flowMNPC 0-SIC — 1200V/ 30mΩ

Features

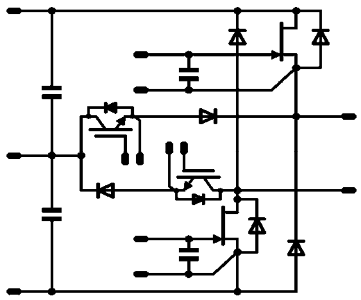
- **Rohm™** Silicon Carbide Power MOSFET
- **Rohm™** Silicon Carbide Power Schottky Diode
- MNPC Topology with Splitted Output
- Ultra Low Inductance with Integrated DC-capacitors
- Extremely Fast Switching with No "Tail" Current
- Unsensitivity for Cross Through Conduction
- Solderless Press-fit Mounting Technology

flow0 12mm housing

Target Applications

- High Efficient Solar Inverter
- UPS

Schematic



Types

- 10-PZ12NMA030MR-M340F18Y

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Half Bridge Inv. Diode					
Repetitive Peak Reverse Voltage	V_{RRM}	T_j=25°C		1200	V
Forward current per diode	I_F	T_j=$T_j$max	T_h=80°C T_c=80°C	20 20	A
Surge forward current	I_{FRM}	tp=10ms		43	A
I^2t-value	I^2t	T_j=$T_j$max	Th=80°C Tc=80°C	10	A²s
Power dissipation per Diode	P_{tot}			65 99	W
Maximum Junction Temperature	$T_j$max			150	°C
Half Bridge MOSFET					
Drain-source break down voltage	V_{DSS}			1200	V
DC drain current	I_D	T_j=$T_j$max	T_h=80°C T_c=80°C	52 60	A
Repetitive peak drain current	I_{Dpulse}	t_p limited by $T_j$max		120	A
Power dissipation per IGBT	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	149 226	W
Gate-source peak voltage	V_{GS}			-6 to +22	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150°C V_{GE}=15V		tbd. tbd.	μs V
Maximum Junction Temperature	$T_j$max			150	°C

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Neutral Point FWD					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25°C		600	V
DC forward current	I_F	T_j=$T_j$max	T_h=80°C T_c=80°C	40 40	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		108	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	73 111	W
Maximum Junction Temperature	$T_j$max			150	°C
Neutral Point IGBT					
Collector-emitter break down voltage	V_{CE}			600	V
DC collector current	I_C	T_j=$T_j$max	T_h=80°C T_c=80°C	57 75	A
Repetitive peak collector current	I_{Cpuls}	t_p limited by $T_j$max		200	A
Power dissipation per IGBT	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	126 191	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150°C V_{GE}=15V		5 400	μs V
Maximum Junction Temperature	$T_j$max			175	°C
Neutral Point Inv. Diode					
Peak Repetitive Reverse Voltage	V_{RRM}	T_c=25°C		1200	V
DC forward current	I_F	T_j=$T_j$max	T_h=80°C T_c=80°C	12 19	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		12	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	40 60	W
Maximum Junction Temperature	$T_j$max			175	°C
Half Bridge FWD					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25°C		1200	V
DC forward current	I_F	T_j=$T_j$max	T_h=80°C T_c=80°C	19 24	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		43	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	52 79	W
Maximum Junction Temperature	$T_j$max			150	°C

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
DC link Capacitor				
Max.DC voltage	V_{MAX}	Tc=25°C	500	V
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{op}		-40…+(Tjmax - 25)	°C
Insulation Properties				
Insulation voltage	V_{is}	t=2s DC voltage	4000	V
Creepage distance			min 12,7	mm
Clearance			min 12,7	mm
Comparative tracking index	CTI		>200	

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 Inv. Diode										
Forward voltage	V_f				10	Tj=25°C Tj=125°C		1,44 1,67	1,7	V
Threshold voltage (for power loss calc. only)	V_{to}				44	Tj=25°C Tj=125°C		1,05 1,06		V
Slope resistance (for power loss calc. only)	r_t				44	Tj=25°C Tj=125°C		0,04 0,06		Ω
Reverse current	I_r			1200		Tj=25°C Tj=125°C			0,2	mA
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,07		K/W
Thermal resistance chip to case per chip	R_{thJC}							0,71		
Half Bridge MOSFET										
Drain-source on-state resistance	$R_{ds(on)}$	V_{CE}=V_{GE}	16		60	Tj=25°C Tj=125°C		0,04 0,05	0,12	Ω
Gate threshold voltage	$V_{(GS)th}$	V_{DS}=V_{GS}			0,0132	Tj=25°C Tj=125°C	1,7	2,20 3,05	3,7	V
Total Gate Reverse Leakage	I_{GSS+} I_{GSS-}		22 -6	0		Tj=25°C Tj=25°C			0,3 -0,3	mA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		Tj=25°C Tj=125°C			300	nA
Turn-on delay time	$t_{d(on)}$	Rgoff=1 Ω Rgon=1 Ω	16/-5	350	44	Tj=25°C Tj=125°C		36 35		ns
Rise time	t_r					Tj=25°C Tj=125°C		14 12		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=125°C		102 108		
Fall time	t_f					Tj=25°C Tj=125°C		29 22		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=125°C		0,24 0,20		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=125°C		0,15 0,13		
Total gate charge *	Q_g		18	600	30	Tj=25°C		294		pF
Gate to source charge	Q_{gs}							90		pF
Gate to drain charge	Q_{gd}							90		pF
Input capacitance *	C_{ies}	f=1MHz	0	25		Tj=25°C		6600		pF
Output capacitance	C_{oss}							1143		
Reverse transfer capacitance	C_{rss}							138		
Gate capacitor	C_{Gate}					Tj=25°C		tbd.		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,47		K/W
Thermal resistance chip to case per chip	R_{thJC}							0,31		
Neutral Point FWD										
Diode forward voltage	V_F				30	Tj=25°C Tj=125°C		1,42 1,57	1,7	V
Peak reverse recovery current	I_{RRM}	Rgon=1 Ω	16/-5	350	44	Tj=25°C Tj=125°C		28 32		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		13 21		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=125°C		0,24 0,30		μC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=125°C		6266 6890		A/μs
Reverse recovered energy	Erec					Tj=25°C Tj=125°C		0,04 0,06		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,95		K/W
Thermal resistance chip to case per chip	R_{thJC}							0,63		

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	
Neutral Point IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,0008	Tj=25°C Tj=125°C	4,1	5,1	5,7	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		50	Tj=25°C Tj=125°C		1,81 2,03	2,3	V
Collector-emitter cut-off incl diode	I_{CES}		0	600		Tj=25°C Tj=125°C			0,04	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=125°C			100	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=4 Ω Rgon=4 Ω	±15	0		Tj=25°C Tj=125°C		62 62		ns
Rise time	t_r					Tj=25°C Tj=125°C		8 9		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=125°C		95 115		
Fall time	t_f					Tj=25°C Tj=125°C		10 15		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=125°C		0,28 0,36		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=125°C		0,32 0,57		
Input capacitance	C_{ies}	f=1MHz	±15	350	44	Tj=25°C		2960		pF
Output capacitance	C_{oss}							116		
Reverse transfer capacitance	C_{rss}							96		
Gate charge	Q_{Gate}	f=1MHz	0	25		Tj=25°C		315		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,75		K/W
Thermal resistance chip to case per chip	R_{thJC}							0,50		
Neutral Point Inv. Diode										
Diode forward voltage	V_F				6	Tj=25°C Tj=125°C	1,25	1,72 1,70	1,95	V
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						2,39		K/W
Thermal resistance chip to case per chip	R_{thJC}							1,57		
Half Bridge FWD										
Diode forward voltage	V_F				10	Tj=25°C Tj=125°C		1,45 1,77	1,7	V
Reverse leakage current	I_r			1200		Tj=25°C Tj=125°C			200	μA
Peak reverse recovery current	I_{RRM}	Rgon=4 Ω	±15	350	44	Tj=25°C Tj=125°C		29 28		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		25 26		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=125°C		0,29 0,26		μC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=125°C		4940 6243		A/μs
Reverse recovery energy	E_{rec}					Tj=25°C Tj=125°C		0,04 0,03		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,34		K/W
Thermal resistance chip to case per chip	R_{thJC}							0,88		

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	
DC link Capacitor										
C value	C							270		nF
Thermistor										
Rated resistance	R					Tj=25°C		22000		Ω
Deviation of R100	ΔR/R	R100=1486 Ω				Tc=100°C	-5		+5	%
Power dissipation	P					Tj=25°C		200		mW
Power dissipation constant						Tj=25°C		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				Tj=25°C		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				Tj=25°C		3996		K
Vincotech NTC Reference									B	

