



Vincotech

10-PY064PA020F7-L582L88Y

datasheet

fastPACK 1

600 V / 15 mΩ

Topology features

- Kelvin Emitter for improved switching performance
- Integrated DC capacitor
- Open Emitter configuration
- Temperature sensor

Component features

- Extremely low losses
- Improved reverse diode commutation ruggedness
- Ultra-fast body diode

Housing features

- Base isolation: Al₂O₃
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

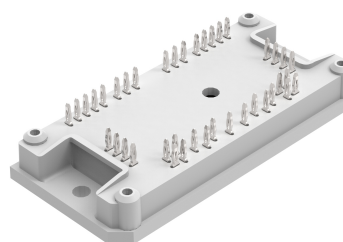
Target applications

- Charging Stations

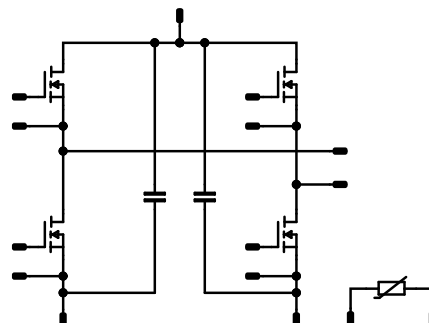
Types

- 10-PY064PA020F7-L582L88Y

flow 1 12 mm housing



Schematic





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Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Inverter Switch				
Drain-source voltage	V_{DS}		600	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	42	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	424	A
Avalanche energy, single pulse	E_{AS}	$V_{DD} = 50\text{ V}$ $I_D = 14,8\text{ A}$	498	mJ
Avalanche energy, repetitive	E_{AR}	$V_{DD} = 50\text{ V}$ $I_D = 14,8\text{ A}$	2,5	mJ
MOSFET dv/dt ruggedness	dv/dt	$V_{DS} = 0..400\text{ V}$ $T_s = 25\text{ °C}$	120	V/ns
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	136	W
Gate-source voltage	V_{GS}		± 20	V
Reverse diode dv/dt	dv/dt		70	V/ns
Maximum Junction Temperature	T_{jmax}		150	°C

Capacitor (DC)

Maximum DC voltage	V_{MAX}		630	V
Operation Temperature	T_{op}		-55 ... 125	°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* $t_p = 2\text{ s}$	6000	V
Isolation voltage	V_{isol}	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			> 12,7	mm
Clearance			7,92	mm
Comparative Tracking Index	CTI		≥ 200	

*100 % tested in production



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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	$r_{DS(on)}$		10		49,8	25 125		38,9 71,3	20 ⁽¹⁾	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$	0		0,0025	25	3,5	4	4,5	V
Gate to Source Leakage Current	I_{GSS}		20	0		25			200	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	600		25			2	μA
Internal gate resistance	r_g							1,9		Ω
Gate charge	Q_g	$V_{DD} = 400$ V	0/10		29,2	25		218		nC
Short-circuit input capacitance	C_{iss}	$f = 250$ kHz	0	400	0	25		8708		pF
Short-circuit output capacitance	C_{oss}							170		

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,52		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 120\ \Omega$ $R_{goff} = 16\ \Omega$	± 16	350	50	25 125		1470,83 1445,82		ns
Rise time	t_r					25 125		77,11 90,59		ns
Turn-off delay time	$t_{d(off)}$					25 125		202,36 212,16		ns
Fall time	t_f					25 125		12,13 11,86		ns
Turn-on energy (per pulse)	E_{on}	$Q_{iFWD}=3,07\ \mu C$ $Q_{iFWD}=6,46\ \mu C$				25 125		3,13 5,02		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,187 0,186		mWs
Peak recovery current	I_{RRM}	$di/dt=744\ A/\mu s$ $di/dt=690\ A/\mu s$				25 125		67,15 91,62		A
Reverse recovery time	t_{rr}					25 125		88,03 137,71		ns
Recovered charge	Q_r					25 125		3,07 6,46		μC
Reverse recovered energy	E_{rec}					25 125		0,144 0,268		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125		16800,52 11354,36		A/ μs



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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	

Capacitor (DC)

Static

Capacitance	C	DC bias voltage = 0 V				25		100		nF
Tolerance							-10		10	%
Dissipation factor		$f = 1$ kHz				25		2,5		%

Thermistor

Static

Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$				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.



