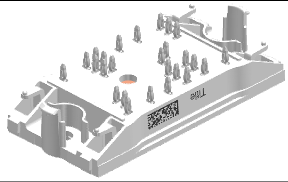
Vincotech

***flow* 3xPHASE-SiC** **1200 V / 80 mΩ**

Features

- SiC-Power MOSFET´s and Schottky Diodes
- 3 phase inverter topology with split output
- Improved switching behavior (reduced turn on energy and X-conduction)
- Ultra Low Inductance with integrated DC-capacitors
- Switching frequency >100kHz
- Temperature sensor

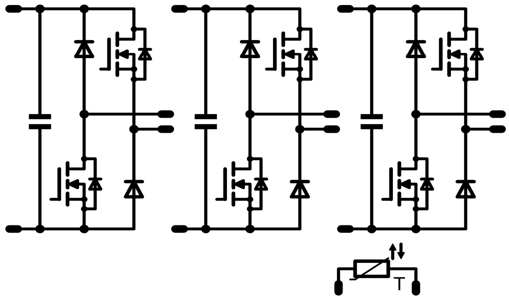
flow 0 12mm housing



Target Applications

- Solar Inverter
- Charger
- Power Supply

Schematic



Types

- 10-PZ126PA080MR-M909F28Y

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
T1, T2, T3, T4, T5, T6					
Drain-source voltage	V_{DS}			1200	V
Drain current	I_D	$T_j=T_j$max	T_h=80°C	19	A
Peak drain current	I_{Dpulse}	t_p limited by $T_j$max		80	A
Total power dissipation	P_{tot}	$T_j=T_j$max	T_h=80°C	50	W
Gate-source voltage	V_{GS}			-6/+22	V
Maximum Junction Temperature	$T_j$max			150	°C
D1, D2, D3, D4, D5, D6					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_{FAV}	$T_j=T_j$max	T_h=80°C	10	A
Surge (non-repetitive) forward current	I_{FSM}	t_p=8,3ms	T_j=25°C	23	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		25	A
Total power dissipation	P_{tot}	$T_j=T_j$max	T_h=80°C	31	W
Maximum Junction Temperature	$T_j$max			175	°C

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
C1, C2, C3				
Max.DC voltage	V_{MAX}	Tc=25°C	1000	V
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation Junction Temperature	T_{op}		-40…+(Tjmax - 25)	°C
Isolation Properties				
Isolation Voltage		t=2s DC voltage	4000	V
Creepage distance			min 12,7	mm
Clearance			min 9,9	mm

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
T1, T2, T3, T4, T5, T6										
Drain-source on-state resistance	$R_{DS(on)}$		20		20	Tj=25°C Tj=125°C		70,00 115,00		mΩ
Gate-source threshold voltage	$V_{(GS)th}$	V_{DS} = V_{GS}			0,0044	Tj=25°C Tj=125°C	1,6		4	V
Gate to Source Leakage Current	I_{gss}		-6/22			Tj=25°C Tj=125°C			100	nA
Zero Gate Voltage Drain Current	I_{dss}		0	1200		Tj=25°C Tj=125°C			10	μA
Internal gate resistance	R_G	f=1MHz; open Drain						9		Ω
Gate charge	Q_g							106		
Gate to source charge	Q_{gs}		18	400	10			27		nC
Gate to drain charge	Q_{gd}							31		
Short-circuit input capacitance	C_{iss}					Tj=25°C		2080		
Short-circuit output capacitance	C_{oss}	f=1MHz	0	800				77		pF
Reverse transfer capacitance	C_{rss}							16		
Thermal resistance junction to sink	R_{thJH}	Phase-Change Material						1,41		K/W
D1, D2, D3, D4, D5, D6										
Forward voltage	V_F				5	Tj=25°C Tj=125°C	0,8	1,40 1,73	1,7	V
Reverse leakage current	I_{rm}			1200		Tj=25°C Tj=125°C			100	μA
Thermal resistance junction to sink	R_{thJH}	Phase-Change Material						3,07		K/W

Single ended configuration

Parameter	Symbol	Conditions	V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	Unit
T1, T2, T3, T4, T5, T6										
Turn-on delay time	$t_{d(ON)}$					Tj=25°C Tj=125°C		14 13		
Rise Time	t_r					Tj=25°C Tj=125°C		7 7		ns
Turn-off delay time	$t_{d(OFF)}$	Rgoff=1 Ω Rgon=1 Ω	16	700	16	Tj=25°C Tj=125°C		96 106		
Fall time	t_f					Tj=25°C Tj=125°C		5 5		
Turn-on energy (per pulse)	E_{on}					Tj=25°C Tj=125°C		0,333 0,244		mWs
Turn-off energy (per pulse)	E_{off}					Tj=25°C Tj=125°C		0,190 0,178		
D1, D2, D3, D4, D5, D6										
Peak reverse recovery current	I_{RRM}					Tj=25°C Tj=125°C		9 10		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		10 10		ns
Recovered charge	Q_{rr}	Rgon=1 Ω	16	700	16	Tj=25°C Tj=125°C		0,080 0,110		μC
Reverse recovered energy	E_{rec}					Tj=25°C Tj=125°C		0,025 0,042		mWs
Peak rate of fall of recovery current	di(rec)max/dt					Tj=25°C Tj=125°C		1960 2220		A/μs

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
Half bridge configuration										
D1, D2, D3, D4, D5, D6										
Peak reverse recovery current	I_{RRM}	Rgon=1 Ω	-6/16	700	16	Tj=25°C Tj=125°C		13 16		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		18 17		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=125°C		0,220 0,300		µC
Peak rate of fall of recovery current	di(rec)max/dt					Tj=25°C Tj=125°C		3080 3572		A/µs
Reverse recovered energy	Erec					Tj=25°C Tj=125°C		0,067 0,119		mWs
T1, T2, T3, T4, T5, T6										
Turn-on delay time	$t_{d(ON)}$	Rgoff=1 Ω Rgon=1 Ω	-6/16	700	16	Tj=25°C Tj=125°C		17 16		ns
Rise Time	t_r					Tj=25°C Tj=125°C		6 5		ns
Turn-off delay time	$t_{d(OFF)}$					Tj=25°C Tj=125°C		75 79		ns
Fall time	t_f					Tj=25°C Tj=125°C		30 74		ns
Turn-on energy (per pulse)	E_{on}					Tj=25°C Tj=125°C		0,330 0,280		mWs
Turn-off energy (per pulse)	E_{off}					Tj=25°C Tj=125°C		0,080 0,080		mWs

Splitted output configuration

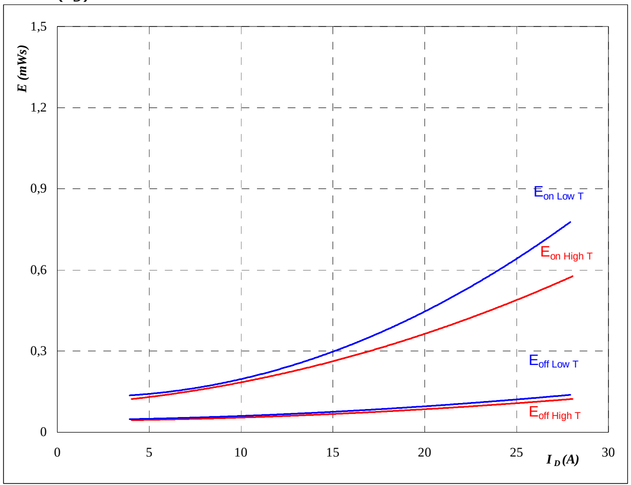
Parameter	Symbol	Conditions	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j	Min	Typ	Max	Unit
T1, T2, T3, T4, T5, T6										
Turn-on delay time	$t_{d(on)}$	Rgoff=1 Ω Rgon=1 Ω	-6/16	700	16	Tj=25°C Tj=125°C		16 16		ns
Rise time	t_r					Tj=25°C Tj=125°C		6 6		ns
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=125°C		71 75		ns
Fall time	t_f					Tj=25°C Tj=125°C		12 10		ns
Turn-on energy (per pulse)	E_{on}					Tj=25°C Tj=125°C		0,310 0,220		mWs
Turn-off energy (per pulse)	E_{off}					Tj=25°C Tj=125°C		0,110 0,090		mWs
D1, D2, D3, D4, D5, D6										
Peak reverse recovery current	I_{RRM}	Rgon=1 Ω	-6/16	700	16	Tj=25°C Tj=125°C		10 12		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		47 47		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=125°C		0,2 0,2		µC
Peak rate of fall of recovery current	di(rec)max/dt					Tj=25°C Tj=125°C		1373 1302		A/µs
Reverse recovery energy	E_{rec}					Tj=25°C Tj=125°C		0,05 0,06		mWs
C1, C2, C3										
C value	C							47		nF
Thermistor										
Rated resistance	R					T=25°C		22000		Ω
Deviation of R100	ΔR/R	R100=1486 Ω				T=100°C	-12,37		13,84	%
Power dissipation	P					T=25°C		200		mW
Power dissipation constant						T=25°C		2		mW/K
B-value	B(25/50)	Tol. ±3%				T=25°C		3950		K
B-value	B(25/100)	Tol. ±3%				T=25°C		3996		K
Vincotech NTC Reference									B	

Half Bridge Configuration

Figure 1 T1, T2, T3, T4, T5, T6 MOSFET

Typical switching energy losses
as a function of drain current

$E = f(I_D)$



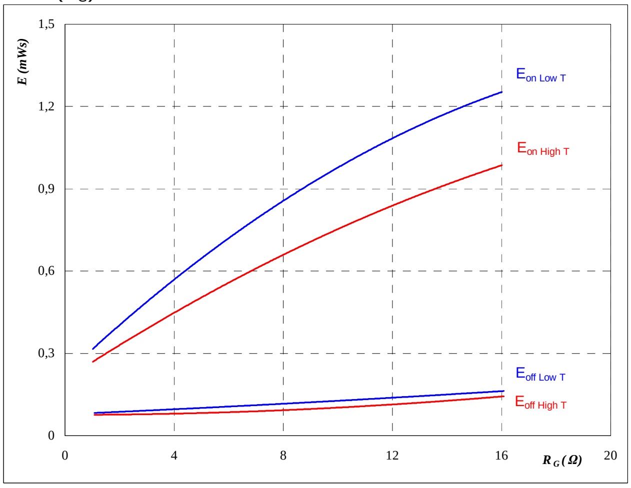
With an inductive load at

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

Figure 2 T1, T2, T3, T4, T5, T6 MOSFET

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



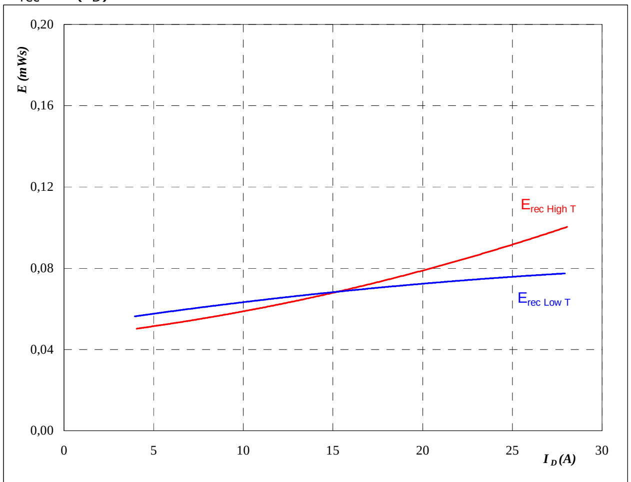
With an inductive load at

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
I_D =	16	A

Figure 3 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery energy loss
as a function of drain current

$E_{rec} = f(I_D)$



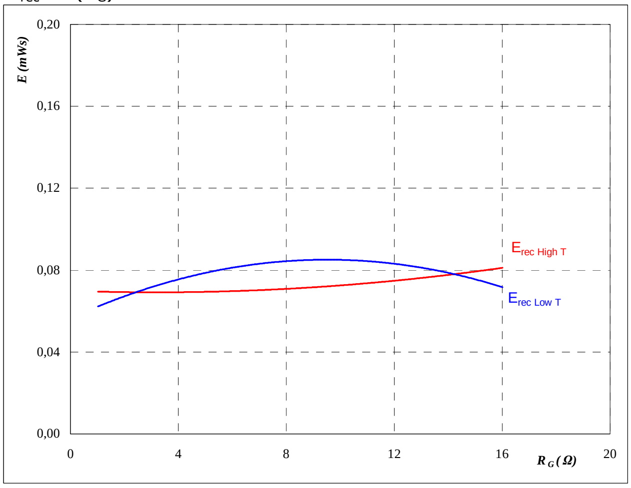
With an inductive load at

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω

Figure 4 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery energy loss
as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

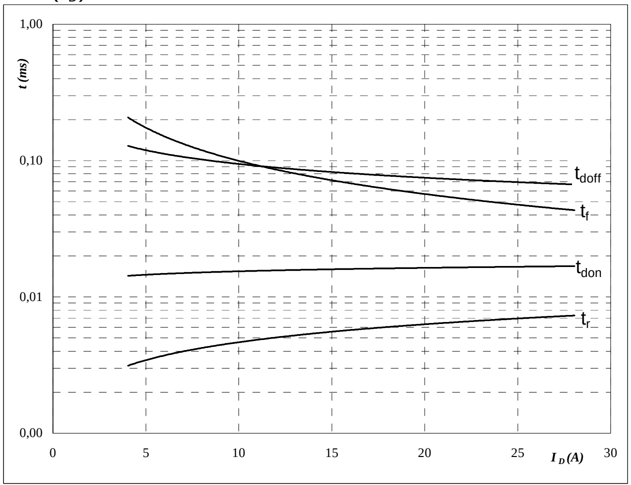
T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
I_D =	16	A

