Vincotech

B0-SP12CFA016ME-PD98G68T
datasheet

flowCSPFC S3 SiC **1200 V / 16 mΩ**

Topology features

- Current Synthesizing PFC + Booster
- Integrated DC Link capacitors
- Kelvin Emitter for improved switching performance
- Temperature sensor
- Thin Al_2O_3 for easy thermal design

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: Al_2O_3
- CTI600 housing material
- Compact, baseplate-less housing
- VINcoPress Technology
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

Target applications

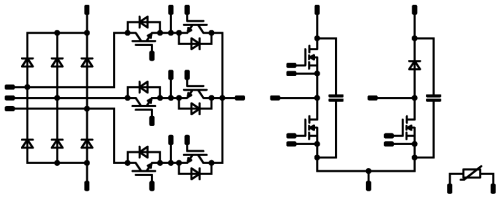
- Charging Stations
- Embedded Drives
- Energy Storage Systems
- Heat Pumps
- Industrial Drives
- Power Supply
- UPS
- Welding & Cutting

Types

- B0-SP12CFA016ME-PD98G68T

flow S3 12 mm housing

Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Boost Switch				
Drain-source voltage	V_{DSS}		1200	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$ T_s = 80 °C	76	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	139	W
Gate-source voltage	V_{GSS}		-4 / 15	V
		dynamic	-8 / 19	
Maximum Junction Temperature	T_{jmax}		175	°C
Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ T_s = 80 °C	90	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	244	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms T_j = 110 °C	440	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	201	W
Maximum junction temperature	T_{jmax}		175	°C
Half-Bridge Switch				
Drain-source voltage	V_{DSS}		1200	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$ T_s = 80 °C	42	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	120	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	87	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
AC Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	82	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	480	A
Surge current capability	I^2t			1100	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	96	W
Maximum junction temperature	T_{jmax}			150	°C
Mux Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	36	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	89	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 800 V	T_j = 150 °C	9,5	µs
Maximum junction temperature	T_{jmax}			175	°C
Mux Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	39	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	200	A
Surge current capability	I^2t			200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	47	W
Maximum junction temperature	T_{jmax}			150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
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 s	6000	V
Isolation voltage	V_{isol}	AC Voltage t_p = 1 min	2500	V
Creepage distance			9,6	mm
Clearance			7,73	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	
Boost Switch										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		15		80	25 125 150	11,2	17,1 21 23,2	20,8[1]	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$			0,023	25	1,8	2,5	3,6	V
Gate to Source Leakage Current	I_{GSS}		15	0		25		20	500	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25		2	38	µA
Internal gate resistance	r_g							0,85		Ω
Gate charge	Q_g		-4/15	800	80	25		236		nC
Short-circuit input capacitance	C_{iss}	f = 100 kHz	0	1000	0	25		6714		pF
Short-circuit output capacitance	C_{oss}							258		
Reverse transfer capacitance	C_{rss}							16		
Diode forward voltage	V_{SD}		0		40	25		4,6		V
Thermal										
Thermal resistance junction to sink[2]	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,69		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	0/15	700	65	25 125 150		13,4 12,08 11,92		ns
Rise time	t_r					25 125 150		7,02 6,73 6,47		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		50,92 55,59 57,21		ns
Fall time	t_f					25 125 150		22,65 26,36 26,92		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,587 µC Q_{rFWD}=0,634 µC Q_{rFWD}=0,648 µC				25 125 150		0,712 0,665 0,656		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,2 0,218 0,227		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	
Boost Diode										
Static										
Forward voltage	V_F				80	25 125 150		1,49 1,86 2,01	1,8(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25		140	800	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,47		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=10558 A/µs di/dt=11682 A/µs di/dt=12466 A/µs	0/15	700	65	25 125 150		77,85 85,13 87,09		A
Reverse recovery time	t_{rr}					25 125 150		12,85 12,73 12,72		ns
Recovered charge	Q_r					25 125 150		0,587 0,634 0,648		µC
Reverse recovered energy	E_{rec}					25 125 150		0,146 0,174 0,181		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		13520,75 15550,05 16212,68		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	
Half-Bridge Switch										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		15		40	25 125 150	22,4	34,2 42,1 46,4	41,6[1]	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$			0,0115	25	1,8	2,5	3,6	V
Gate to Source Leakage Current	I_{GSS}		15	0		25		10	250	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25		1	19	µA
Internal gate resistance	r_g							1,7		Ω
Gate charge	Q_g		-4/15	800	40	25		118		nC
Short-circuit input capacitance	C_{iss}	f = 100 kHz	0	1000	0	25		3357		pF
Short-circuit output capacitance	C_{oss}							129		
Reverse transfer capacitance	C_{rss}							8		
Diode forward voltage	V_{SD}		0		20	25		4,6		V
Thermal										
Thermal resistance junction to sink[2]	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						1,09		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} = 2 Ω R_{goff} = 2 Ω	-4/15	600	30	25 125 150		10,47 9,67 9,75		ns
Rise time	t_r					25 125 150		4 3,88 3,77		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		29,76 31,9 32,44		ns
Fall time	t_f					25 125 150		6,49 6,84 6,41		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,422 µC Q_{rFWD}=0,703 µC Q_{rFWD}=0,82 µC				25 125 150		0,245 0,301 0,321		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,024 0,024 0,024		mWs
Peak recovery current	I_{RRM}	di/dt=10397 A/µs di/dt=10543 A/µs di/dt=9550 A/µs				25 125 150		62,32 82,09 90,05		A
Reverse recovery time	t_{rr}					25 125 150		11,43 13,52 14,36		ns
Recovered charge	Q_r					25 125 150		0,422 0,703 0,82		µC
Reverse recovered energy	E_{rec}					25 125 150		0,112 0,216 0,261		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		14654,11 21255,77 24444,67		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	
AC Diode										
Static										
Forward voltage	V_F				5	25 125 150		0,851 0,725 0,695	1,1(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			100 2000	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,73		K/W
Mux Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$			10	0,0025	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		25	25 125 150		1,64 1,89 1,95	2,1(1)	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			70	µA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}							4800		pF
Output capacitance	C_{oes}		0	10		25		170		pF
Reverse transfer capacitance	C_{res}							57		pF
Gate charge	Q_g	V_{CC} = 600 V	0/15		25	25		180		nC
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						1,06		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	
Mux Diode										
Static										
Forward voltage	V_F				5	25 125 150		0,915 0,799 0,771	1,1(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			100 1000	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						1,5		K/W
Capacitor (DC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		10		nF
Tolerance							-10		10	%
Dissipation factor		f = 1 kHz				25		0,15		%

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 R100	$\Delta_{R/R}$	R_{100} = 1484 Ω				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	

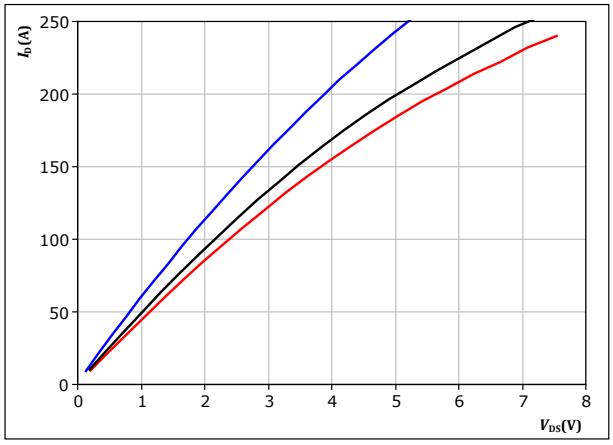
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Boost Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

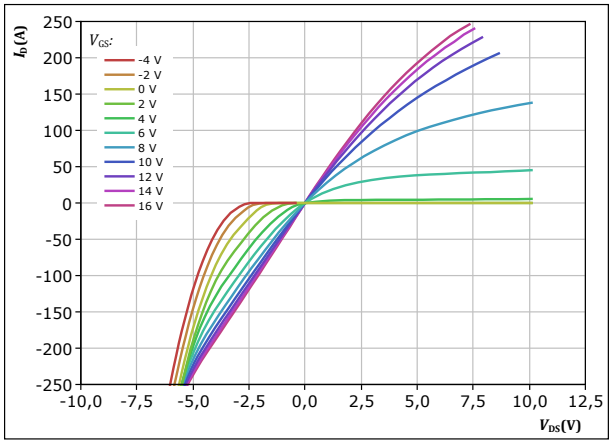


t_p =	250	µs		
V_{GS} =	14	V	T_j:	25 °C
				125 °C
				150 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



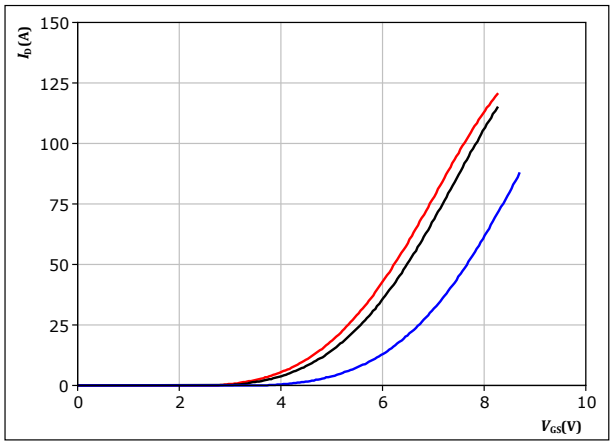
t_p =	250	µs
T_j =	150	°C

V_{GS} from -4 V to 16 V in steps of 2 V

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

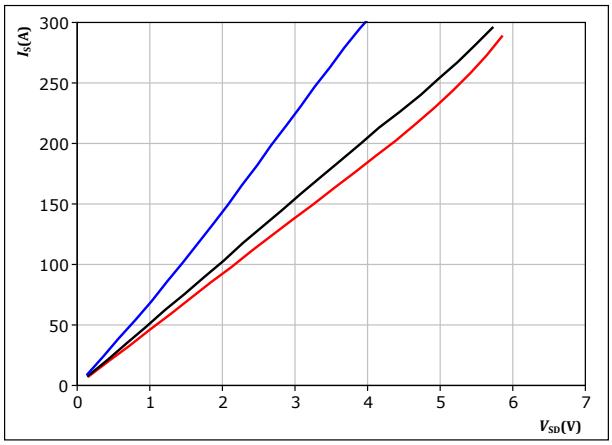


t_p =	250	µs		
V_{DS} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 4. **MOSFET**

