



fastPACK 0 SiC

900 V / 22 mΩ

Features

- 900V SiC MOS
- Switching frequency up to 400kHz
- Suitable for hard switching/soft switching
- Increased power density
- NTC

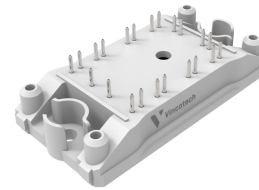
Target applications

- Power Supply
- Special Application
- Welding & Cutting

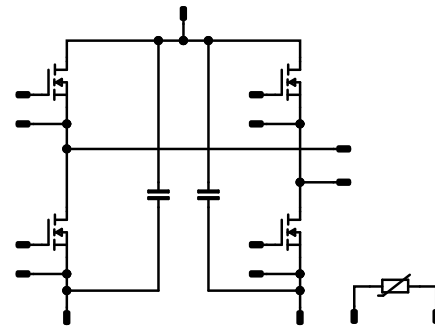
Types

- 10-FU094PB017ME02-L620F36

flow 0 12 mm housing



Schematic





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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
H-Bridge Switch				
Drain-source voltage	V_{DSS}		900	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	59	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	270	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	101	W
Gate-source voltage	V_{GSS}		-4 / 15	V
		dynamic	-8 / 19	
Maximum Junction Temperature	T_{jmax}		175	°C

Capacitor (DC)

Maximum DC voltage	V_{MAX}		1000	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			9,52	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		

H-Bridge Switch

Static

Drain-source on-state resistance	$r_{DS(on)}$		15		60	25 125 150		22 26 29	26 ⁽¹⁾	mΩ
Gate-source threshold voltage	$V_{GS(th)}$		0		0,015	25	1,7	2,4	3,5	V
Gate to Source Leakage Current	I_{GSS}		15	0		25		30	750	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	900		25		3	300	μA
Internal gate resistance	r_g							1,57		Ω
Gate charge	Q_g							91,2		nC
Gate to source charge	Q_{GS}		-4/15	400	60	25		22,5		
Gate to drain charge	Q_{GD}							36		
Short-circuit input capacitance	C_{iss}							1980		pF
Short-circuit output capacitance	C_{oss}	$f = 1$ Mhz	0	600	0	25		180		
Reverse transfer capacitance	C_{rss}							12		
Diode forward voltage	V_{SD}		0		0	25		4,8		V

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,94		K/W
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Vincotech

10-FU094PB017ME02-L620F36
datasheet

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	$t_{d(on)}$					25 125 150		15,2 14,2 15,2		ns
Rise time	t_r					25 125 150		6,8 6,2 6,2		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		47,2 48,4 46,8		ns
Fall time	t_f					25 125 150		11,4 11,8 10,2		ns
Turn-on energy (per pulse)	E_{on}					25 125 150		0,681 0,607 0,618		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,153 0,101 0,095		mWs
Peak recovery current	I_{RRM}					25 125 150		99,37 115,43 126,62		A
Reverse recovery time	t_{rr}					25 125 150		18,2 17,1 17,9		ns
Recovered charge	Q_r					25 125 150		1,06 1,15 1,32		μ C
Reverse recovered energy	E_{rec}					25 125 150		0,07 0,07 0,12		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		18427 26726 30513		A/ μ s



Characteristic Values

Parameter	Symbol	Conditions						Values			Unit
		V_{GE} [V]	V_{GS} [V]	V_{CE} [V]	V_{DS} [V]	I_C [A]	I_D [A]	T_j [°C]	Min	Typ	

Capacitor (DC)

Static

Capacitance	C	DC bias voltage = 0 V				25		94		nF
Tolerance							-20		20	%
Dissipation factor		$f = 1$ kHz				25		25		%

Thermistor

Static

Rated resistance	R					25		22		k Ω
Deviation of R_{100}	$A_{R/R}$	$R_{100} = 1484 \Omega$				100	-5		5	%
Power dissipation	P							5		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.