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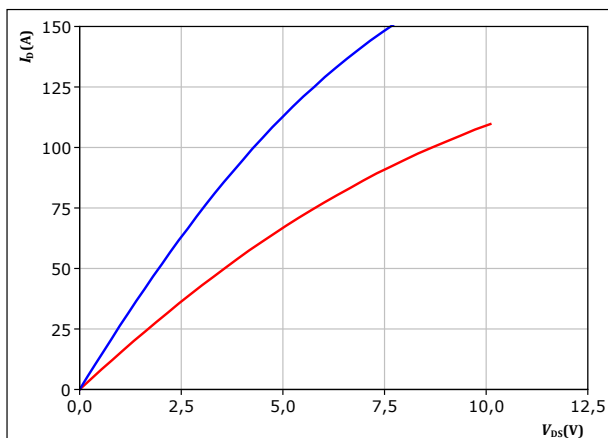
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Inverter Switch Characteristics

figure 1. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

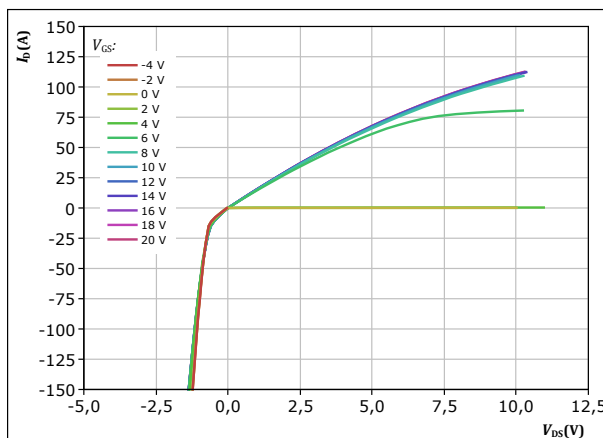


$t_p = 250 \mu s$
 $V_{GS} = 10 V$
 T_j : — 25 °C
— 125 °C

figure 2. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

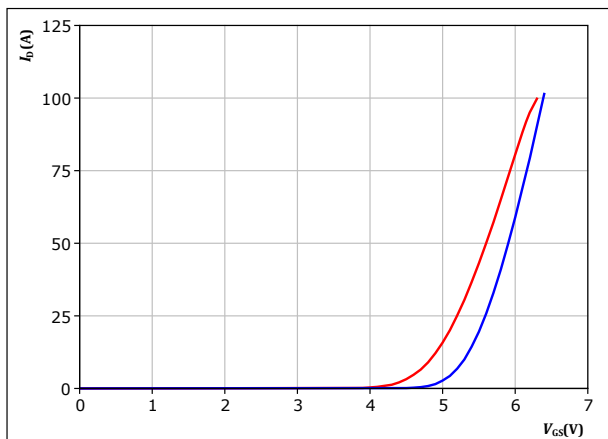


$t_p = 250 \mu s$
 $T_j = 125 ^\circ C$
 V_{GS} from -4 V to 20 V in steps of 2 V

figure 3. MOSFET

Typical transfer characteristics

$$I_D = f(V_{GS})$$

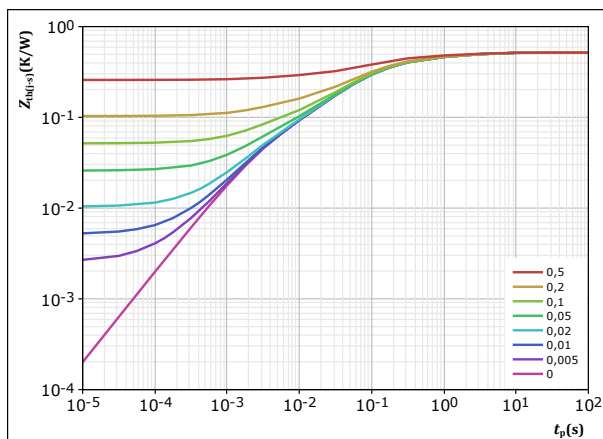


$t_p = 250 \mu s$
 $V_{DS} = 10 V$
 T_j : — 25 °C
— 125 °C

figure 4. MOSFET

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,516 K/W$
MOSFET thermal model values

$R (K/W)$	$\tau (s)$
4,99E-02	3,29E+00
9,35E-02	5,93E-01
2,26E-01	1,08E-01
1,06E-01	2,89E-02
4,17E-02	2,95E-03