Typical reverse drain current characteristics

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



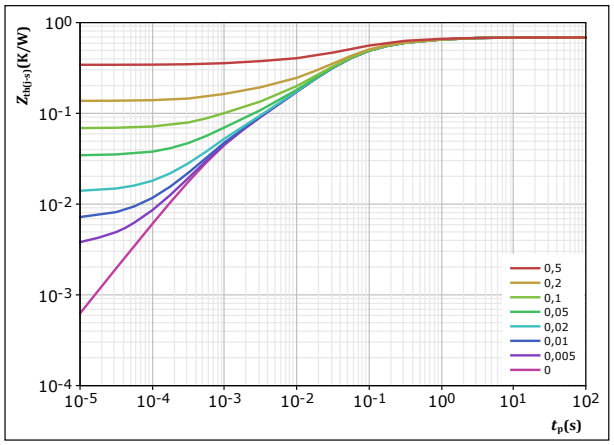
t_p =	250	µs		
V_{GS} =	14	V	T_j:	25 °C
				125 °C
				150 °C

Boost 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

$R_{th(j-s)} =$ 0,685 K/W

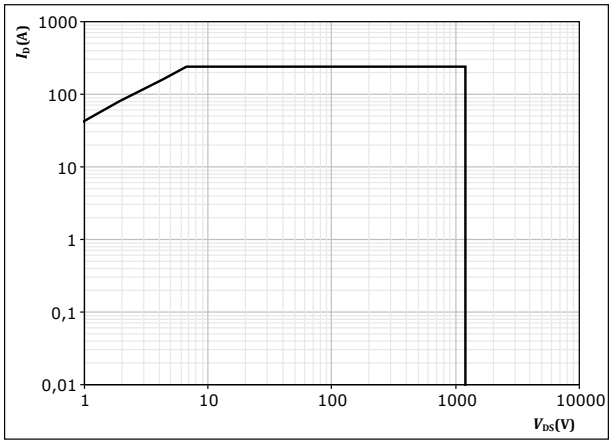
MOSFET thermal model values

R (K/W)	τ (s)
5,36E-02	1,76E+00
1,16E-01	2,91E-01
3,52E-01	5,76E-02
1,19E-01	1,18E-02
4,51E-02	9,78E-04

figure 6. **MOSFET**

Safe operating area

$I_D = f(V_{DS})$



$D =$ single pulse

$T_s =$ 80 °C

$V_{GS} =$ 14 V

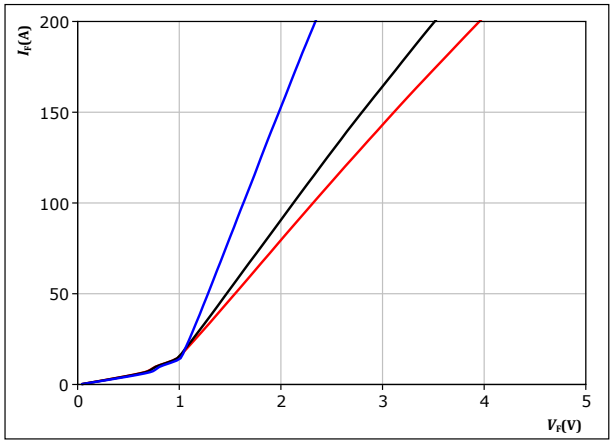
$T_j =$ T_{jmax}

Boost Diode Characteristics

figure 7. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



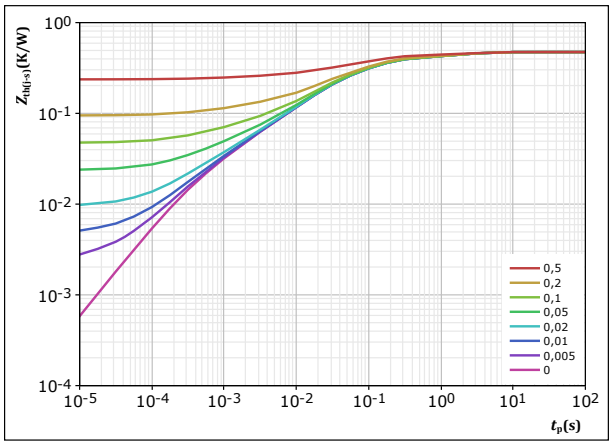
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 8. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,474 K/W

FWD thermal model values

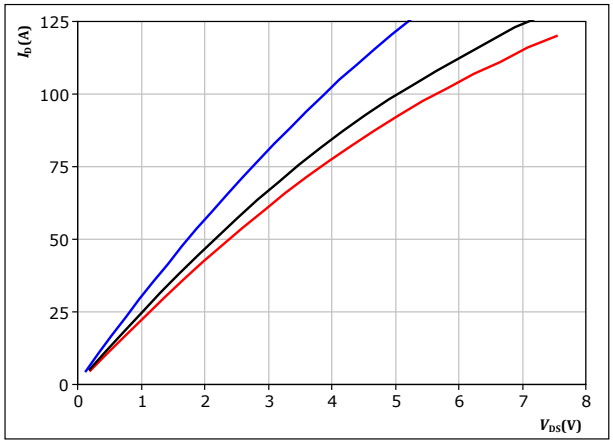
R (K/W)	τ (s)
7,82E-02	1,90E+00
2,08E-01	1,12E-01
1,45E-01	2,05E-02
3,05E-02	2,13E-03
1,25E-02	3,52E-04

Half-Bridge Switch Characteristics

figure 9. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

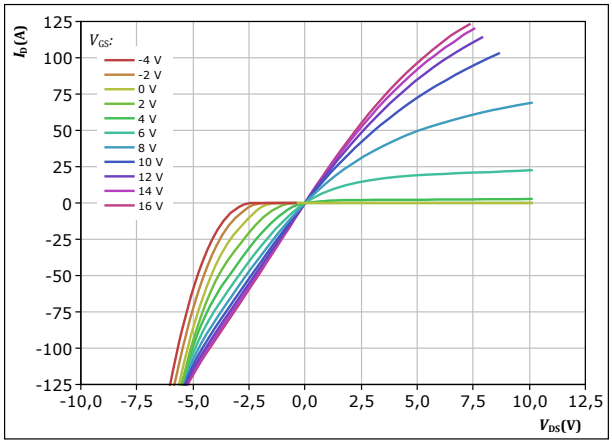


t_p =	250	µs		
V_{GS} =	14	V	T_j:	25 °C
				125 °C
				150 °C

figure 10. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



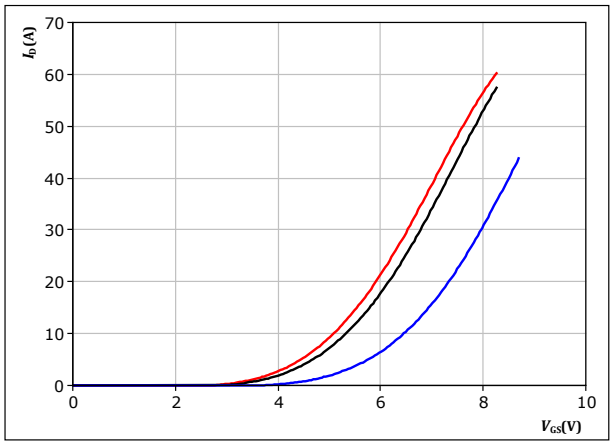
t_p =	250	µs
T_j =	150	°C

V_{GS} from -4 V to 16 V in steps of 2 V

figure 11. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

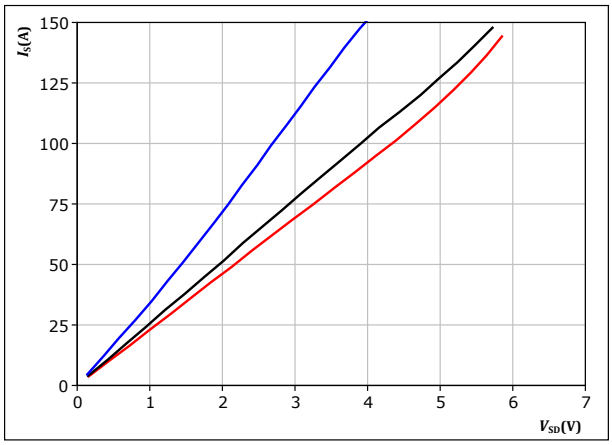


t_p =	250	µs		
V_{DS} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 12. **MOSFET**