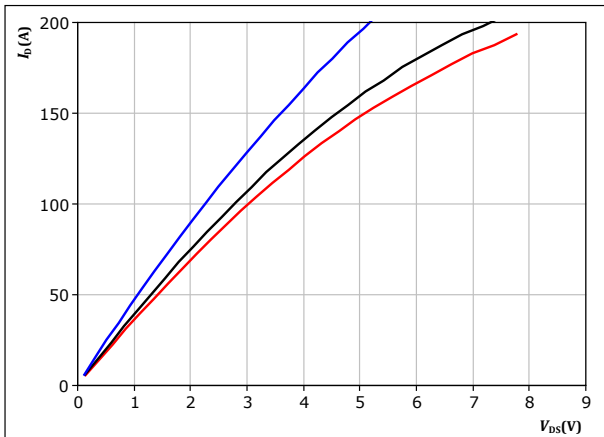


H-Bridge Switch Characteristics

figure 1. MOSFET

Typical output characteristics

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

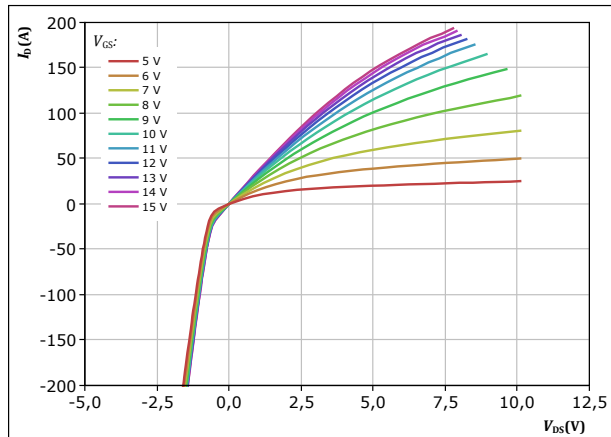


$t_p = 250 \mu s$
 $V_{GS} = 15 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 2. MOSFET

Typical output characteristics

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

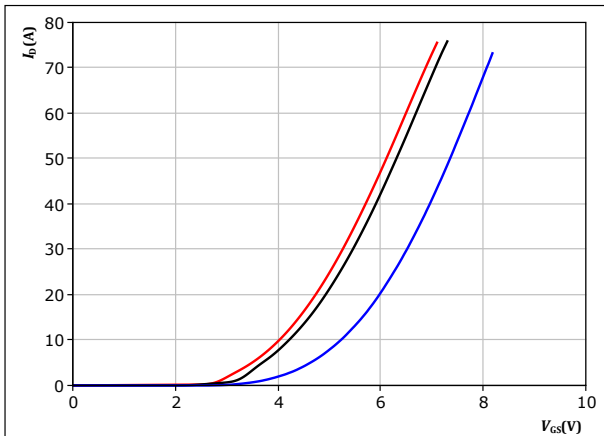


$t_p = 250 \mu s$
 $T_j = 150 \text{ °C}$
 V_{GS} from 5 V to 15 V in steps of 1 V

figure 3. MOSFET

Typical transfer characteristics

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

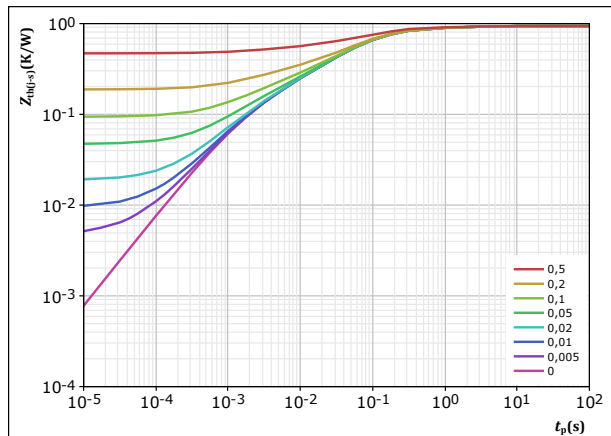


$t_p = 250 \mu s$
 $V_{DS} = 10 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 4. MOSFET

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,94 \text{ K/W}$
MOSFET thermal model values

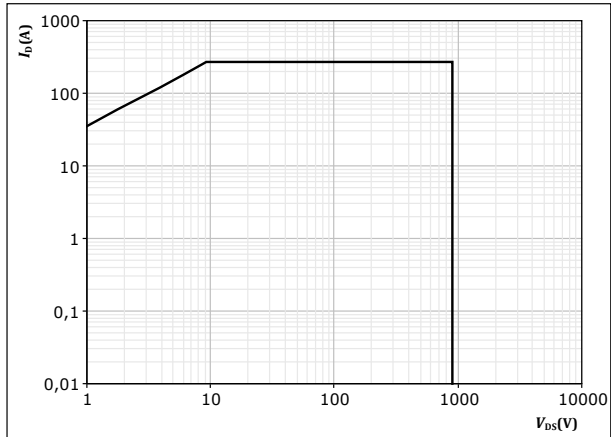
R (K/W)	τ (s)
4,21E-02	2,99E+00
1,28E-01	4,21E-01
5,28E-01	7,51E-02
1,69E-01	9,86E-03
7,30E-02	1,37E-03