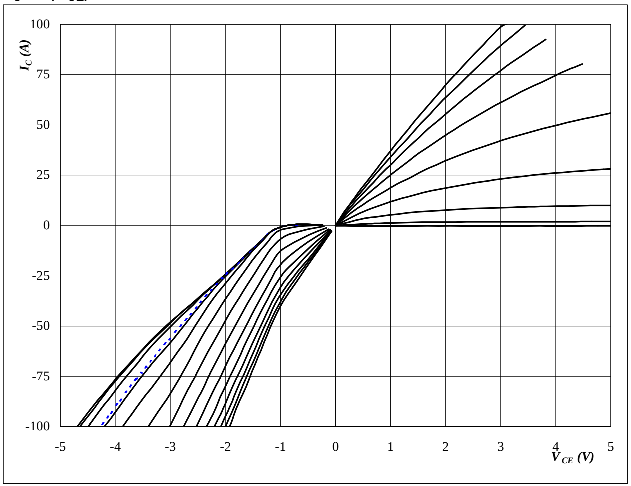
Half Bridge

half bridge MOSFET and neutral point FWD

Figure 1 MOSFET

Typical output characteristics

$I_C = f(V_{CE})$



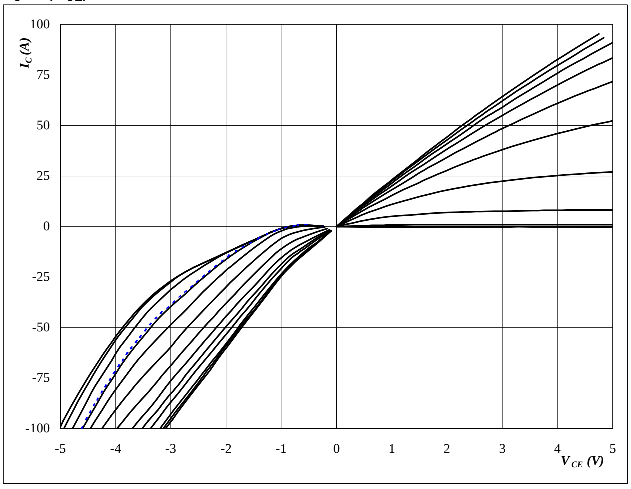
At

t_p =	250	μs
T_j =	25	°C
V_{GE} from	-6 V to 20 V in steps of 2 V	

Figure 2 MOSFET

Typical output characteristics

$I_C = f(V_{CE})$



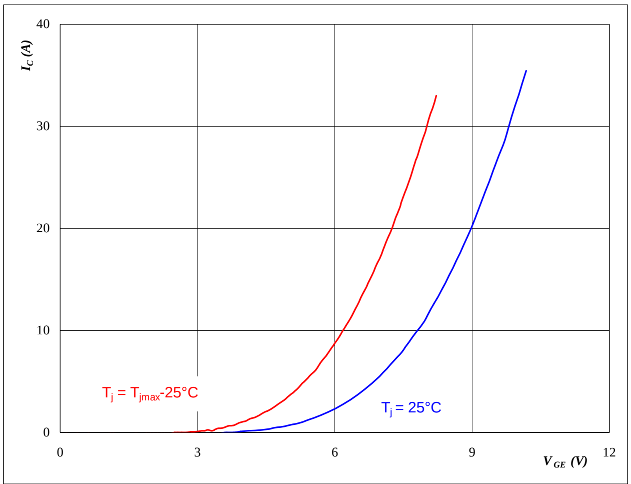
At

t_p =	250	μs
T_j =	125	°C
V_{GE} from	-6 V to 20 V in steps of 2 V	

Figure 3 MOSFET

Typical transfer characteristics

$I_C = f(V_{GE})$



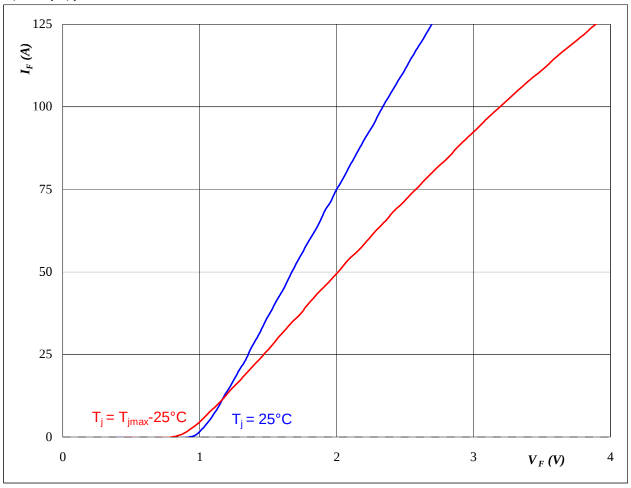
At

t_p =	250	μs
V_{CE} =	10	V

Figure 4 FWD

Typical FWD forward current as a function of forward voltage

$I_F = f(V_F)$



At

t_p =	250	μs

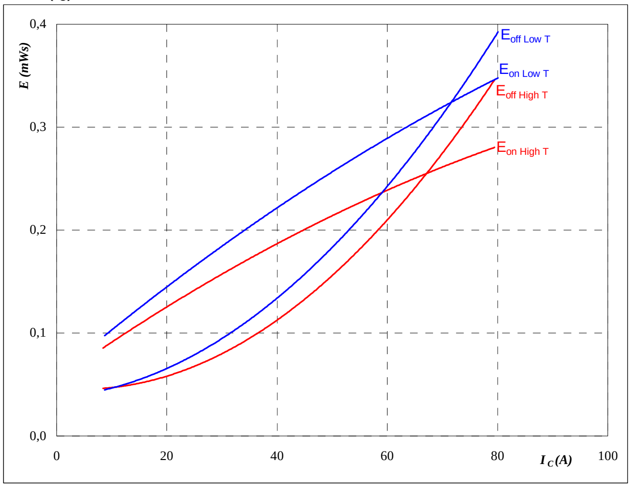
Half Bridge

half bridge MOSFET and neutral point FWD

Figure 5 MOSFET

Typical switching energy losses
as a function of collector current

$E = f(I_C)$



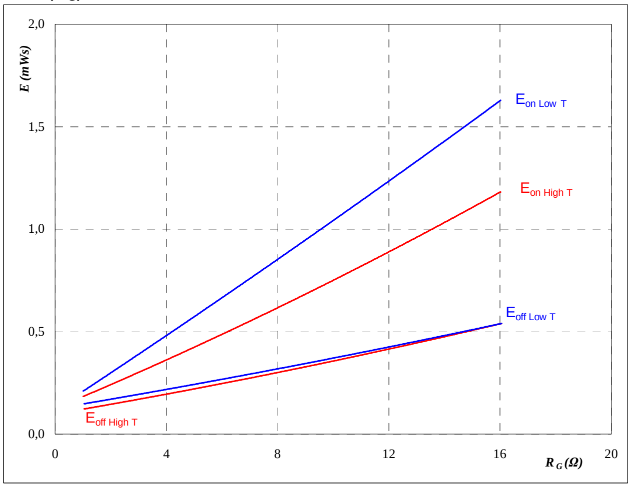
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	+16/-5	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

Figure 6 MOSFET

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



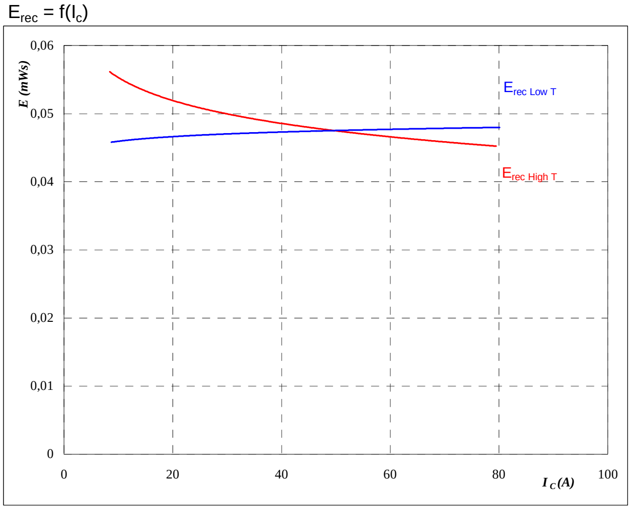
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	+16/-5	V
I_C =	44	A

Figure 7 FWD

Typical reverse recovery energy loss
as a function of collector current

$E_{rec} = f(I_c)$



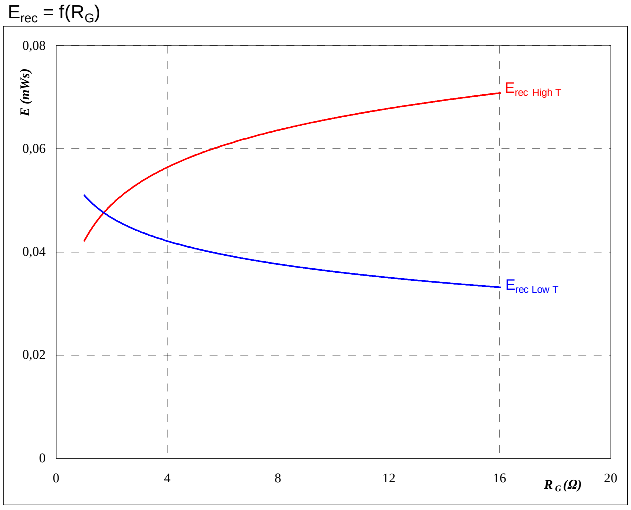
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	+16/-5	V
R_{gon} =	1	Ω

Figure 8 FWD

Typical reverse recovery energy loss
as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

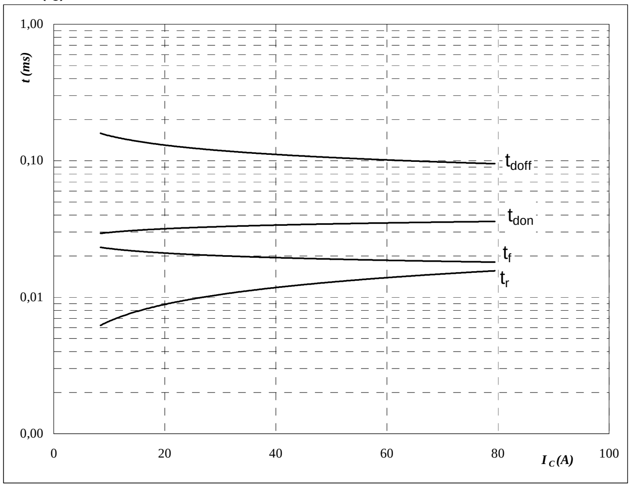
T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	+16/-5	V
I_C =	44	A

Half Bridge

Figure 9 MOSFET

Typical switching times as a function of collector current

t = f(I_C)



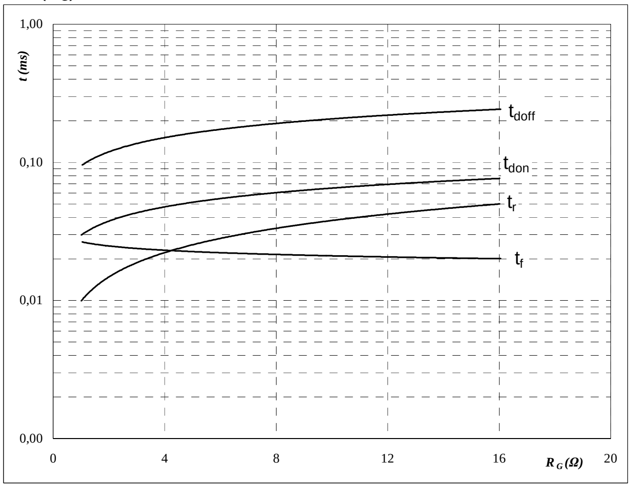
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	+16/-5	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

Figure 10 MOSFET

Typical switching times as a function of gate resistor

t = f(R_G)



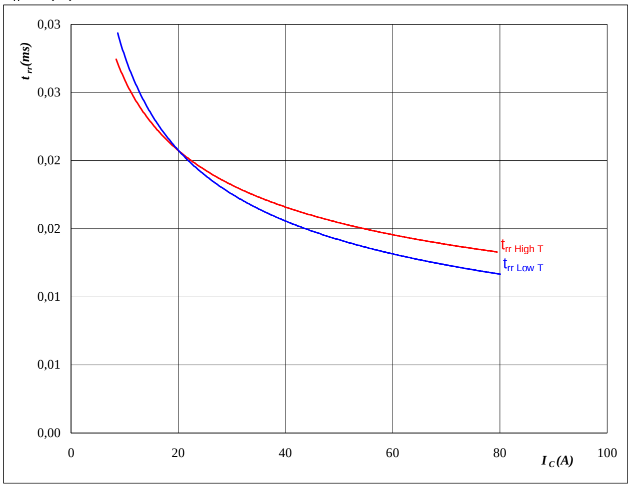
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	+16/-5	V
I_C =	44	A

Figure 11 FWD

Typical reverse recovery time as a function of collector current

t_{rr} = f(Ic)



