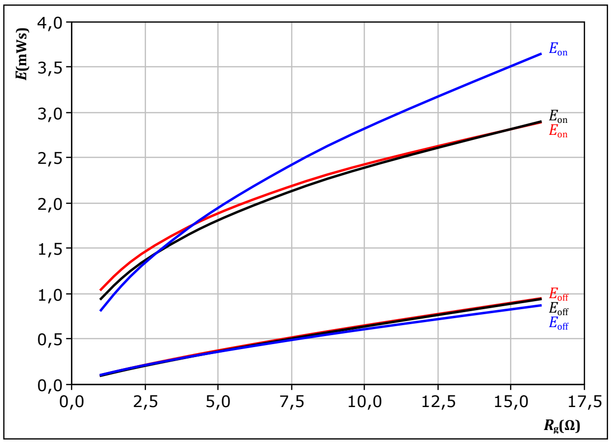
With an inductive load at

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

figure 9. **MOSFET**

Typical switching energy losses as a function of MOSFET turn on gate resistor

$E = f(R_g)$



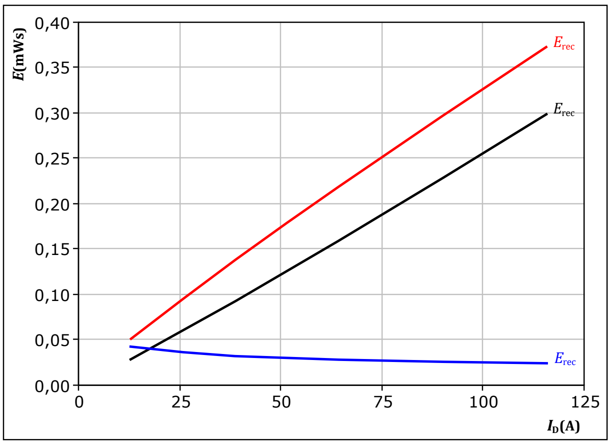
With an inductive load at

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

figure 10. **MOSFET**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



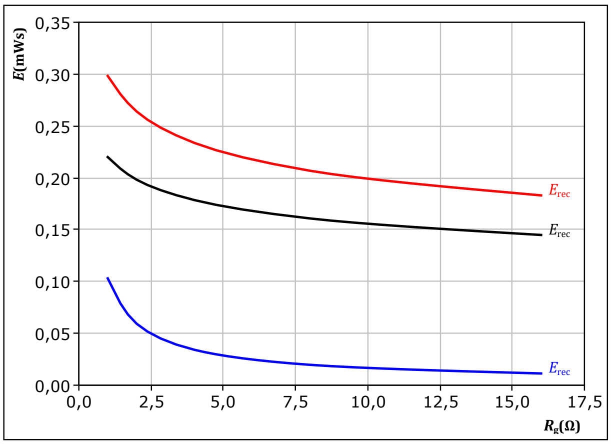
With an inductive load at

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

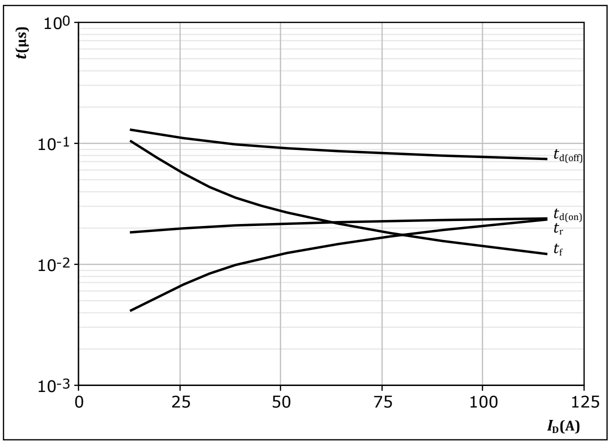
V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	0/18	V		125 °C
I_D =	64	A		150 °C