H-Bridge Switch Characteristics

figure 5. MOSFET

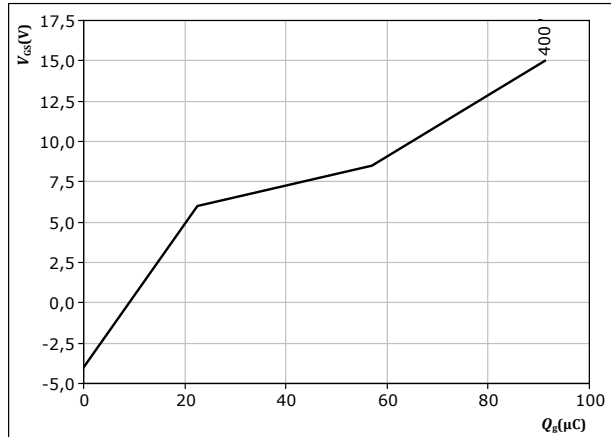
Safe operating area
 $I_D = f(V_{DS})$



$D =$ single pulse
 $T_s = 80$ °C
 $V_{GS} = 15$ V
 $T_j = T_{jmax}$

figure 6. MOSFET

Gate voltage vs gate charge
 $V_{GS} = f(Q_g)$



$I_D = 20$ A
 $T_j = 25$ °C

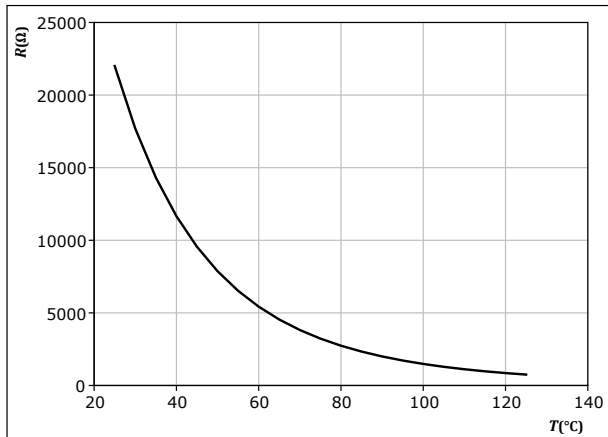


Thermistor Characteristics

figure 7. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

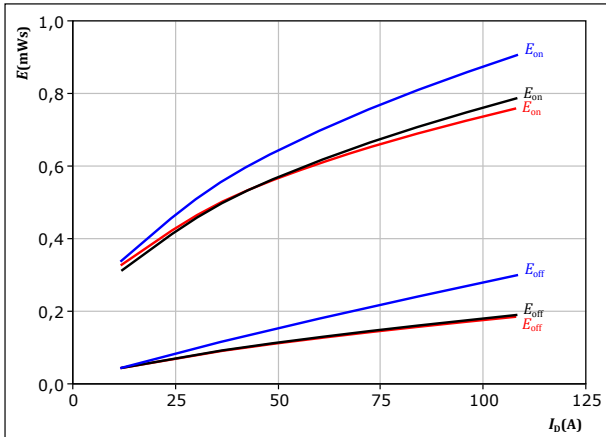




H-Bridge Switching Characteristics

figure 8. MOSFET

Typical switching energy losses as a function of drain current
 $E = f(I_D)$



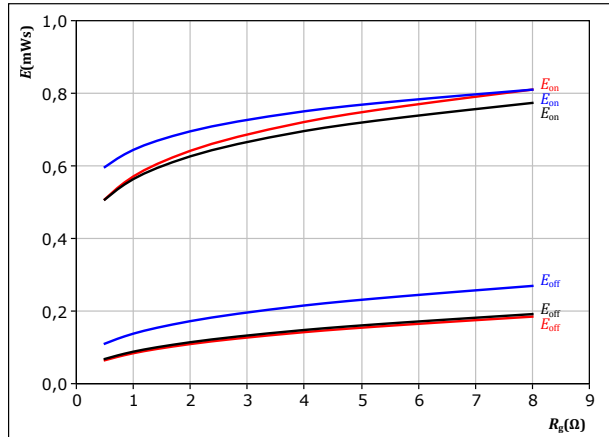
With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $R_{gon} = 2 \ \Omega$
 $R_{goff} = 2 \ \Omega$

T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 9. MOSFET

Typical switching energy losses as a function of gate resistor
 $E = f(R_g)$



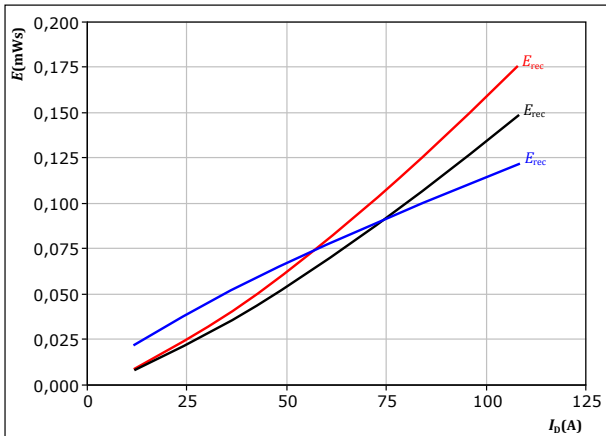
With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $I_D = 60 \text{ A}$

T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 10. MOSFET

Typical reverse recovered energy loss as a function of drain current
 $E_{rec} = f(I_D)$