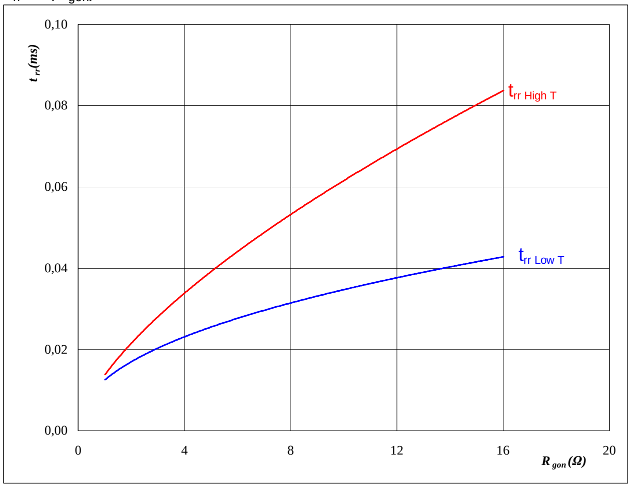
At

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	+16/-5	V
R_{gon} =	1	Ω

Figure 12 FWD

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

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



At

T_j =	25/125	°C
V_R =	350	V
I_F =	44	A
V_{GE} =	+16/-5	V

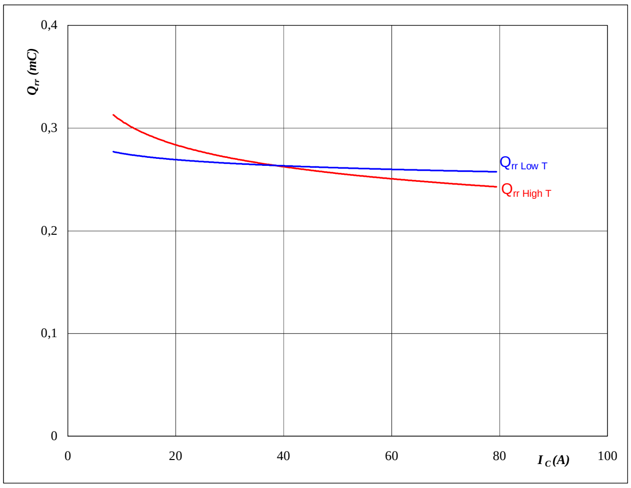
Half Bridge

half bridge MOSFET and neutral point FWD

Figure 13 — FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



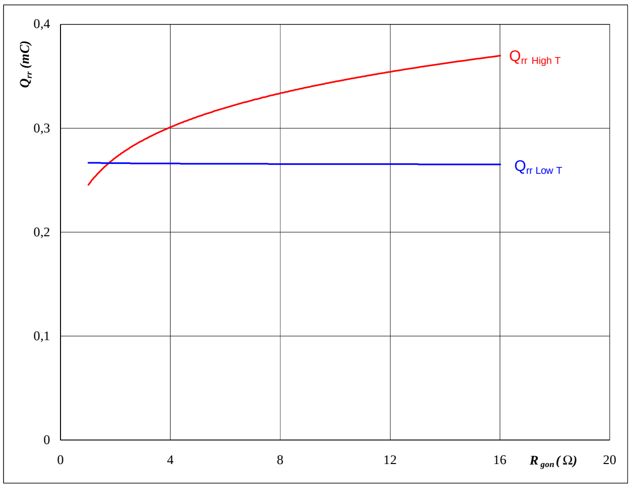
At

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	+16/-5	V
R_{gon} =	1	Ω

Figure 14 — FWD

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

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



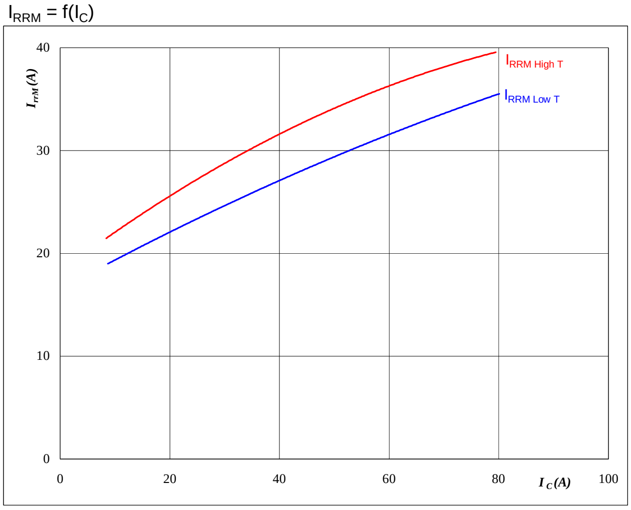
At

T_j =	25/125	°C
V_R =	350	V
I_F =	44	A
V_{GE} =	+16/-5	V

Figure 15 — FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



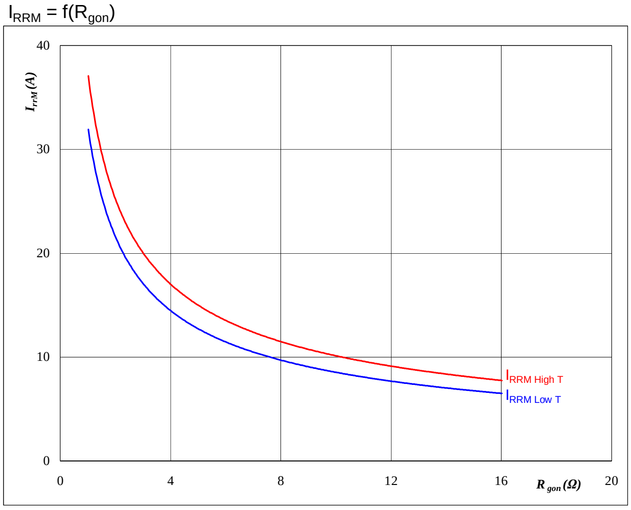
At

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	+16/-5	V
R_{gon} =	1	Ω

Figure 16 — FWD

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

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



At

T_j =	25/125	°C
V_R =	350	V
I_F =	44	A
V_{GE} =	+16/-5	V

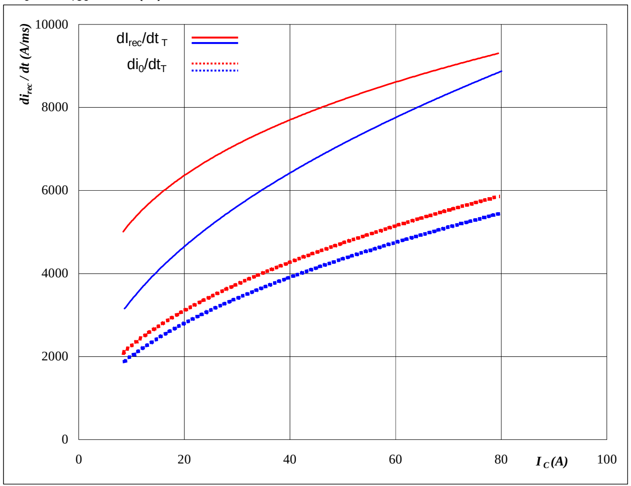
Half Bridge

half bridge MOSFET and neutral point FWD

Figure 17 FWD

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

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



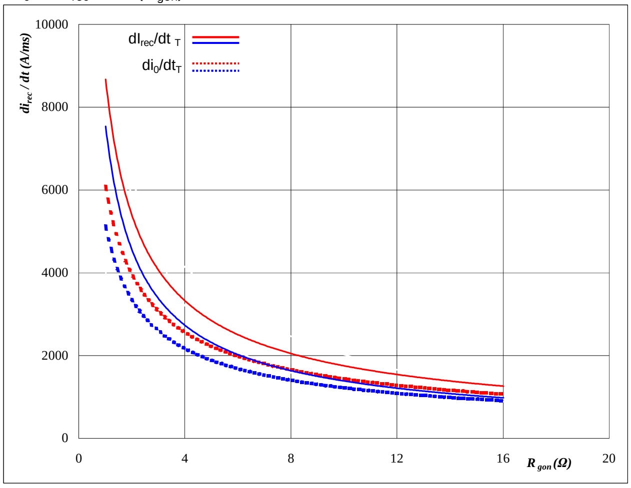
At

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	+16/-5	V
R_{gon} =	1	Ω

Figure 18 FWD

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

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



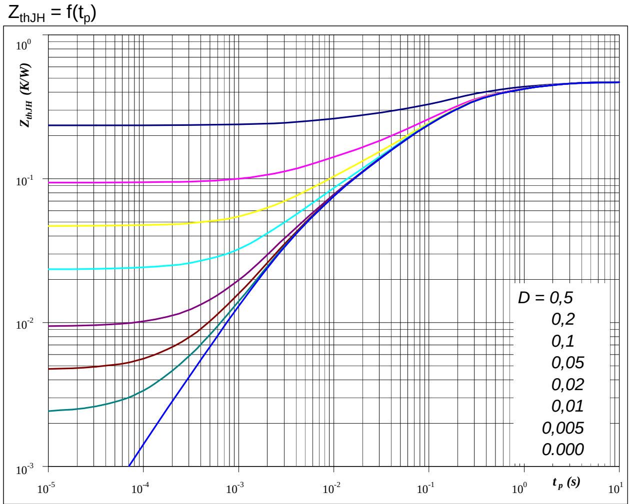
At

T_j =	25/125	°C
V_R =	350	V
I_F =	44	A
V_{GE} =	+16/-5	V

Figure 19 MOSFET

IGBT transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	0,47	K/W

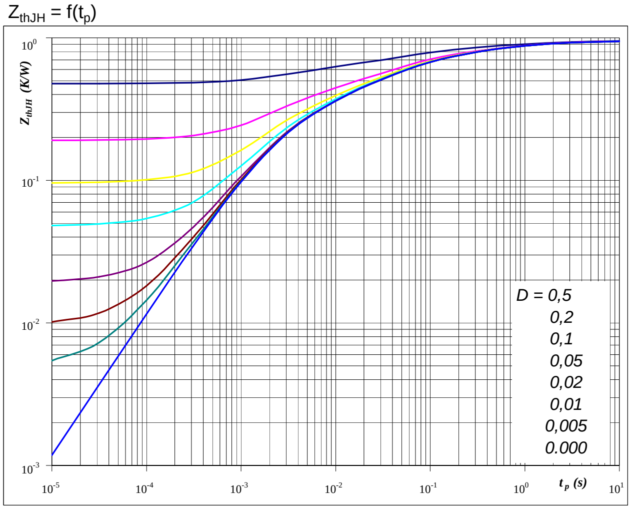
IGBT thermal model values

R (C/W)	Tau (s)
0,09	1,5E+00
0,18	2,3E-01
0,12	7,4E-02
0,06	1,1E-02
0,02	2,7E-03

Figure 20 FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	0,95	K/W

FWD thermal model values

R (C/W)	Tau (s)
0,02	8,7E+00
0,12	1,3E+00
0,18	2,3E-01
0,29	4,7E-02
0,17	8,7E-03
0,18	2,0E-03

