Vincotech

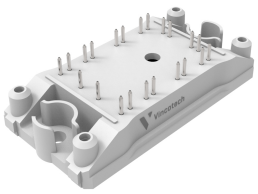
10-FU094PB017ME05-L620F31
datasheet

fastPACK 0 SiC **900 V / 17 mΩ**

Features

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

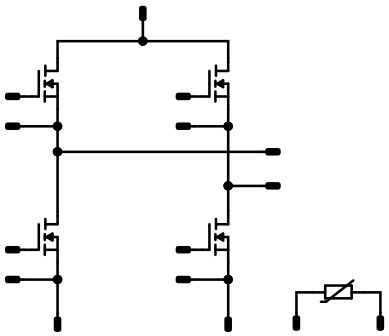
flow 0 12 mm housing



Target applications

- Power Supply
- Special Application
- Welding & Cutting

Schematic



Types

- 10-FU094PB017ME05-L620F31

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
H-Bridge Switch - Lo side				
Drain-source voltage	V_{DSS}		900	V
Drain current	I_D	$T_j = T_{jmax}$ T_s = 80 °C	57	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	270	A
Avalanche energy, single pulse	E_{AS}	V_{DD} = 50 V I_D = 66 A	330	mJ
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	101	W
Gate-source voltage	V_{GSS}		-4 / 15	V
		dynamic	-8 / 19	
Maximum Junction Temperature	T_{jmax}		175	°C
H-Bridge Switch - Hi side				
Drain-source voltage	V_{DSS}		900	V
Drain current	I_D	$T_j = T_{jmax}$ T_s = 80 °C	57	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	270	A
Avalanche energy, single pulse	E_{AS}	V_{DD} = 50 V I_D = 66 A	330	mJ
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	101	W
Gate-source voltage	V_{GSS}		-4 / 15	V
		dynamic	-8 / 19	
Maximum Junction Temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
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			min. 12,7	mm
Clearance			9,52	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	
H-Bridge Switch - Lo side										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		15		114	25 125 150		23 28 31	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		
Gate to source charge	Q_{GS}		-4/15	400	60	25		22,5		nC
Gate to drain charge	Q_{GD}							36		
Short-circuit input capacitance	C_{iss}							1980		
Short-circuit output capacitance	C_{oss}	f = 1 Mhz	0	600	0	25		180		pF
Reverse transfer capacitance	C_{rss}							12		
Diode forward voltage	V_{SD}		0		0	25		4,8		V
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,94		K/W
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	$t_{d(off)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω				25 125 150		47,2 48,4 46,8		ns
Fall time	t_f		-5/15	600	60	25 125 150		11,4 11,8 10,2		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=1,06 µC Q_{rFWD}=1,15 µC Q_{rFWD}=1,32 µC				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

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 - Hi side										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		15		114	25 125 150		23 28 31	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		
Gate to source charge	Q_{GS}		-4/15	400	60	25		22,5		nC
Gate to drain charge	Q_{GD}							36		
Short-circuit input capacitance	C_{iss}							1980		
Short-circuit output capacitance	C_{oss}	f = 1 Mhz	0	600	0	25		180		pF
Reverse transfer capacitance	C_{rss}							12		
Diode forward voltage	V_{SD}		0		0	25		4,8		V
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,94		K/W
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	$t_{d(off)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω				25 125 150		47,2 48,4 46,8		ns
Fall time	t_f		-5/15	600	60	25 125 150		11,4 11,8 10,2		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=1,06 µC Q_{rFWD}=1,15 µC Q_{rFWD}=1,32 µC				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

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							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	

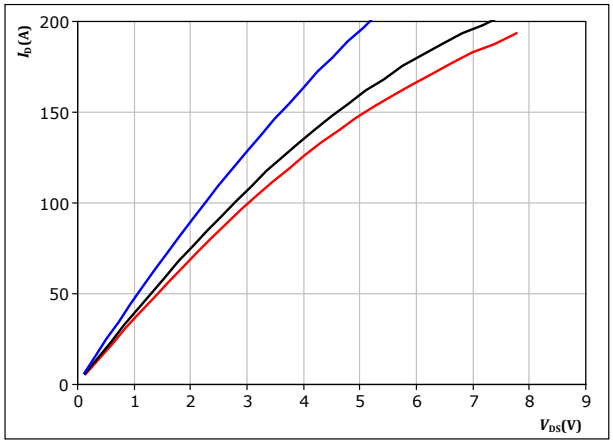
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