Inverter Switching Characteristics

figure 12. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



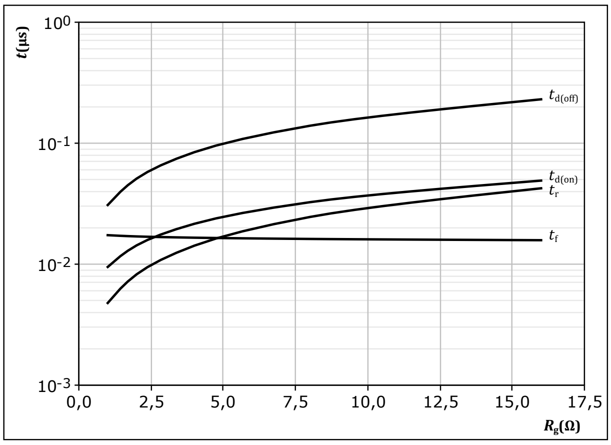
With an inductive load at

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

$t = f(R_g)$



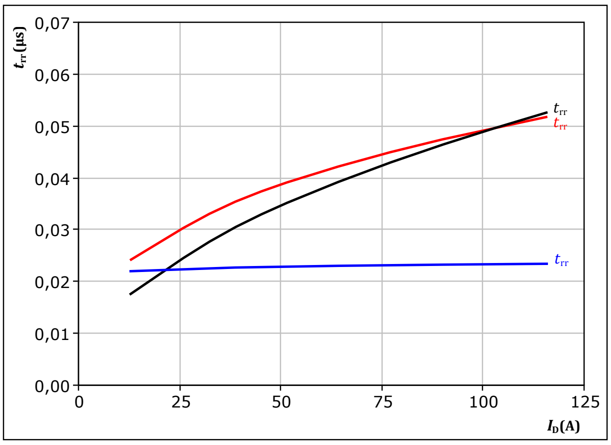
With an inductive load at

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

$t_{rr} = f(I_D)$



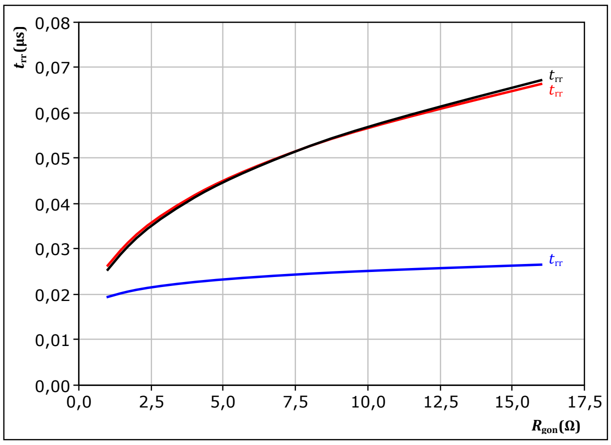
At			
	V_{DS} =	600	V
	V_{GS} =	0/18	V
	R_{gon} =	4	Ω

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

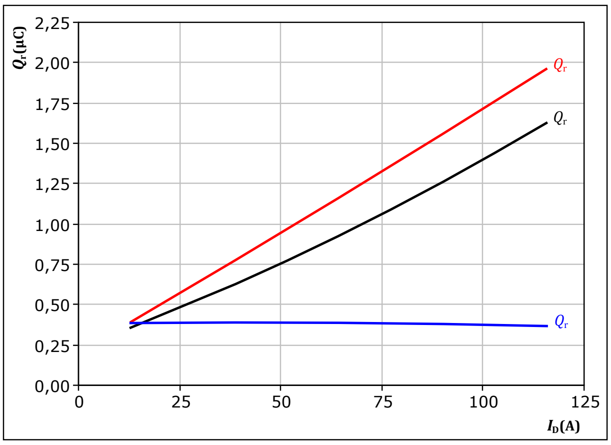
T_j: 25 °C, 125 °C, 150 °C

Inverter Switching Characteristics

figure 16. **MOSFET**

Typical recovered charge as a function of drain current

Q_r = f(I_D)