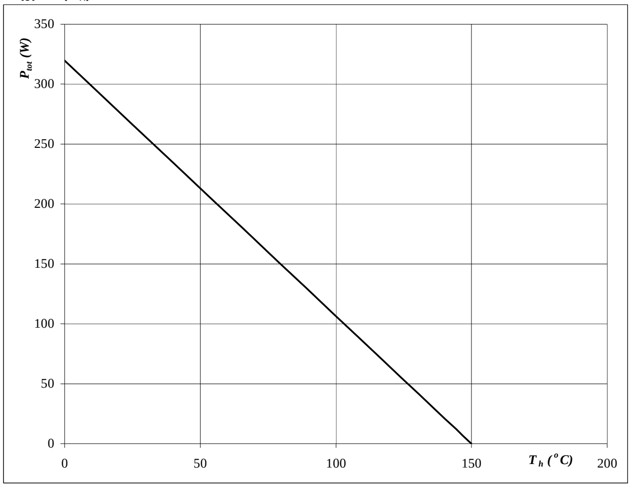
Half Bridge

half bridge MOSFET and neutral point FWD

Figure 21 MOSFET

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



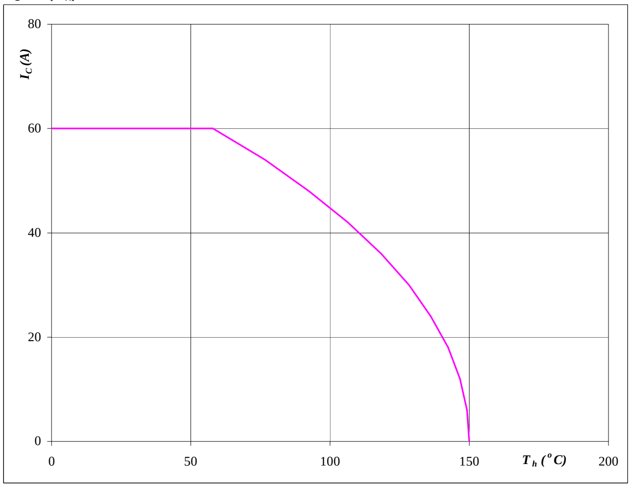
At

T_j = 150 °C

Figure 22 MOSFET

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

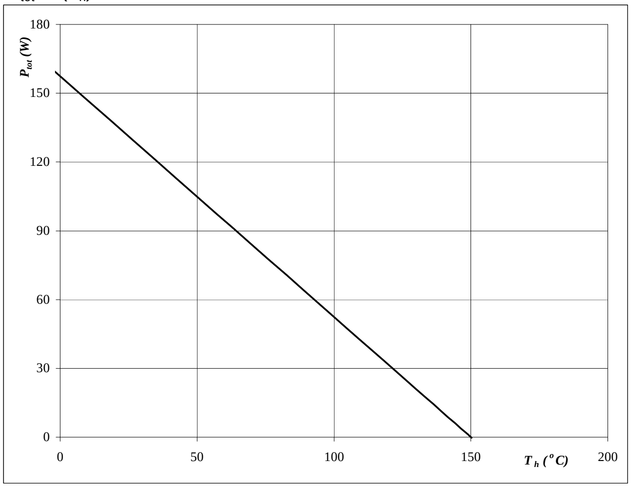
T_j = 150 °C

V_{GE} = 15 V

Figure 23 FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



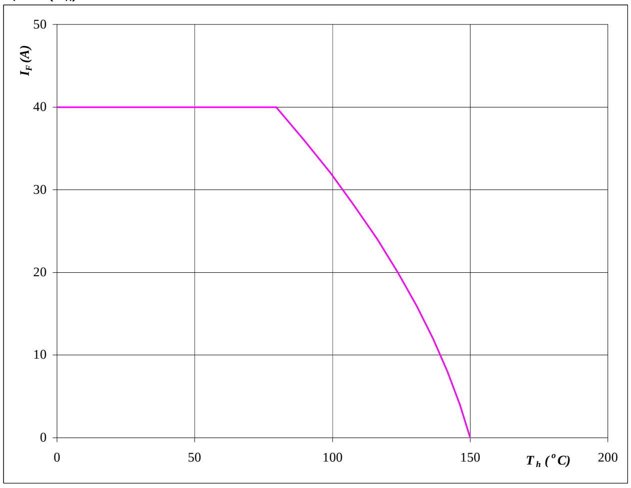
At

T_j = 150 °C

Figure 24 FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

T_j = 150 °C

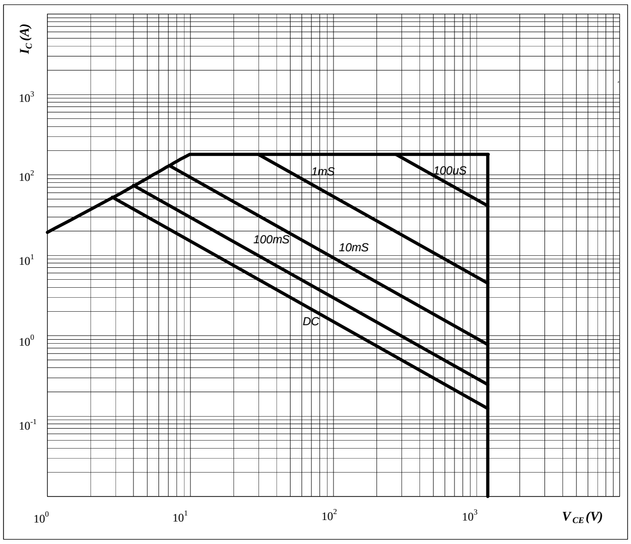
Half Bridge

half bridge MOSFET and neutral point FWD

Figure 25 MOSFET

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



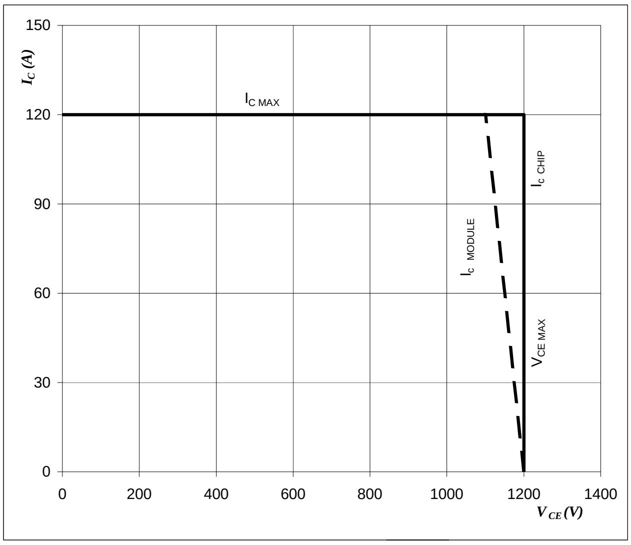
At

D =	single pulse	
Th =	80	ºC
V_{GE} =	15	V
T_j =	T_{jmax}	ºC

Figure 27 MOSFET

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j = T_{jmax}-25 ºC

$U_{ccminus}$=U_{ccplus}

Switching mode : 3 level switching

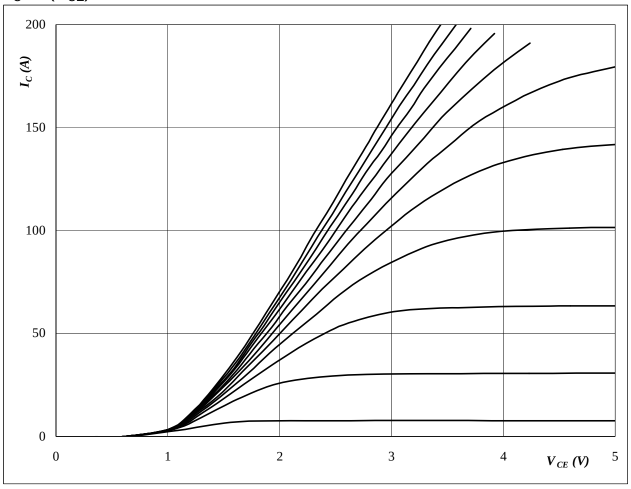
Neutral Point

neutral point IGBT and half bridge FWD

Figure 1 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



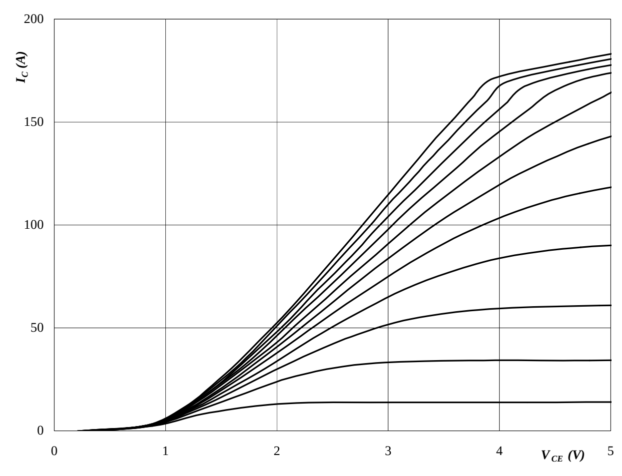
At

t_p =	250	µs
T_j =	25	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

Figure 2 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



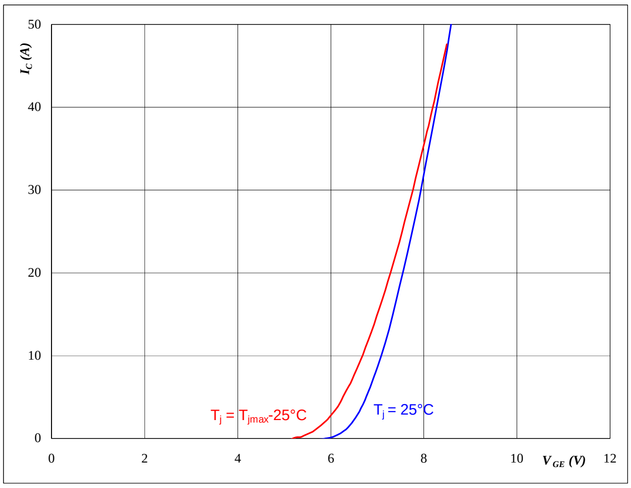
At

t_p =	250	µs
T_j =	125	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

Figure 3 IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



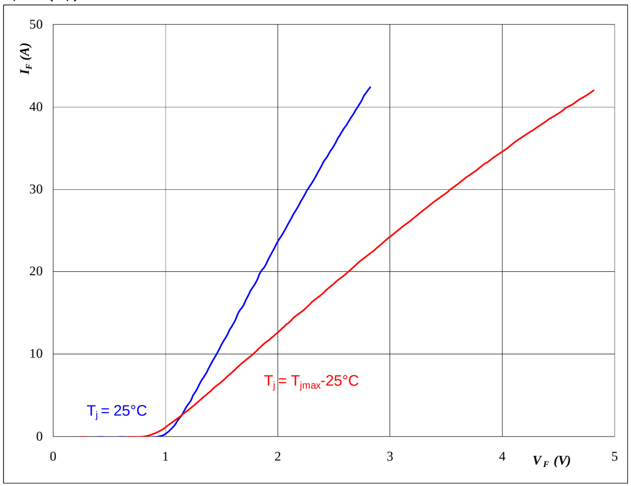
At

t_p =	250	µs
V_{CE} =	10	V

Figure 4 FWD

Typical FWD forward current as a function of forward voltage

$I_F = f(V_F)$



At

t_p =	250	µs

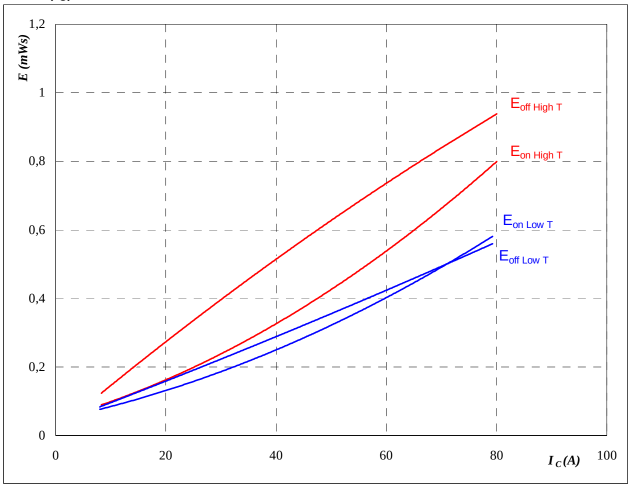
Neutral Point

neutral point IGBT and half bridge FWD

Figure 5 IGBT

Typical switching energy losses
as a function of collector current

$E = f(I_C)$



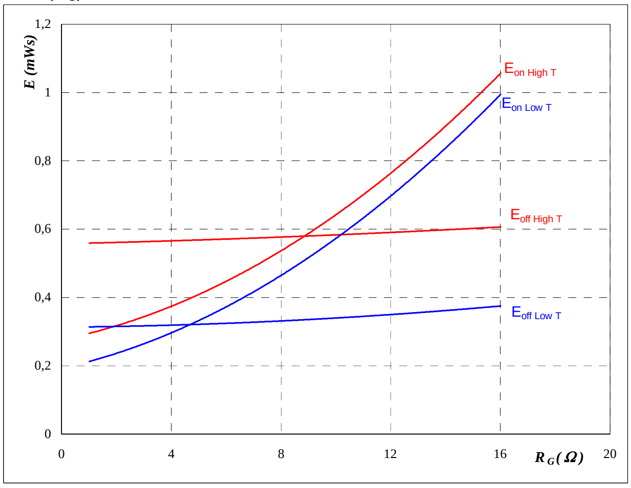
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 6 IGBT