Typical reverse drain current characteristics

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



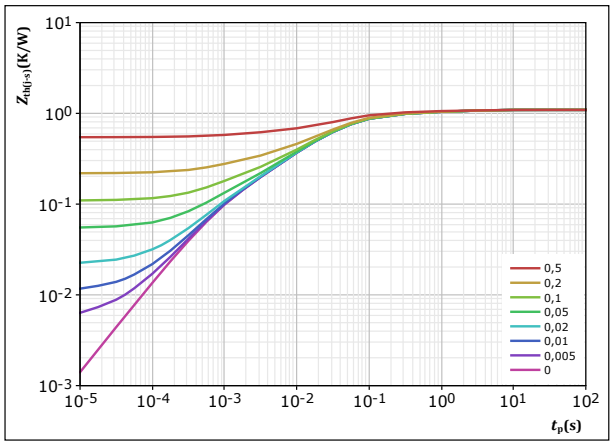
t_p =	250	µs		
V_{GS} =	14	V	T_j:	25 °C
				125 °C
				150 °C

Half-Bridge Switch Characteristics

figure 13. **MOSFET**

Transient thermal impedance as a function of pulse width

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



$D =$ t_p / T

$R_{th(j-s)} =$ 1,092 K/W

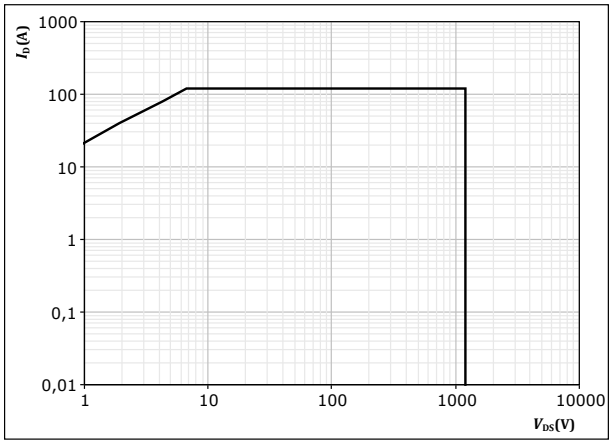
MOSFET thermal model values

R (K/W)	τ (s)
7,99E-02	2,12E+00
1,75E-01	1,98E-01
5,57E-01	3,73E-02
1,94E-01	7,57E-03
8,64E-02	8,67E-04

figure 14. **MOSFET**

Safe operating area

$I_D = f(V_{DS})$



$D =$ single pulse

$T_s =$ 80 °C

$V_{GS} =$ 14 V

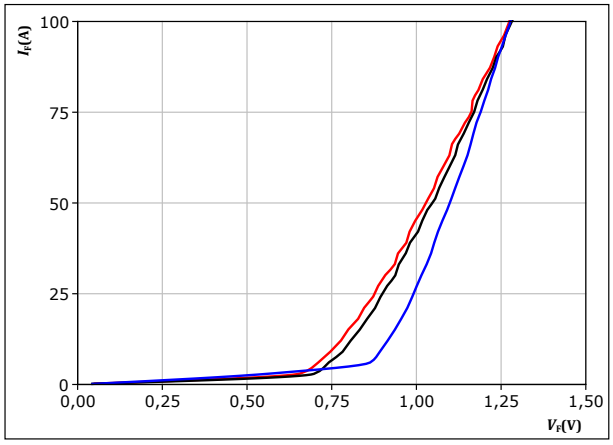
$T_j =$ T_{jmax}

AC Diode Characteristics

figure 15. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



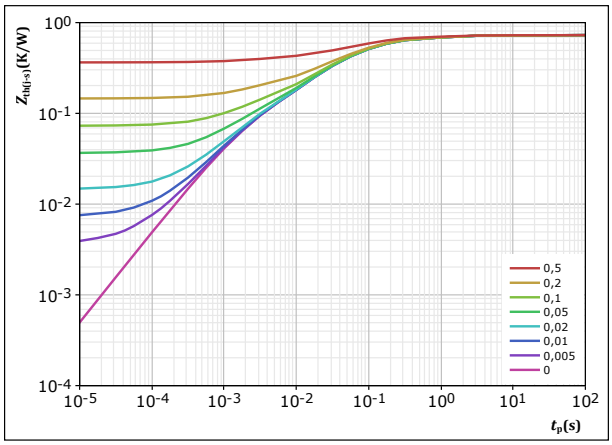
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 16. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,728 K/W

Rectifier thermal model values

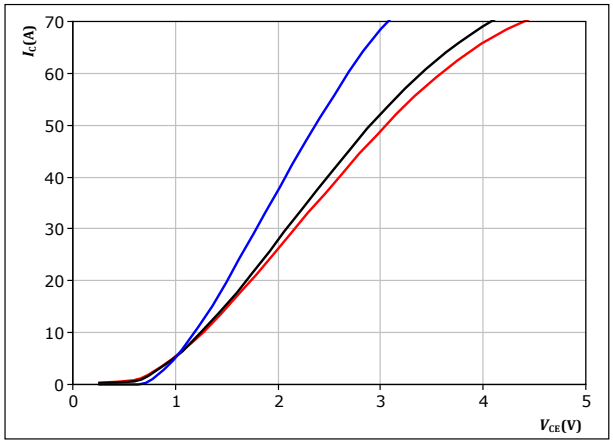
R (K/W)	τ (s)
8,72E-03	3,72E+01
8,69E-02	1,06E+00
3,35E-01	1,02E-01
2,34E-01	2,21E-02
6,43E-02	1,80E-03

Mux Switch Characteristics

figure 17. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

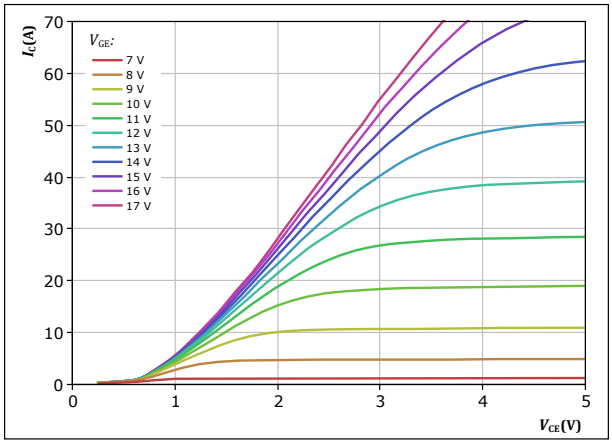


t_p =	250	µs		
V_{GE} =	15	V	T_j:	25 °C
				125 °C
				150 °C

figure 18. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



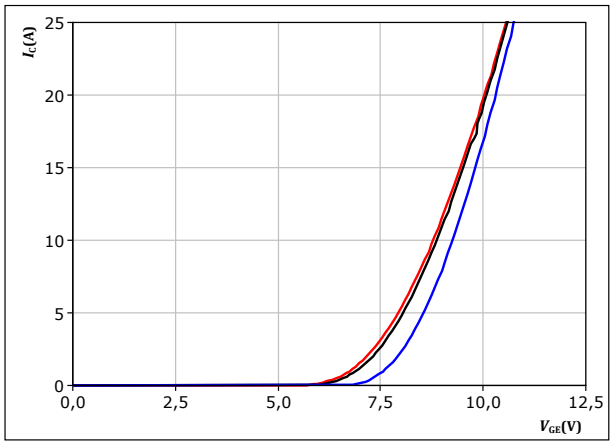
t_p =	250	µs
T_j =	150	°C

V_{GE} from 7 V to 17 V in steps of 1 V

figure 19. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

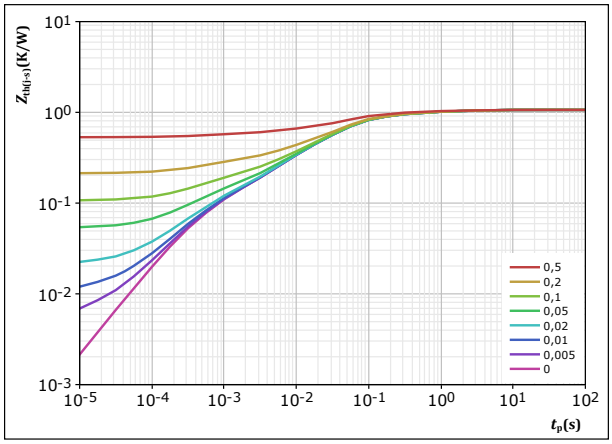


t_p =	250	µs		
V_{CE} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 20. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,064	K/W

IGBT thermal model values

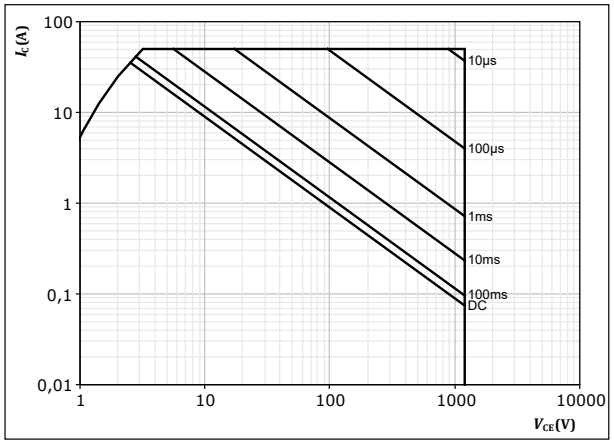
R (K/W)	τ (s)
7,43E-02	2,04E+00
1,91E-01	2,18E-01
5,73E-01	4,01E-02
1,48E-01	5,24E-03
7,80E-02	4,52E-04