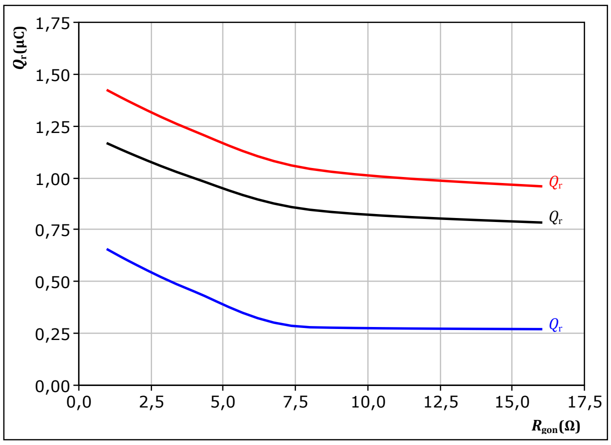


At				Tj:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	0/18	V		125 °C
	R_{gon} =	4	Ω		150 °C

figure 17. **MOSFET**

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

Q_r = f(R_{gon})

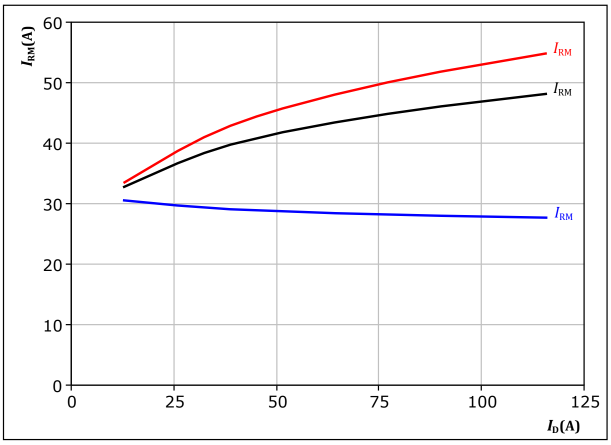


At				Tj:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	0/18	V		125 °C
	I_D =	64	A		150 °C

figure 18. **MOSFET**

Typical peak reverse recovery current as a function of drain current

I_{RM} = f(I_D)

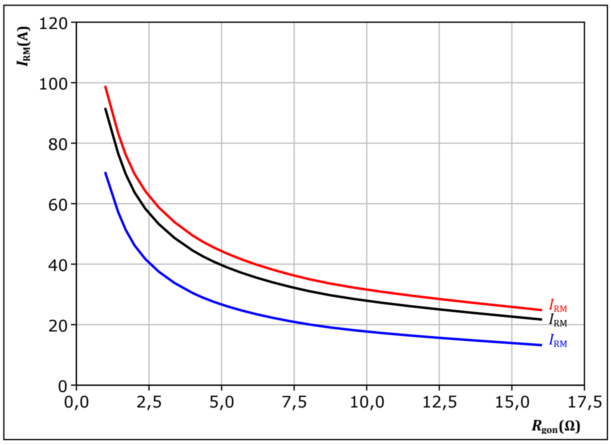


At				Tj:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	0/18	V		125 °C
	R_{gon} =	4	Ω		150 °C

figure 19. **MOSFET**

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

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



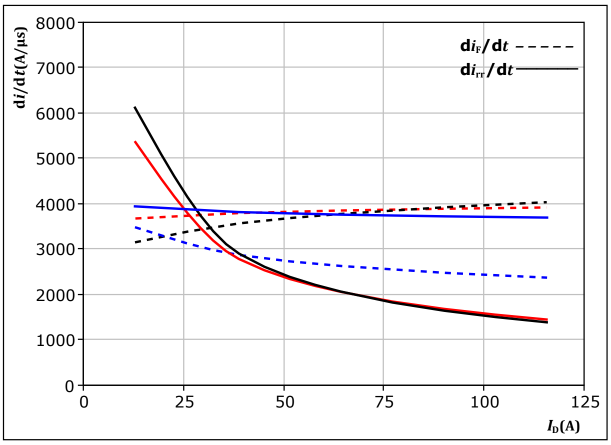
At				Tj:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	0/18	V		125 °C
	I_D =	64	A		150 °C

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)