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



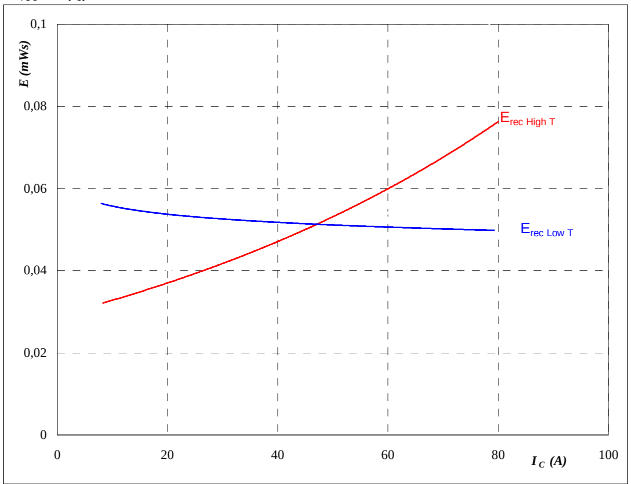
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	44	A

Figure 7 FWD

Typical reverse recovery energy loss
as a function of collector current

$E_{rec} = f(I_c)$



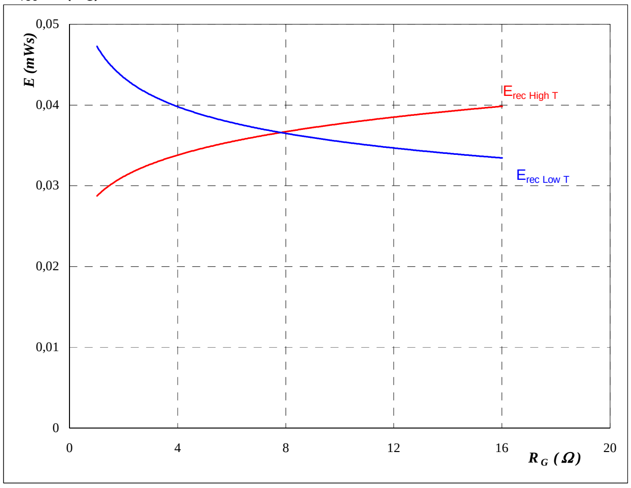
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

Figure 8 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_{CE} =	350	V
V_{GE} =	±15	V
I_C =	44	A

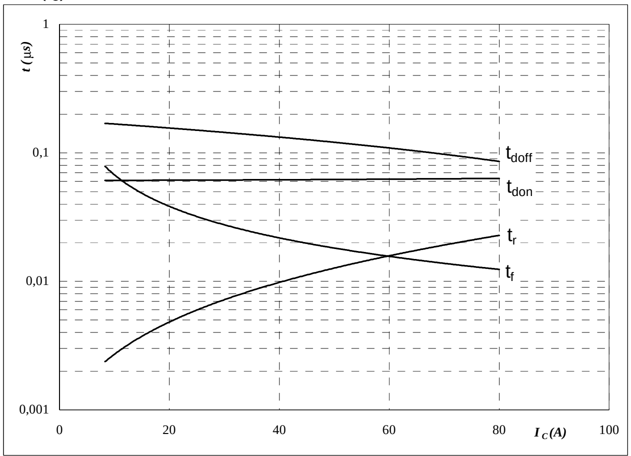
Neutral Point

neutral point IGBT and half bridge FWD

Figure 9 IGBT

Typical switching times as a function of collector current

t = f(I_C)



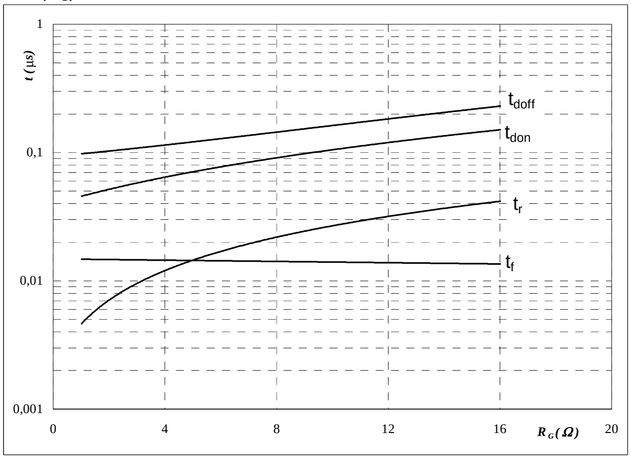
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 10 IGBT

Typical switching times as a function of gate resistor

t = f(R_G)



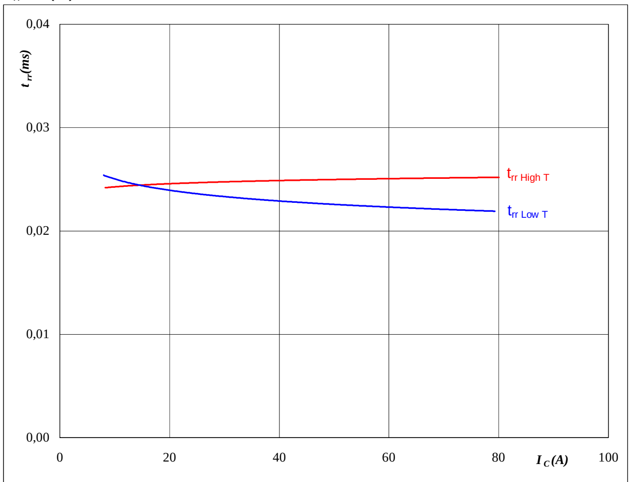
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	44	A

Figure 11 FWD

Typical reverse recovery time as a function of collector current

t_{rr} = f(Ic)