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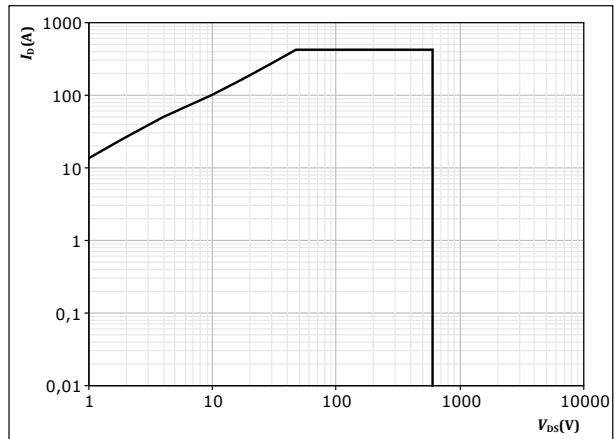
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Inverter Switch Characteristics

figure 5. MOSFET

Safe operating area

$$I_D = f(V_{DS})$$



$D =$ single pulse

$T_s = 80$ °C

$V_{GS} = 10$ V

$T_j = T_{jmax}$



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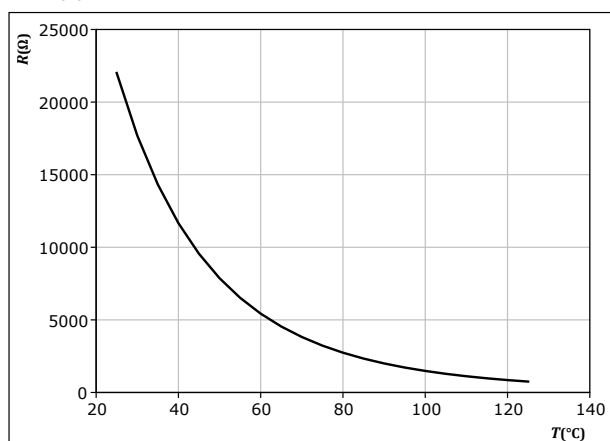
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Thermistor Characteristics

figure 6. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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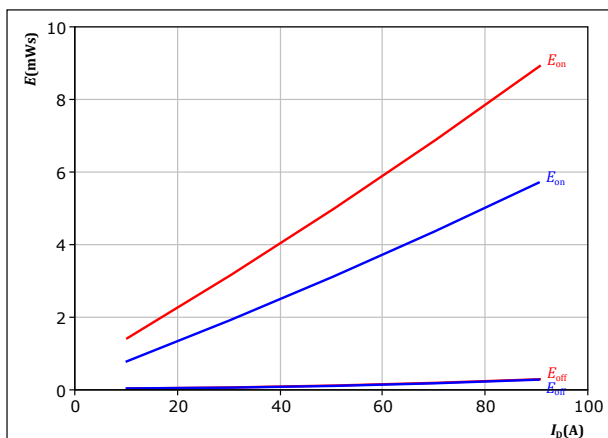
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Inverter Switching Characteristics

figure 7. MOSFET

Typical switching energy losses as a function of drain current

$$E = f(I_D)$$



With an inductive load at

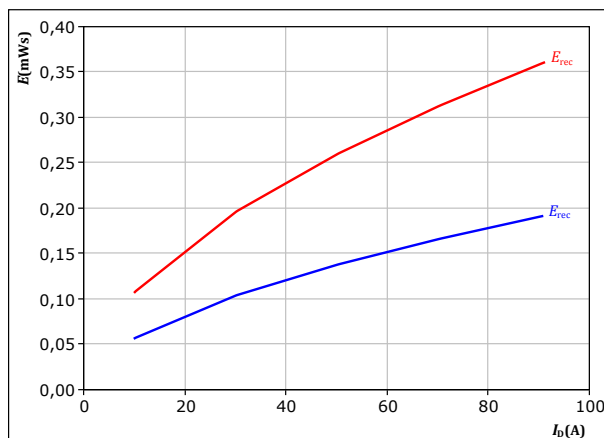
$V_{DS} = 350$ V
 $V_{GS} = \pm 16$ V
 $R_{gon} = 120$ Ω
 $R_{goff} = 16$ Ω