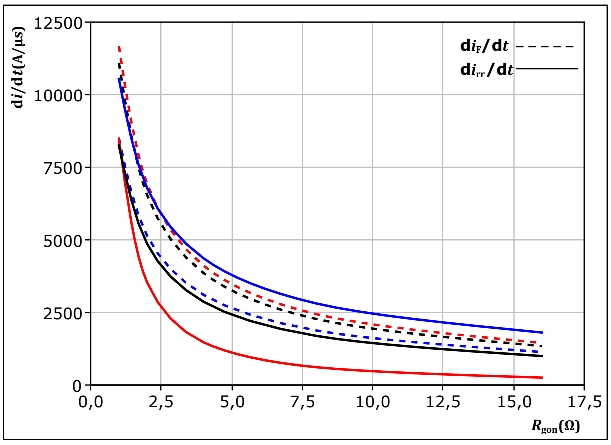
At	V_{DS} =	600	V
	V_{GS} =	0/18	V
	R_{gon} =	4	Ω

T_j: 25 °C, 125 °C, 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})



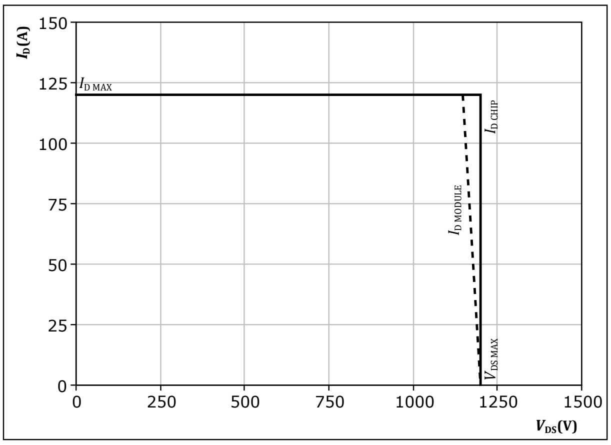
At	V_{DS} =	600	V
	V_{GS} =	0/18	V
	I_D =	64	A

T_j: 25 °C, 125 °C, 150 °C

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})