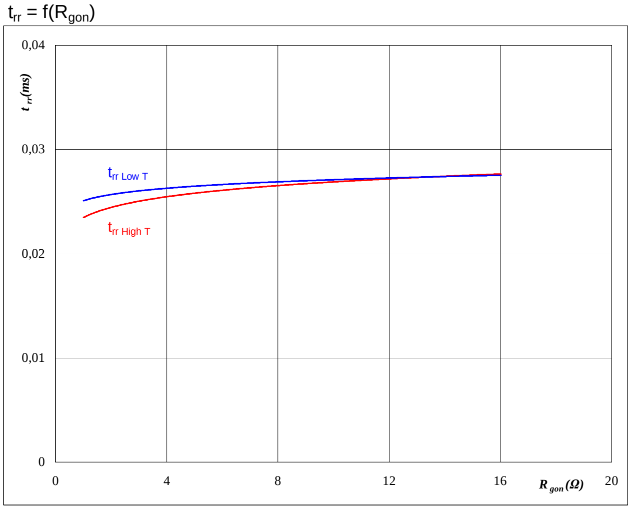
At

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

Figure 12 FWD

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

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



At

T_j =	25/125	°C
V_R =	350	V
I_F =	44	A
V_{GE} =	±15	V

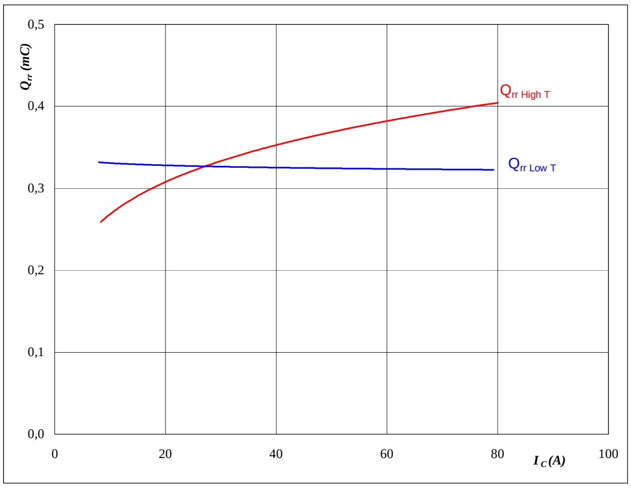
Neutral Point

neutral point IGBT and half bridge FWD

Figure 13 FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



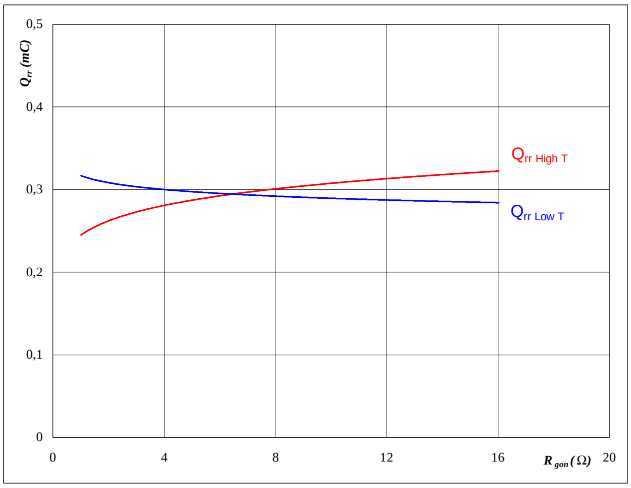
At

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

Figure 14 FWD

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

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



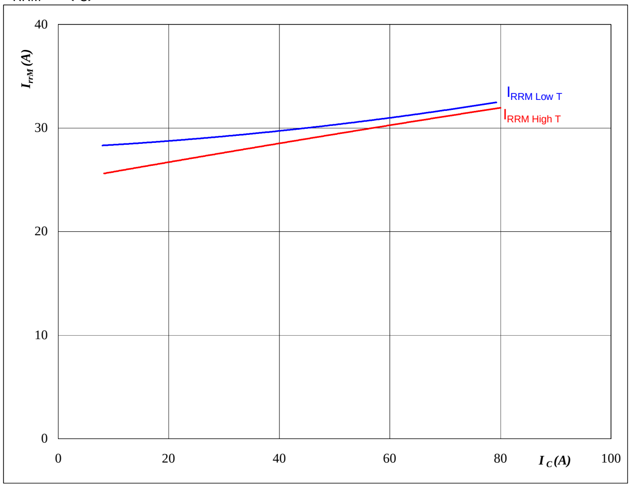
At

T_j =	25/125	°C
V_R =	350	V
I_F =	44	A
V_{GE} =	±15	V

Figure 15 FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



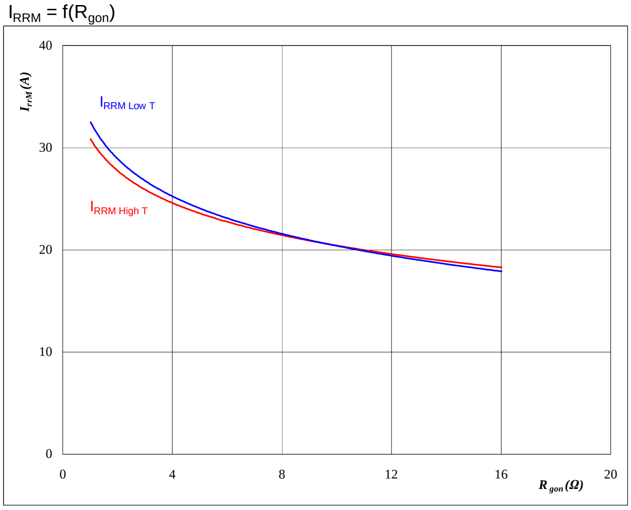
At

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

Figure 16 FWD

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

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



At

T_j =	25/125	°C
V_R =	350	V
I_F =	44	A
V_{GE} =	±15	V

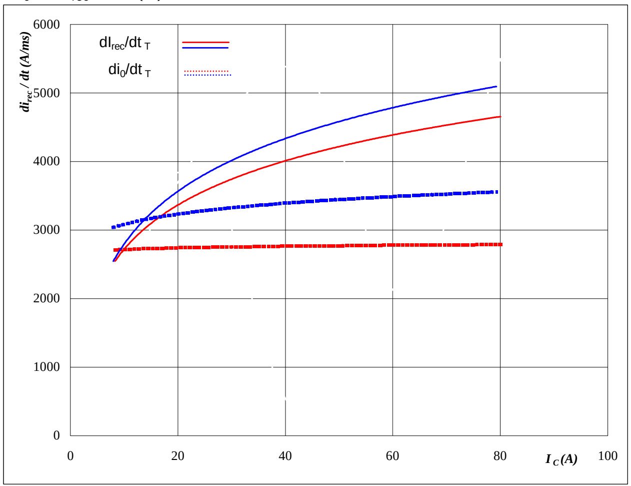
Neutral Point

neutral point IGBT and half bridge FWD

Figure 17 FWD

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

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



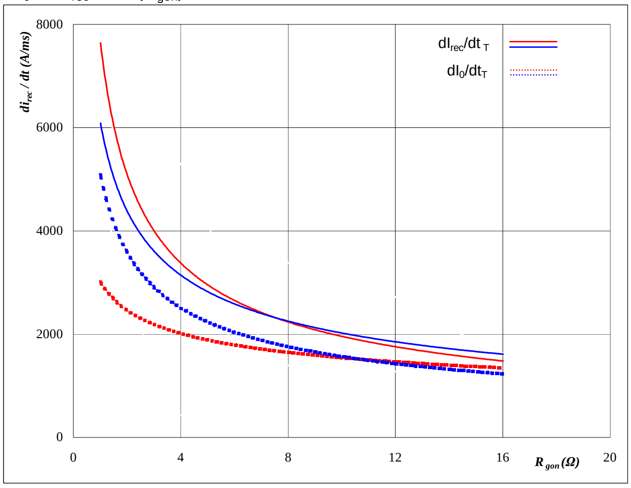
At

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

Figure 18 FWD

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

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



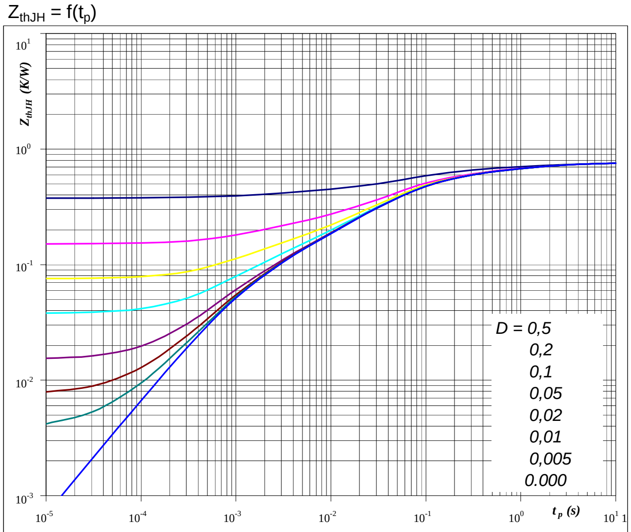
At

T_j =	25/125	°C
V_R =	350	V
I_F =	44	A
V_{GE} =	±15	V

Figure 19 IGBT

IGBT transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	tp / T	
R_{thJH} =	0,75	K/W

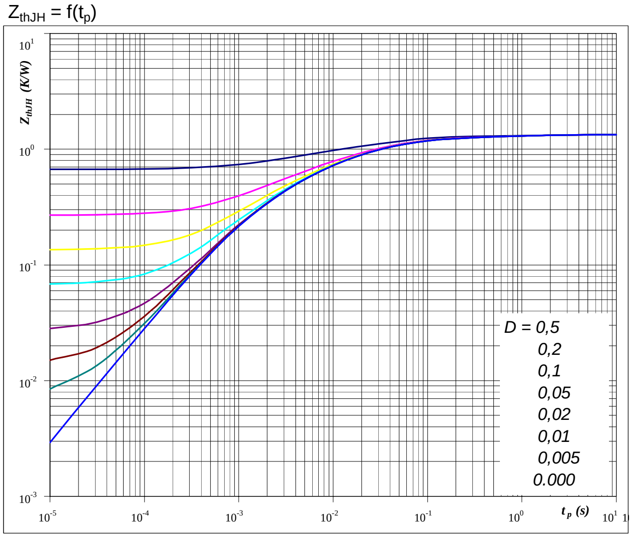
IGBT thermal model values

R (C/W)	Tau (s)
0,08	2,57
0,12	0,60
0,18	0,13
0,25	0,04
0,07	0,01

Figure 20 FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	tp / T	
R_{thJH} =	1,34	K/W

FWD thermal model values

R (C/W)	Tau (s)
0,03	4,10
0,07	0,76
0,18	0,09
0,50	0,02
0,38	0,00

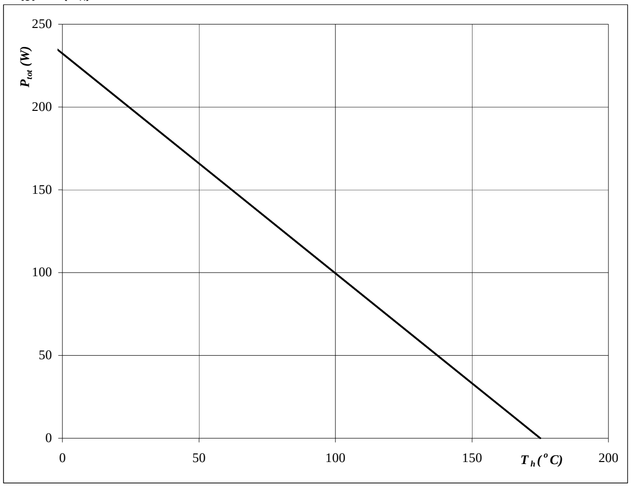
Neutral Point

neutral point IGBT and half bridge FWD

Figure 21 IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



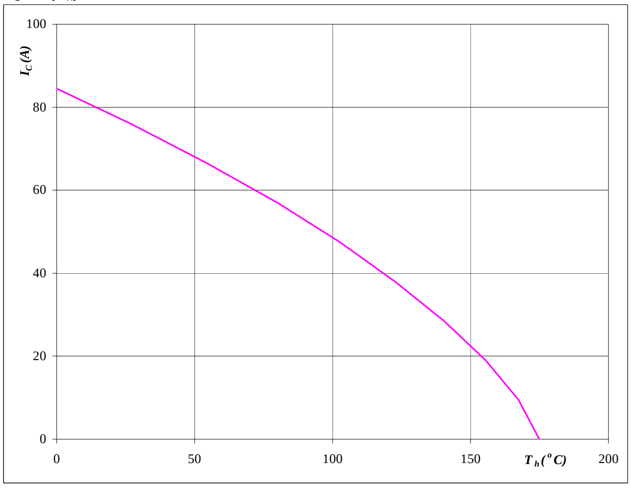
At

T_j = 175 ºC

Figure 22 IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

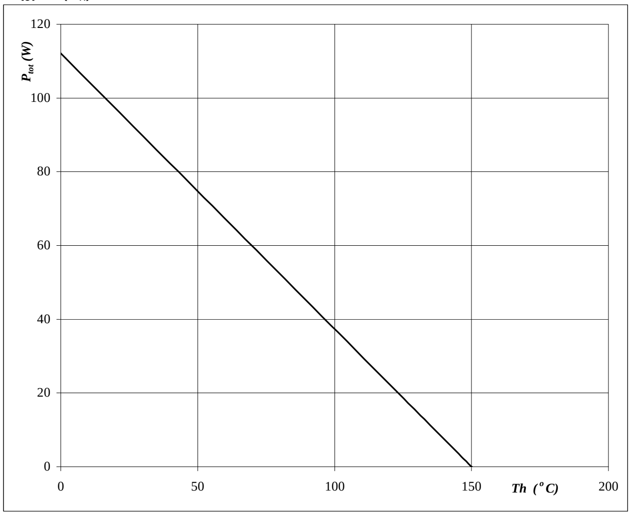
T_j = 175 ºC

V_{GE} = 15 V

Figure 23 FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



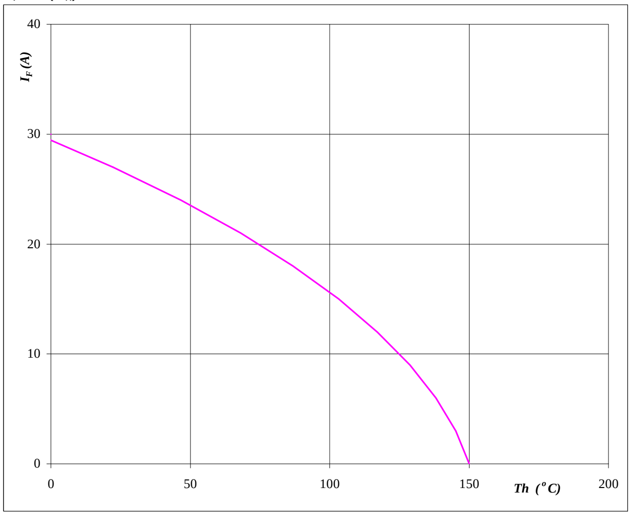
At

T_j = 150 ºC

Figure 24 FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

T_j = 150 ºC

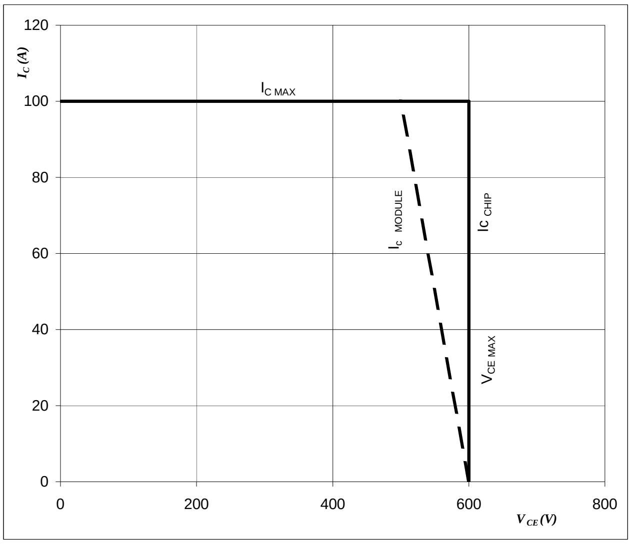
Neutral Point

neutral point IGBT

Figure 25 IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j = T_{jmax}-25 ºC