T_j : — 25 °C
— 125 °C

figure 8. MOSFET

Typical reverse recovered energy loss as a function of drain current

$$E_{rec} = f(I_D)$$



With an inductive load at

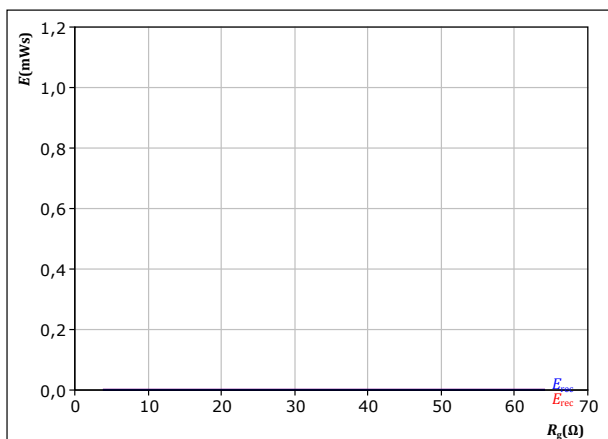
$V_{DS} = 350$ V
 $V_{GS} = \pm 16$ V
 $R_{gon} = 120$ Ω

T_j : — 25 °C
— 125 °C

figure 9. 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

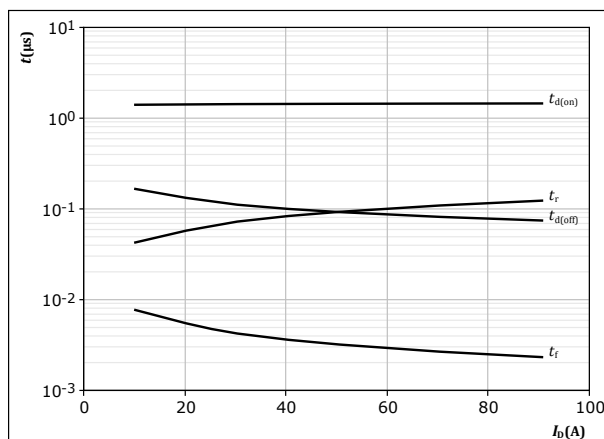
$V_{DS} = 350$ V
 $V_{GS} = \pm 16$ V
 $I_D = 50$ A

T_j : — 25 °C
— 125 °C

figure 10. MOSFET

Typical switching times as a function of drain current

$$t = f(I_D)$$



With an inductive load at

$T_j = 125$ °C
 $V_{DS} = 350$ V
 $V_{GS} = \pm 16$ V
 $R_{gon} = 120$ Ω
 $R_{goff} = 16$ Ω



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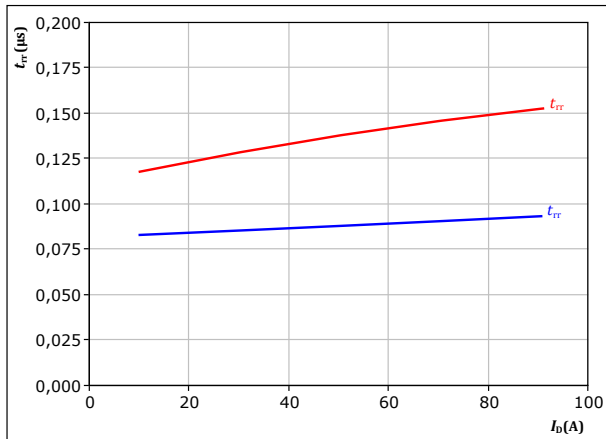
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datasheet

Inverter Switching Characteristics

figure 11. MOSFET

Typical reverse recovery time as a function of drain current

$$t_{rr} = f(I_D)$$

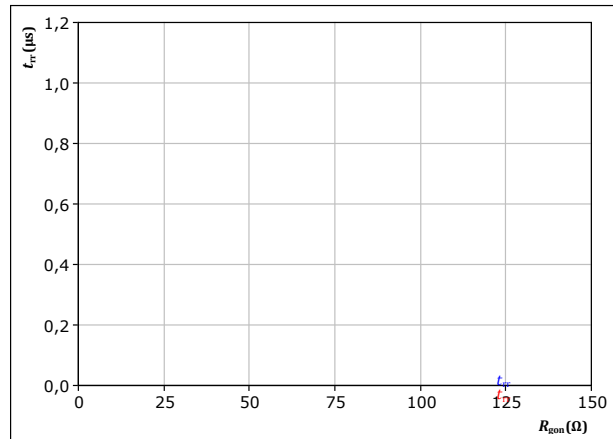


At $V_{DS} = 350$ V
 $V_{GS} = \pm 16$ V
 $R_{gon} = 120$ Ω
 T_j : — 25 °C
— 125 °C