Mux Switch Characteristics

figure 21. **IGBT**

Safe operating area

$I_C = f(V_{CE})$

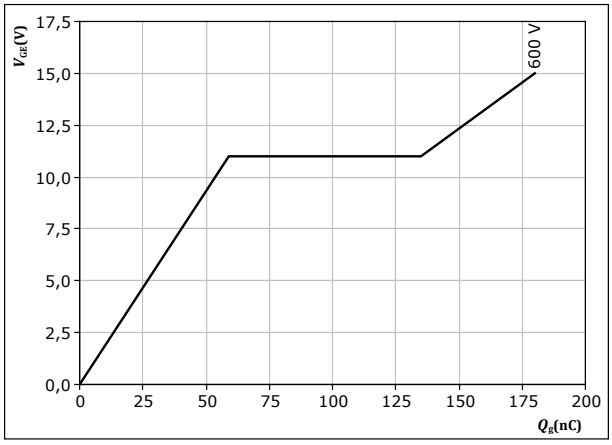


D = single pulse
T_s = 80 °C
V_{GE} = 15 V
T_j = T_{jmax}

figure 22. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_g)$



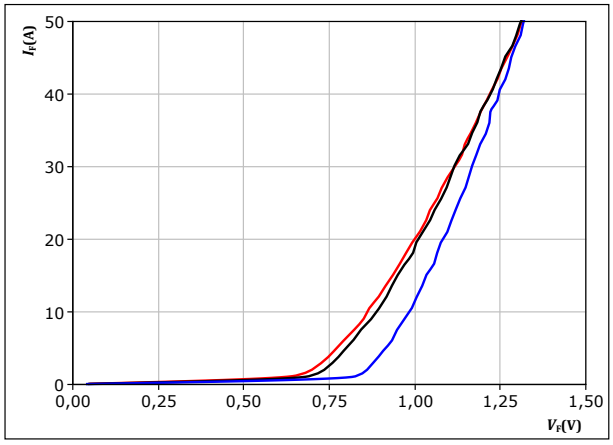
I_C = 25 A
T_j = 25 °C

Mux Diode Characteristics

figure 23. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



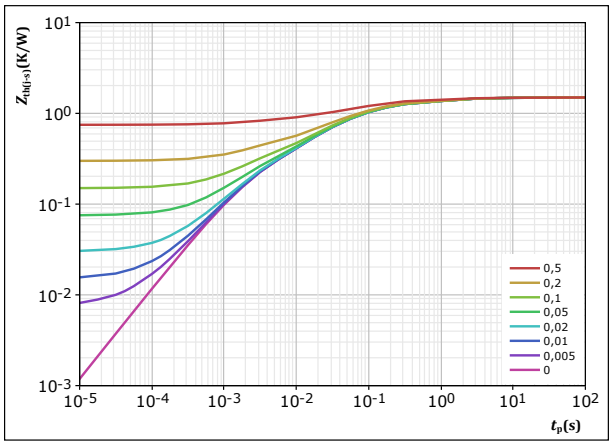
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 24. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,496 K/W

Rectifier thermal model values

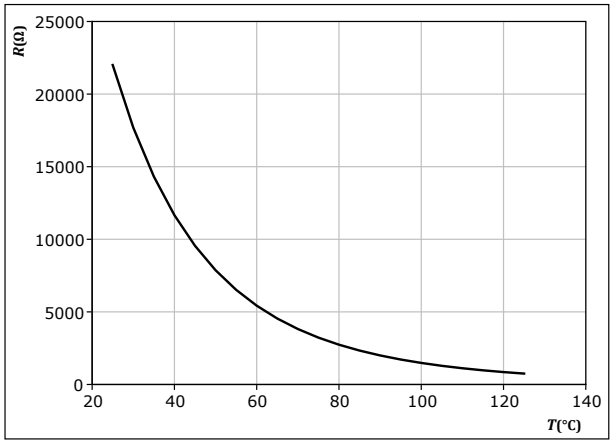
R (K/W)	τ (s)
2,19E-02	2,36E+01
2,36E-01	1,27E+00
6,03E-01	9,96E-02
4,58E-01	2,06E-02
1,77E-01	1,96E-03

Thermistor Characteristics

figure 25. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

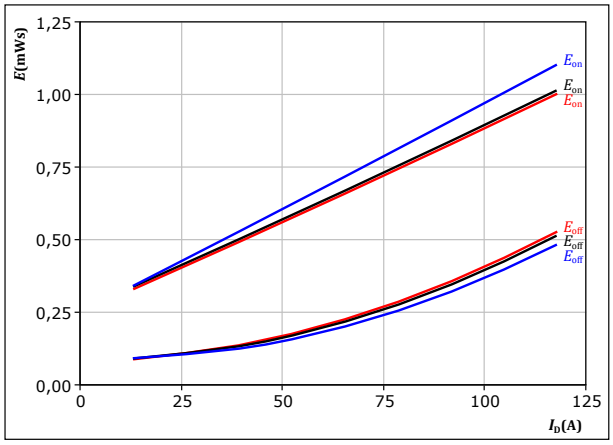


Boost Switching Characteristics

figure 26. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



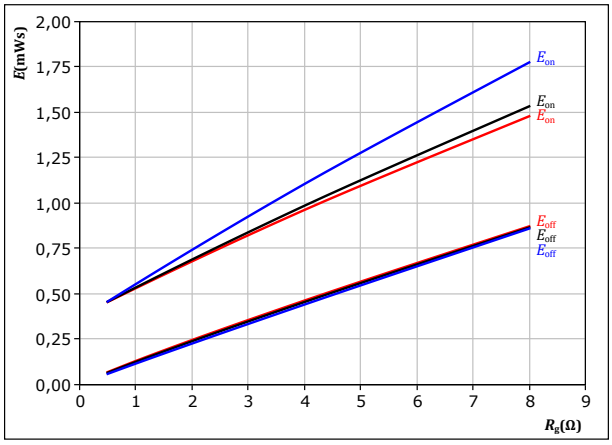
With an inductive load at

			T_j:	
V_{DS} =	700	V		25 °C
V_{GS} =	0/15	V		125 °C
R_{gon} =	2	Ω		150 °C
R_{goff} =	2	Ω		

figure 27. **MOSFET**

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

$E = f(R_g)$



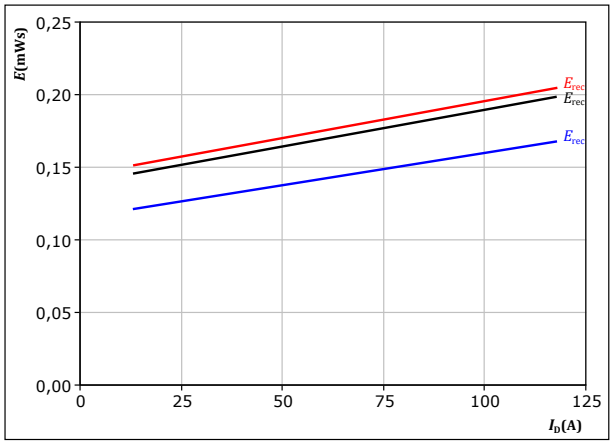
With an inductive load at

			T_j:	
V_{DS} =	700	V		25 °C
V_{GS} =	0/15	V		125 °C
I_D =	65	A		150 °C

figure 28. **FWD**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



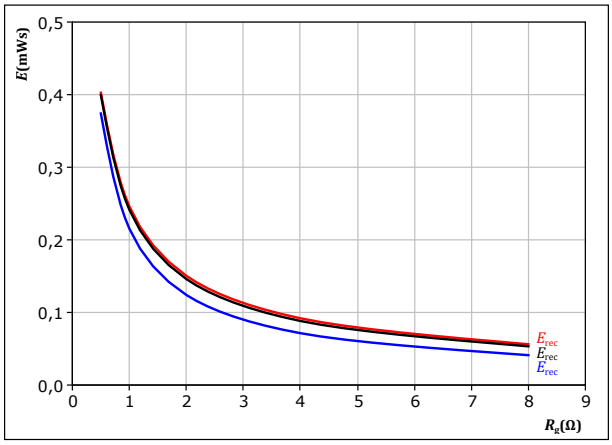
With an inductive load at

			T_j:	
V_{DS} =	700	V		25 °C
V_{GS} =	0/15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 29. **FWD**

Typical reverse recovered energy loss as a function of MOSFET turn on gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

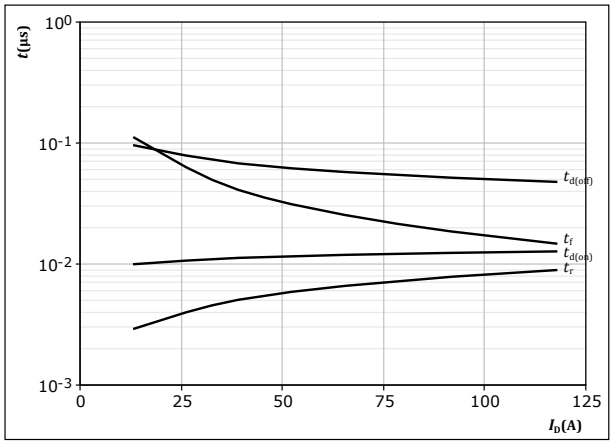
			T_j:	
V_{DS} =	700	V		25 °C
V_{GS} =	0/15	V		125 °C
I_D =	65	A		150 °C