H-Bridge Switch - Lo side Characteristics

figure 1. MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



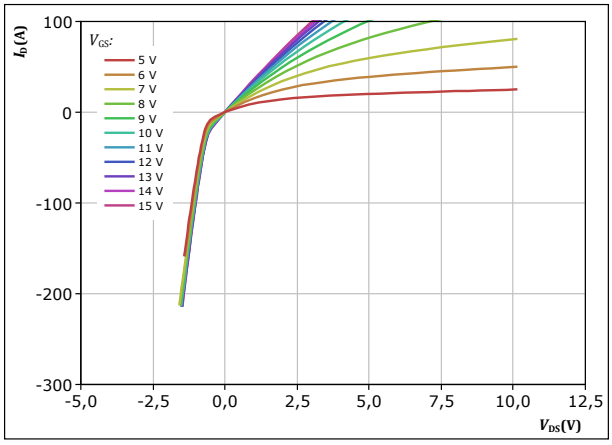
t_p = 250 µs
V_{GS} = 15 V

T_j: 25 °C, 125 °C, 150 °C

figure 2. MOSFET

Typical output characteristics

$I_D = f(V_{DS})$

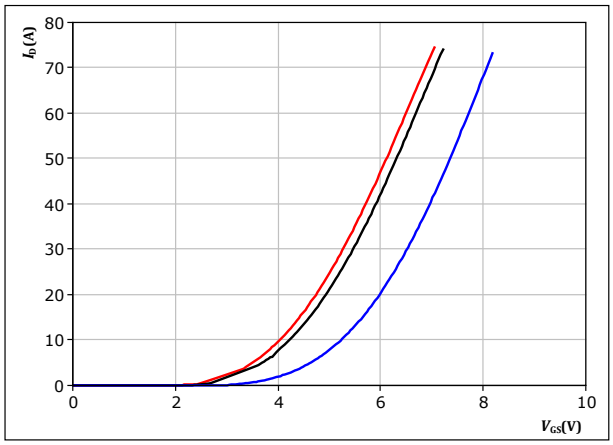


t_p = 250 µs
T_j = 150 °C
V_{GS} from 5 V to 15 V in steps of 1 V

figure 3. MOSFET

Typical transfer characteristics

$I_D = f(V_{GS})$



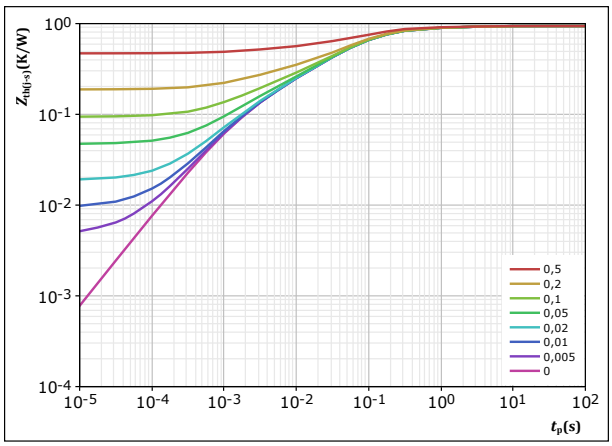
t_p = 250 µs
V_{DS} = 10 V

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
$R_{th(j-s)}$ = 0,94 K/W

MOSFET thermal model values

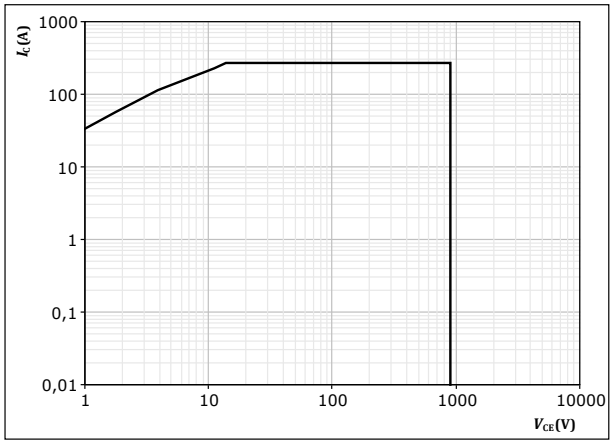
R (K/W)	τ (s)
4,21E-02	2,99E+00
1,28E-01	4,21E-01
5,28E-01	7,51E-02
1,69E-01	9,86E-03
7,30E-02	1,37E-03

H-Bridge Switch - Lo side Characteristics

figure 5. **MOSFET**

Safe operating area

$I_C = f(V_{CE})$

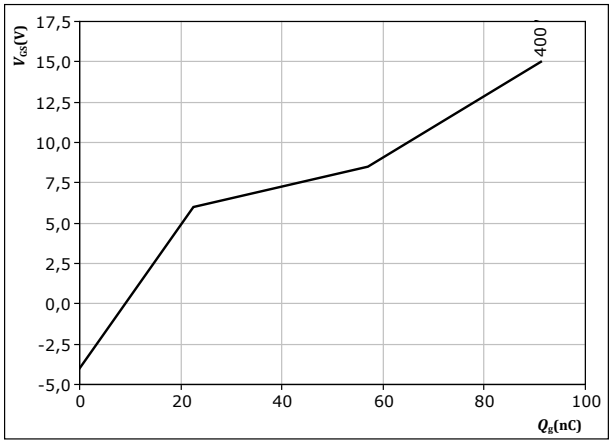


D = single pulse
T_s = 80 °C
V_{GE} = 15 V
T_j = T_{jmax}

figure 6. **MOSFET**

Gate voltage vs gate charge

$V_{GS} = f(Q_g)$



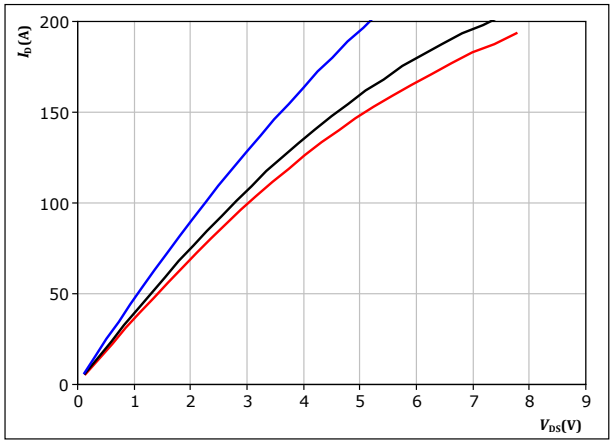
At I_D = 60 A

H-Bridge Switch - Hi side Characteristics

figure 7. MOSFET

Typical output characteristics

$I_D = f(V_{DS})$

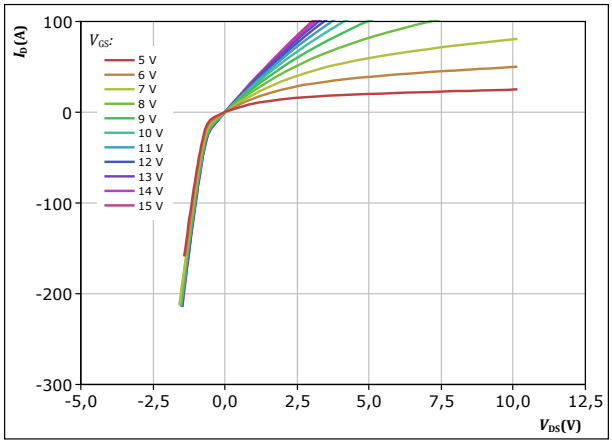


t_p =	250	µs		
V_{GS} =	15	V	T_j:	25 °C
				125 °C
				150 °C

figure 8. MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



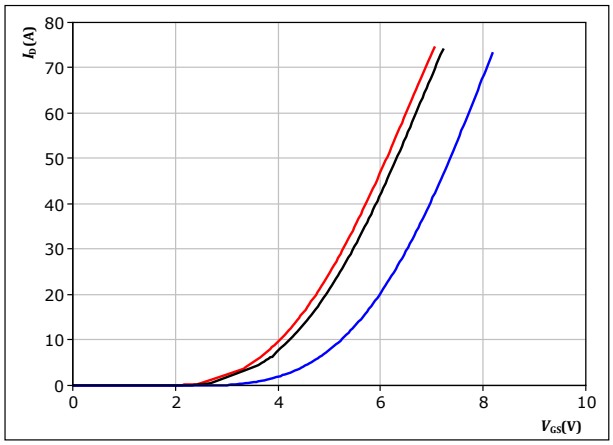
t_p =	250	µs
T_j =	150	°C

V_{GS} from 5 V to 15 V in steps of 1 V

figure 9. MOSFET

Typical transfer characteristics

$I_D = f(V_{GS})$

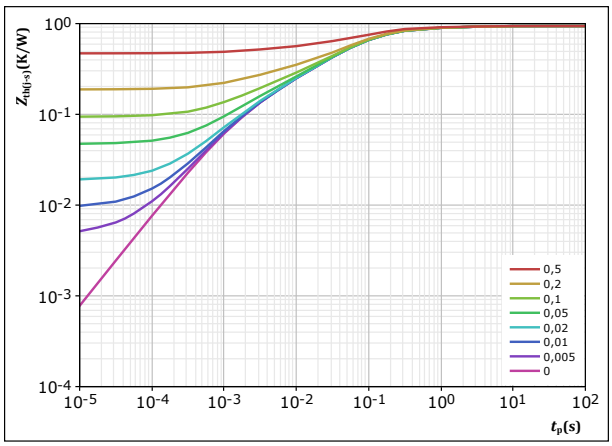


t_p =	250	µs		
V_{DS} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 10. 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	K/W