$U_{ccminus}$=U_{ccplus}

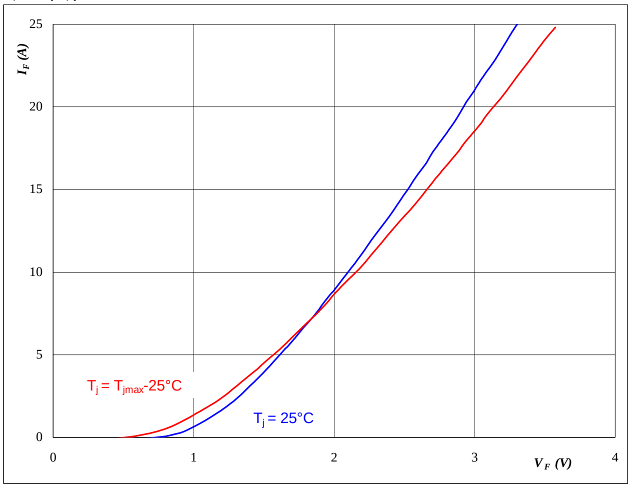
Switching mode : 3 level switching

Neutral Point Inverse Diode

Figure 25 Neutral Point Inverse Diode

Typical FWD forward current as a function of forward voltage

$I_F = f(V_F)$



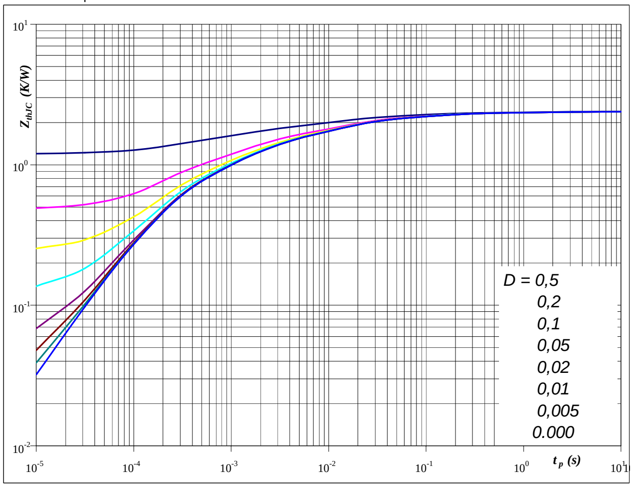
At

t_p = 250 µs

Figure 26 Neutral Point Inverse Diode

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

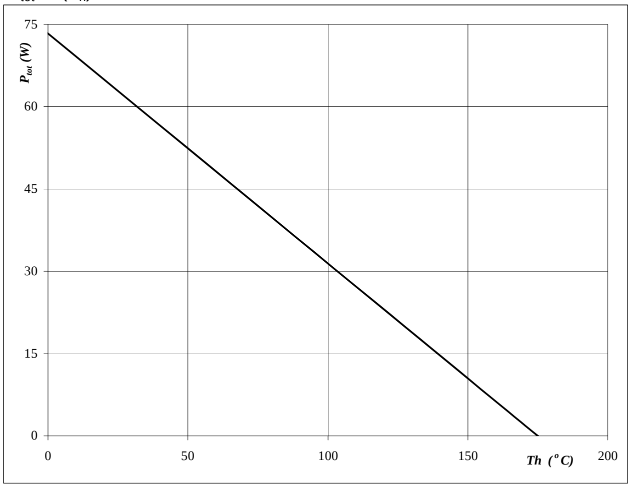
D = tp / T

R_{thJH} = 2,39 K/W

Figure 27 Neutral Point Inverse Diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



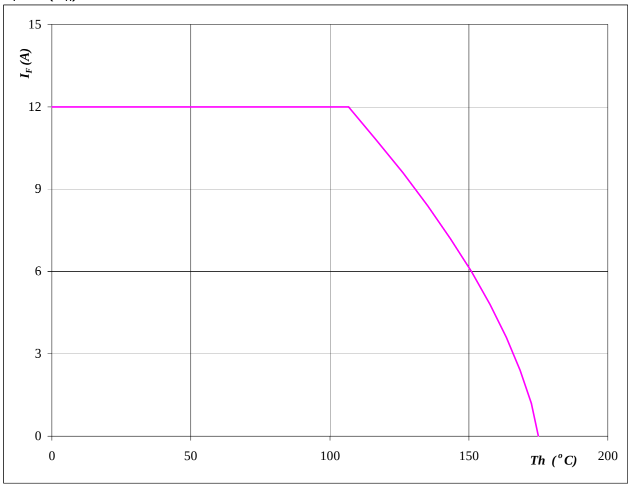
At

T_j = 175 ºC

Figure 28 Neutral Point Inverse Diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

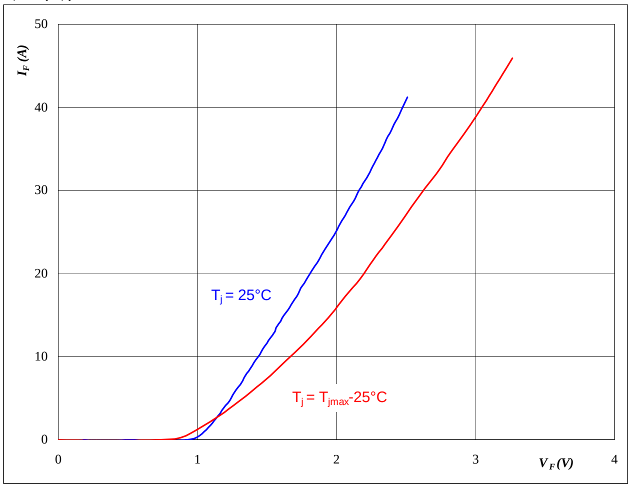
T_j = 175 ºC

Half Bridge Inv. FWD

Figure 1 Half Bridge Inv. FWD

Typical FWD forward current as a function of forward voltage

$I_F = f(V_F)$



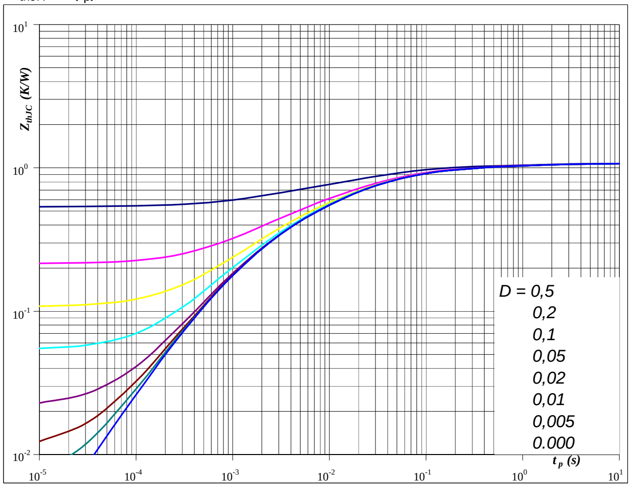
At

t_p =	250	µs

Figure 2 Half Bridge Inv. FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



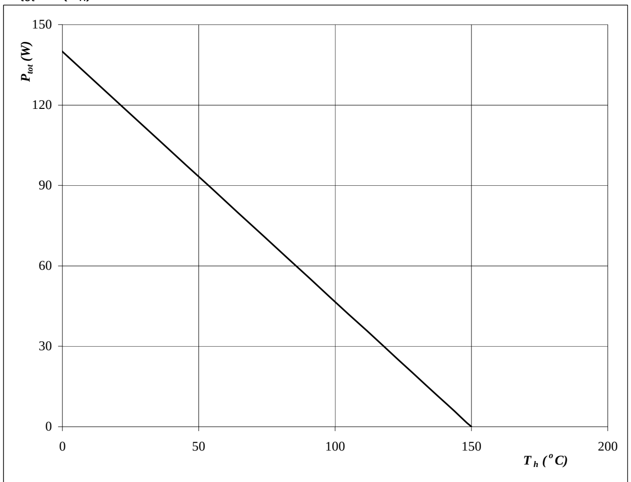
At

D =	t_p / T	
R_{thJH} =	1,07	K/W

Figure 3 Half Bridge Inv. FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



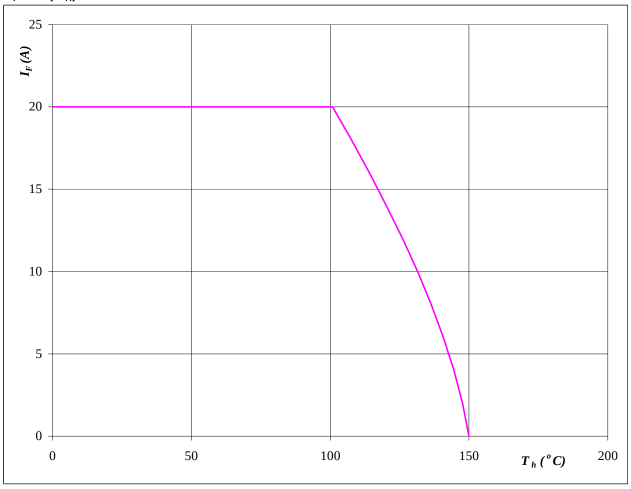
At

T_j =	150	ºC

Figure 4 Half Bridge Inv. FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



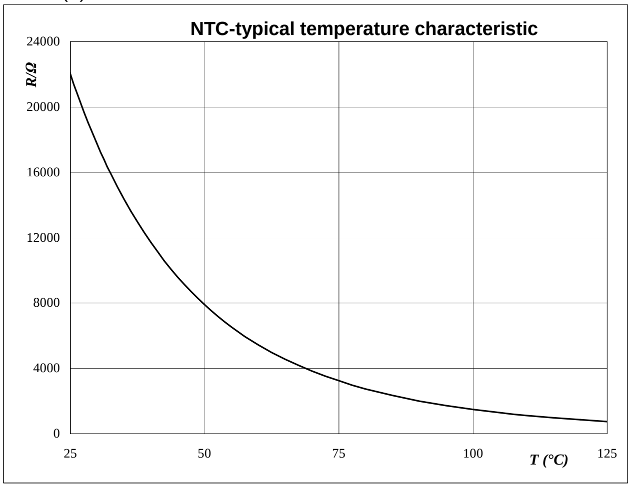
At

T_j =	150	ºC

Thermistor

Figure 1	Thermistor

Typical NTC characteristic
as a function of temperature
$R_T = f(T)$



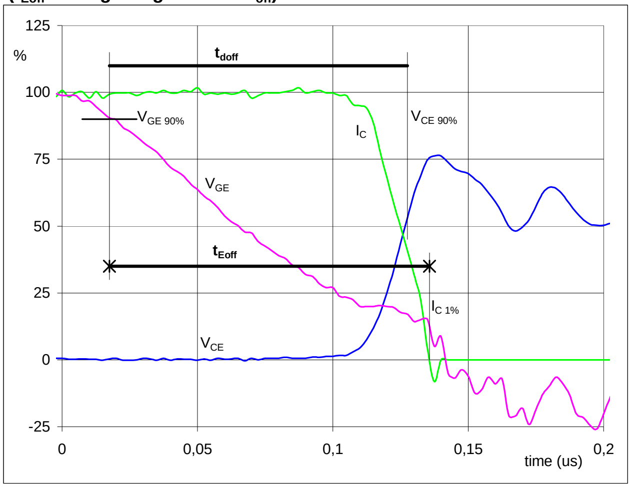
Switching Definitions Half Bridge MOSFET