Boost Switching Characteristics

figure 30. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



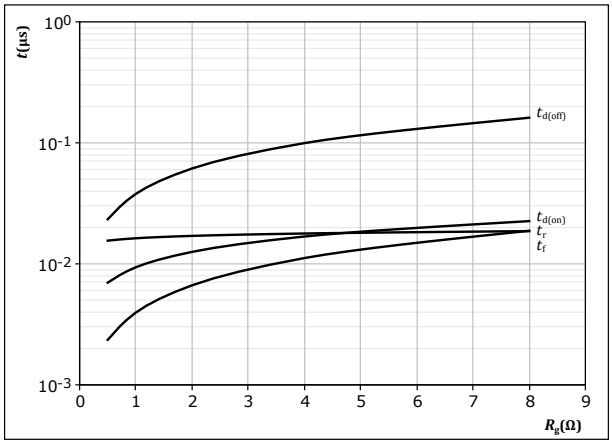
With an inductive load at

T_j =	150	°C
V_{DS} =	700	V
V_{GS} =	0/15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 31. **MOSFET**

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

$t = f(R_g)$



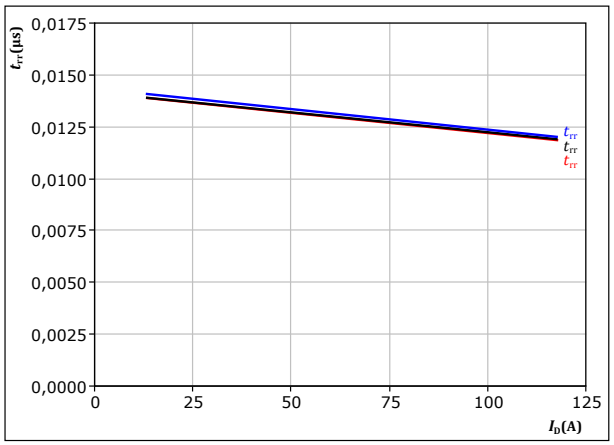
With an inductive load at

T_j =	150	°C
V_{DS} =	700	V
V_{GS} =	0/15	V
I_D =	65	A

figure 32. **FWD**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



At

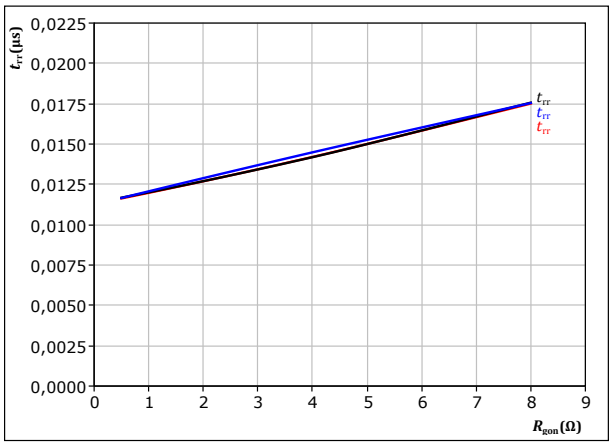
V_{DS} =	700	V
V_{GS} =	0/15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 33. **FWD**

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

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



At

V_{DS} =	700	V
V_{GS} =	0/15	V
I_D =	65	A

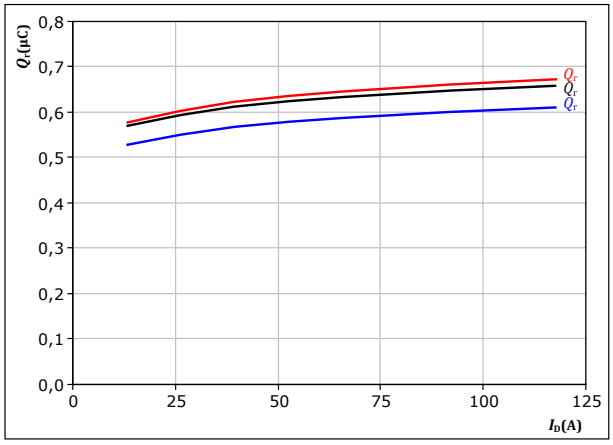
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 34. **FWD**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

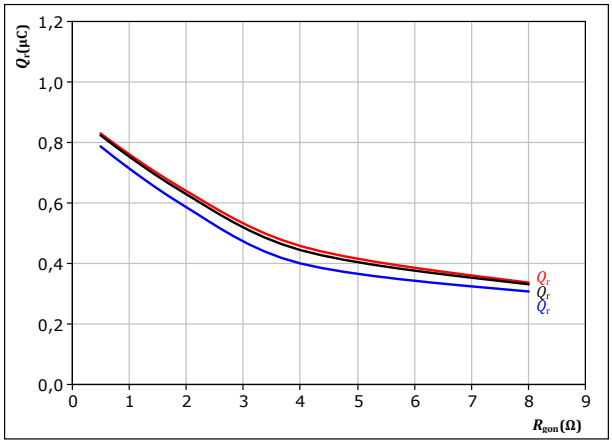


At				T_j:	
	V_{DS} =	700	V		25 °C
	V_{GS} =	0/15	V		125 °C
	R_{gon} =	2	Ω		150 °C

figure 35. **FWD**

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

$Q_r = f(R_{gon})$

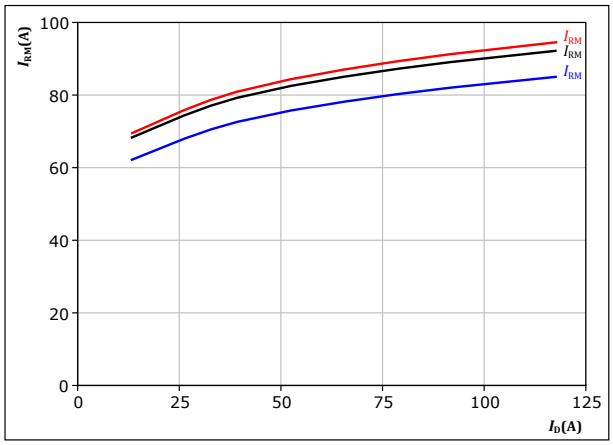


At				T_j:	
	V_{DS} =	700	V		25 °C
	V_{GS} =	0/15	V		125 °C
	I_D =	65	A		150 °C

figure 36. **FWD**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

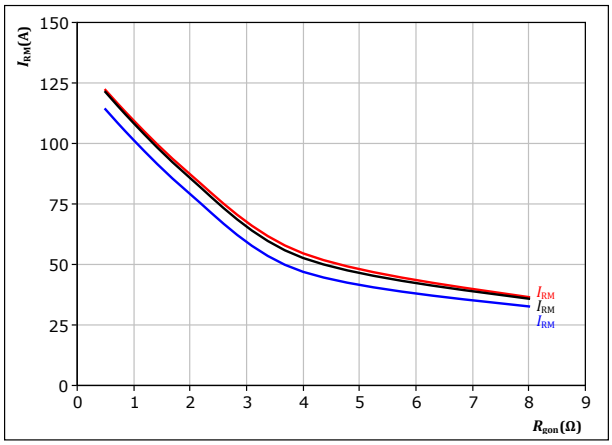


At				T_j:	
	V_{DS} =	700	V		25 °C
	V_{GS} =	0/15	V		125 °C
	R_{gon} =	2	Ω		150 °C

figure 37. **FWD**

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

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



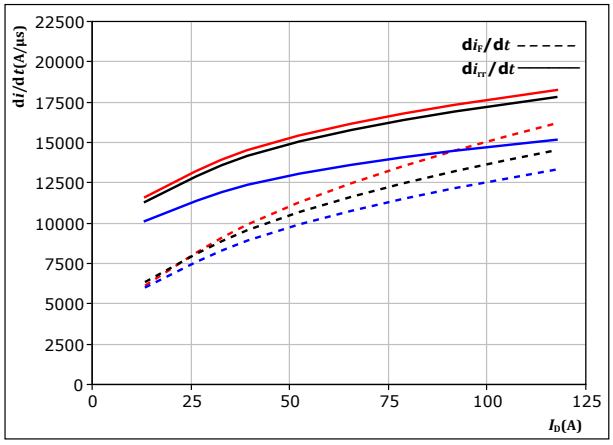
At				T_j:	
	V_{DS} =	700	V		25 °C
	V_{GS} =	0/15	V		125 °C
	I_D =	65	A		150 °C

Boost Switching Characteristics

figure 38. **FWD**

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)

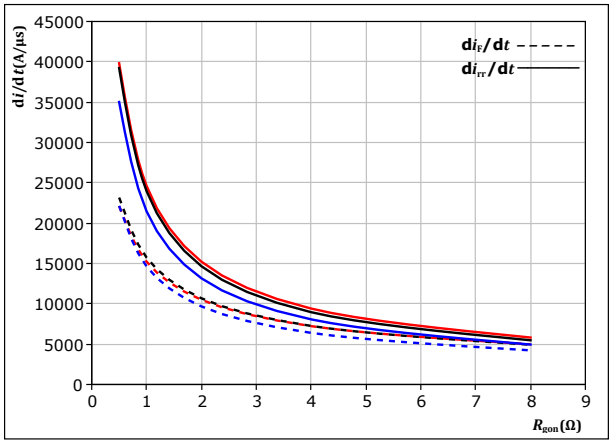


At	V_{DS} =	700	V		
	V_{GS} =	0/15	V	T_j:	25 °C
	R_{gon} =	2	Ω		125 °C
					150 °C

figure 39. **FWD**

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})