figure 12. MOSFET

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

$$t_{rr} = f(R_{gon})$$

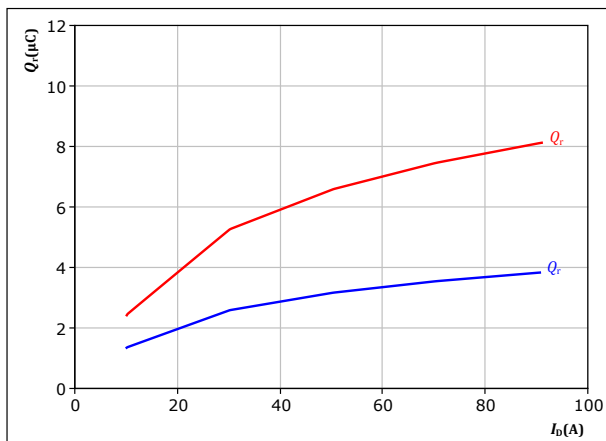


At $V_{DS} = 350$ V
 $V_{GS} = \pm 16$ V
 $I_D = 50$ A
 T_j : — 25 °C
— 125 °C

figure 13. MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$

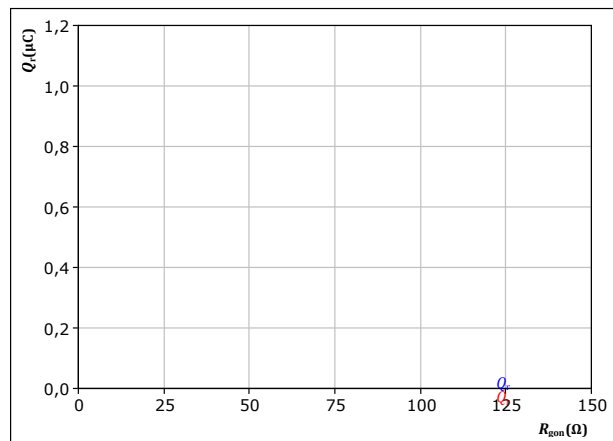


At $V_{DS} = 350$ V
 $V_{GS} = \pm 16$ V
 $R_{gon} = 120$ Ω
 T_j : — 25 °C
— 125 °C

figure 14. MOSFET

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

$$Q_r = f(R_{gon})$$



At $V_{DS} = 350$ V
 $V_{GS} = \pm 16$ V
 $I_D = 50$ A
 T_j : — 25 °C
— 125 °C



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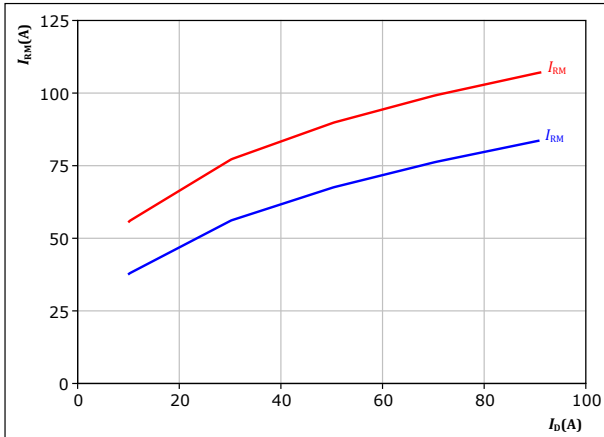
Inverter Switching Characteristics

figure 15.

MOSFET

Typical peak reverse recovery current as a function of drain current

$$I_{RM} = f(I_D)$$



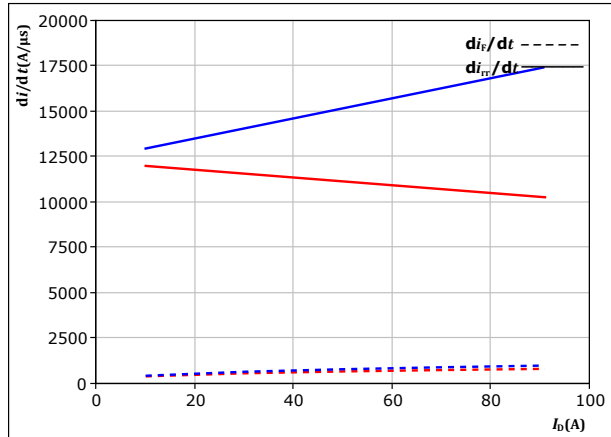
At $V_{DS} = 350$ V
 $V_{GS} = \pm 16$ V
 $R_{gon} = 120$ Ω
 T_j : 25 °C (blue), 125 °C (red)

figure 16.