MOSFET thermal model values

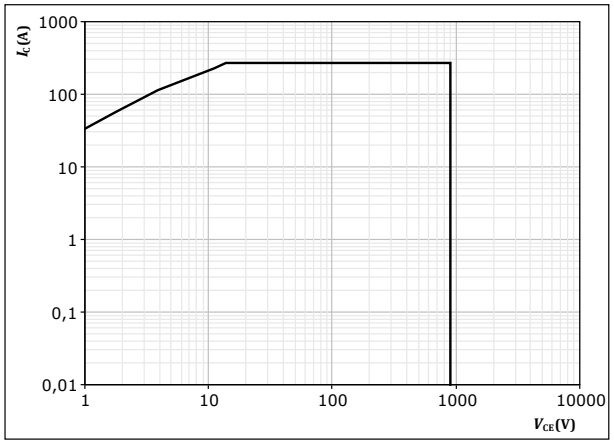
R (K/W)	τ (s)
4,21E-02	2,99E+00
1,28E-01	4,21E-01
5,28E-01	7,51E-02
1,69E-01	9,86E-03
7,30E-02	1,37E-03

H-Bridge Switch - Hi side Characteristics

figure 11. **MOSFET**

Safe operating area

$I_C = f(V_{CE})$

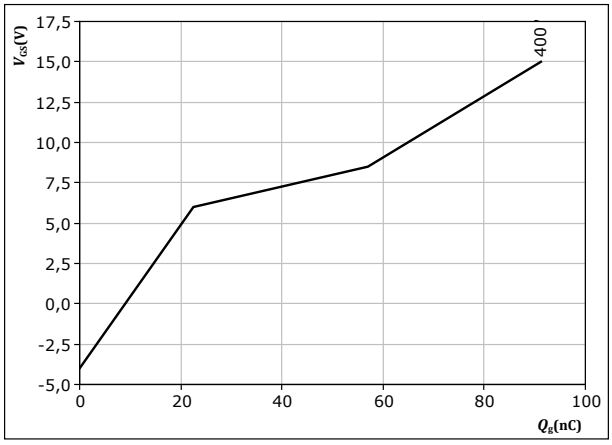


$D =$ single pulse
$T_s =$ 80 °C
$V_{GE} =$ 15 V
$T_j =$ T_{jmax}

figure 12. **MOSFET**

Gate voltage vs gate charge

$V_{GS} = f(Q_g)$



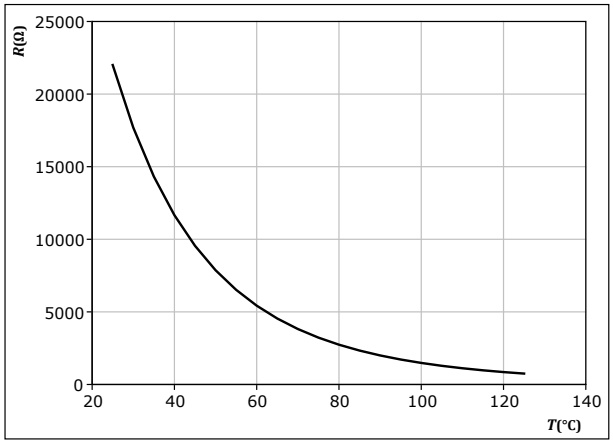
At $I_D =$ 60 A

Thermistor Characteristics

figure 13. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

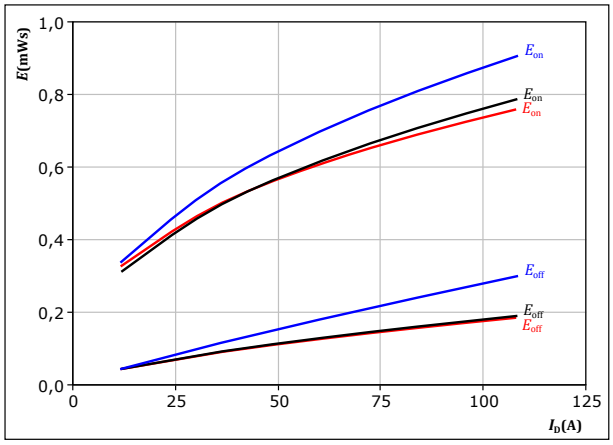


H-Bridge Switching Characteristics - Lo side

figure 14. MOSFET

Typical switching energy losses as a function of drain current

$E = f(I_D)$



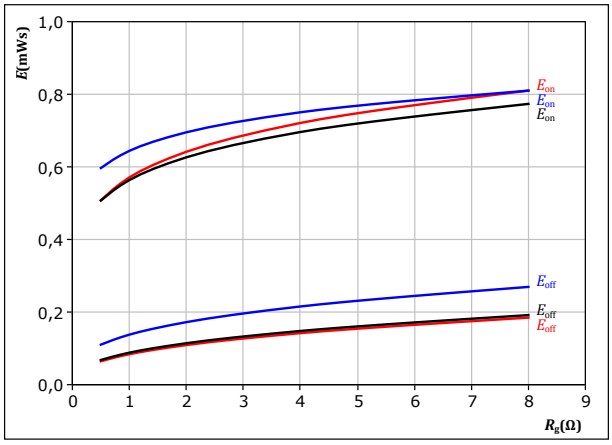
With an inductive load at

V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-5/15	V		125 °C
R_{gon} =	2	Ω		150 °C
R_{goff} =	2	Ω		

figure 15. MOSFET

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



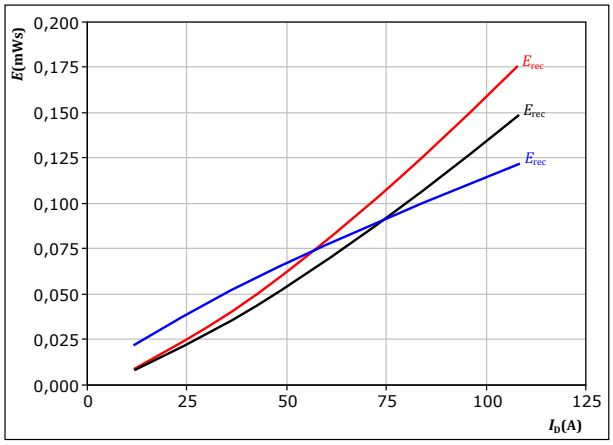
With an inductive load at

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

figure 16. MOSFET

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



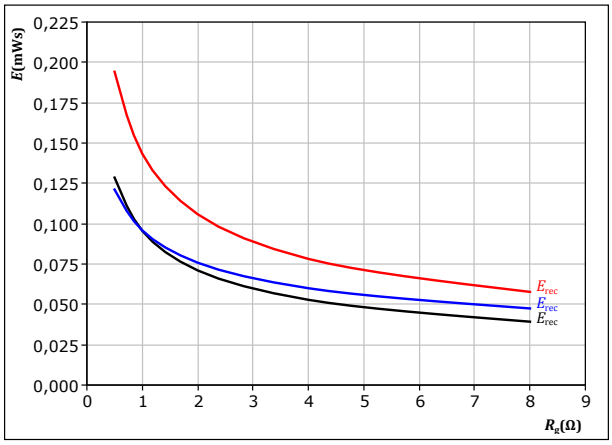
With an inductive load at

V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-5/15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 17. MOSFET