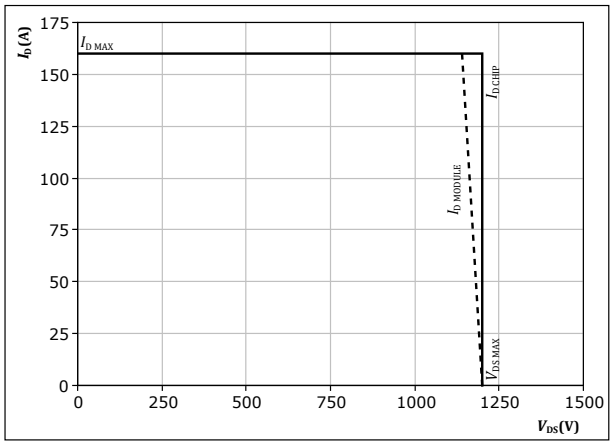


At	V_{DS} =	700	V		
	V_{GS} =	0/15	V	T_j:	25 °C
	I_D =	65	A		125 °C
					150 °C

figure 40. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



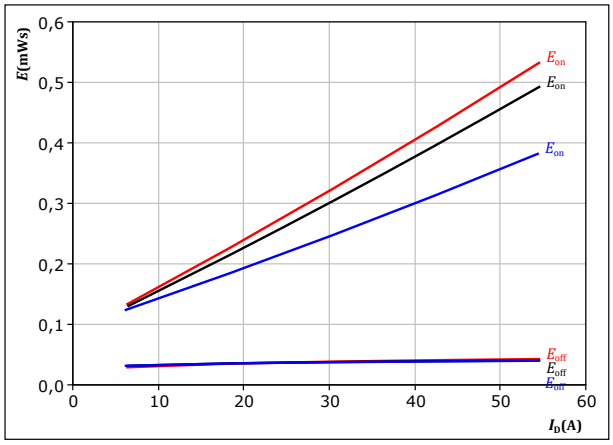
At	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

Half-Bridge Switching Characteristics

figure 41. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



With an inductive load at

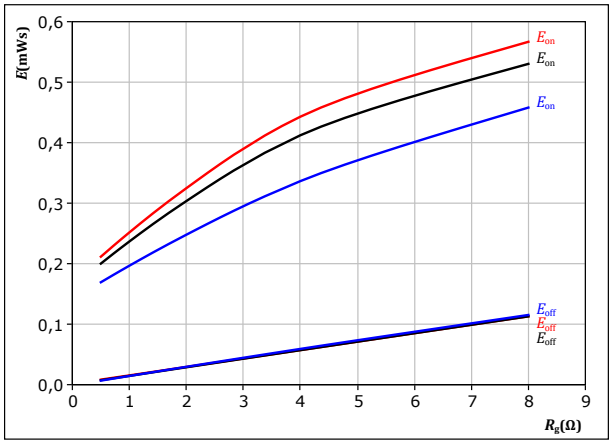
V_{DS} =	600	V
V_{GS} =	-4/15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 42. **MOSFET**

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

$E = f(R_g)$



With an inductive load at

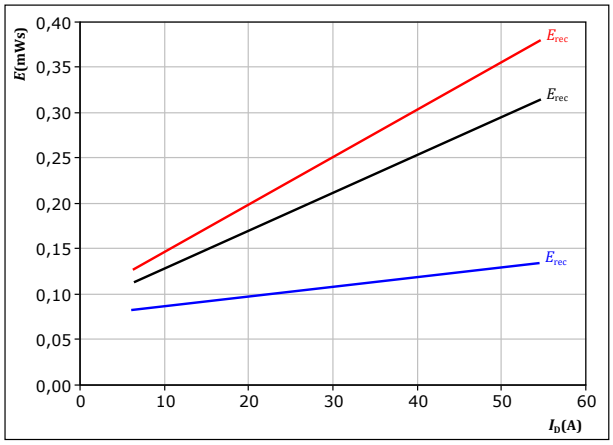
V_{DS} =	600	V
V_{GS} =	-4/15	V
I_D =	30	A

T_j: 25 °C, 125 °C, 150 °C

figure 43. **MOSFET**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



With an inductive load at

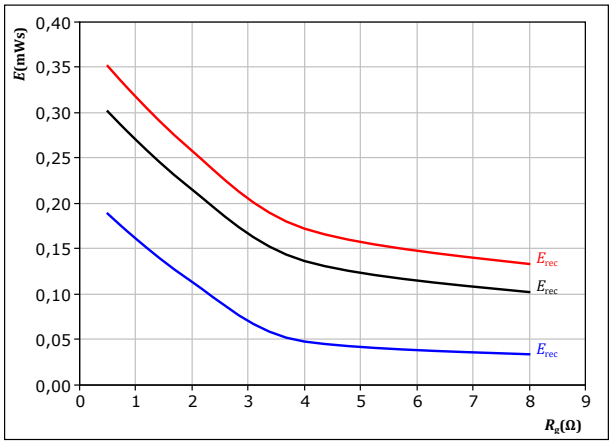
V_{DS} =	600	V
V_{GS} =	-4/15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 44. **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} =	-4/15	V
I_D =	30	A

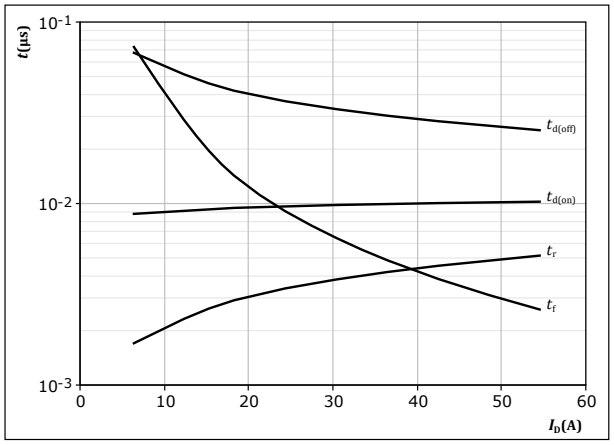
T_j: 25 °C, 125 °C, 150 °C

Half-Bridge Switching Characteristics

figure 45. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



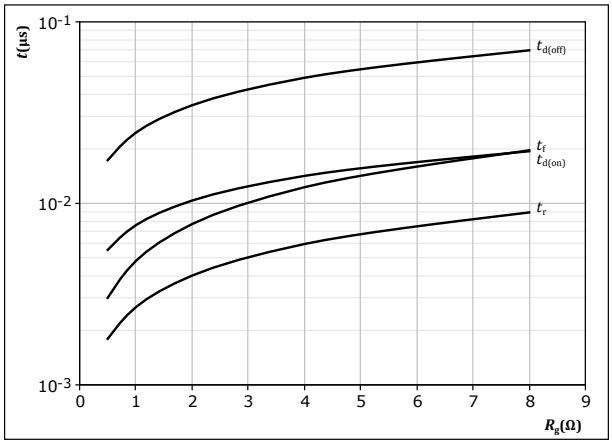
With an inductive load at

$T_j =$	150	°C
$V_{DS} =$	600	V
$V_{GS} =$	-4/15	V
$R_{gon} =$	2	Ω
$R_{goff} =$	2	Ω

figure 46. **MOSFET**

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

$t = f(R_g)$



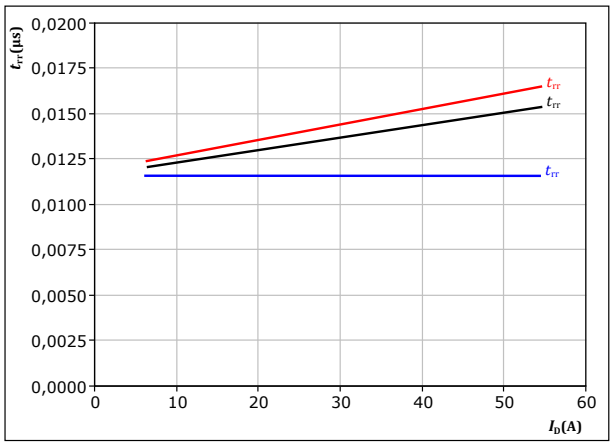
With an inductive load at

$T_j =$	150	°C
$V_{DS} =$	600	V
$V_{GS} =$	-4/15	V
$I_D =$	30	A

figure 47. **MOSFET**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



At

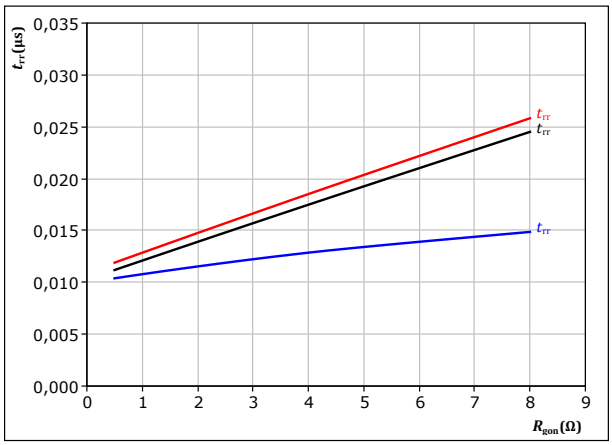
$V_{DS} =$	600	V
$V_{GS} =$	-4/15	V
$R_{gon} =$	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 48. **MOSFET**