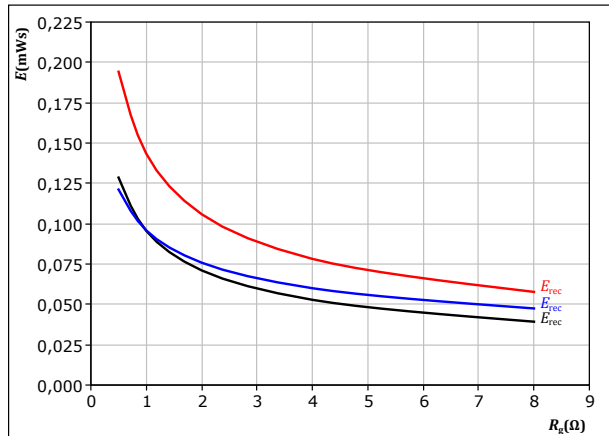
With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $R_{gon} = 2 \ \Omega$

T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 11. MOSFET

Typical reverse recovered energy loss as a function of gate resistor
 $E_{rec} = f(R_g)$



With an inductive load at

$V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $I_D = 60 \text{ A}$

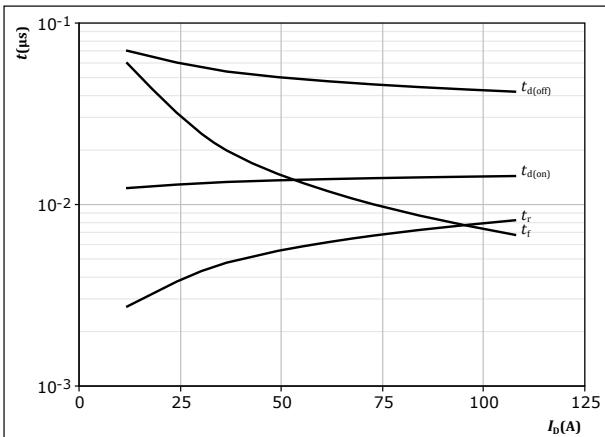
T_j : 25 °C (blue), 125 °C (black), 150 °C (red)



H-Bridge Switching Characteristics

figure 12. MOSFET

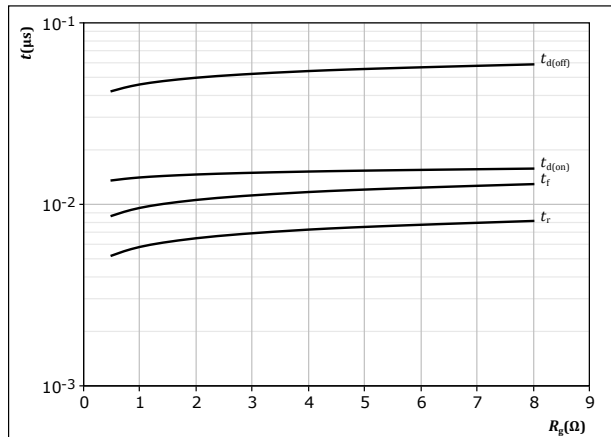
Typical switching times as a function of drain current
 $t = f(I_D)$



With an inductive load at
 $T_j = 150 \text{ } ^\circ\text{C}$
 $V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $R_{g(on)} = 2 \text{ } \Omega$
 $R_{g(off)} = 2 \text{ } \Omega$

figure 13. MOSFET

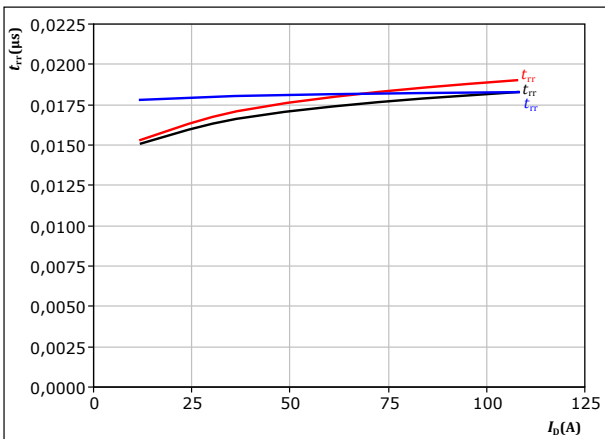
Typical switching times as a function of gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150 \text{ } ^\circ\text{C}$
 $V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $I_D = 60 \text{ A}$

figure 14. MOSFET

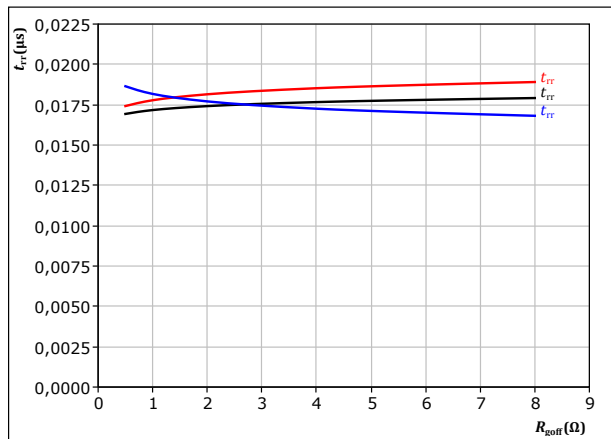
Typical reverse recovery time as a function of drain current
 $t_{rr} = f(I_D)$