Half Bridge Configuration

Figure 5 T1, T2, T3, T4, T5, T6 MOSFET

Typical switching times as a function of drain current

$t = f(I_D)$



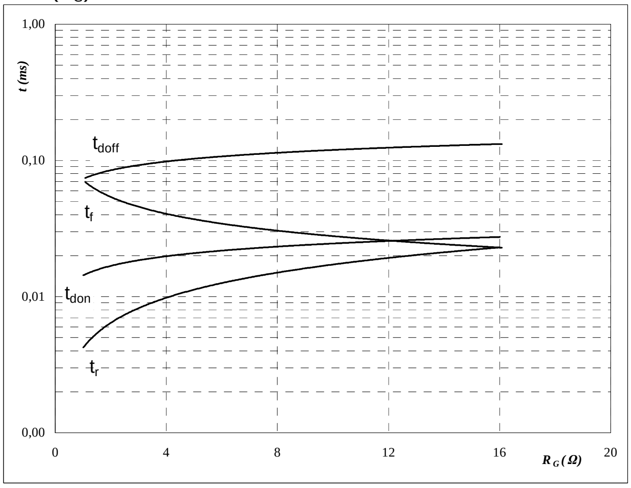
With an inductive load at

T_j =	125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

Figure 6 T1, T2, T3, T4, T5, T6 MOSFET

Typical switching times as a function of gate resistor

$t = f(R_G)$



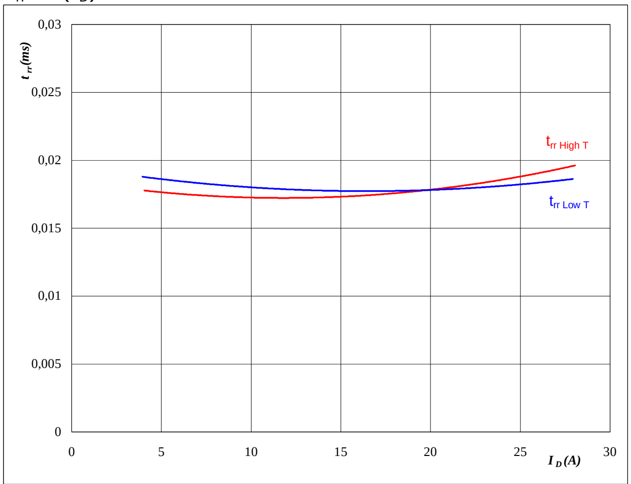
With an inductive load at

T_j =	125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
I_D =	16	A

Figure 7 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



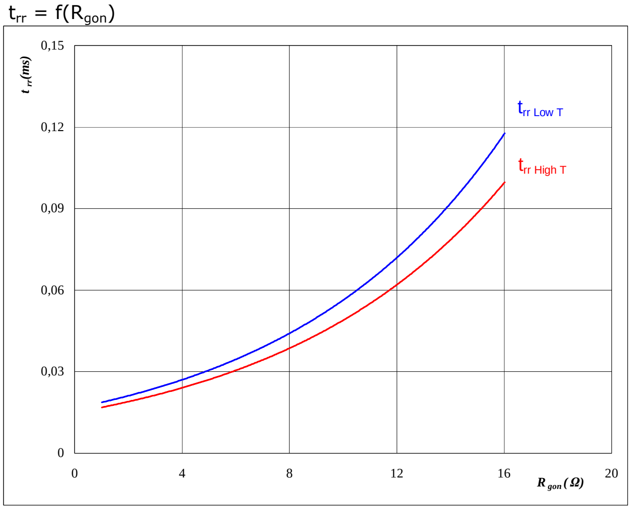
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω

Figure 8 D1, D2, D3, D4, D5, D6 FWD

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

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



At

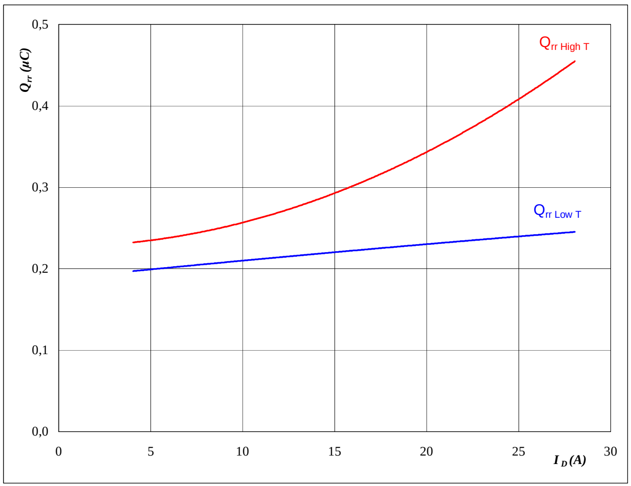
T_j =	25/125	°C
V_R =	700	V
I_F =	16	A
V_{GS} =	-6/16	V

Half Bridge Configuration

Figure 9 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery charge as a function of drain current

$Q_{rr} = f(I_D)$



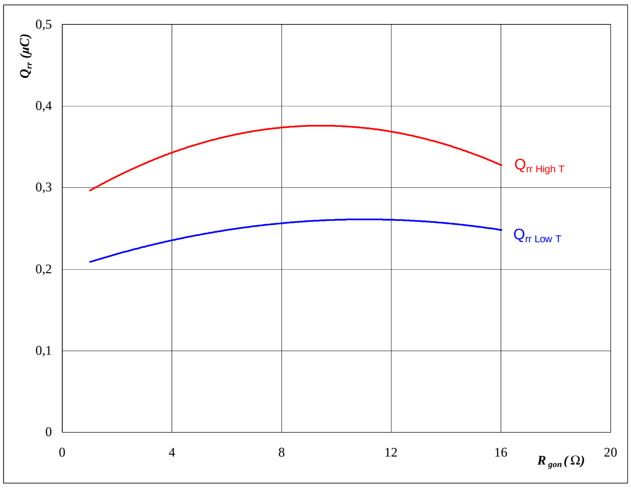
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω

Figure 10 D1, D2, D3, D4, D5, D6 FWD

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

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



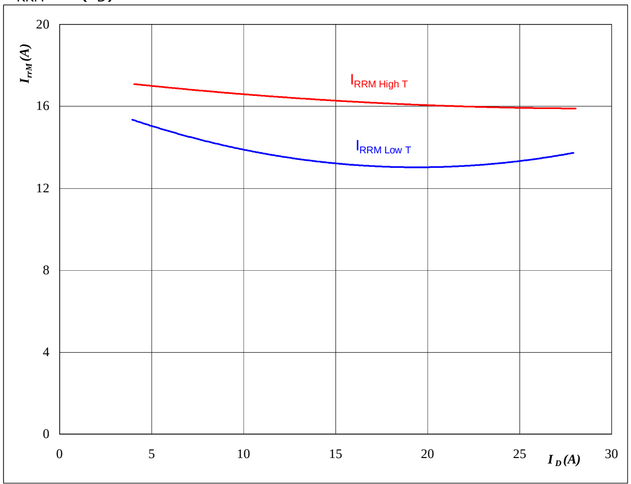
At

T_j =	25/125	°C
V_R =	700	V
I_F =	16	A
V_{GS} =	-6/16	V

Figure 11 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery current as a function of drain current

$I_{RRM} = f(I_D)$



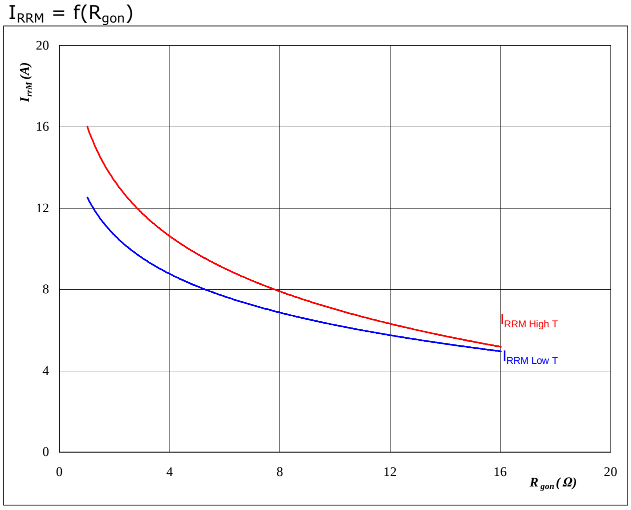
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω

Figure 12 D1, D2, D3, D4, D5, D6 FWD

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

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



At

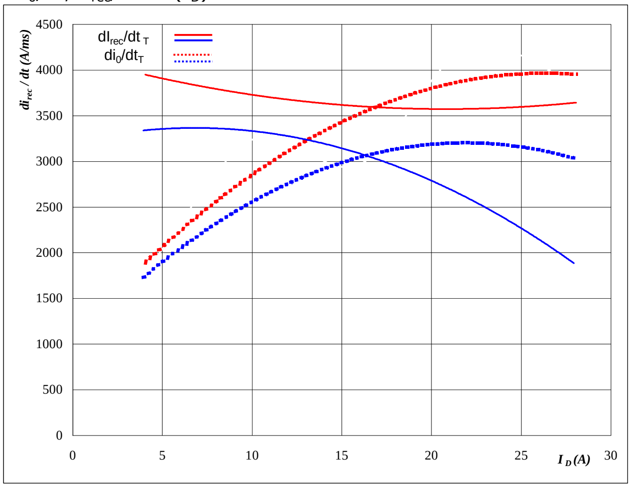
T_j =	25/125	°C
V_R =	700	V
I_F =	16	A
V_{GS} =	-6/16	V

Half Bridge Configuration

Figure 13 D1, D2, D3, D4, D5, D6 FWD

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

$dI_0/dt, dI_{rec}/dt = f(I_D)$



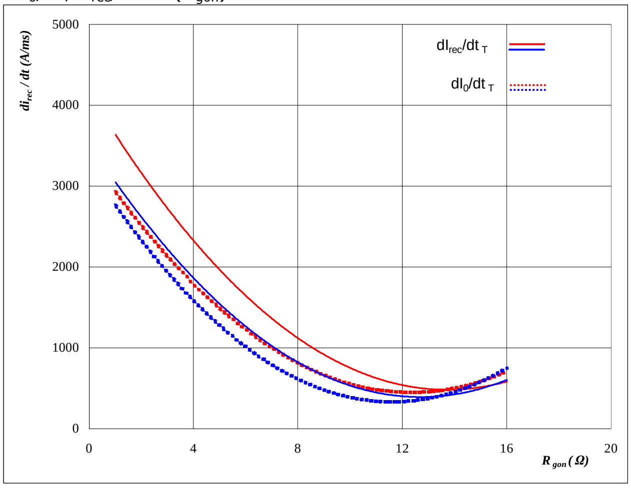
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω

Figure 14 D1, D2, D3, D4, D5, D6 FWD

Typical rate of fall of forward and reverse recovery current as a function of MOSFET turn on gate resistor

$dI_0/dt, dI_{rec}/dt = f(R_{gon})$



At

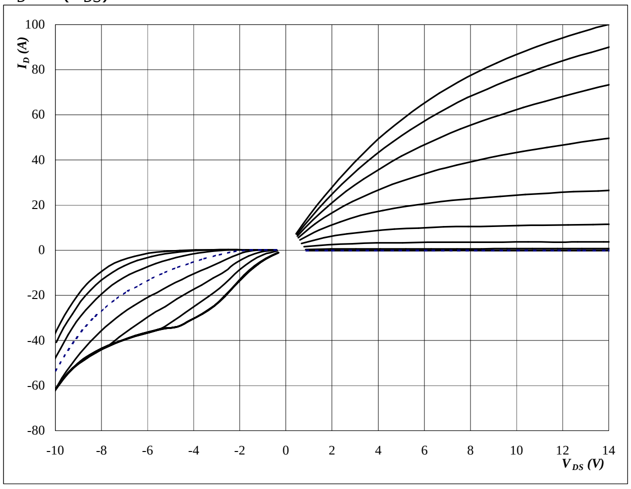
T_j =	25/125	°C
V_R =	700	V
I_F =	16	A
V_{GS} =	-6/16	V

T1, T3, T4, T5, T6 / D1, D2, D3, D4, D5, D6

Figure 1 T1, T2, T3, T4, T5, T6 MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 250 µs

T_j = 25 °C

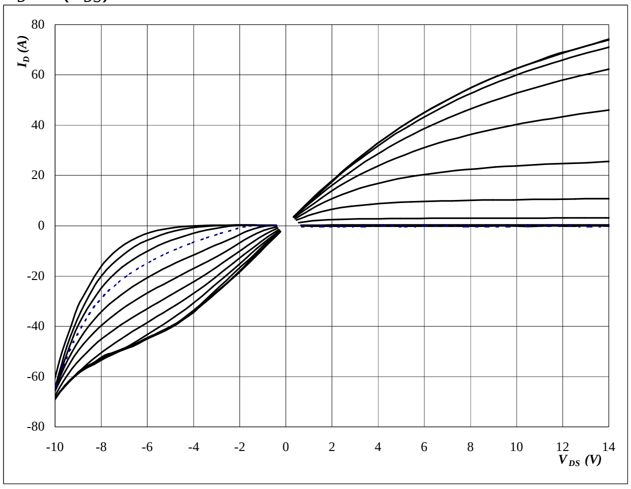
V_{GS} from -6 V to 20 V in steps of 2 V

Dashed line is 0V

Figure 2 T1, T2, T3, T4, T5, T6 MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 250 µs

T_j = 125 °C

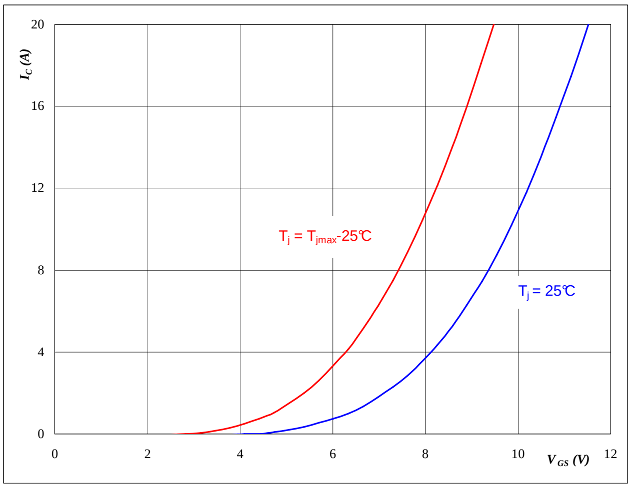
V_{GS} from -6 V to 20 V in steps of 2 V

Dashed line is 0V

Figure 3 T1, T2, T3, T4, T5, T6 MOSFET

Typical transfer characteristics

$I_D = f(V_{GS})$



At

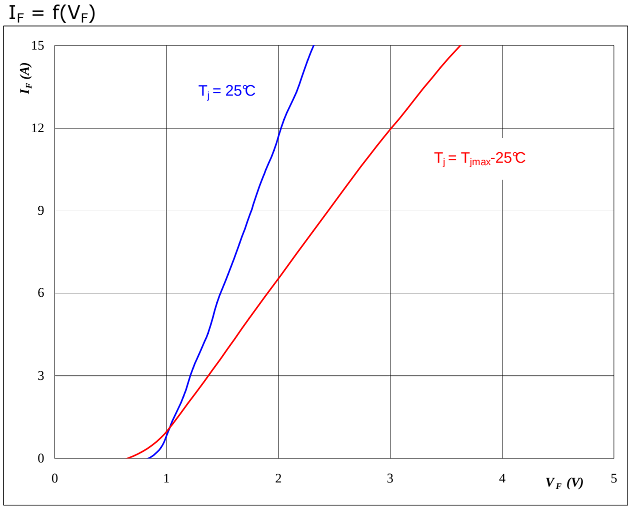
t_p = 250 µs

V_{DS} = 10 V

Figure 4 D1, D2, D3, D4, D5, D6 FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