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

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



At

$V_{DS} =$	600	V
$V_{GS} =$	-4/15	V
$I_D =$	30	A

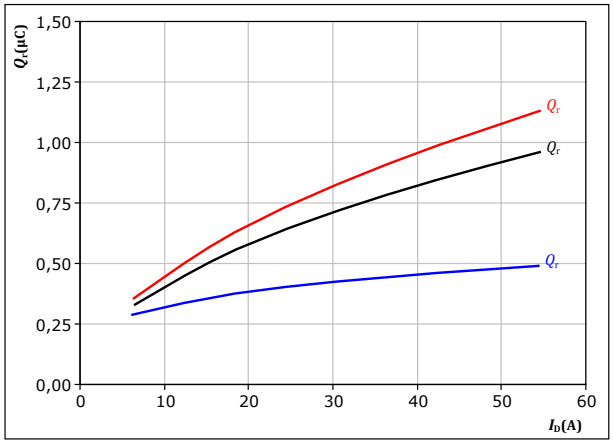
T_j: 25 °C, 125 °C, 150 °C

Half-Bridge Switching Characteristics

figure 49. **MOSFET**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

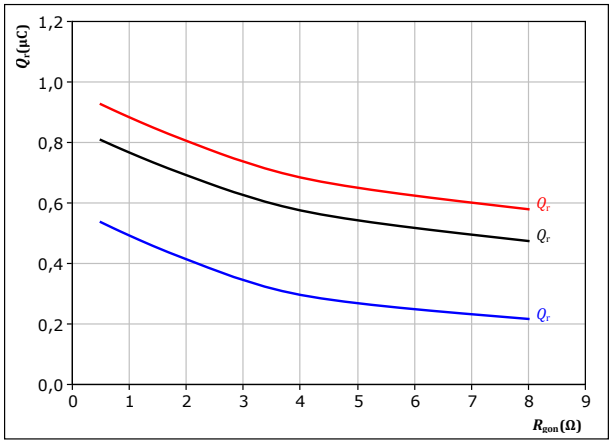


At				
V_{DS} =	600	V		
V_{GS} =	-4/15	V	T_j:	25 °C
R_{gon} =	2	Ω		125 °C
				150 °C

figure 50. **MOSFET**

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

$Q_r = f(R_{gon})$

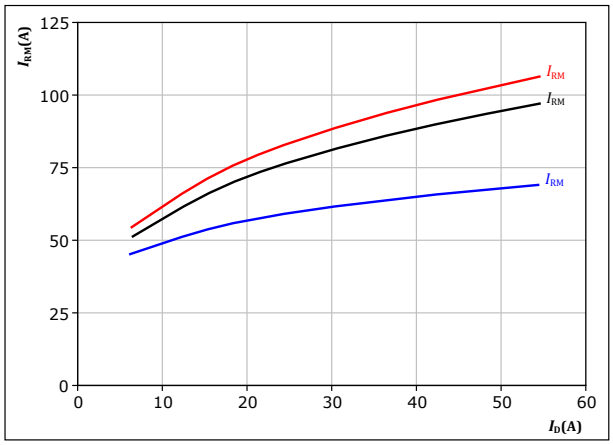


At				
V_{DS} =	600	V		
V_{GS} =	-4/15	V	T_j:	25 °C
I_D =	30	A		125 °C
				150 °C

figure 51. **MOSFET**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

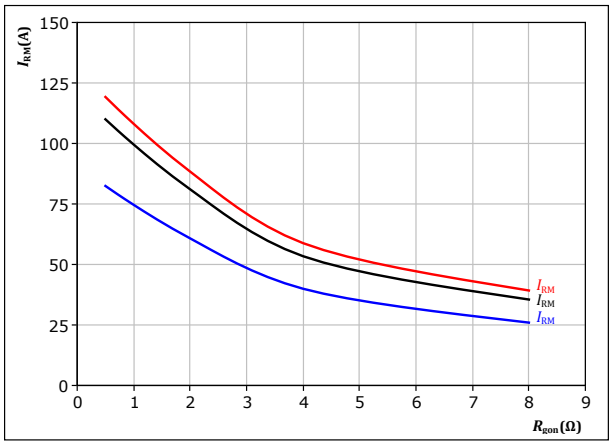


At				
V_{DS} =	600	V		
V_{GS} =	-4/15	V	T_j:	25 °C
R_{gon} =	2	Ω		125 °C
				150 °C

figure 52. **MOSFET**

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

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



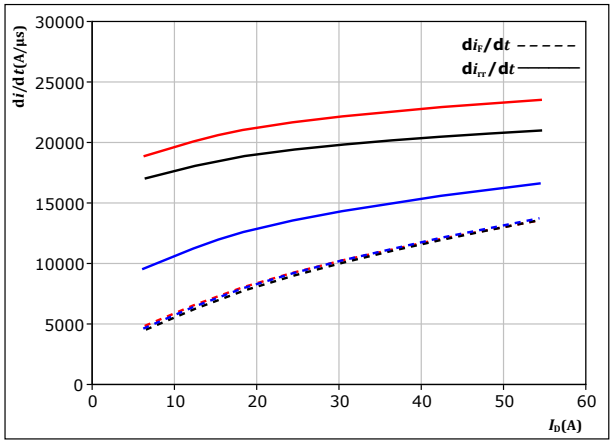
At				
V_{DS} =	600	V		
V_{GS} =	-4/15	V	T_j:	25 °C
I_D =	30	A		125 °C
				150 °C

Half-Bridge Switching Characteristics

figure 53. **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)

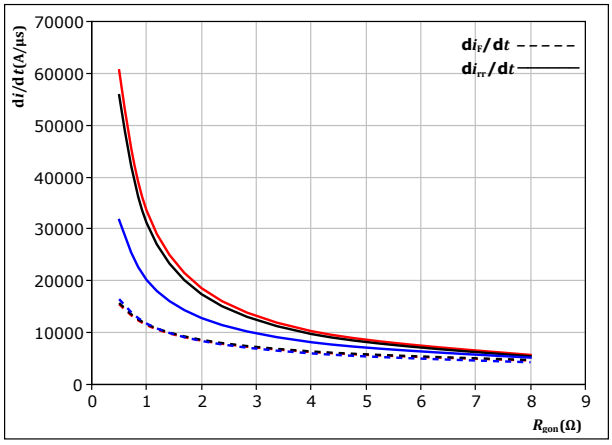


At	V_{DS} =	600	V		
	V_{GS} =	-4/15	V	T_j:	25 °C
	R_{gon} =	2	Ω		125 °C
					150 °C

figure 54. **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})

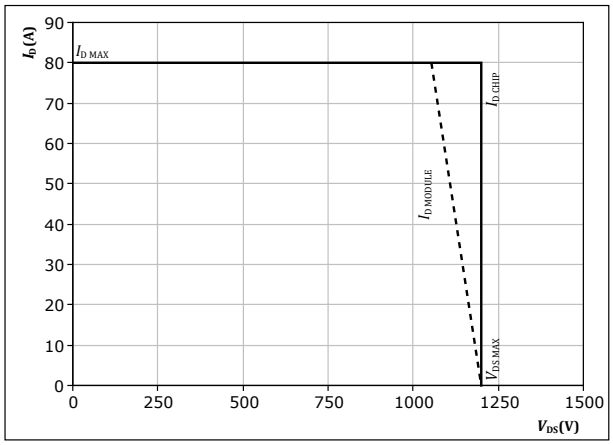


At	V_{DS} =	600	V		
	V_{GS} =	-4/15	V	T_j:	25 °C
	I_D =	30	A		125 °C
					150 °C

figure 55. **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 56. MOSFET

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

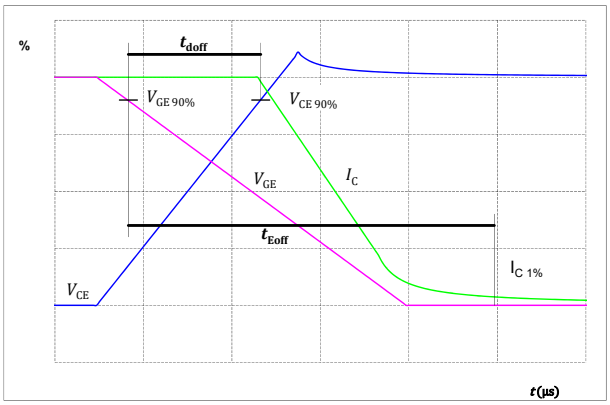


figure 57. MOSFET

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

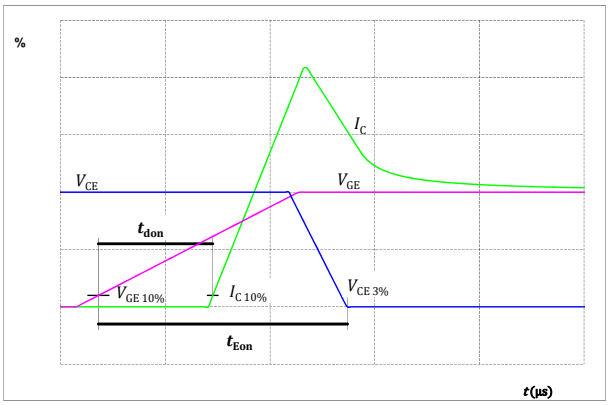


figure 58. MOSFET

Turn-off Switching Waveforms & definition of t_f

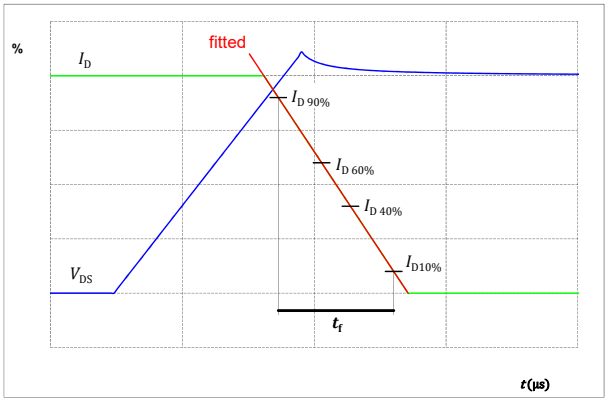
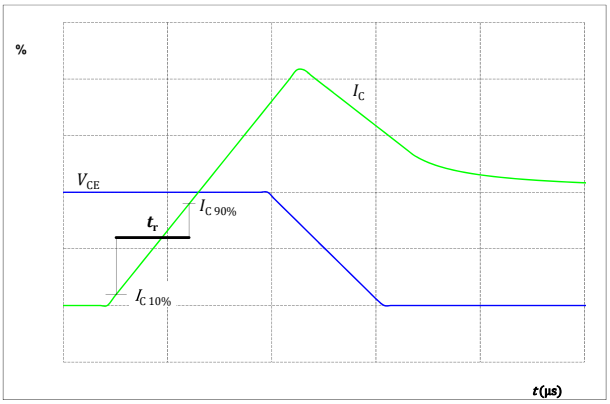