At $V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $R_{g(on)} = 2 \text{ } \Omega$
 T_j : — 25 °C
— 125 °C
— 150 °C

figure 15. MOSFET

Typical reverse recovery time as a function of turn off gate resistor
 $t_{rr} = f(R_{g(off)})$



At $V_{DS} = 600 \text{ V}$
 $V_{GS} = -5/15 \text{ V}$
 $I_D = 60 \text{ A}$
 T_j : — 25 °C
— 125 °C
— 150 °C

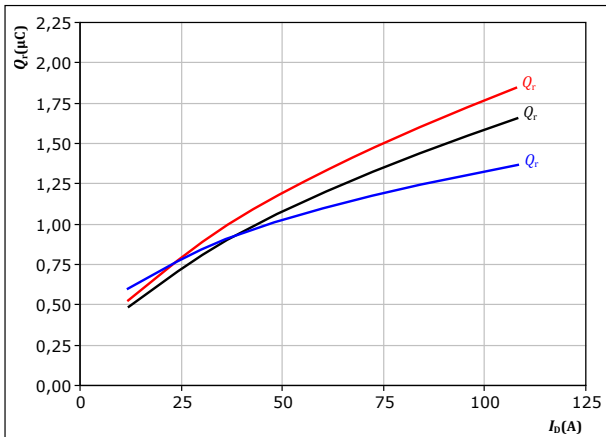


H-Bridge Switching Characteristics

figure 16. MOSFET

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$



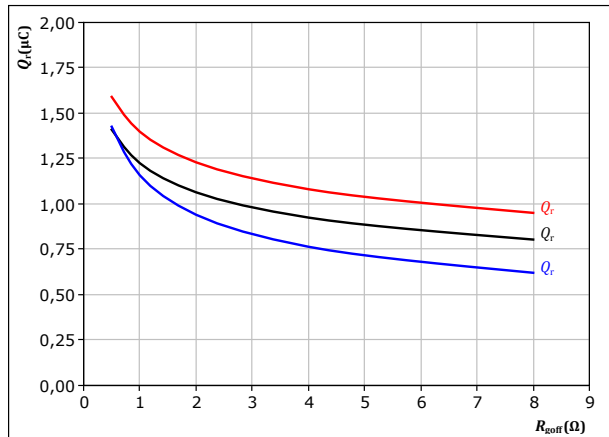
At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $R_{goff} = 2$ Ω

T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 17. MOSFET

Typical recovered charge as a function of turn off gate resistor

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



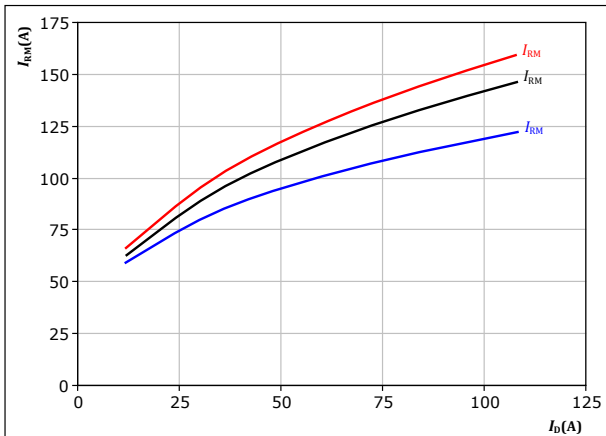
At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $I_D = 60$ A

T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 18. MOSFET

Typical peak reverse recovery current as a function of drain current

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



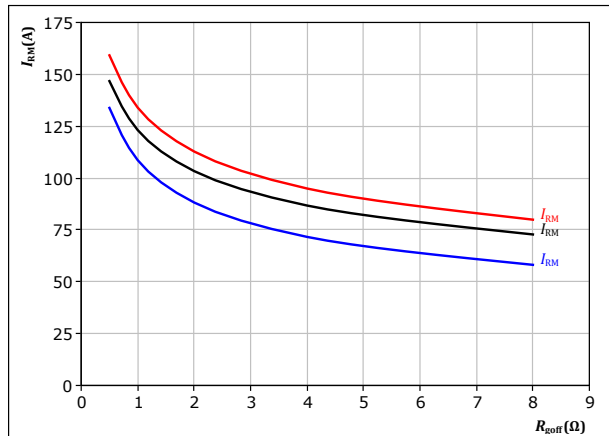
At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $R_{goff} = 2$ Ω

T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 19. MOSFET

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

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



At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $I_D = 60$ A

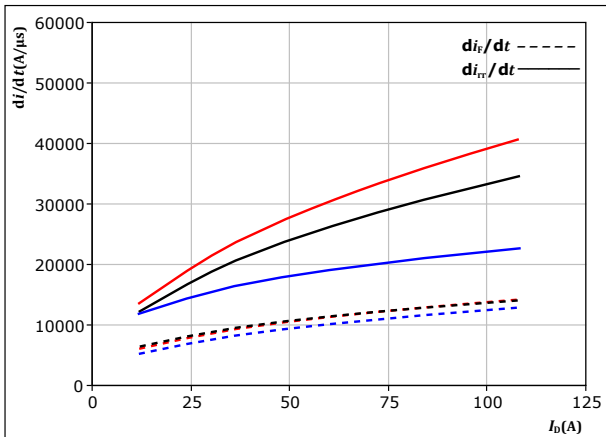
T_j : 25 °C (blue), 125 °C (black), 150 °C (red)