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

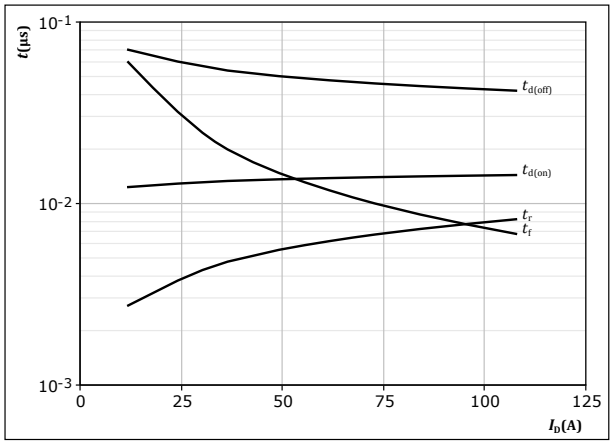
V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-5/15	V		125 °C
I_D =	60	A		150 °C

H-Bridge Switching Characteristics - Lo side

figure 18. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



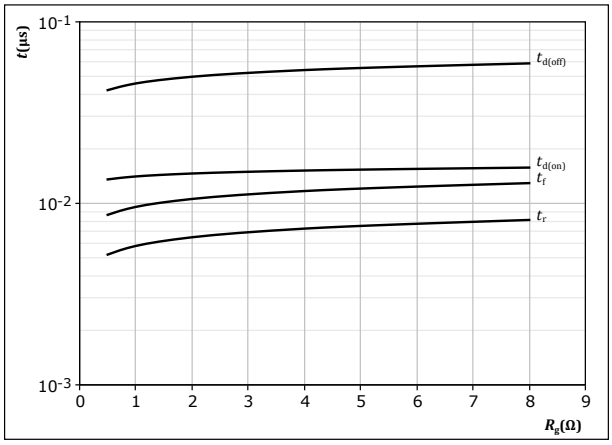
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	-5/15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 19. **MOSFET**

Typical switching times as a function of gate resistor

$t = f(R_g)$



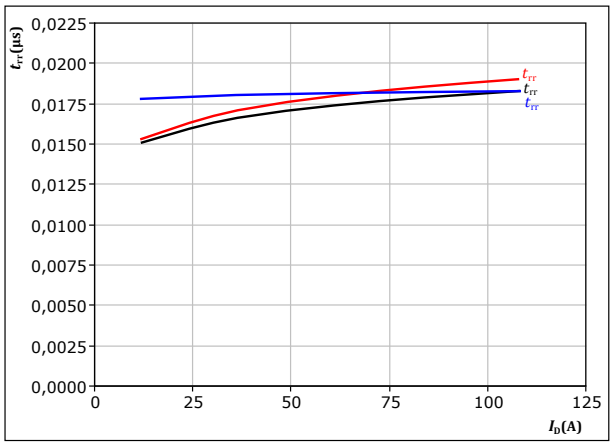
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	-5/15	V
I_D =	60	A

figure 20. **MOSFET**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



At

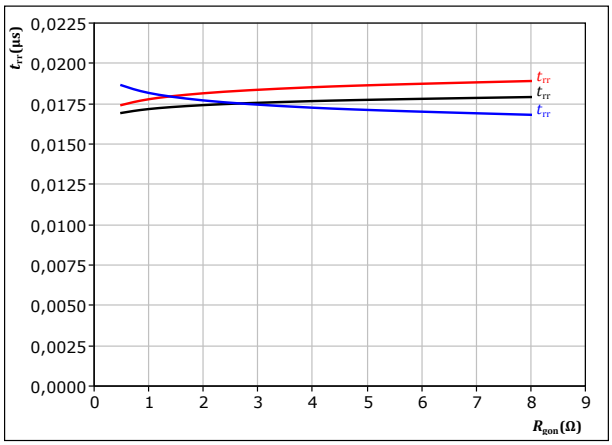
V_{DS} =	600	V
V_{GS} =	-5/15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 21. **MOSFET**

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

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



At

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

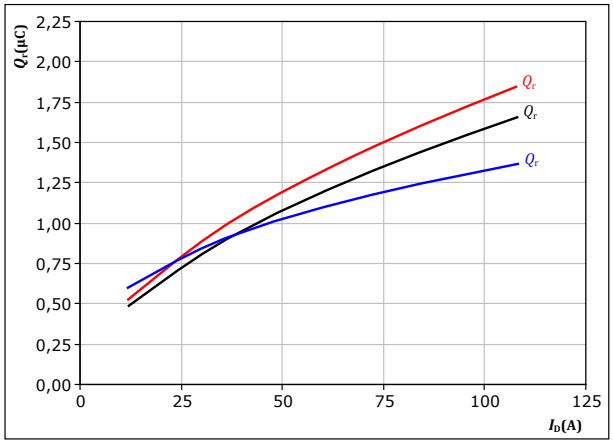
T_j: 25 °C, 125 °C, 150 °C

H-Bridge Switching Characteristics - Lo side

figure 22. **MOSFET**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

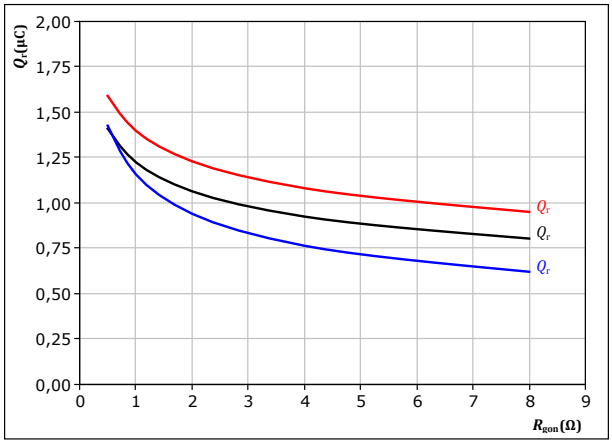


At				T_j:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	-5/15	V		125 °C
	R_{gon} =	2	Ω		150 °C

figure 23. **MOSFET**

Typical recovered charge as a function of turn on gate resistor

$Q_r = f(R_{gon})$

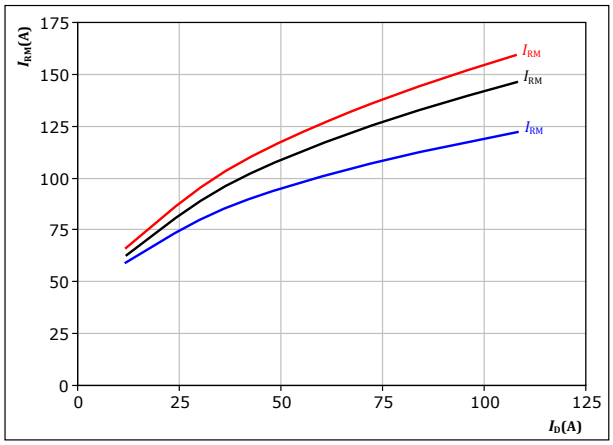


At				T_j:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	-5/15	V		125 °C
	I_D =	60	A		150 °C