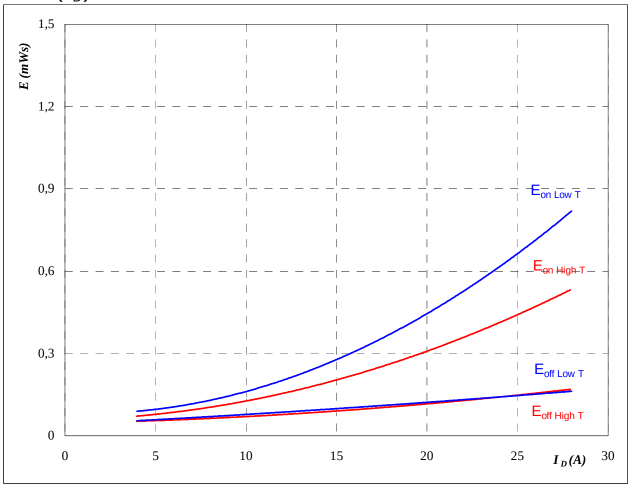
t_p = 250 µs

Splitted Configuration

Figure 5 T1, T2, T3, T4, T5, T6 MOSFET

Typical switching energy losses
as a function of drain current

$E = f(I_D)$



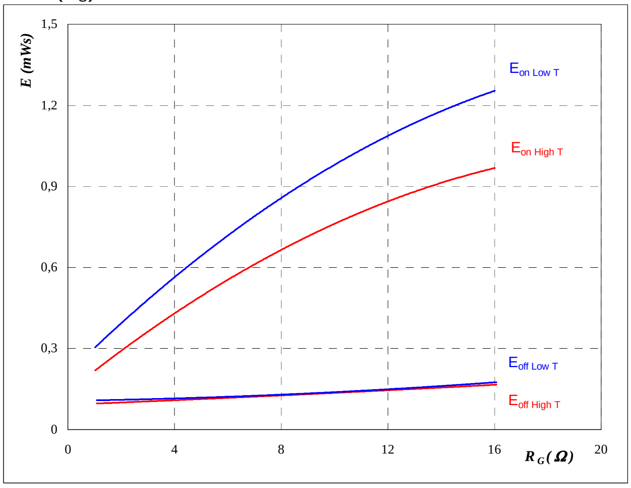
With an inductive load at

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

Figure 6 T1, T2, T3, T4, T5, T6 MOSFET

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



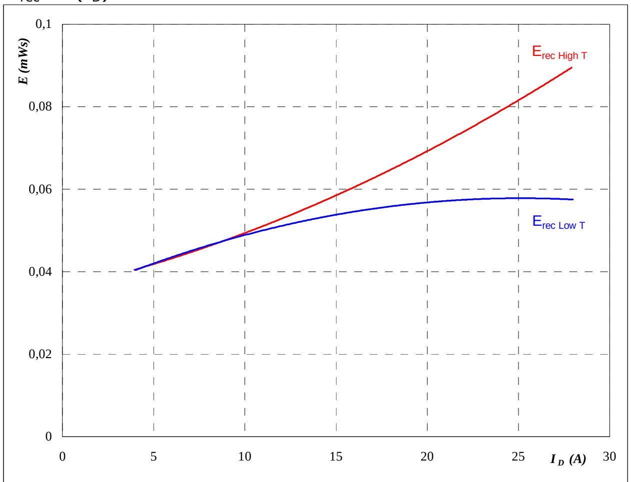
With an inductive load at

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
I_D =	16	A

Figure 7 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery energy loss
as a function of drain current

$E_{rec} = f(I_D)$



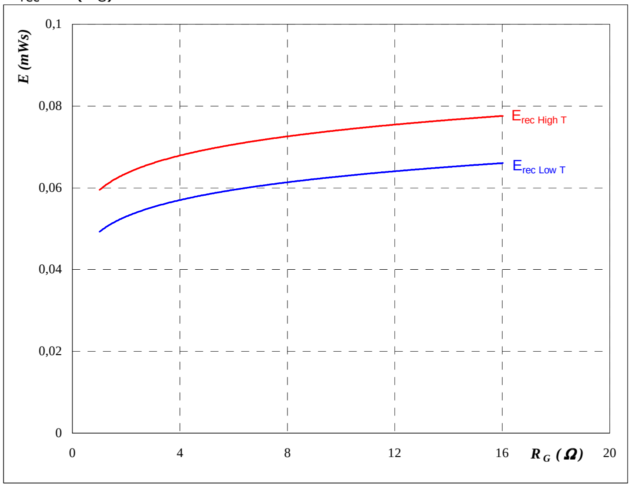
With an inductive load at

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω

Figure 8 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery energy loss
as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

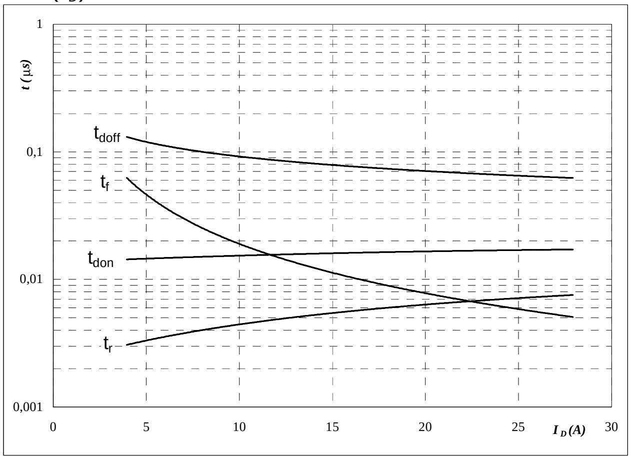
T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
I_D =	16	A

Splitted Configuration

Figure 9 T1, T2, T3, T4, T5, T6 MOSFET

Typical switching times as a function of drain current

t = f(I_D)



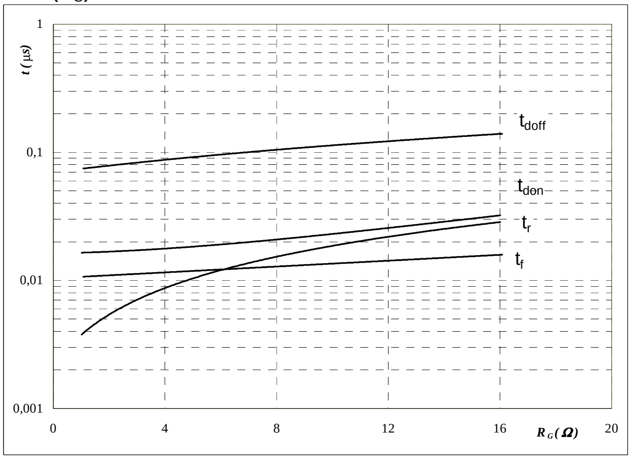
With an inductive load at

T_j =	125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

Figure 10 T1, T2, T3, T4, T5, T6 MOSFET

Typical switching times as a function of gate resistor

t = f(R_G)



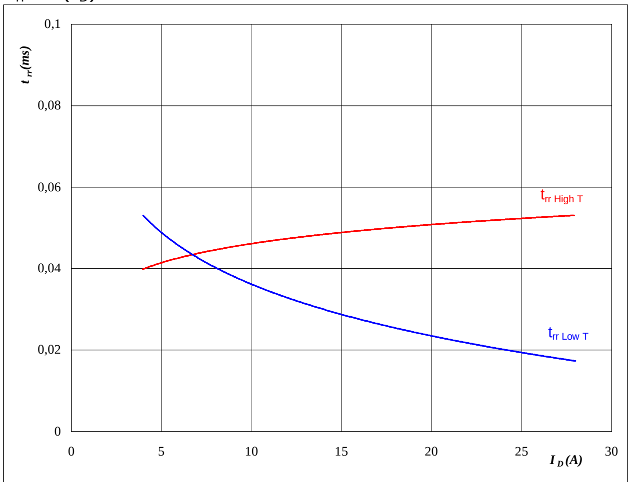
With an inductive load at

T_j =	125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
I_D =	16	A

Figure 11 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery time as a function of drain current

t_{rr} = f(I_D)



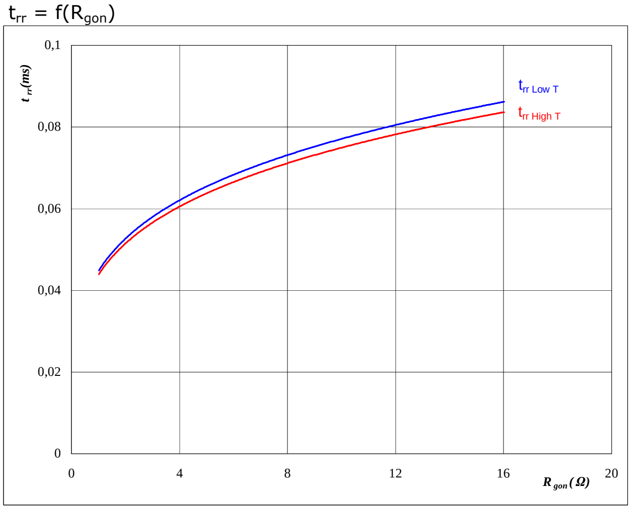
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω

Figure 12 D1, D2, D3, D4, D5, D6 FWD

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

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



At

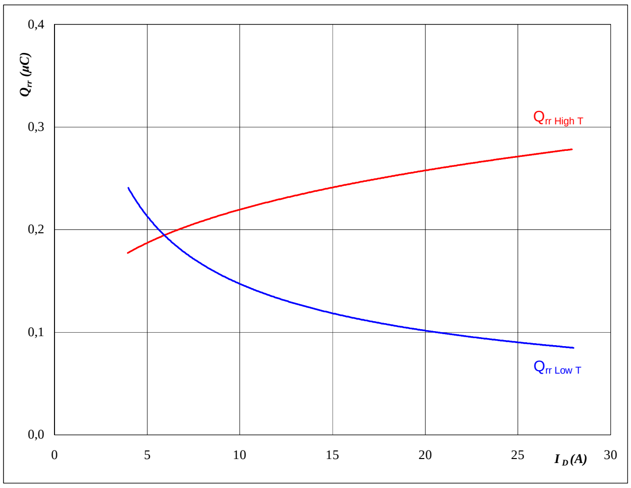
T_j =	25/125	°C
V_R =	700	V
I_F =	16	A
V_{GS} =	-6/16	V

Splitted Configuration

Figure 13 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery charge as a function of drain current

$Q_{rr} = f(I_D)$



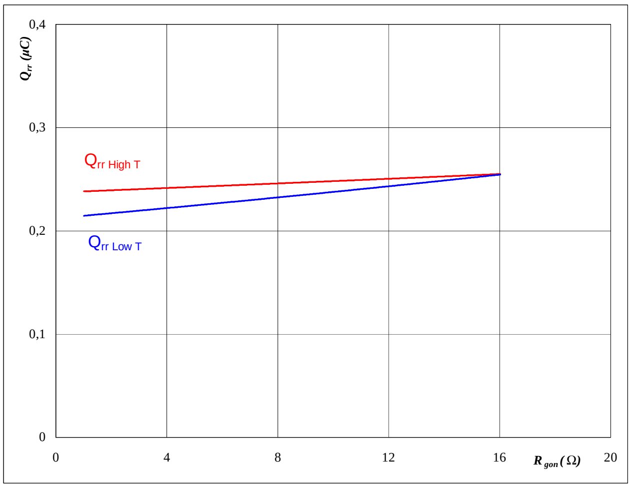
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω

Figure 14 D1, D2, D3, D4, D5, D6 FWD

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

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



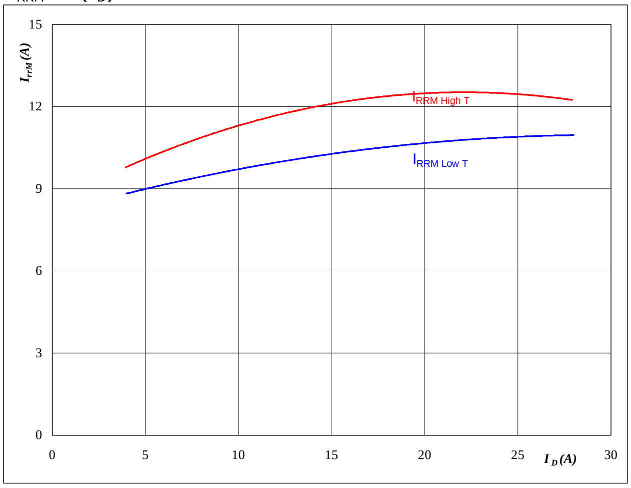
At

T_j =	25/125	°C
V_R =	700	V
I_F =	16	A
V_{GS} =	-6/16	V

Figure 15 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery current as a function of drain current

$I_{RRM} = f(I_D)$



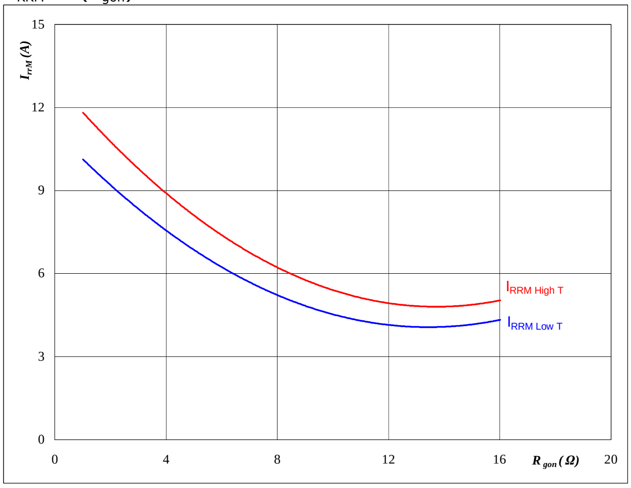
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω

Figure 16 D1, D2, D3, D4, D5, D6 FWD

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

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



At

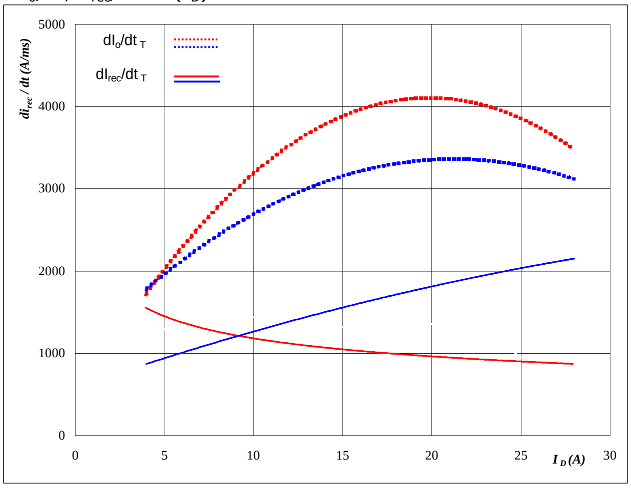
T_j =	25/125	°C
V_R =	700	V
I_F =	16	A
V_{GS} =	-6/16	V

Splitted Configuration

Figure 17 D1, D2, D3, D4, D5, D6 FWD

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

$dI_0/dt, dI_{rec}/dt = f(I_D)$



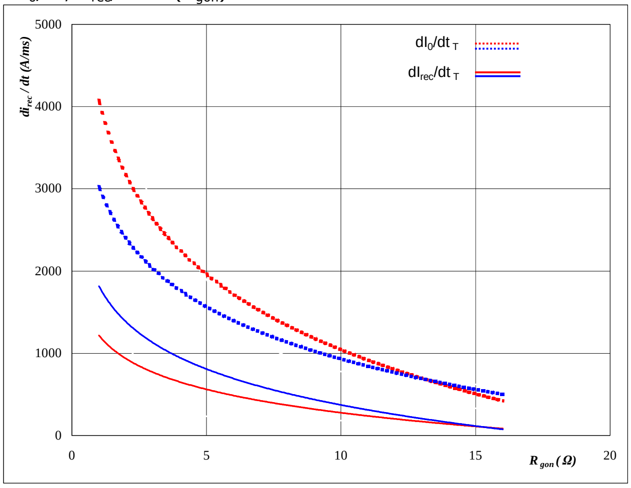
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	-6/16	V
R_{gon} =	1	Ω

Figure 18 D1, D2, D3, D4, D5, D6 FWD

Typical rate of fall of forward and reverse recovery current as a function of MOSFET turn on gate resistor