MOSFET

Typical rate of fall of forward and reverse recovery current as a function of drain current

$$di_f/dt, di_r/dt = f(I_D)$$



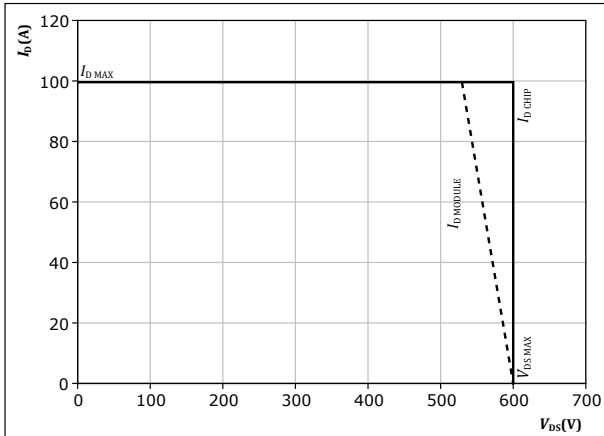
At $V_{DS} = 350$ V
 $V_{GS} = \pm 16$ V
 $R_{gon} = 120$ Ω
 T_j : 25 °C (blue), 125 °C (red)

figure 17.

MOSFET

Reverse bias safe operating area

$$I_D = f(V_{DS})$$



At $T_j = 125$ °C
 $R_{gon} = 120$ Ω
 $R_{goff} = 16$ Ω



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Inverter Switching Definitions