figure 24. **MOSFET**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

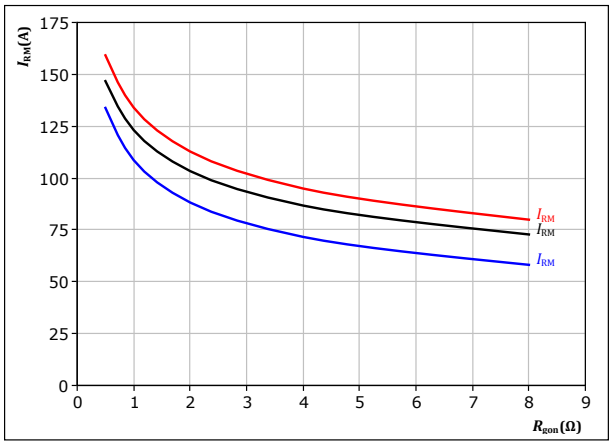


At				T_j:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	-5/15	V		125 °C
	R_{gon} =	2	Ω		150 °C

figure 25. **MOSFET**

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

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



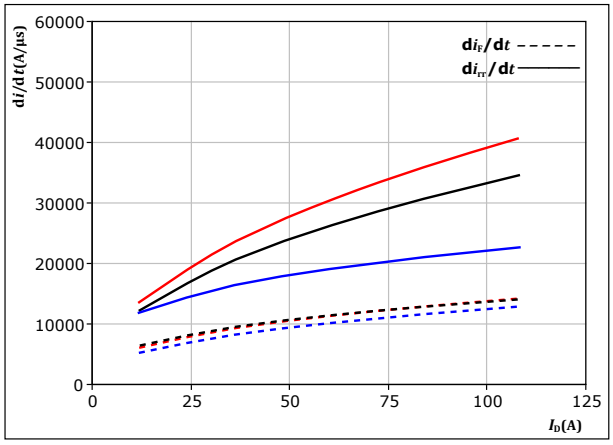
At				T_j:	
	V_{DS} =	600	V		25 °C
	V_{GS} =	-5/15	V		125 °C
	I_D =	60	A		150 °C

H-Bridge Switching Characteristics - Lo side

figure 26. **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)

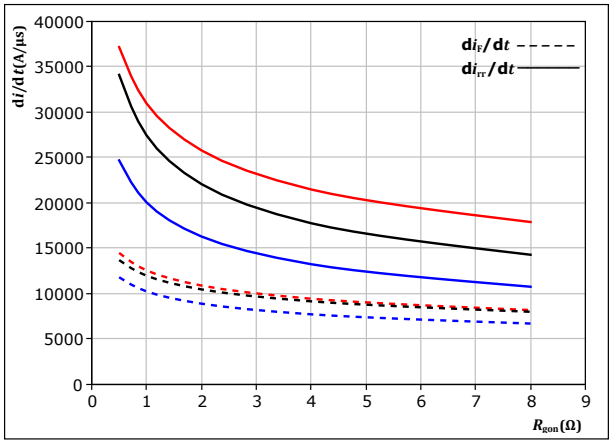


At					
	V_{DS} =	600	V		
	V_{GS} =	-5/15	V	T_j:	25 °C, 125 °C, 150 °C
	R_{gon} =	2	Ω		

figure 27. **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})

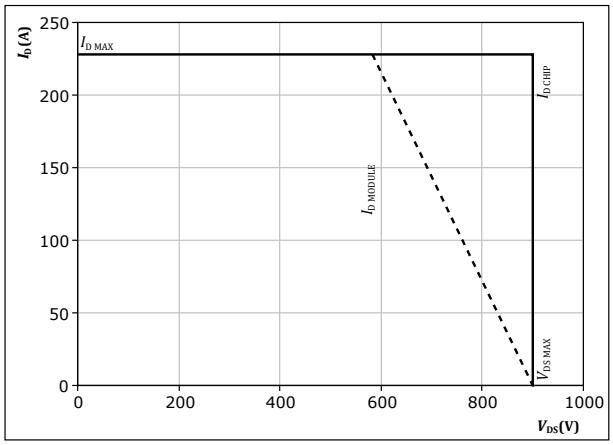


At					
	V_{DS} =	600	V		
	V_{GS} =	-5/15	V	T_j:	25 °C, 125 °C, 150 °C
	I_D =	60	A		

figure 28. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



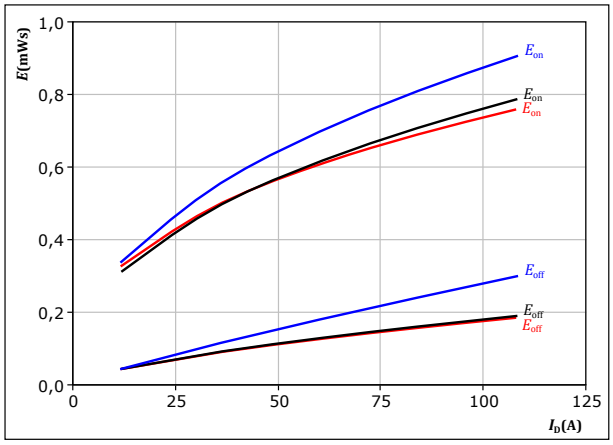
At			
	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

H-Bridge Switching Characteristics - Hi side

figure 29. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



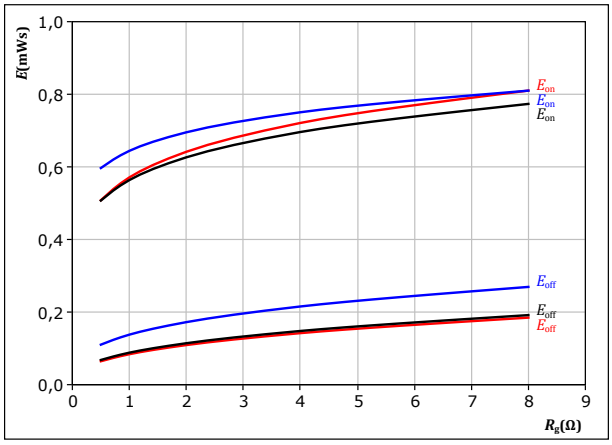
With an inductive load at

V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-5/15	V		125 °C
R_{gon} =	2	Ω		150 °C
R_{goff} =	2	Ω		