$dI_0/dt, dI_{rec}/dt = f(R_{gon})$



At

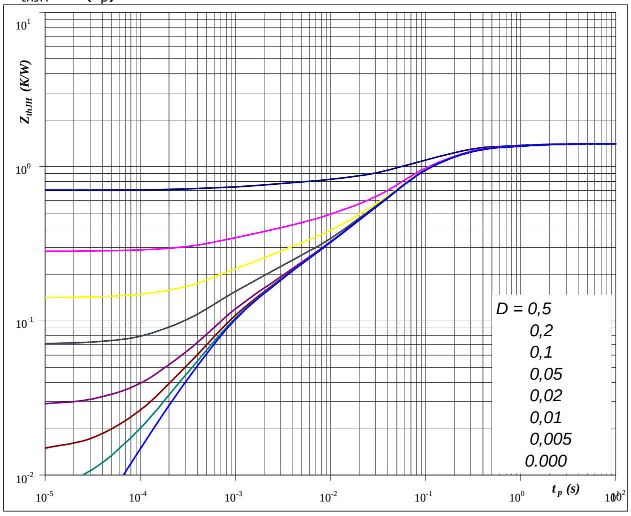
T_j =	25/125	°C
V_R =	700	V
I_F =	16	A
V_{GS} =	-6/16	V

T1, T3, T4, T5, T6 / D1, D2, D3, D4, D5, D6

Figure 19 T1, T2, T3, T4, T5, T6 MOSFET

MOSFET transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D = tp / T

R_{thJH} = 1,41 K/W

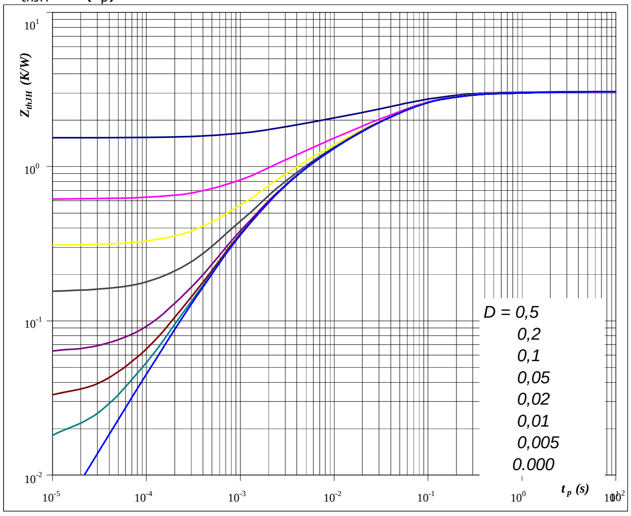
MOSFET thermal model values

R (K/W)	Tau (s)
0,12	1,0E+00
0,39	1,7E-01
0,68	6,1E-02
0,12	5,5E-03
0,10	8,0E-04

Figure 20 D1, D2, D3, D4, D5, D6 FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D = tp / T

R_{thJH} = 3,07 K/W

FWD thermal model values

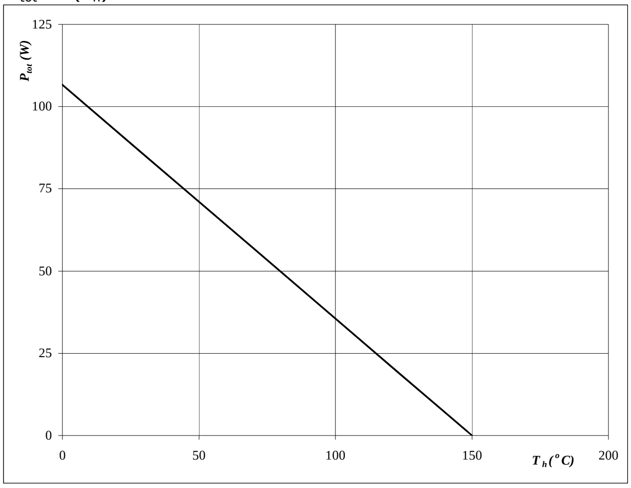
R (K/W)	Tau (s)
0,06	3,5E+00
0,14	5,2E-01
1,00	7,8E-02
0,83	2,6E-02
0,64	5,8E-03
0,40	1,3E-03

T1, T3, T4, T5, T6 / D1, D2, D3, D4, D5, D6

Figure 21 T1, T2, T3, T4, T5, T6 MOSFET

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



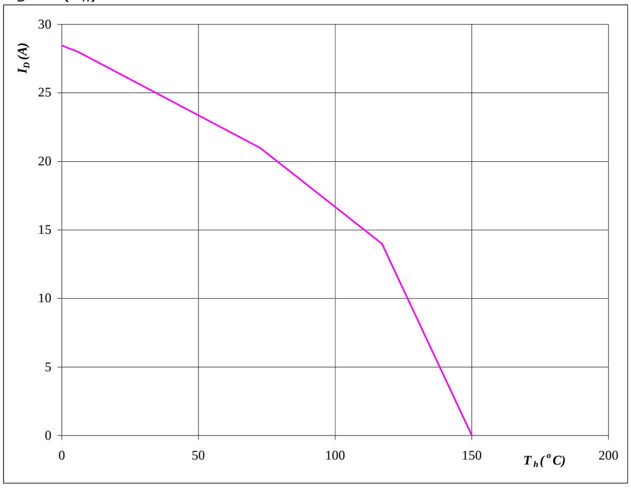
At

T_j = 150 ºC

Figure 22 T1, T2, T3, T4, T5, T6 MOSFET

Drain current as a function of heatsink temperature

$I_D = f(T_h)$



At

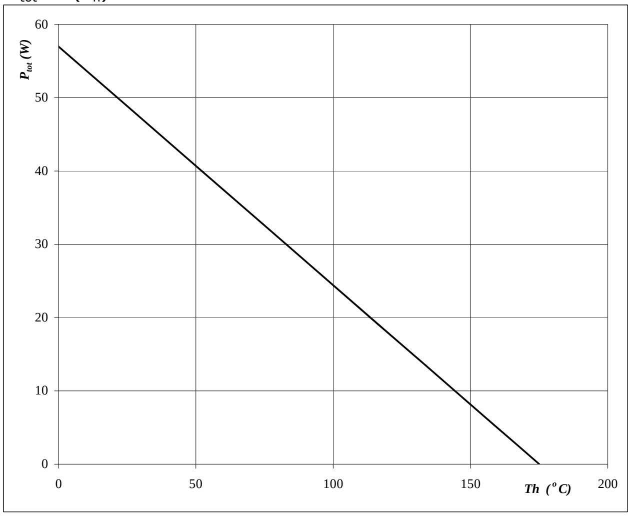
T_j = 150 ºC

V_{GS} = 15 V

Figure 23 D1, D2, D3, D4, D5, D6 FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



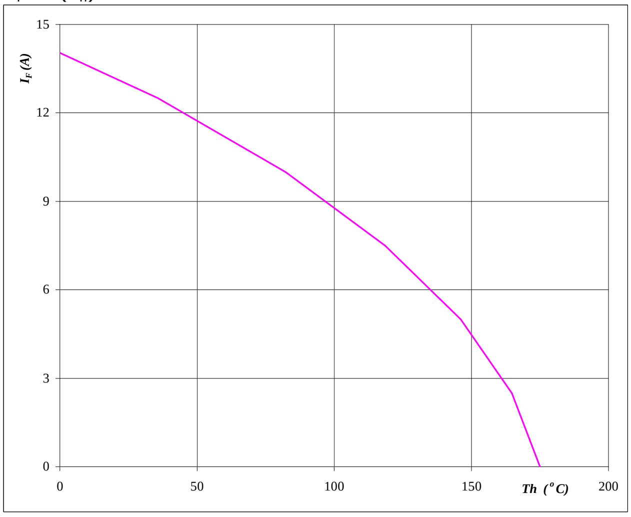
At

T_j = 175 ºC

Figure 24 D1, D2, D3, D4, D5, D6 FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

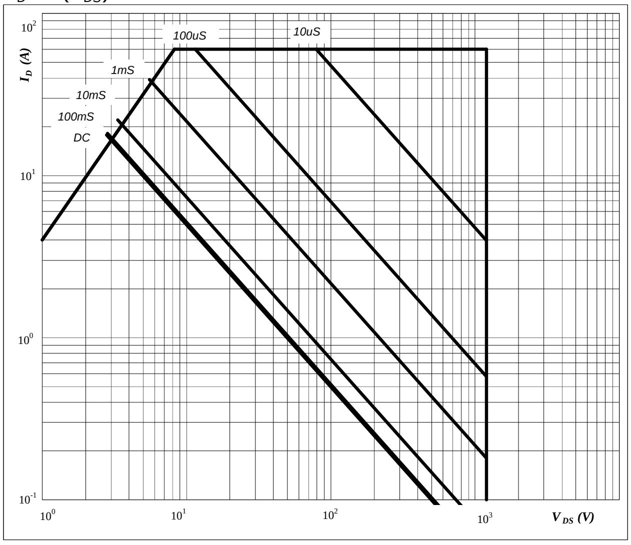
T_j = 175 ºC

T1, T2, T3, T4, T5, T6

Figure 25	T1, T2, T3, T4, T5, T6 MOSFET

Safe operating area as a function of drain-source voltage

$I_D = f(V_{DS})$



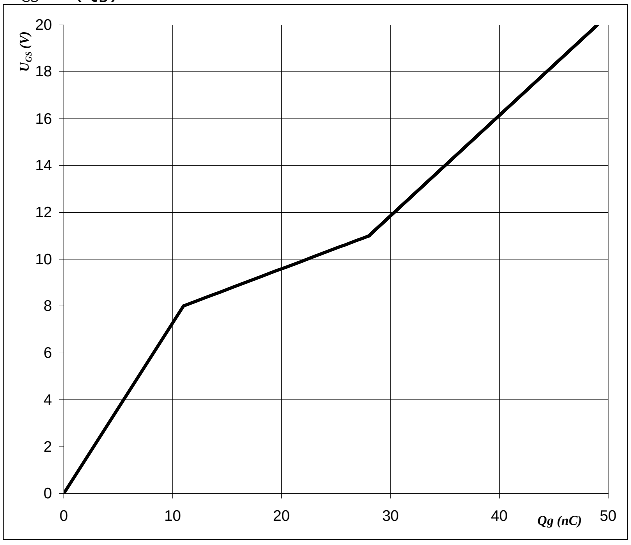
At

D =	single pulse	
T_h =	80	ºC
V_{GS} =	0	V
T_j =	T_{jmax}	ºC

Figure 26	T1, T2, T3, T4, T5, T6 MOSFET

Gate voltage vs Gate charge

$V_{GS} = f(Qg)$



At

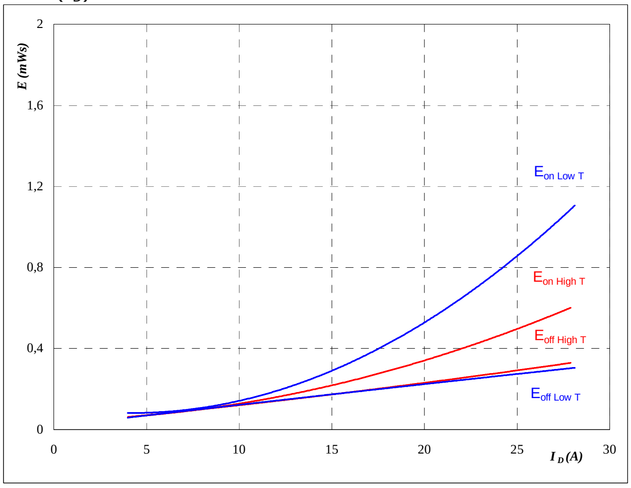
I_{DS} =	20	A
V_{DS}=	800	V
I_{GS}=	10	mA
T_j =	25	ºC

Booster Configuration

Figure 1 T1, T2, T3, T4, T5, T6 MOSFET

Typical switching energy losses as a function of drain current

E = f(I_D)



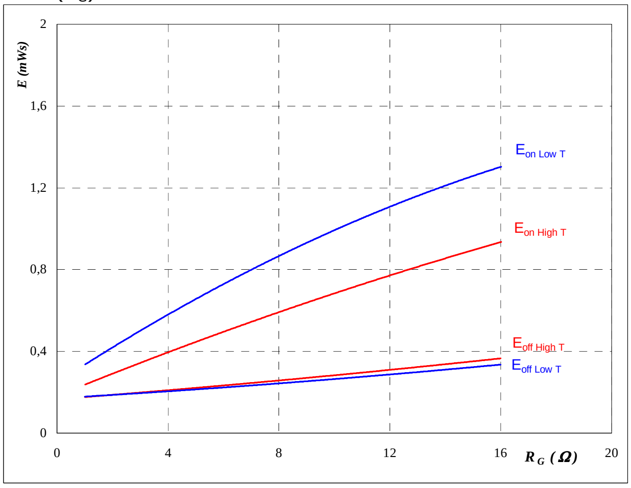
With an inductive load at

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	16	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

Figure 2 T1, T2, T3, T4, T5, T6 MOSFET

Typical switching energy losses as a function of gate resistor

E = f(R_G)



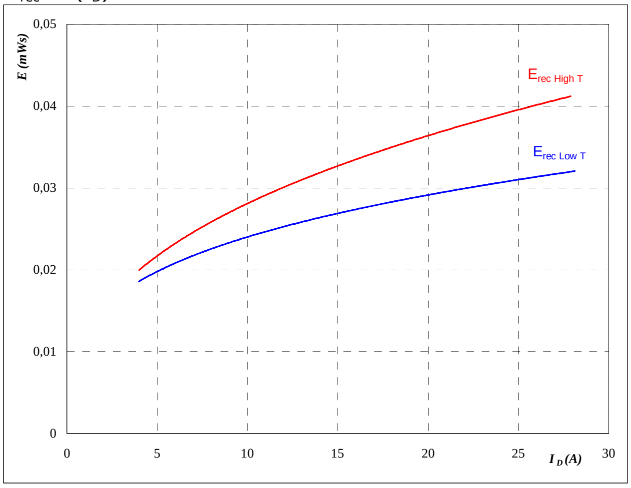
With an inductive load at

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	16	V
I_D =	16	A

Figure 3 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery energy loss as a function of drain current

E_{rec} = f(I_D)



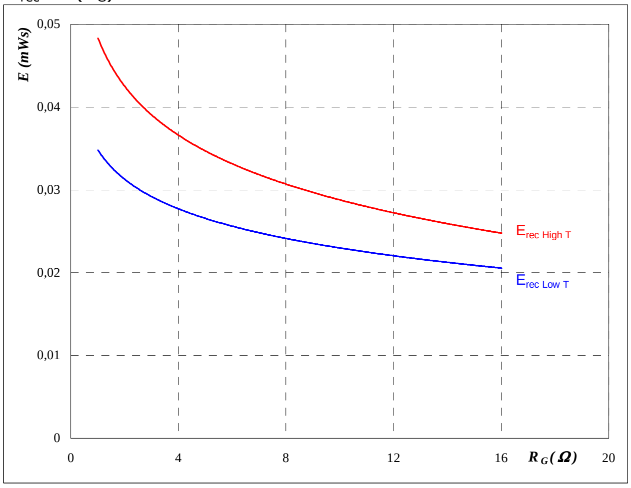
With an inductive load at

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	16	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

Figure 4 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery energy loss as a function of gate resistor

E_{rec} = f(R_G)