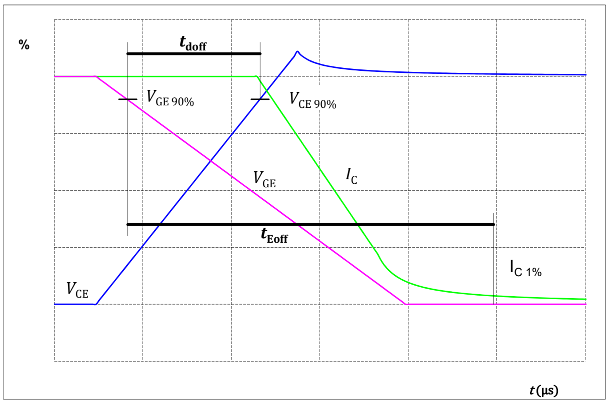


figure 24.	MOSFET

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

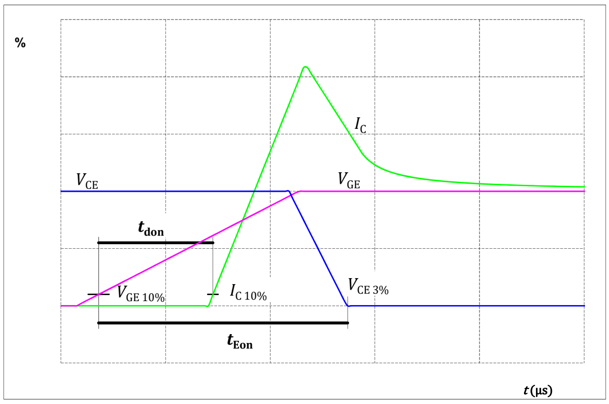


figure 25.	MOSFET

Turn-off Switching Waveforms & definition of t_f

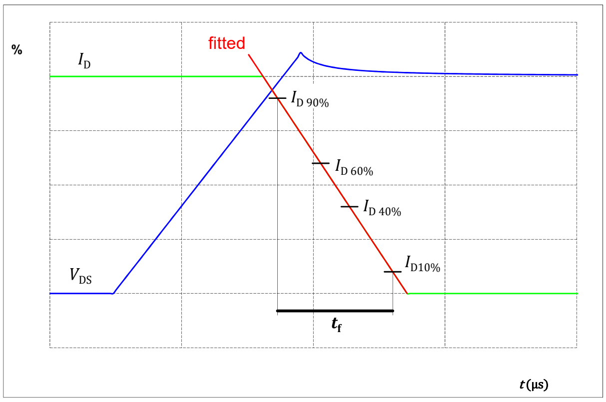
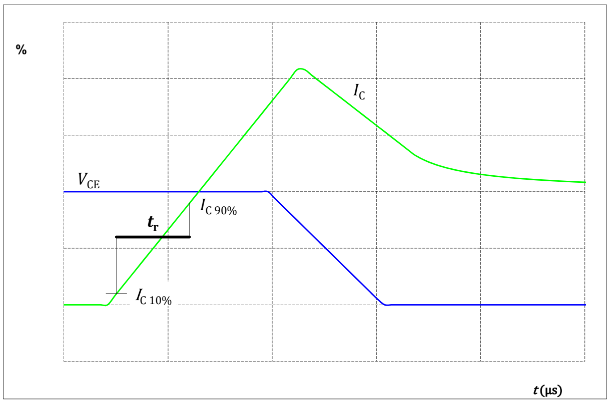


figure 26.	MOSFET

Turn-on Switching Waveforms & definition of t_r



Inverter Switching Definitions

figure 27. **FWD**

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

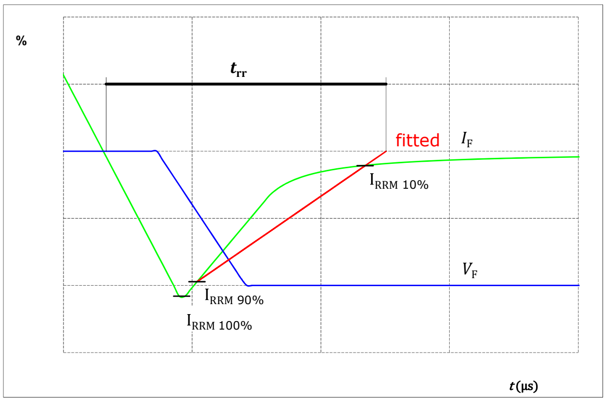


figure 28. **FWD**

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

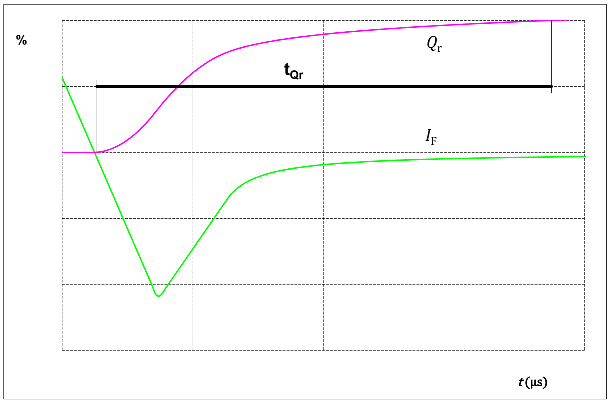
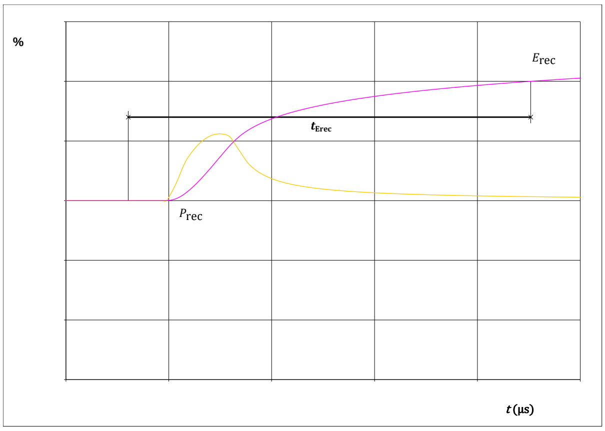


figure 29. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	10-EY126PB020MS02-PJ17F78T
With thermal paste (5,2 W/mK, PTM6000HV)	10-EY126PB020MS02-PJ17F78T-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-EY126PB020MS02-PJ17F78T-/3/