figure 30. **MOSFET**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



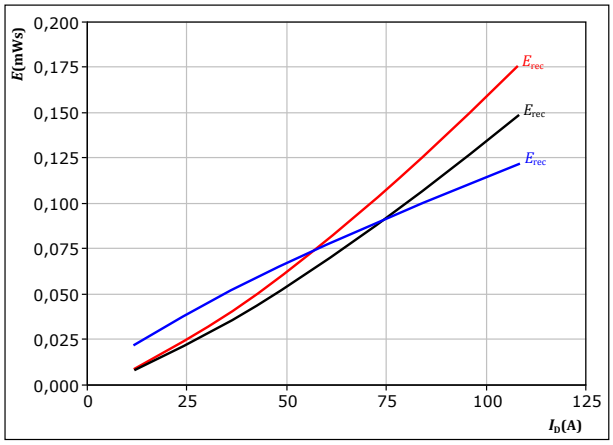
With an inductive load at

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

figure 31. **MOSFET**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



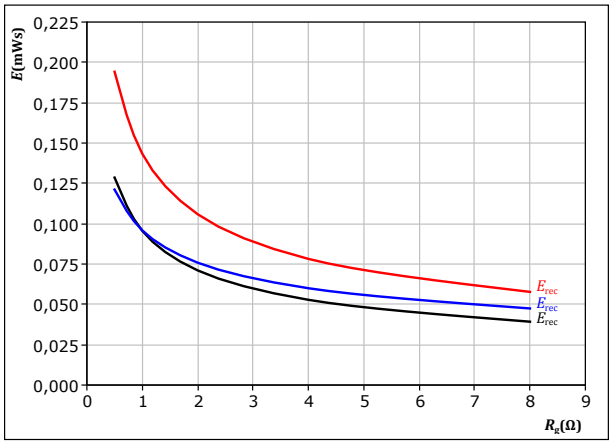
With an inductive load at

V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-5/15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 32. **MOSFET**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

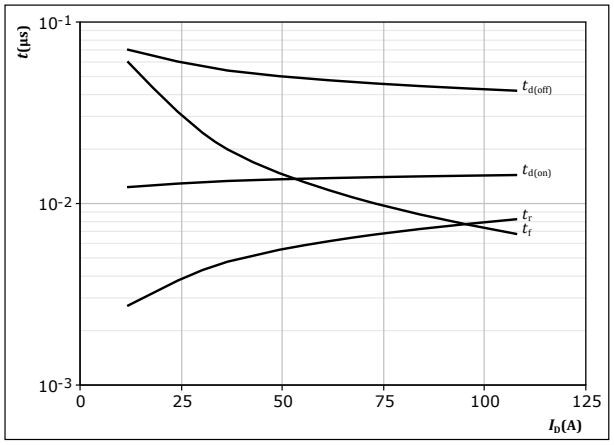
V_{DS} =	600	V	T_j:	25 °C
V_{GS} =	-5/15	V		125 °C
I_D =	60	A		150 °C

H-Bridge Switching Characteristics - Hi side

figure 33. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



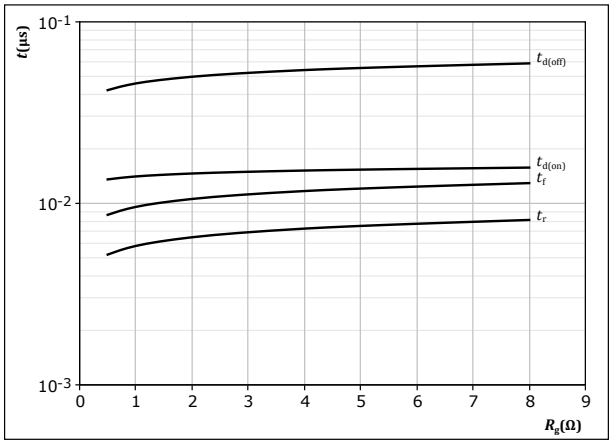
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	-5/15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 34. **MOSFET**

Typical switching times as a function of gate resistor

$t = f(R_g)$



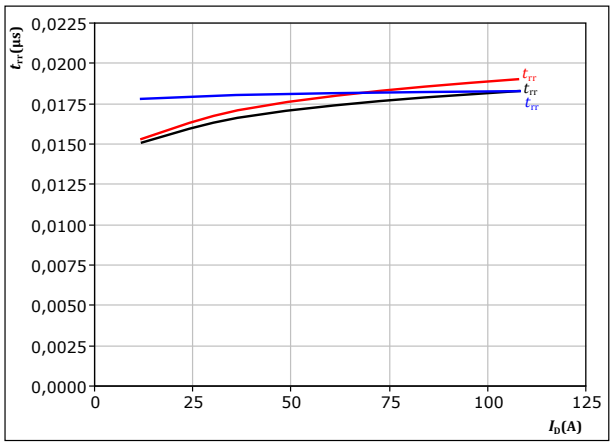
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	-5/15	V
I_D =	60	A

figure 35. **MOSFET**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



At

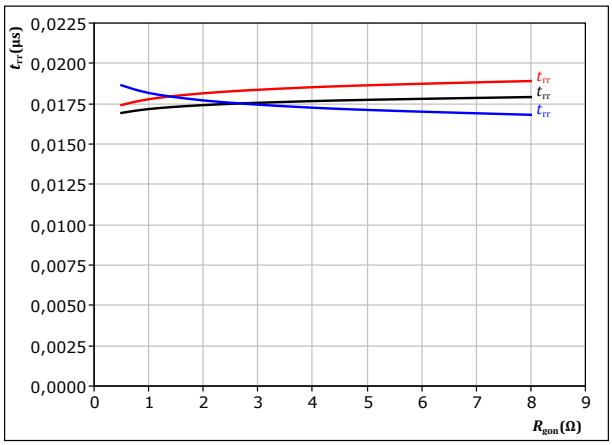
V_{DS} =	600	V
V_{GS} =	-5/15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 36. **MOSFET**

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

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



At

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

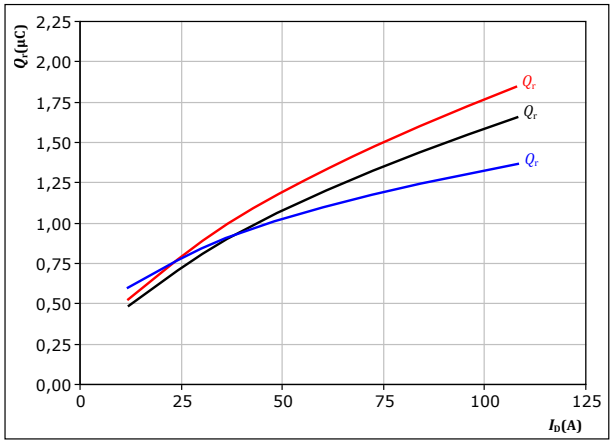
T_j: 25 °C, 125 °C, 150 °C

H-Bridge Switching Characteristics - Hi side

figure 37. **MOSFET**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

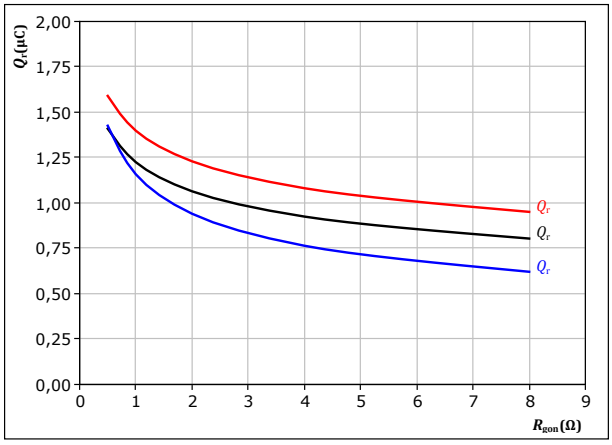


At				
V_{DS} =	600	V		
V_{GS} =	-5/15	V	T_j:	25 °C
R_{gon} =	2	Ω		125 °C
				150 °C