With an inductive load at

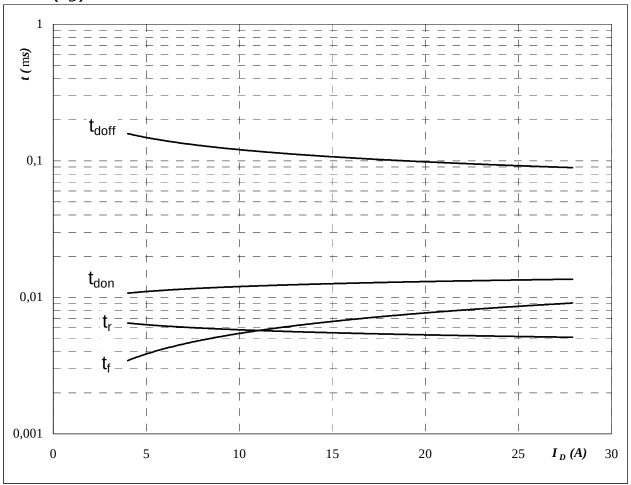
T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	16	V
I_D =	16	A

Booster Configuration

Figure 5 T1, T2, T3, T4, T5, T6 MOSFET

Typical switching times as a function of drain current

$t = f(I_D)$



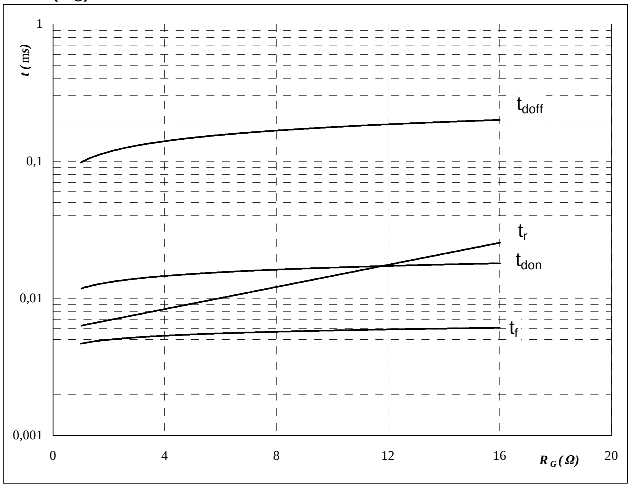
With an inductive load at

T_j =	125	°C
V_{DS} =	700	V
V_{GS} =	16	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

Figure 6 T1, T2, T3, T4, T5, T6 MOSFET

Typical switching times as a function of gate resistor

$t = f(R_G)$



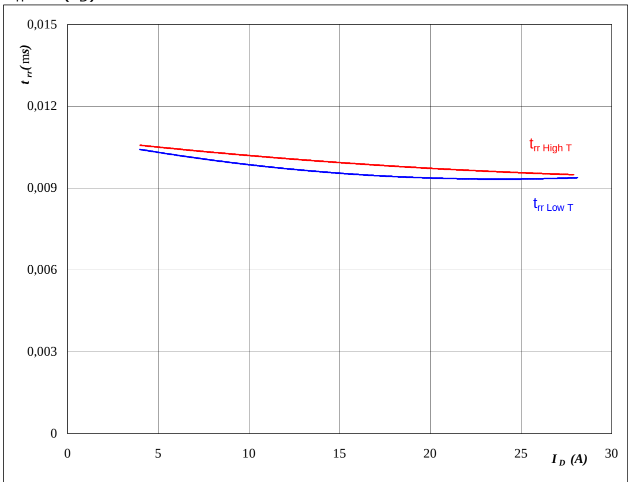
With an inductive load at

T_j =	125	°C
V_{DS} =	700	V
V_{GS} =	16	V
I_D =	16	A

Figure 7 D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



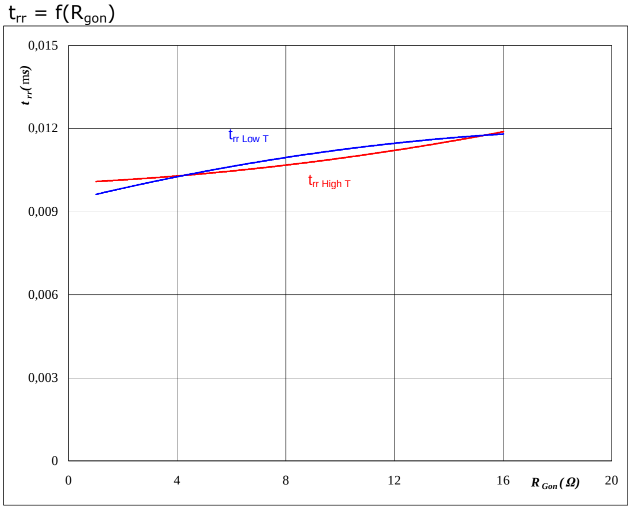
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	16	V
R_{gon} =	1	Ω

Figure 8 D1, D2, D3, D4, D5, D6 FWD

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

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



At

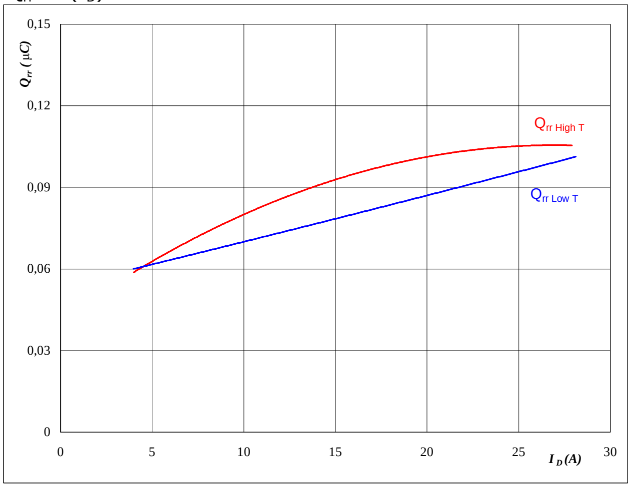
T_j =	25/125	°C
V_R =	700	V
I_F =	16	A
V_{GS} =	16	V

Booster Configuration

Figure 9	D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery charge as a function of drain current

$Q_{rr} = f(I_D)$



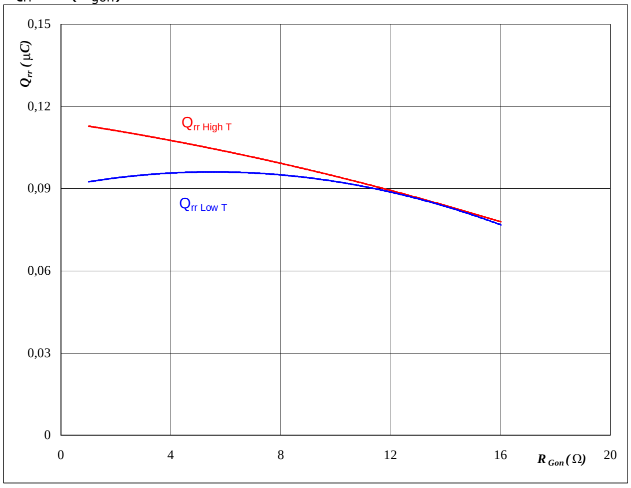
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	16	V
R_{gon} =	1	Ω

Figure 10	D1, D2, D3, D4, D5, D6 FWD

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

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



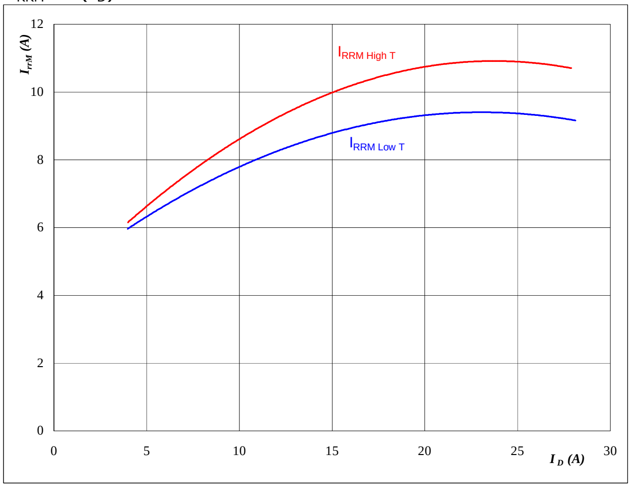
At

Tj =	25/125	°C
VR =	700	V
IF =	16	A
VGS =	16	V

Figure 11	D1, D2, D3, D4, D5, D6 FWD

Typical reverse recovery current as a function of drain current

$I_{RRM} = f(I_D)$



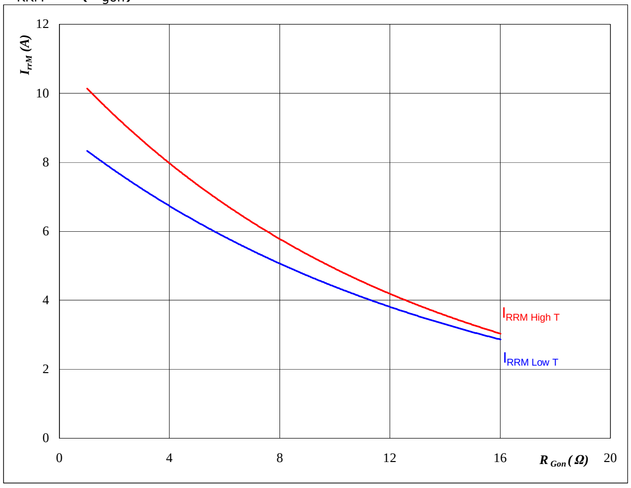
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	16	V
R_{gon} =	1	Ω

Figure 12	D1, D2, D3, D4, D5, D6 FWD

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

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



At

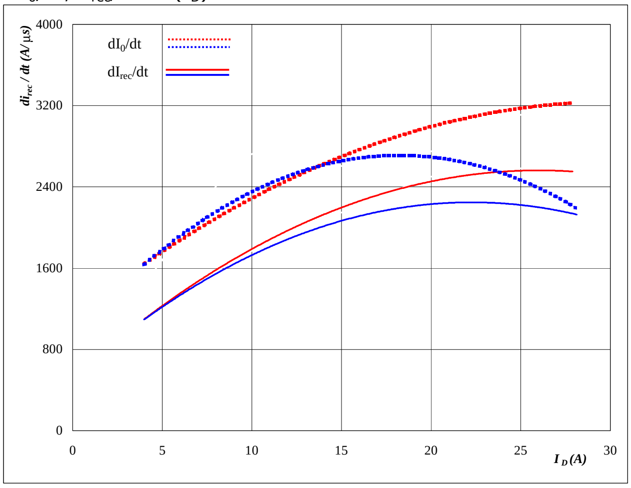
T_j =	25/125	°C
V_R =	700	V
I_F =	16	A
V_{GS} =	16	V

Booster Configuration

Figure 13 D1, D2, D3, D4, D5, D6 FWD

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

$dI_0/dt, dI_{rec}/dt = f(I_D)$



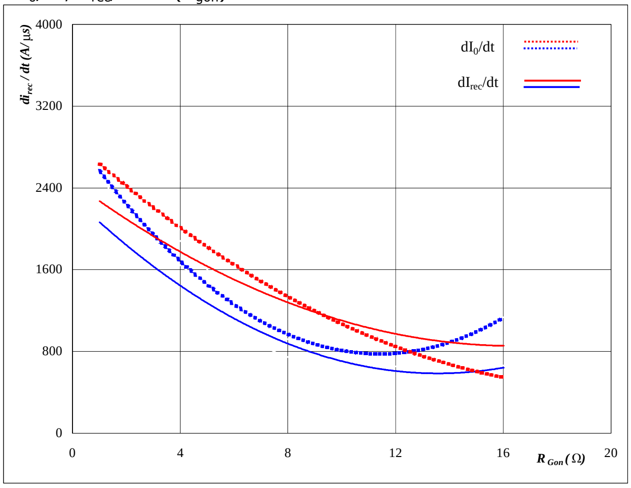
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	16	V
R_{gon} =	1	Ω

Figure 14 D1, D2, D3, D4, D5, D6 FWD

Typical rate of fall of forward and reverse recovery current as a function of MOSFET turn on gate resistor

$dI_0/dt, dI_{rec}/dt = f(R_{gon})$



At

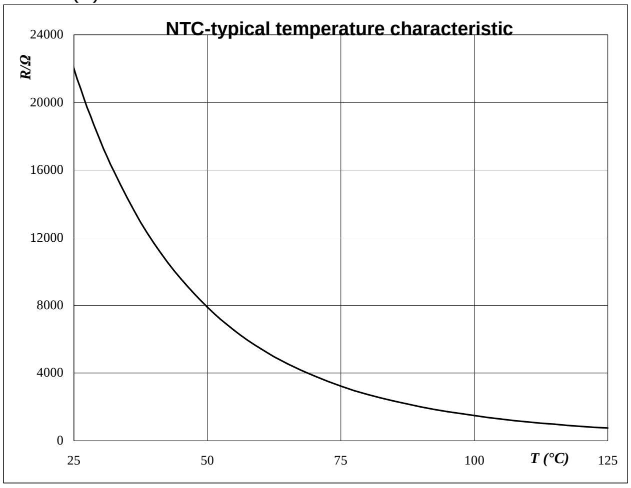
Tj =	25/125	°C
V_R =	700	V
I_F =	16	A
V_{GS} =	16	V

Thermistor

Figure 1	Thermistor

Typical NTC characteristic
as a function of temperature

R_T = f(T)



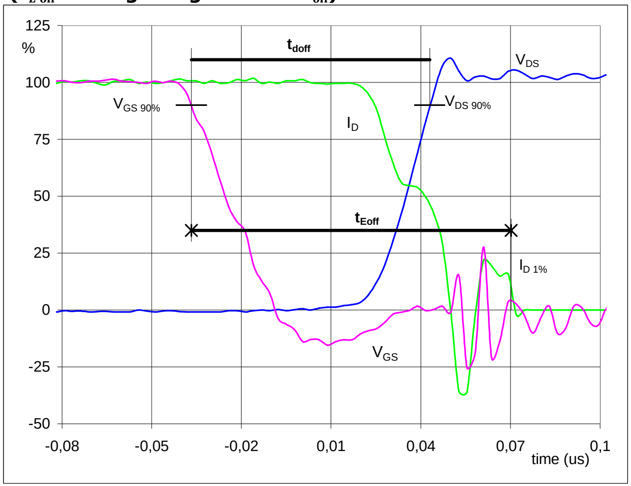
Switching Definitions Half Bridge Configuration

General conditions

T_j	=	125 °C
R_{gon}	=	1 Ω
R_{goff}	=	1 Ω

Figure 1 — **T1, T2, T3, T4, T5, T6 MOSFET**

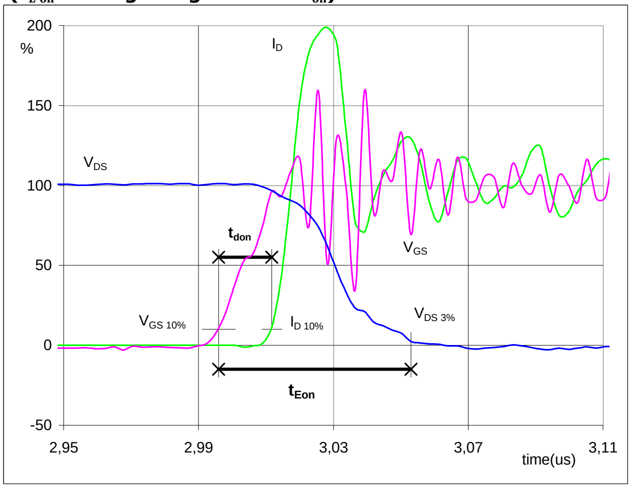
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\ off}$ = integrating time for E_{off})