figure 18. MOSFET

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

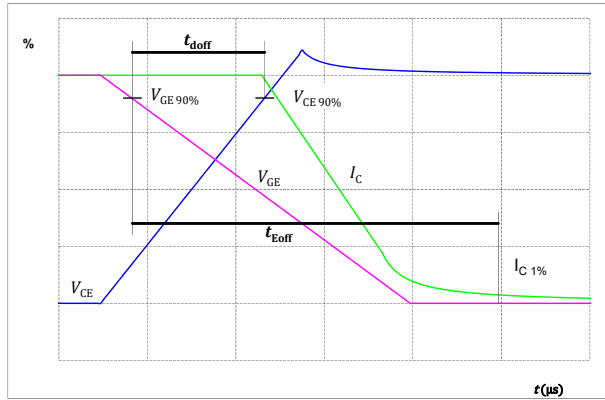


figure 19. MOSFET

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

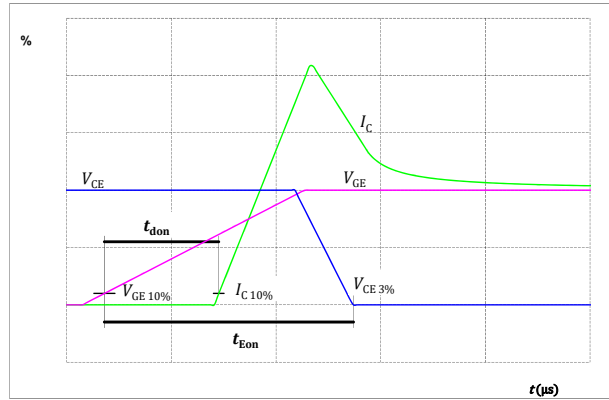


figure 20. MOSFET

Turn-off Switching Waveforms & definition of t_f

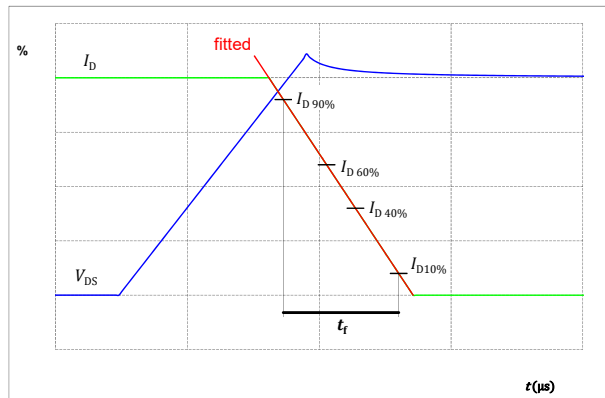
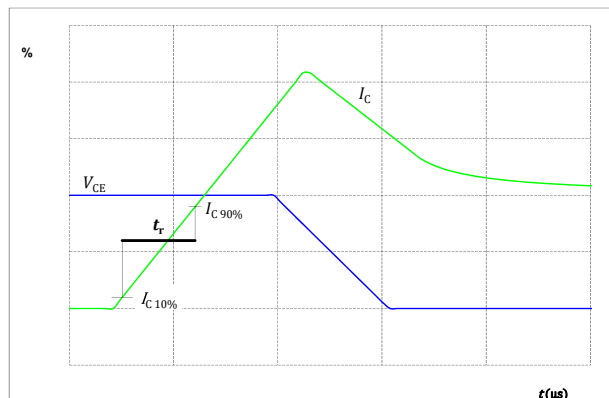


figure 21. MOSFET

Turn-on Switching Waveforms & definition of t_r





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Inverter Switching Definitions

figure 22.

FWD

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

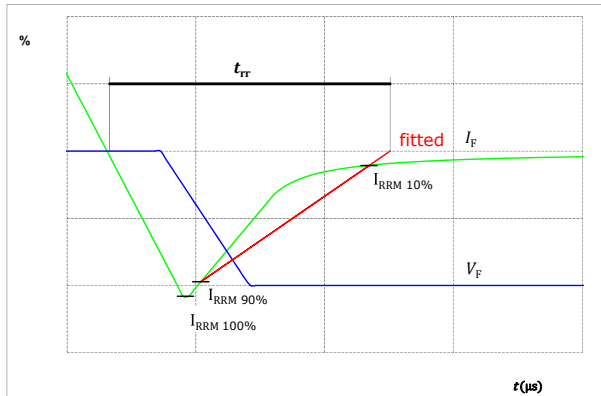


figure 23.

FWD

Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)

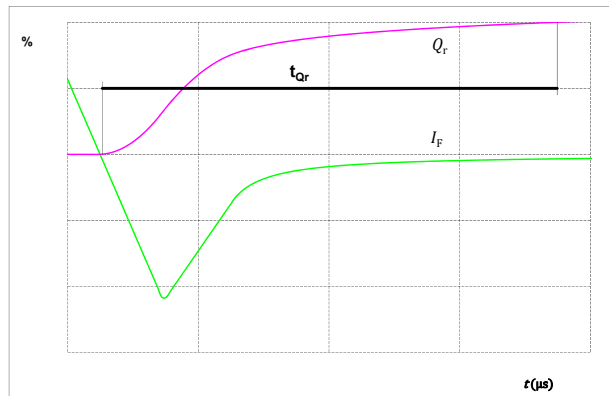
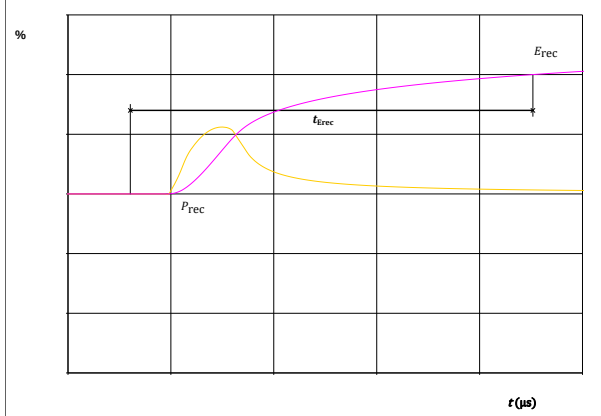


figure 24.

FWD

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





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Ordering Code	
Version	Ordering Code
Without thermal paste	10-PY064PA020F7-L582L88Y
With thermal paste (5,2 W/mK, PTM6000HV)	10-PY064PA020F7-L582L88Y-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-PY064PA020F7-L582L88Y-/3/