figure 38. **MOSFET**

Typical recovered charge as a function of turn on gate resistor

$Q_r = f(R_{gon})$

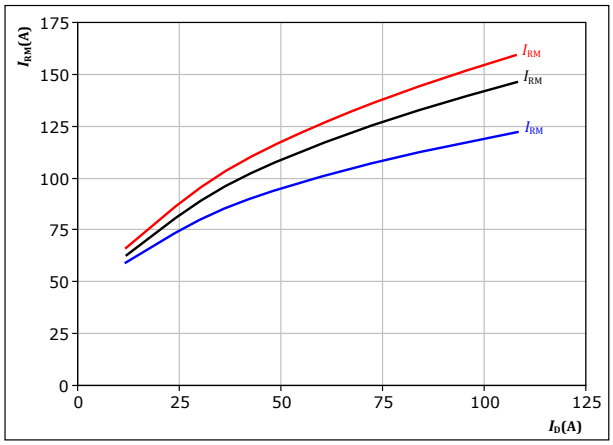


At				
V_{DS} =	600	V		
V_{GS} =	-5/15	V	T_j:	25 °C
I_D =	60	A		125 °C
				150 °C

figure 39. **MOSFET**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

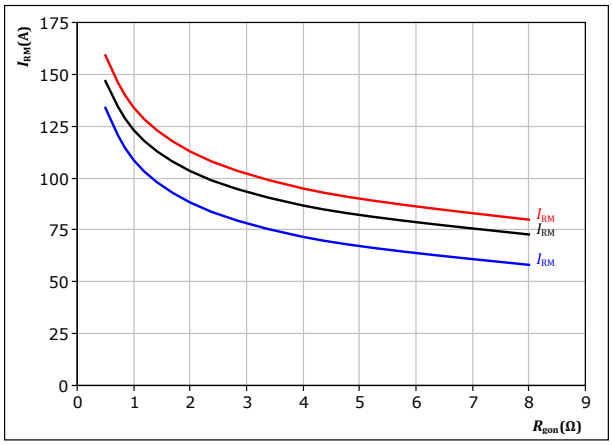


At				
V_{DS} =	600	V		
V_{GS} =	-5/15	V	T_j:	25 °C
R_{gon} =	2	Ω		125 °C
				150 °C

figure 40. **MOSFET**

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

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



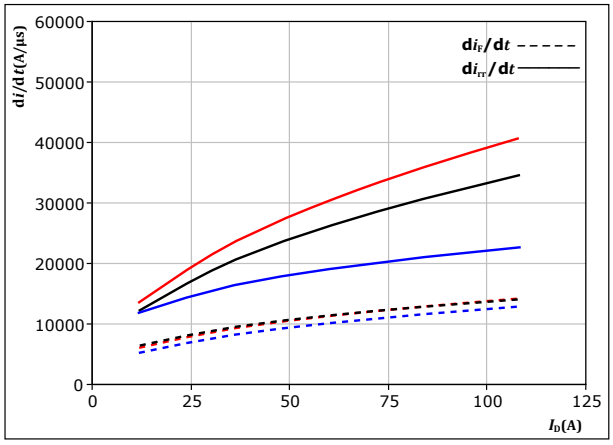
At				
V_{DS} =	600	V		
V_{GS} =	-5/15	V	T_j:	25 °C
I_D =	60	A		125 °C
				150 °C

H-Bridge Switching Characteristics - Hi side

figure 41. **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)

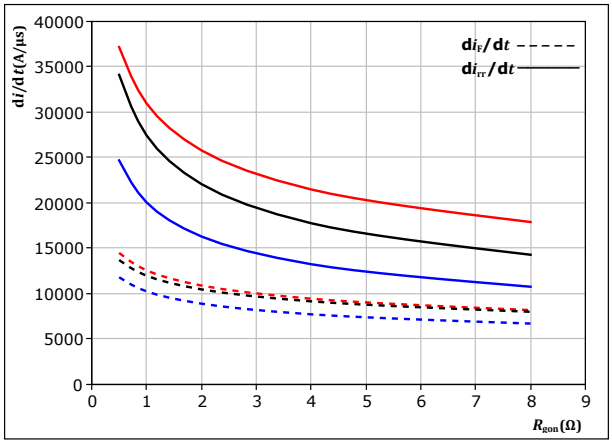


At					
	V_{DS} =	600	V		
	V_{GS} =	-5/15	V	T_j:	25 °C
	R_{gon} =	2	Ω		125 °C
					150 °C

figure 42. **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})