V_{GS} (0%) =	0	V
V_{GS} (100%) =	16	V
VD (100%) =	700	V
I_D (100%) =	16	A
t_{doff} =	0,079	µs
$t_{E\ off}$ =	0,107	µs

Figure 2 — **T1, T2, T3, T4, T5, T6 MOSFET**

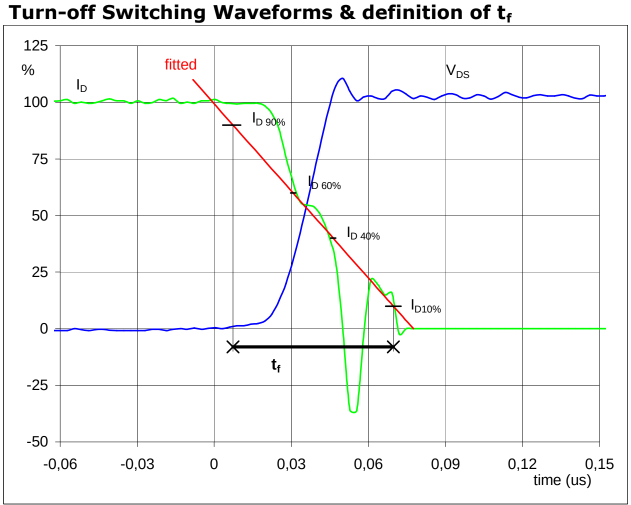
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\ on}$ = integrating time for E_{on})



V_{GS} (0%) =	0	V
V_{GS} (100%) =	16	V
VD (100%) =	700	V
I_D (100%) =	16	A
t_{don} =	0,016	µs
$t_{E\ on}$ =	0,057	µs

Figure 3 — **T1, T2, T3, T4, T5, T6 MOSFET**

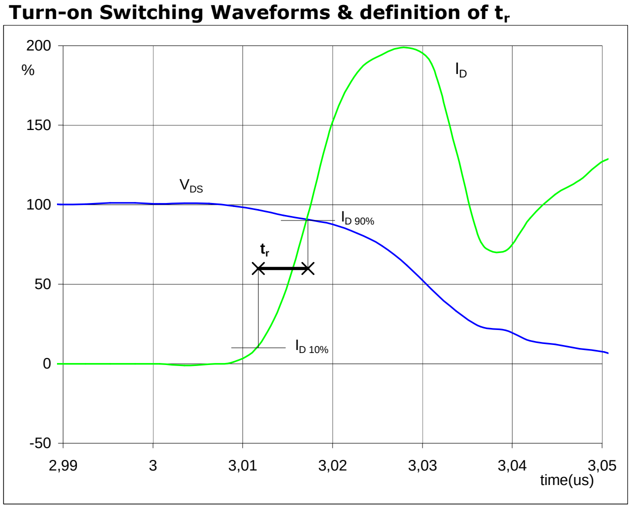
Turn-off Switching Waveforms & definition of t_f



VD (100%) =	700	V
I_D (100%) =	16	A
t_f =	0,074	µs

Figure 4 — **T1, T2, T3, T4, T5, T6 MOSFET**

Turn-on Switching Waveforms & definition of t_r

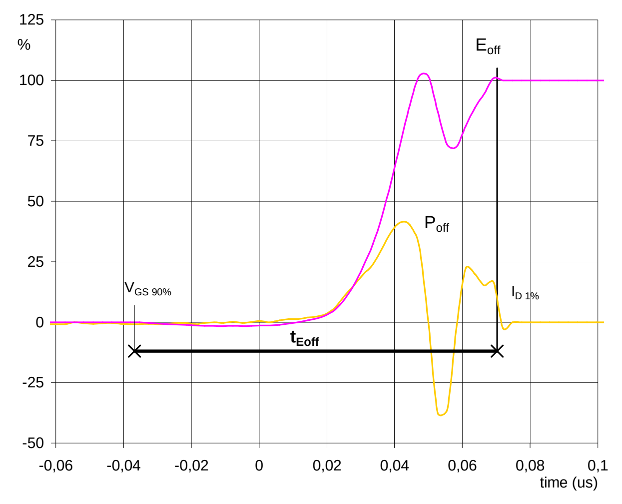


VD (100%) =	700	V
I_D (100%) =	16	A
t_r =	0,005	µs

Switching Definitions Half Bridge Configuration

Figure 5 — **T1, T2, T3, T4, T5, T6 MOSFET**

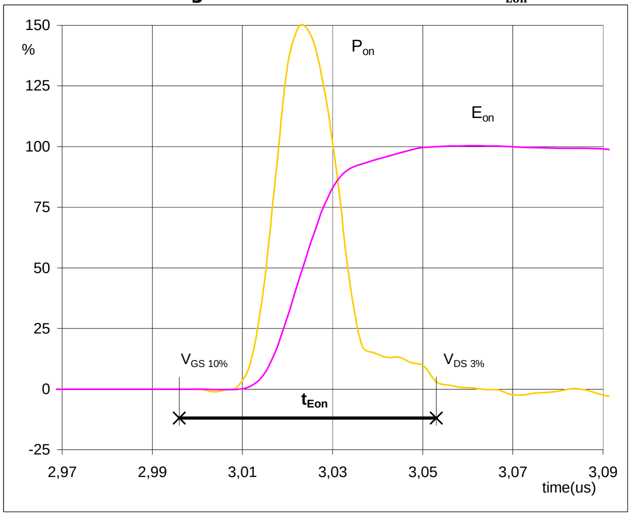
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	11,16	kW
E_{off} (100%) =	0,08	mJ
$t_{E\,off}$ =	0,107	μs

Figure 6 — **T1, T2, T3, T4, T5, T6 MOSFET**

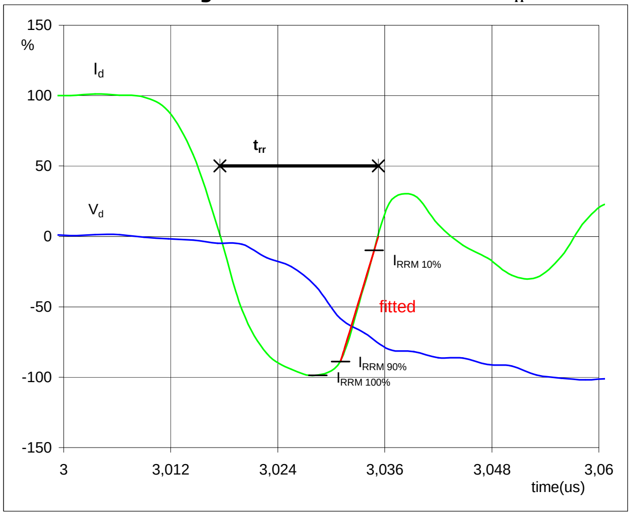
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	11,16	kW
E_{on} (100%) =	0,28	mJ
$t_{E\,on}$ =	0,057	μs

Figure 7 — **D1, D2, D3, D4, D5, D6 FWD**

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

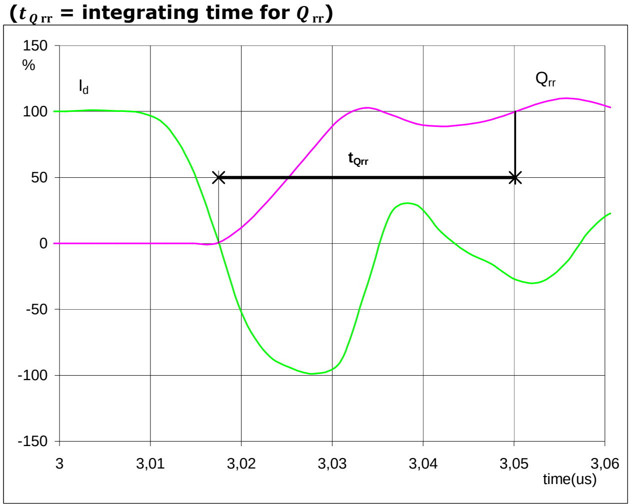


V_d (100%) =	700	V
I_d (100%) =	16	A
IRRM (100%) =	-16	A
trr =	0,017	μs

Switching Definitions Half Bridge Configuration

Figure 8 **D1, D2, D3, D4, D5, D6 FWD**

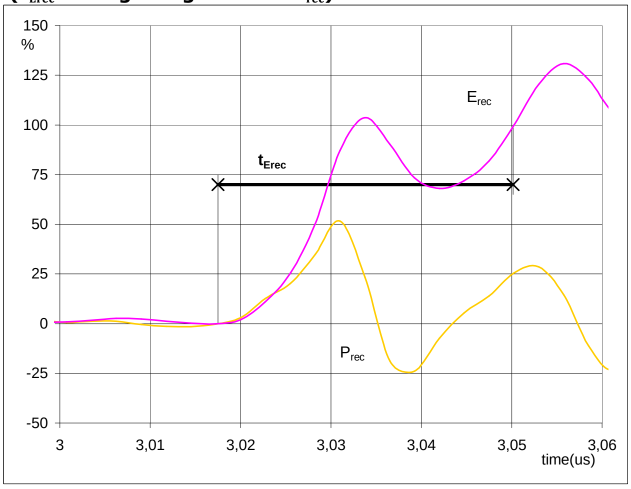
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	16	A
Qrr (100%) =	0,30	μC
$t_{Q\,rr}$ =	0,033	μs

Figure 9 **D1, D2, D3, D4, D5, D6 FWD**

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

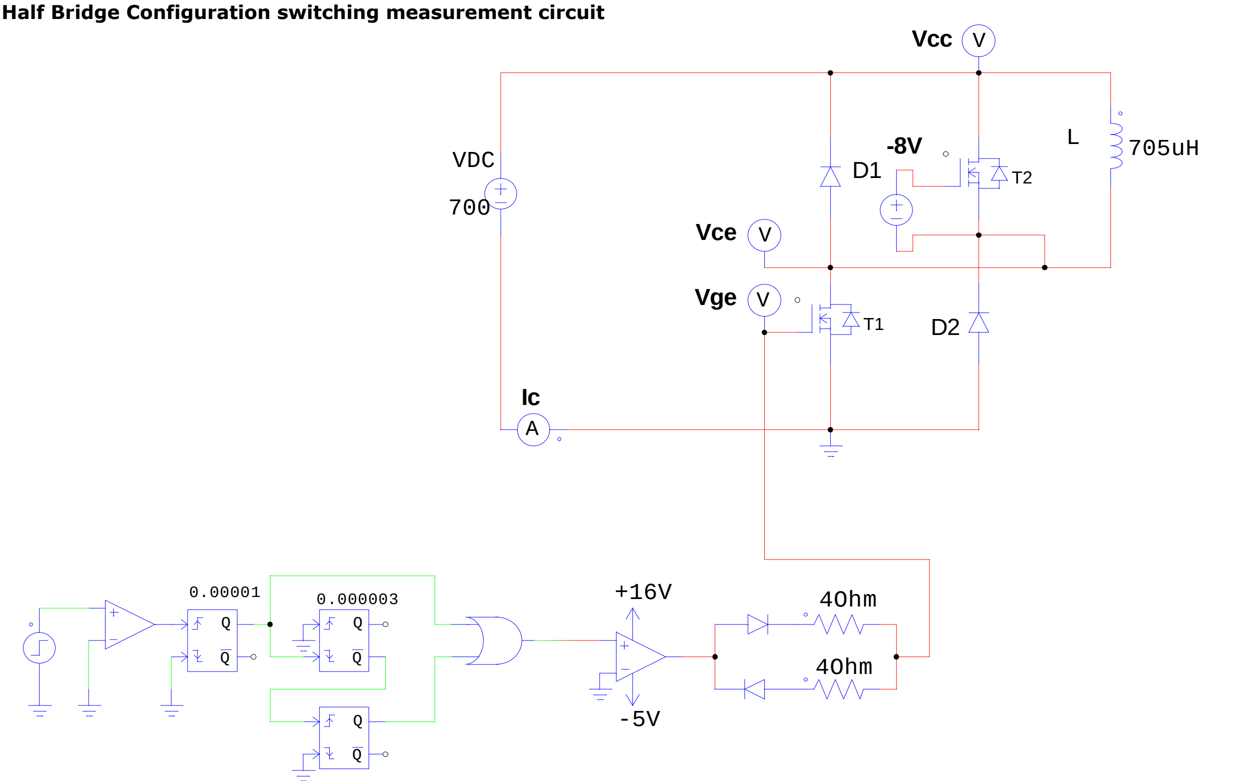


P_{rec} (100%) =	11,16	kW
E_{rec} (100%) =	0,12	mJ
$t_{E\,rec}$ =	0,033	μs

Measurement circuit

Figure 10

Half Bridge Configuration switching measurement circuit



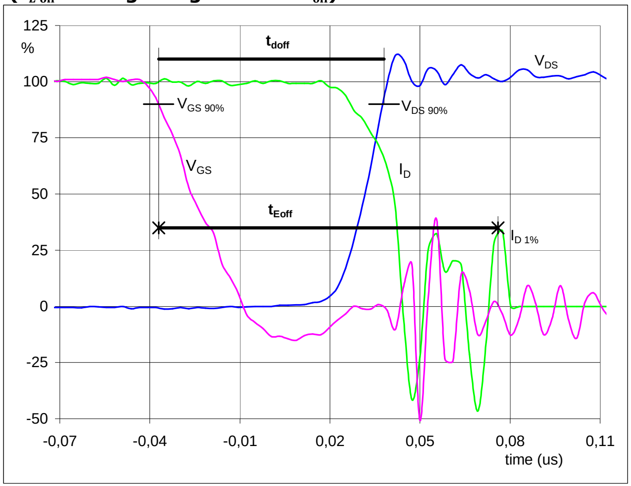
Switching Definitions Splitted Configuration

General conditions

T_j	=	124 °C
R_{gon}	=	1 Ω
R_{goff}	=	1 Ω

Figure 1 — **T1, T2, T3, T4, T5, T6 MOSFET**

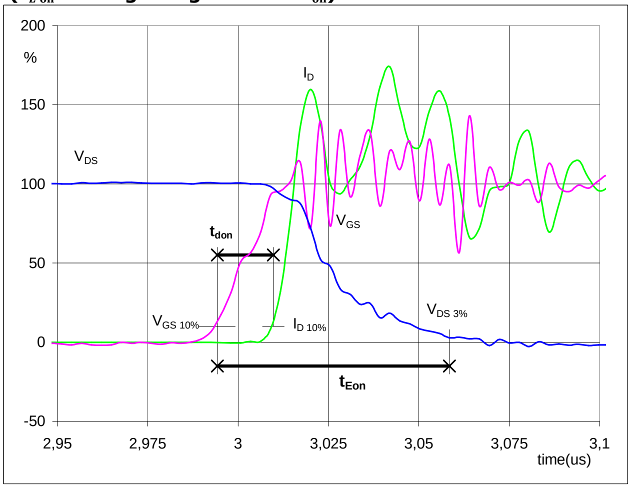
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GS} (0%) =	0	V
V_{GS} (100%) =	-6/16	V
VD (100%) =	700	V
I_D (100%) =	16	A
t_{doff} =	0,075	µs
$t_{E\,off}$ =	0,113	µs