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

Outline			
Pin table [mm]			
Pin	X	Y	Function
1	46,3	2,7	DC-2
2	46,3	0	DC-2
3	43,6	2,7	DC-2
4	43,6	0	DC-2
5	39,2	1	G13-a
6	36,2	0	S13
7	33,2	1	G13-b
8	28,8	0	Therm2
9	23,8	0	Therm1
10	19,4	1	G11-b
11	16,4	0	S11
12	13,4	1	G11-a
13	9	2,7	DC-1
14	9	0	DC-1
15	6,3	2,7	DC-1
16	6,3	0	DC-1
17	0	6,8	DC+
18	0	9,5	DC+
19	0	12,2	DC+
20	0	14,9	DC+
21	0	28,6	Ph1
22	2,7	28,6	Ph1
23	5,4	28,6	Ph1
24	8,1	28,6	Ph1
25	10,8	28,6	Ph1
26	15,25	28,6	G12-a
27	18,25	28,6	S12
28	21,25	28,6	G12-b
29	31,35	28,6	G14-b
30	34,35	28,6	S14
31	37,35	28,6	G14-a
32	41,8	28,6	Ph2
33	44,5	28,6	Ph2
34	47,2	28,6	Ph2
35	49,9	28,6	Ph2
36	52,6	28,6	Ph2
37	52,6	14,9	DC+
38	52,6	12,2	DC+
39	52,6	9,5	DC+
40	52,6	6,8	DC+

Tolerance of pinpositions: ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

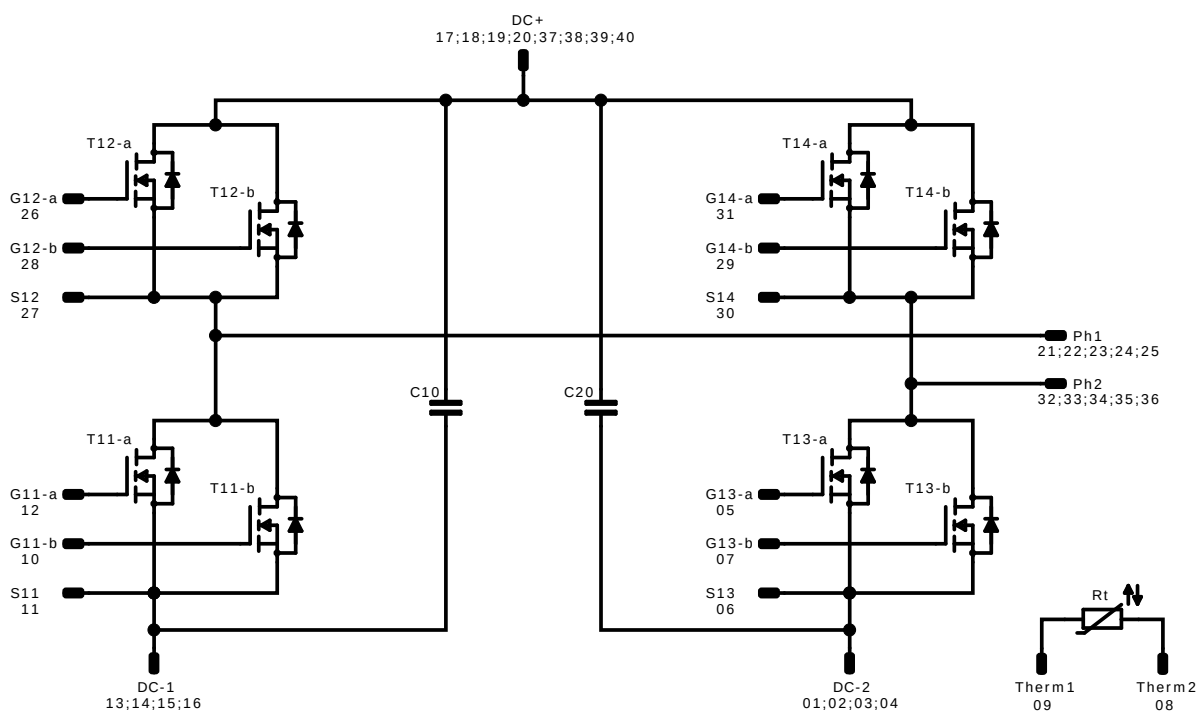


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Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11-a, T11-b, T12-a, T12-b, T13-a, T13-b, T14-a, T14-b	MOSFET	600 V	15,5 mΩ	Inverter Switch	Parallel devices with separate control. Values apply to complete device.
C10, C20	Capacitor	630 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	



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

Handling instruction
Handling instructions for <i>flow 1</i> packages see vincotech.com website.

Package data
Package data for <i>flow 1</i> 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-PY064PA020F7-L582L88Y-D1-14	15 Sep. 2022		

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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.