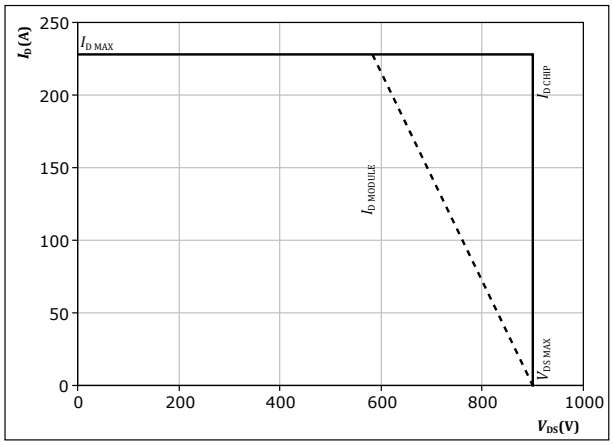


At					
	V_{DS} =	600	V		
	V_{GS} =	-5/15	V	T_j:	25 °C
	I_D =	60	A		125 °C
					150 °C

figure 43. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



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

Switching Definitions

figure 44. MOSFET

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

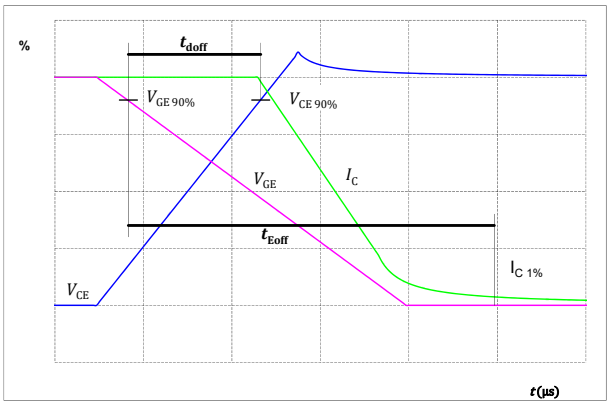


figure 45. MOSFET

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

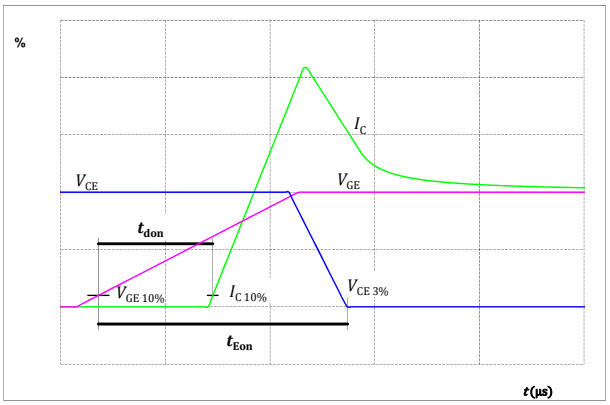


figure 46. MOSFET

Turn-off Switching Waveforms & definition of t_f

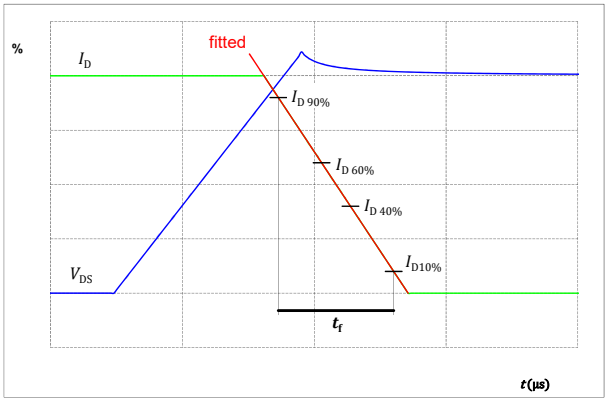
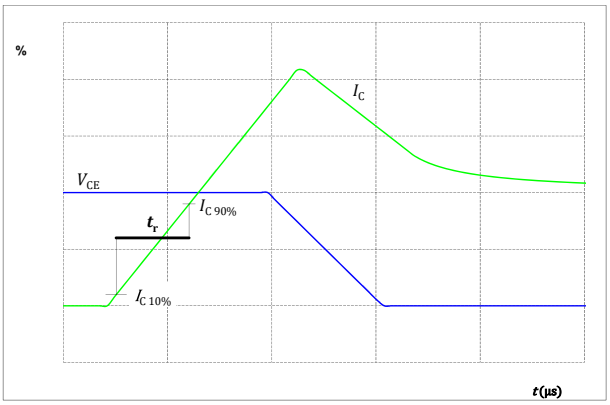


figure 47. MOSFET

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 48. **FWD**

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

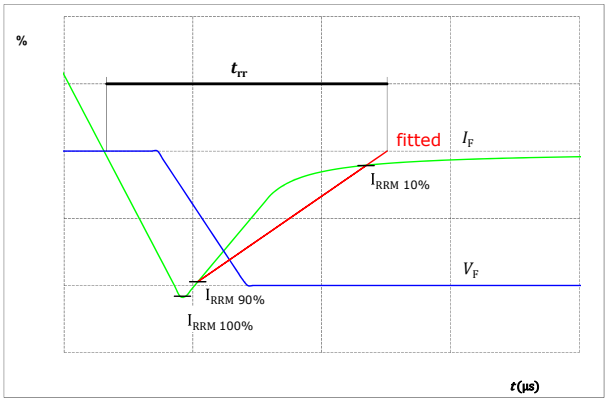


figure 49. **FWD**

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

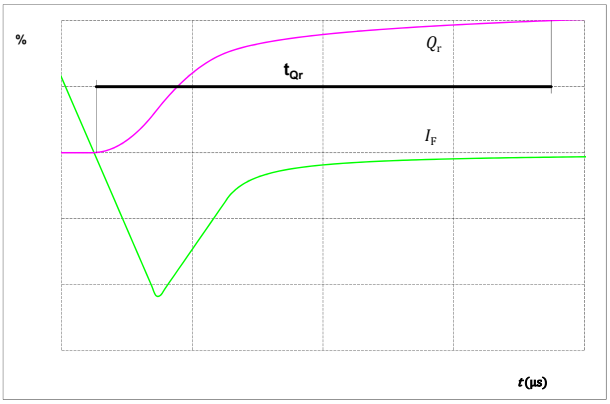
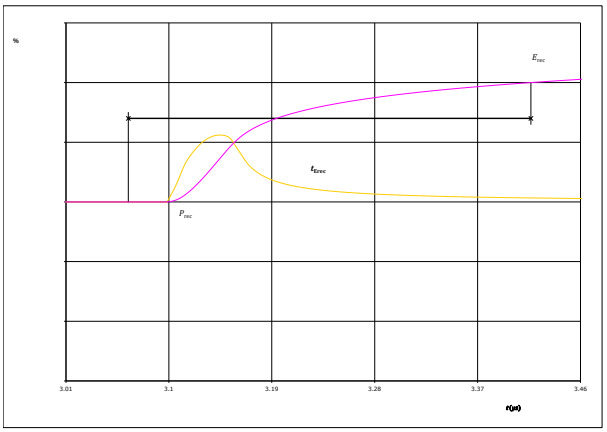


figure 50. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	10-FU094PB017ME05-L620F31
With thermal paste	10-FU094PB017ME05-L620F31-/3/

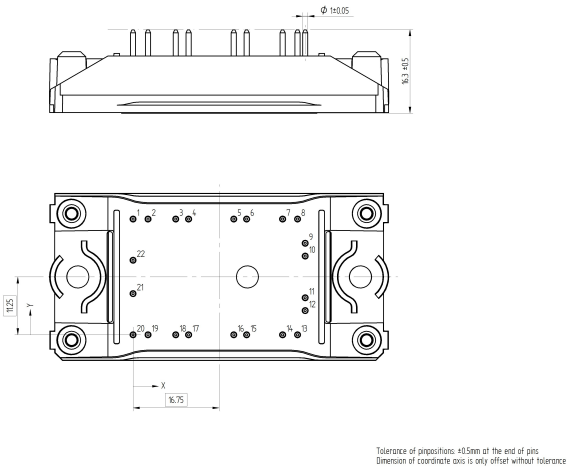
Marking

	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		

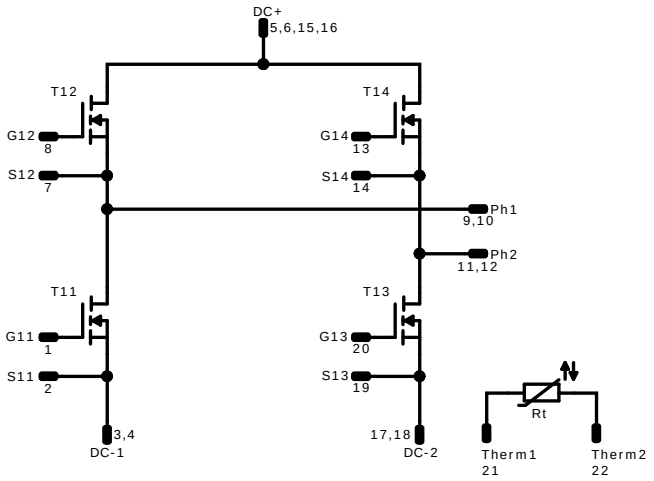
Outline

Pin table [mm]

Pin	X	Y	Function
1	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



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T13	MOSFET	900 V	21,67 mΩ	H-Bridge Switch - Lo side	
T12, T14	MOSFET	900 V	21,67 mΩ	H-Bridge Switch - Hi side	
Rt	Thermistor			Thermistor	

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

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 packages see 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-FU094PB017ME05-L620F31-D1-14	19 Jun. 2020		