Figure 2 — **T1, T2, T3, T4, T5, T6 MOSFET**

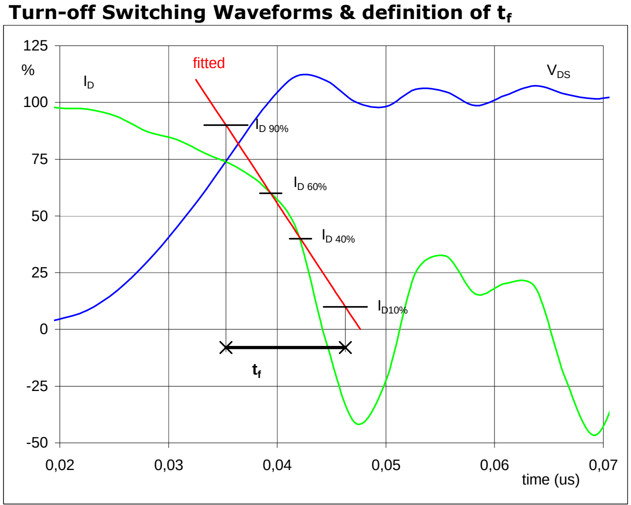
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GS} (0%) =	0	V
V_{GS} (100%) =	-6/16	V
VD (100%) =	700	V
I_D (100%) =	16	A
t_{don} =	0,016	µs
$t_{E\,on}$ =	0,064	µs

Figure 3 — **T1, T2, T3, T4, T5, T6 MOSFET**

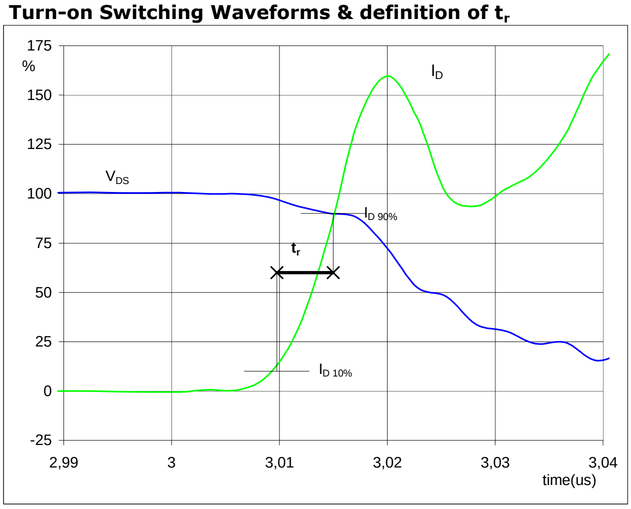
Turn-off Switching Waveforms & definition of t_f



VD (100%) =	700	V
I_D (100%) =	16	A
t_f =	0,010	µs

Figure 4 — **T1, T2, T3, T4, T5, T6 MOSFET**

Turn-on Switching Waveforms & definition of t_r

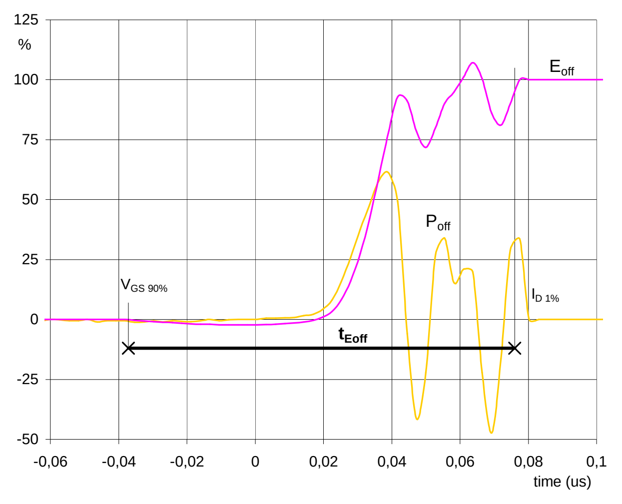


VD (100%) =	700	V
I_D (100%) =	16	A
t_r =	0,006	µs

Switching Definitions Splitted Configuration

Figure 5 — **T1, T2, T3, T4, T5, T6 MOSFET**

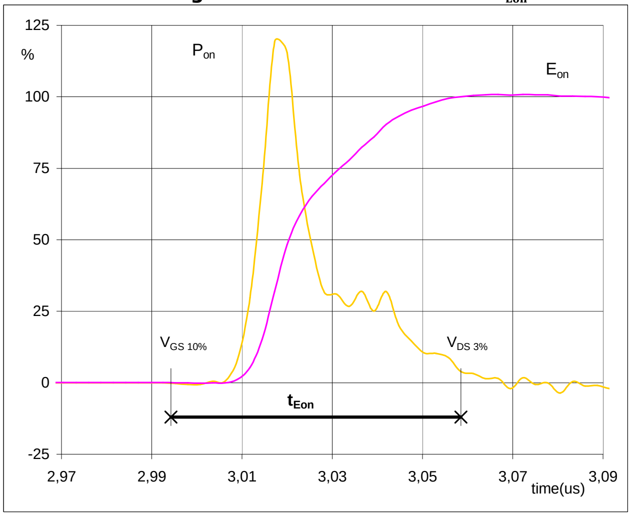
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	11,23	kW
E_{off} (100%) =	0,095	mJ
$t_{E\,off}$ =	0,113	μs

Figure 6 — **T1, T2, T3, T4, T5, T6 MOSFET**

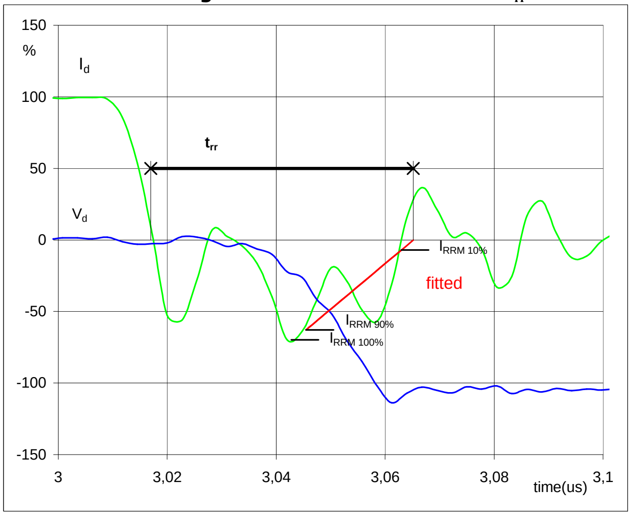
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	11,23	kW
E_{on} (100%) =	0,223	mJ
$t_{E\,on}$ =	0,064	μs

Figure 7 — **D1, D2, D3, D4, D5, D6 FWD**

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

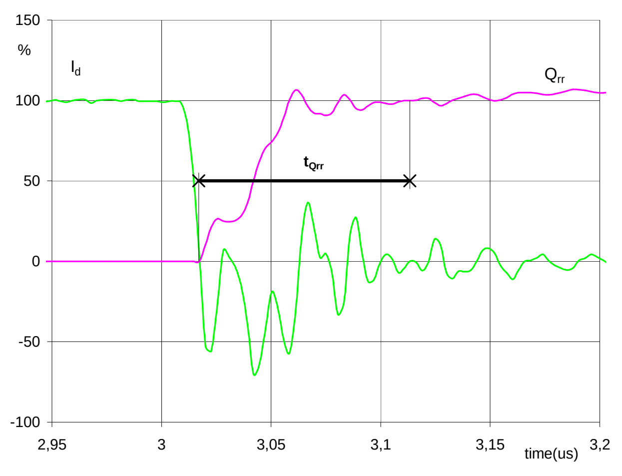


V_d (100%) =	700	V
I_d (100%) =	16	A
IRRM (100%) =	-12	A
trr =	0,047	μs

Switching Definitions Splitted Configuration

Figure 8	D1, D2, D3, D4, D5, D6 FWD

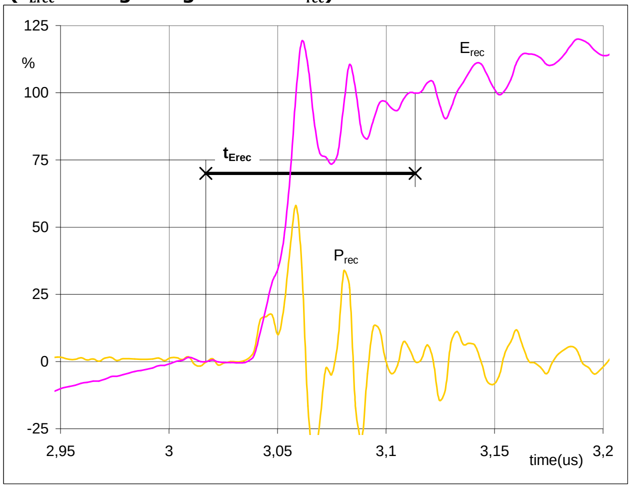
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	16	A
Qrr (100%) =	0,27	μC
$t_{Q\,rr}$ =	0,100	μs

Figure 9	D1, D2, D3, D4, D5, D6 FWD

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

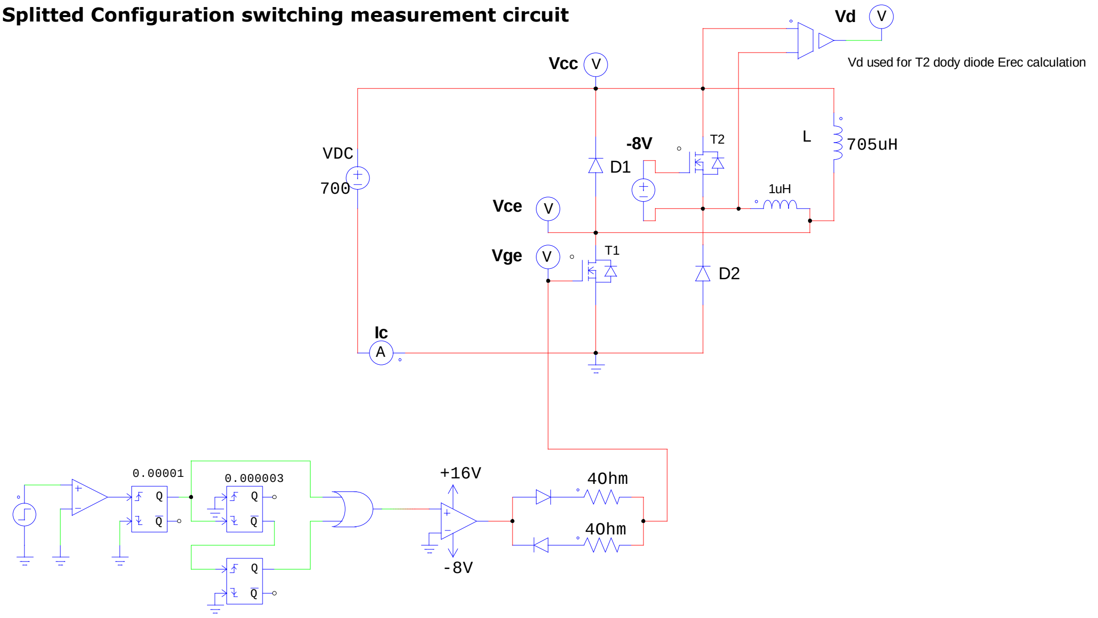


P_{rec} (100%) =	11,23	kW
E_{rec} (100%) =	0,05	mJ
$t_{E\,rec}$ =	0,100	μs

Measurement circuit

Figure 10

Splitted Configuration switching measurement circuit



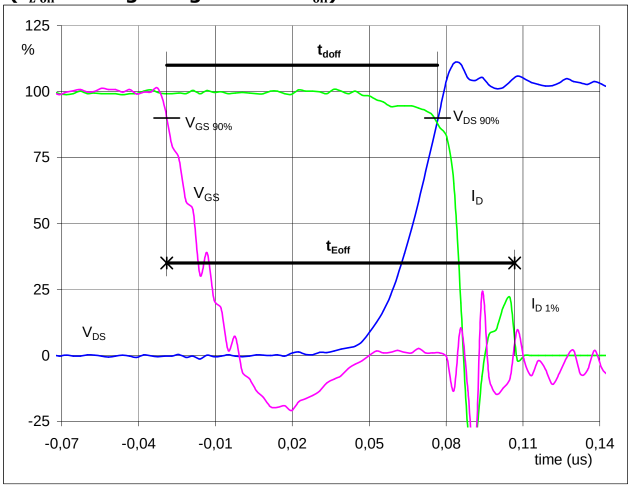
Switching Definitions Booster Configuration

General conditions

T_j	=	124 °C
R_{gon}	=	1 Ω
R_{goff}	=	1 Ω

Figure 1 T1, T2, T3, T4, T5, T6 MOSFET

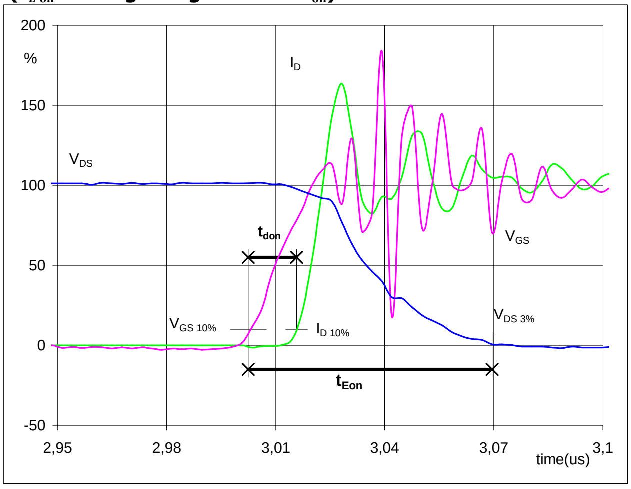
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GS} (0%) =	0	V
V_{GS} (100%) =	16	V
VD (100%) =	700	V
I_D (100%) =	16	A
t_{doff} =	0,106	μs
$t_{E\,off}$ =	0,136	μs

Figure 2 T1, T2, T3, T4, T5, T6 MOSFET

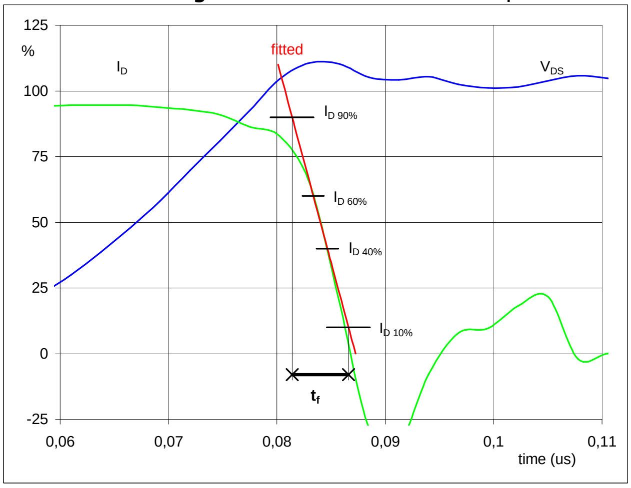
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GS} (0%) =	0	V
V_{GS} (100%) =	16	V
VD (100%) =	700	V
I_D (100%) =	16	A
t_{don} =	0,012	μs
$t_{E\,on}$ =	0,067	μs