H-Bridge Switching Characteristics

figure 20. MOSFET

Typical rate of fall of forward and reverse recovery current as a function of drain current
 $di_f/dt, di_{rr}/dt = f(I_D)$

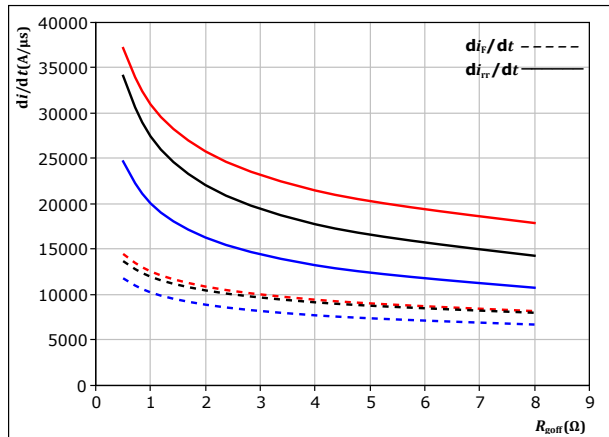


At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $R_{gson} = 2$ Ω

T_j : 25 °C (blue)
 125 °C (black)
 150 °C (red)

figure 21. MOSFET

Typical rate of fall of forward and reverse recovery current as a function of turn off gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{goff})$

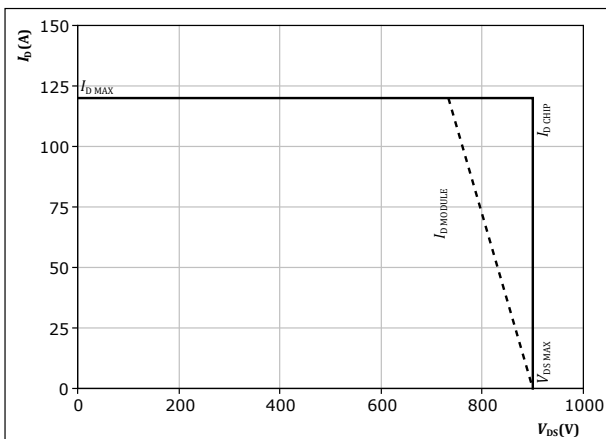


At $V_{DS} = 600$ V
 $V_{GS} = -5/15$ V
 $I_D = 60$ A

T_j : 25 °C (blue)
 125 °C (black)
 150 °C (red)