figure 59. MOSFET

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 60. **FWD**

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

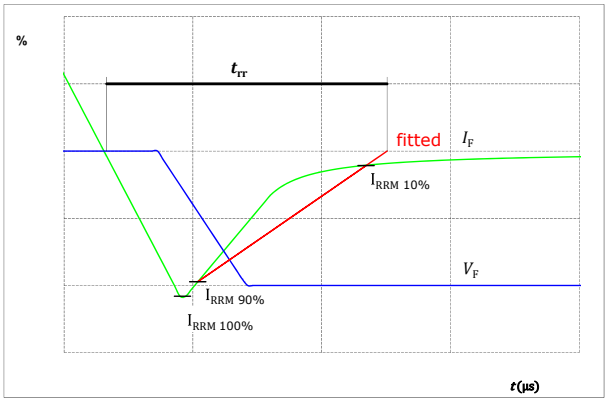


figure 61. **FWD**

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

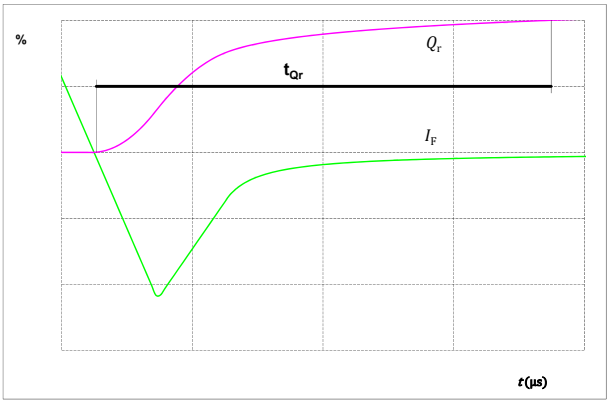
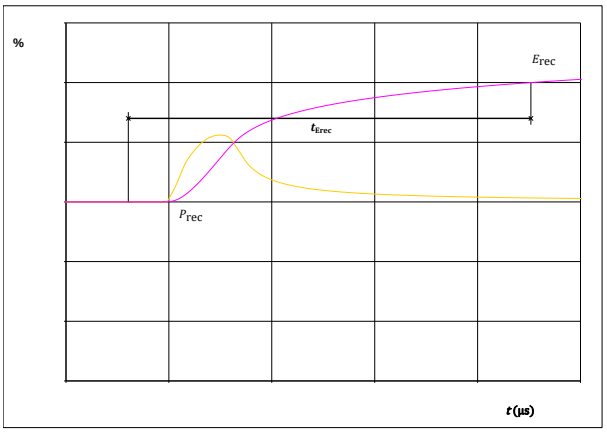


figure 62. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	B0-SP12CFA016ME-PD98G68T
With thermal paste (5,2 W/mK, PTM6000HV)	B0-SP12CFA016ME-PD98G68T-/7/
With thermal paste (5,2 W/mK, PTM6000HV) and Protection Foil	B0-SP12CFA016ME-PD98G68T-/7F/

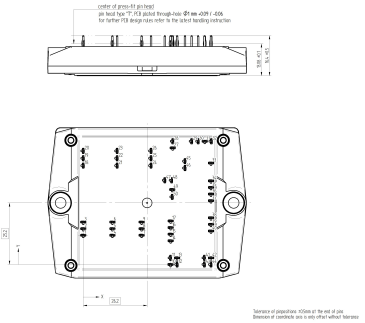
Marking

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

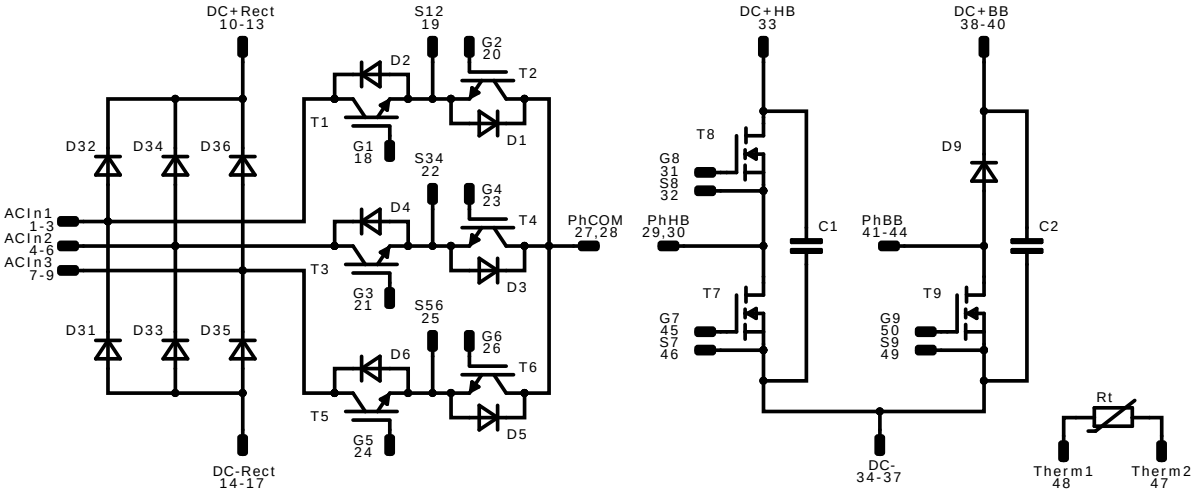
Outline

Pin table [mm]

Pin	X	Y	Function	33	52,4	41,5	DC+HB
1	0	11,95	ACIn1	34	52,4	34,2	DC-
2	0	14,65	ACIn1	35	52,4	31,5	DC-
3	0	17,35	ACIn1	36	52,4	28,8	DC-
4	11,95	11,95	ACIn2	37	52,4	26,1	DC-
5	11,95	14,65	ACIn2	38	52,4	19,1	DC+BB
6	11,95	17,35	ACIn2	39	52,4	16,4	DC+BB
7	23,95	11,95	ACIn3	40	52,4	13,7	DC+BB
8	23,95	14,65	ACIn3	41	49,7	2,7	PhBB
9	23,95	17,35	ACIn3	42	52,4	2,7	PhBB
10	35,8	0	DC+Rect	43	49,7	0	PhBB
11	35,8	2,7	DC+Rect	44	52,4	0	PhBB
12	38,5	0	DC+Rect	45	41,75	42,25	G7
13	38,5	2,7	DC+Rect	46	41,75	39,45	S7
14	35,85	9,7	DC-Rect	47	33,45	34,45	Therm1
15	35,85	12,4	DC-Rect	48	36,25	34,45	Therm2
16	35,85	15,1	DC-Rect	49	36,5	30,65	S9
17	35,85	17,8	DC-Rect	50	36,5	27,65	G9
18	0	40,45	G1	51	not assembled		
19	0	43,45	S12	52	not assembled		
20	0	46,45	G2	53	not assembled		
21	13,9	40,45	G3	54	not assembled		
22	13,9	43,45	S34	55	not assembled		
23	13,9	46,45	G4	56	not assembled		
24	27,8	40,45	G5	57	not assembled		
25	27,8	43,45	S56	58	not assembled		
26	27,8	46,45	G6	59	not assembled		
27	36,7	47,7	PhCOM	60	not assembled		
28	36,7	50,4	PhCOM	61	not assembled		
29	44,45	50,4	PhHB	62	not assembled		
30	47,15	50,4	PhHB	63	not assembled		
31	49,85	50,4	G8	64	not assembled		
32	52,55	50,4	S8				



Pinout



Identification					
ID	**Component**	**Voltage**	**Current**	**Function**	**Comment**
T9	MOSFET	1200 V	16 mΩ	Boost Switch	
D9	FWD	1200 V	80 A	Boost Diode	
T7, T8	MOSFET	1200 V	32 mΩ	Half-Bridge Switch	
D31, D32, D33, D34, D35, D36	Rectifier	1600 V	40 A	AC Diode	
T1, T2, T3, T4, T5, T6	IGBT	1200 V	25 A	Mux Switch	
D1, D2, D3, D4, D5, D6	Rectifier	1600 V	18 A	Mux Diode	
C1, C2	Capacitor	1000 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 45	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* S3 packages see vincotech.com website.

Package data
Package data for *flow* S3 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
B0-SP12CFA016ME-PD98G68T-D3-14	15 Jan. 2024	Change of Capacitor (DC)	