Figure 3 T1, T2, T3, T4, T5, T6 MOSFET

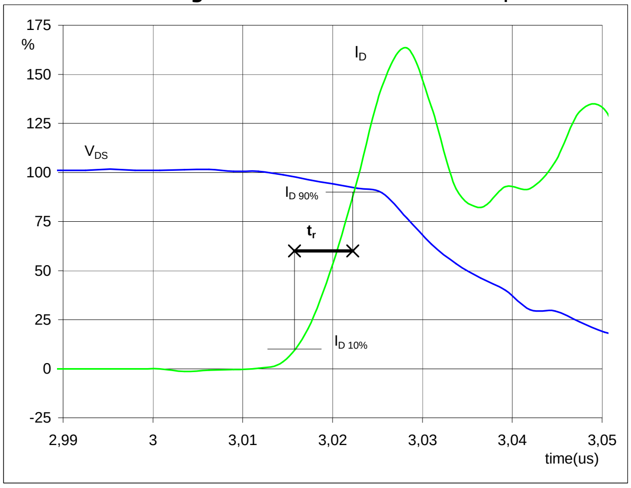
Turn-off Switching Waveforms & definition of t_f



VD (100%) =	700	V
I_D (100%) =	16	A
t_f =	0,005	μs

Figure 4 T1, T2, T3, T4, T5, T6 MOSFET

Turn-on Switching Waveforms & definition of t_r

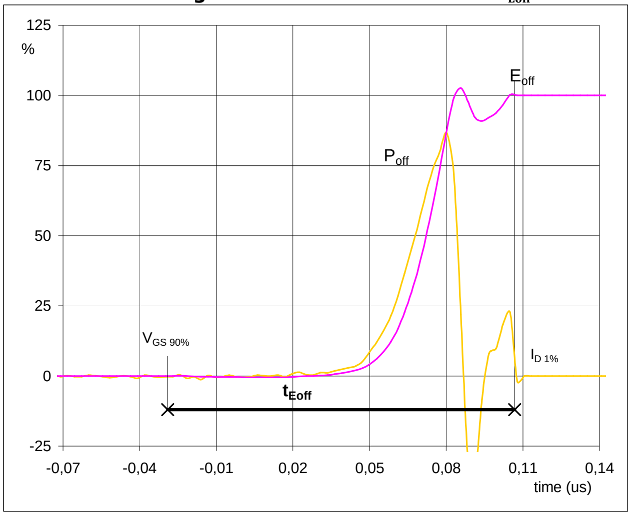


VD (100%) =	700	V
I_D (100%) =	16	A
t_r =	0,007	μs

Switching Definitions Booster Configuration

Figure 5 T1, T2, T3, T4, T5, T6 MOSFET

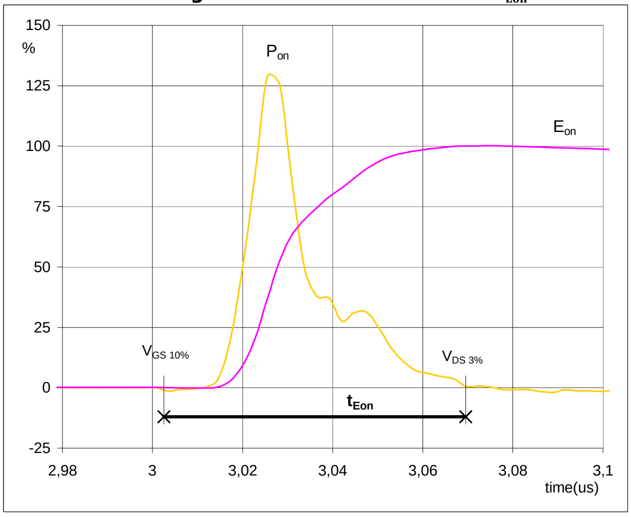
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	11,23	kW
E_{off} (100%) =	0,18	mJ
$t_{E\,off}$ =	0,136	µs

Figure 6 T1, T2, T3, T4, T5, T6 MOSFET

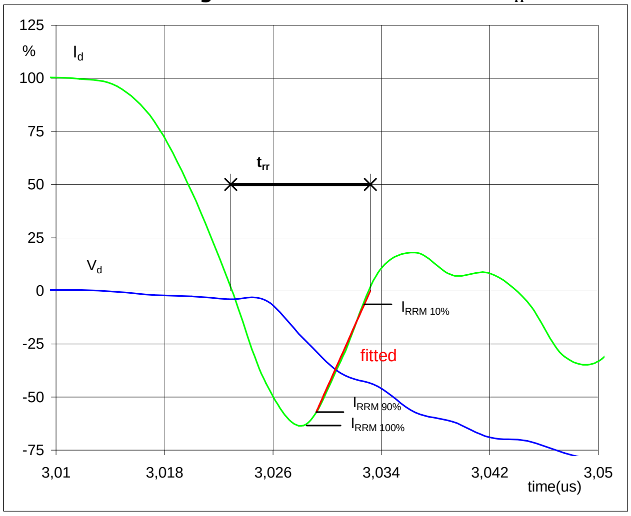
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	11,23	kW
E_{on} (100%) =	0,24	mJ
$t_{E\,on}$ =	0,067	µs

Figure 7 D1, D2, D3, D4, D5, D6 FWD

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

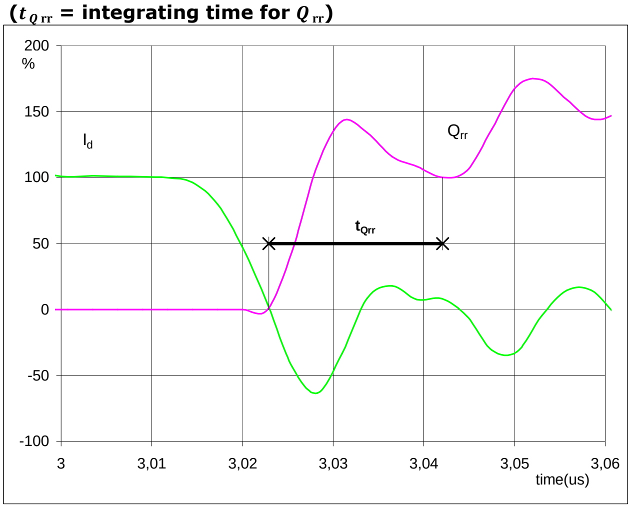


V_d (100%) =	700	V
I_d (100%) =	16	A
IRRM (100%) =	-10	A
trr =	0,010	µs

Switching Definitions Booster Configuration

Figure 8 D1, D2, D3, D4, D5, D6 FWD

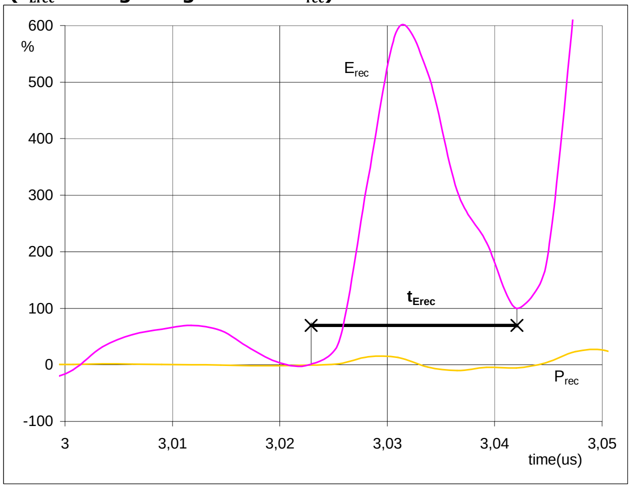
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	16	A
Qrr (100%) =	0,11	µC
$t_{Q\,rr}$ =	0,019	µs

Figure 9 D1, D2, D3, D4, D5, D6 FWD

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

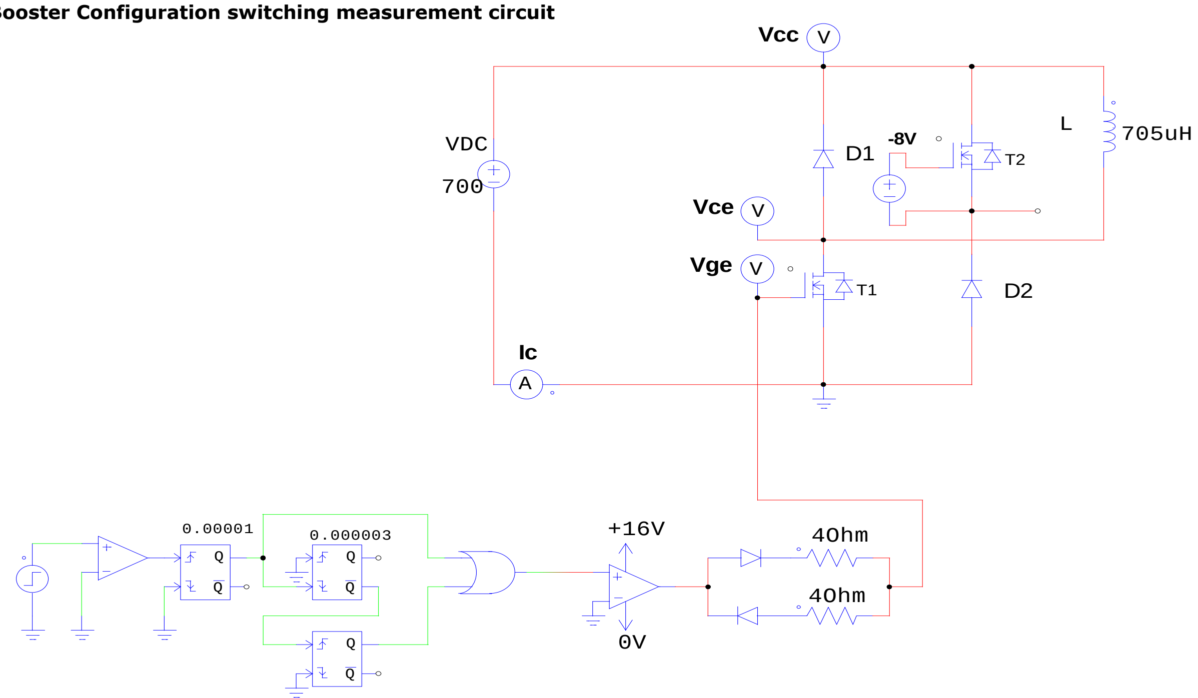


P_{rec} (100%) =	11,23	kW
E_{rec} (100%) =	0,04	mJ
$t_{E\,rec}$ =	0,019	µs

Measurement circuit

Figure 10

Booster Configuration switching measurement circuit



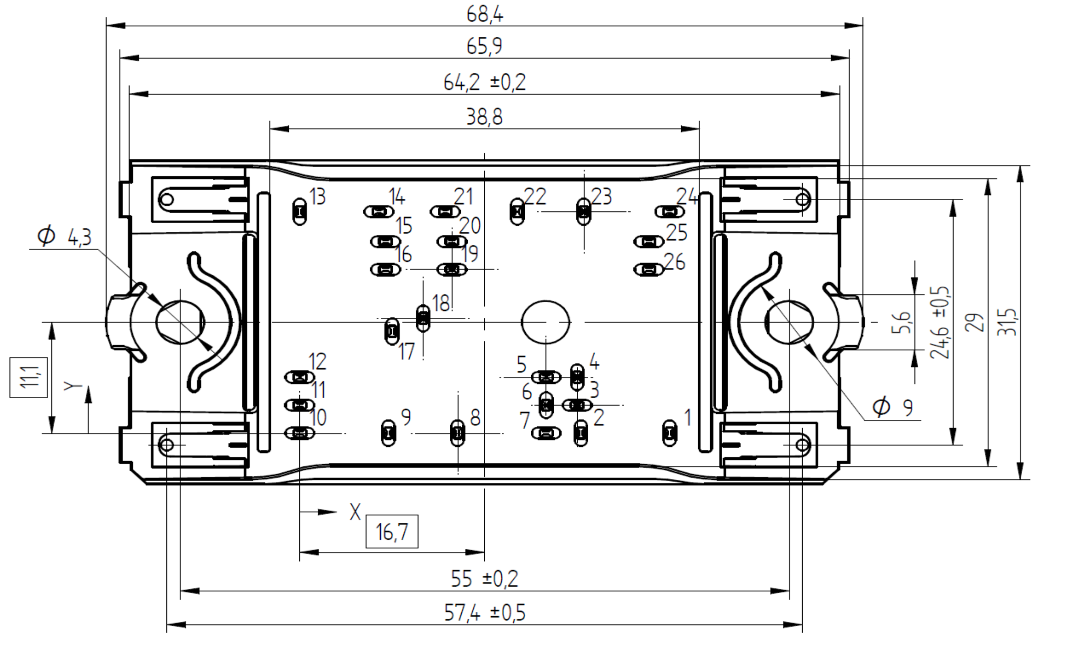
Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

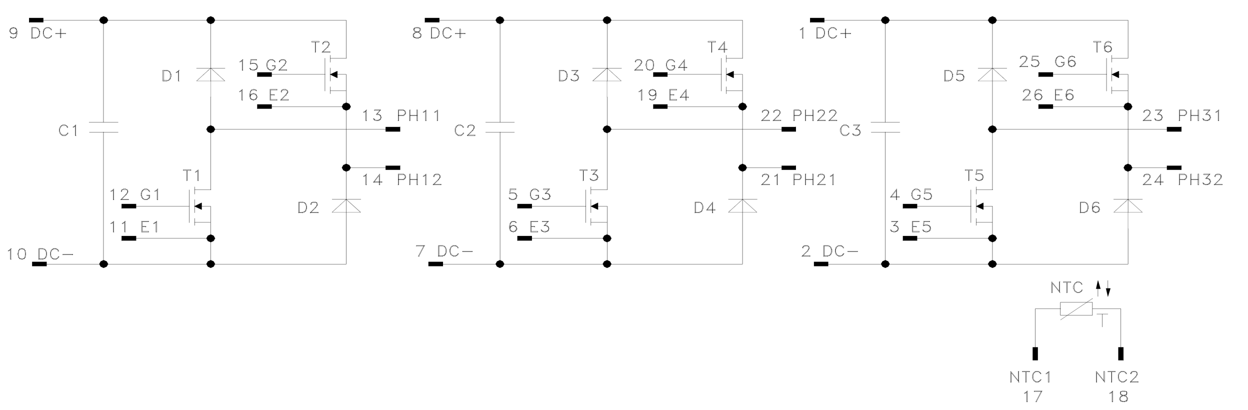
Version	Ordering Code	in DataMatrix as	in packaging barcode as
w/o thermal paste 12mm housing Press-fit pin	10-PZ126PA080MR-M909F28Y	M909F28Y	M909F28Y

Outline

Pin table		
Pin	X	Y
1	33,4	0
2	25,4	0
3	25,05	2,8
4	25,05	5,6
5	22,25	5,6
6	22,25	2,8
7	22,25	0
8	14,25	0
9	8	0
10	0	0
11	0	2,8
12	0	5,6
13	0	22,2
14	7,15	22,2
15	7,75	19,2
16	7,75	16,4
17	8,35	10,2
18	11,15	11,5
19	13,75	16,4
20	13,75	19,2
21	13,15	22,2
22	19,65	22,2
23	25,65	22,2
24	33,4	22,2
25	31,55	19,2
26	31,55	16,4



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1-T6	IGBT	1200V	35A	Half-Bridge Switch	
D1-D6	FWD	1200V	5A	Half-Bridge Diode	
C1-C3	Capacitor	1000V		DC Capacitor	
NTC	NTC			Thermistor	

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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.