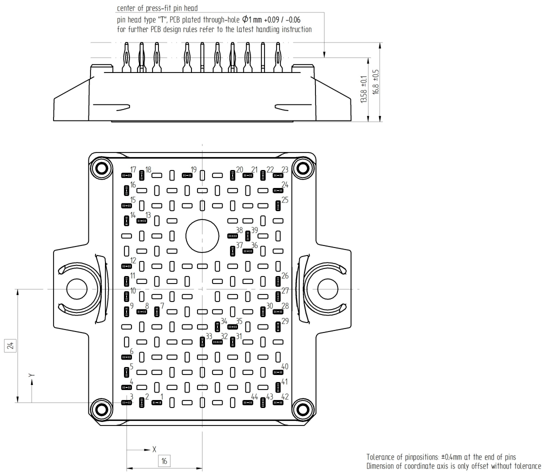
Marking

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

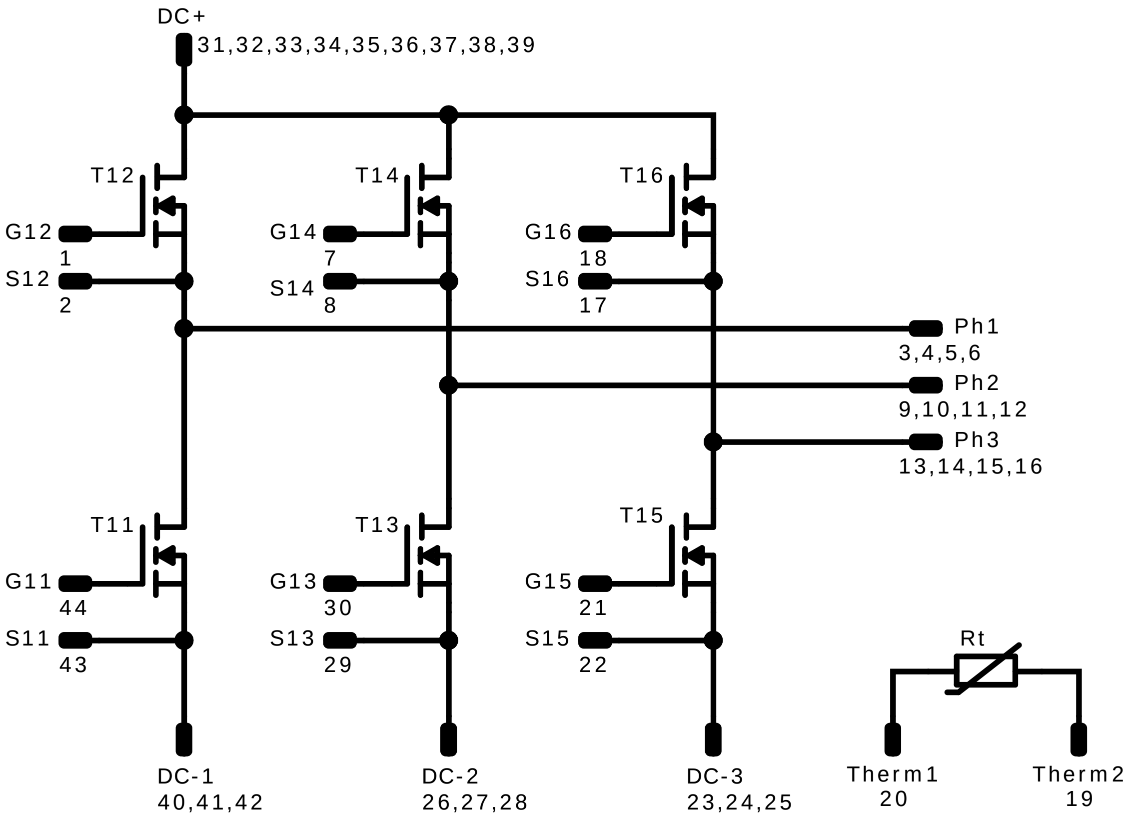
Outline

Pin table [mm]

Pin	X	Y	Function
1	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 certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-EY126PB020MS02-PJ17F78T-D1-14	26 Jan. 2024		

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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.