figure 22. MOSFET

Reverse bias safe operating area
 $I_D = f(V_{DS})$



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



H-Bridge Switching Definitions

figure 23. MOSFET

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

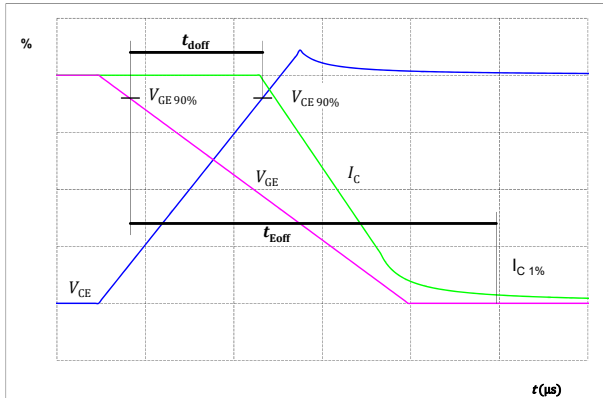


figure 24. MOSFET

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

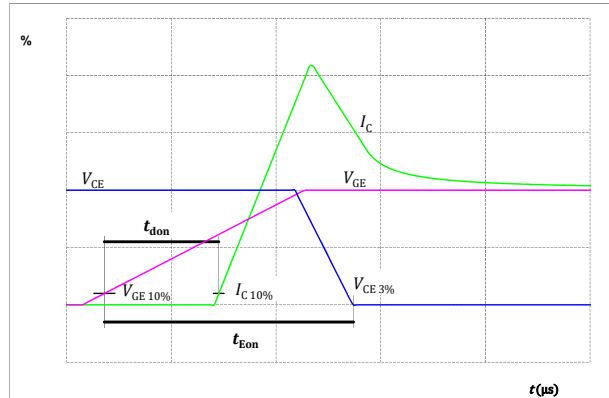


figure 25. MOSFET

Turn-off Switching Waveforms & definition of t_f

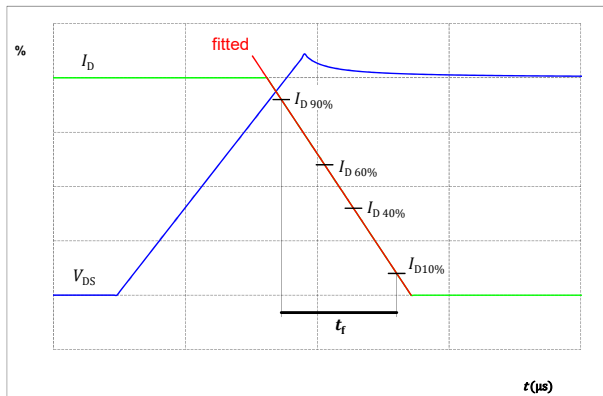
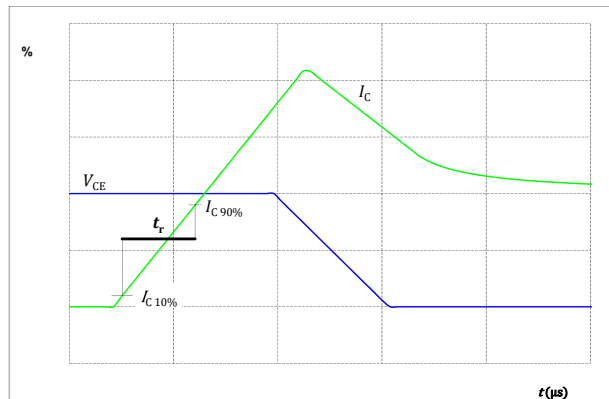


figure 26. MOSFET

Turn-on Switching Waveforms & definition of t_r





H-Bridge Switching Definitions

figure 27. FWD

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

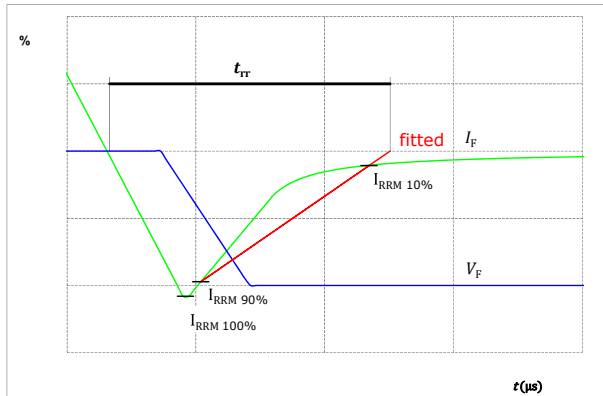


figure 28. FWD

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

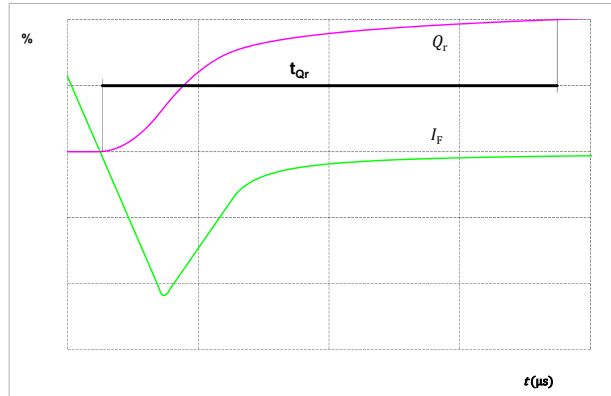
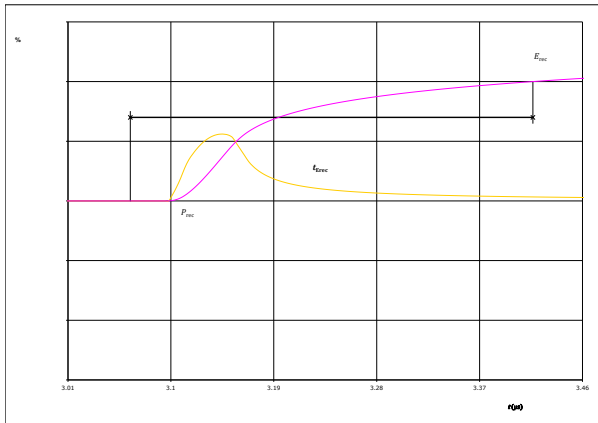


figure 29. FWD

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





Vincotech

10-FU094PB017ME02-L620F36
datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	10-FU094PB017ME02-L620F36
With thermal paste (4,4 W/mK, PTM6000)	10-FU094PB017ME02-L620F36-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-FU094PB017ME02-L620F36-/3/

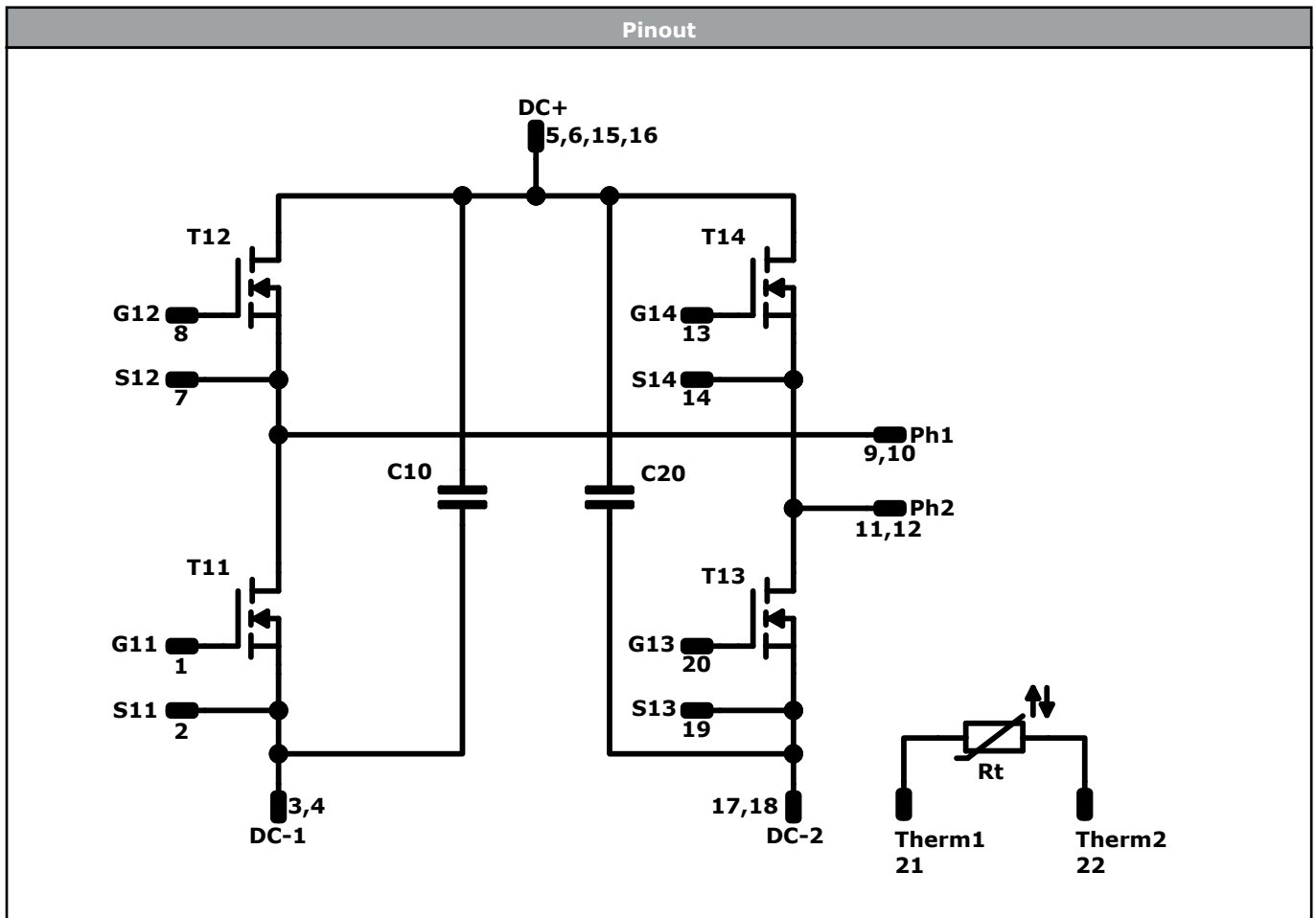
Marking						
	Text	Name NN-NNNNNNNNNNNNNN- TTTTIV	Date code WWYY	UL & VIN UL VIN	Lot LLLLL	Serial SSSS
	Datamatrix	Type&Ver TTTTIV	Lot number LLLLL	Serial SSSS	Date code WWYY	

Outline			
Pin table [mm]			
Pin	X	Y	Function
1	0	22,5	G11
2	2,9	22,5	S11
3	8,3	22,5	DC-1
4	10,8	22,5	DC-1
5	19,6	22,5	DC+
6	22,1	22,5	DC+
7	29,1	22,5	S12
8	32	22,5	G12
9	33,5	17,8	Ph1
10	33,5	15,3	Ph1
11	33,5	7,2	Ph2
12	33,5	4,7	Ph2
13	32	0	G14
14	29,1	0	S14
15	22,1	0	DC+
16	19,6	0	DC+
17	10,8	0	DC-2
18	8,3	0	DC-2
19	2,9	0	S13
20	0	0	G13
21	0	8	Therm1
22	0	14,5	Therm2

Tolerance of pinpositions: ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance



Vincotech



Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14	MOSFET	900 V	21,67 mΩ	H-Bridge Switch	
C10, C20	Capacitor	1000 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	




Vincotech

Packaging instruction				
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for <i>flow 0</i> packages see vincotech.com website.

Package data
Package data for <i>flow 0</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-FU094PB017ME02-L620F36-D1-14	3 Aug. 2021	Initial Release	

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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.