General conditions

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

Figure 1 Half bridge MOSFET

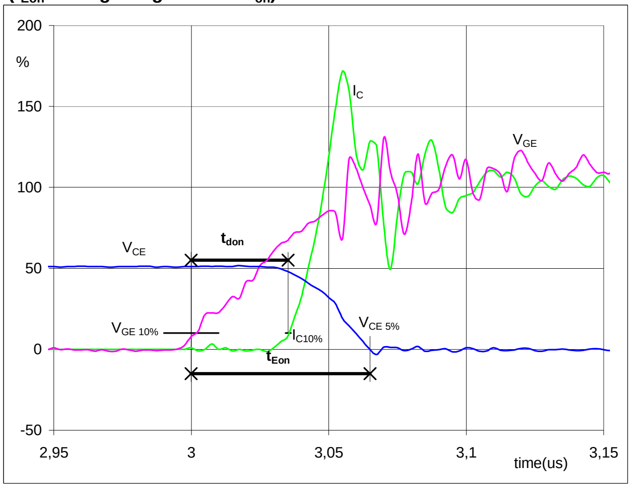
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-5	V
V_{GE} (100%) =	16	V
V_C (100%) =	700	V
I_C (100%) =	44	A
t_{doff} =	0,11	μs
t_{Eoff} =	0,12	μs

Figure 2 Half bridge MOSFET

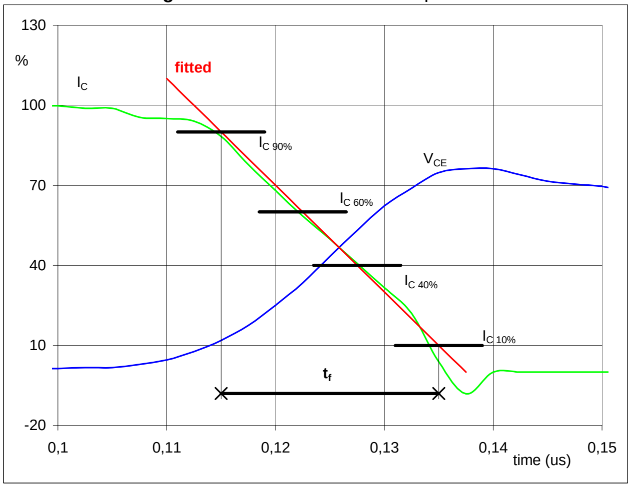
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-5	V
V_{GE} (100%) =	16	V
V_C (100%) =	700	V
I_C (100%) =	44	A
t_{don} =	0,04	μs
t_{Eon} =	0,06	μs

Figure 3 Half bridge MOSFET

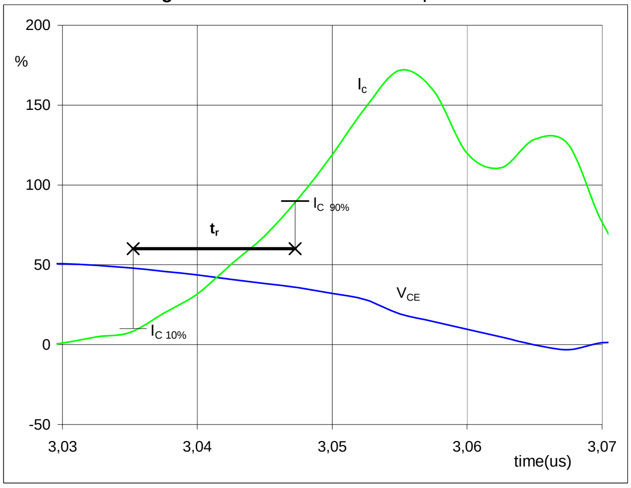
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	700	V
I_C (100%) =	44	A
t_f =	0,02	μs

Figure 4 Half bridge MOSFET

Turn-on Switching Waveforms & definition of t_r

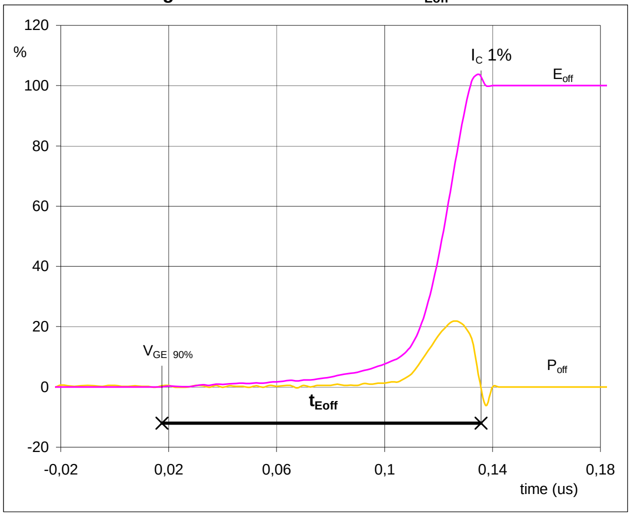


V_C (100%) =	700	V
I_C (100%) =	44	A
t_r =	0,01	μs

Switching Definitions Half Bridge MOSFET

Figure 5 Half bridge MOSFET

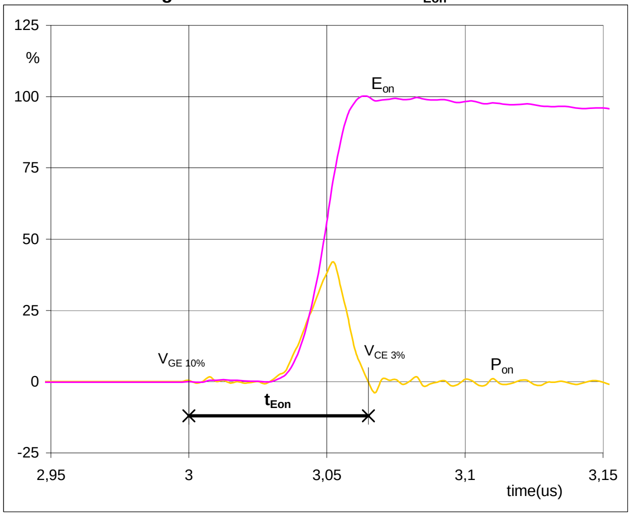
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	30,94	kW
E_{off} (100%) =	0,13	mJ
t_{Eoff} =	0,12	μs

Figure 6 Half bridge MOSFET

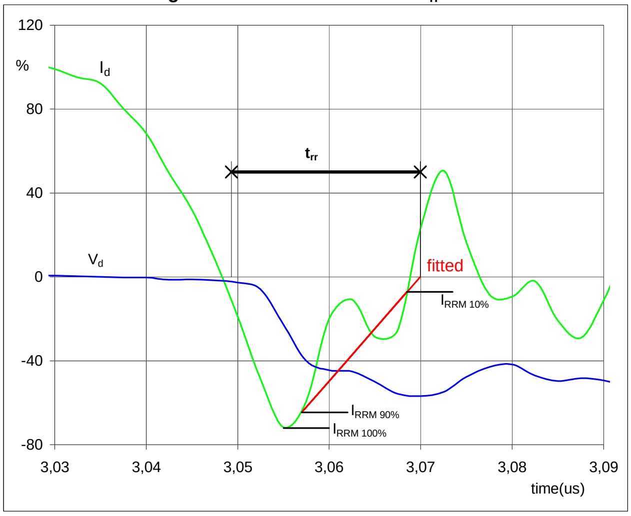
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	30,94	kW
E_{on} (100%) =	0,20	mJ
t_{Eon} =	0,06	μs

Figure 8 neutral point FWD

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

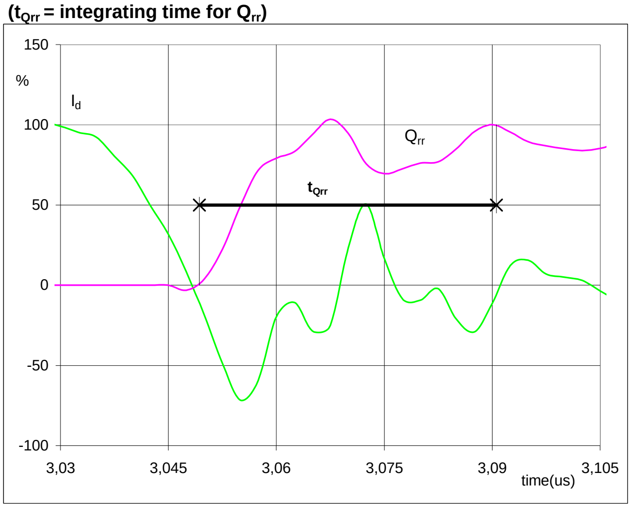


V_d (100%) =	700	V
I_d (100%) =	44	A
I_{RRM} (100%) =	-32	A
t_{rr} =	0,02	μs

Switching Definitions Half Bridge MOSFET

Figure 9 neutral point FWD

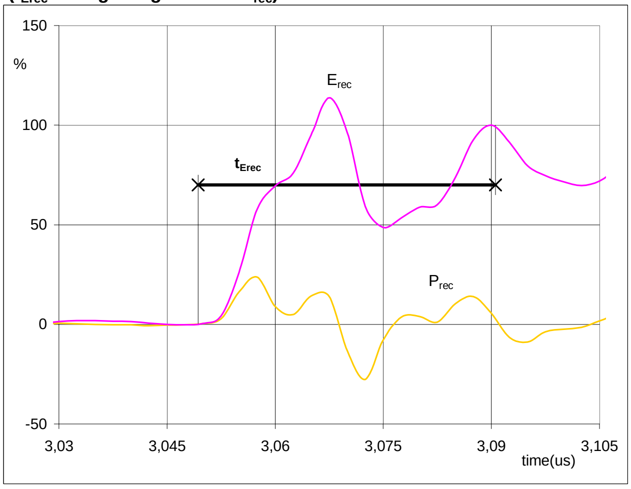
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	44	A
Q_{rr} (100%) =	0,30	μC
t_{Qrr} =	0,04	μs

Figure 10 neutral point FWD

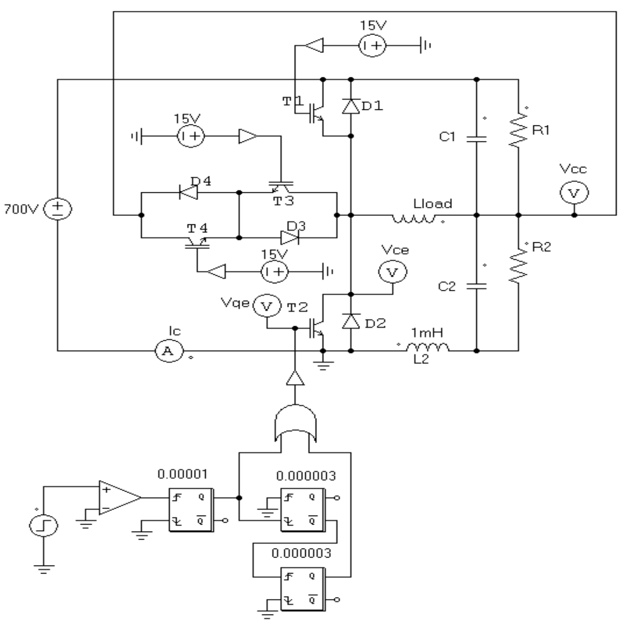
Turn-on Switching Waveforms & definition of t_{Erec}
(t_{Erec}= integrating time for E_{rec})



P_{rec} (100%) =	30,94	kW
E_{rec} (100%) =	0,06	mJ
t_{Erec} =	0,04	μs

Half Bridge MOSFET switching measurement circuit

Figure 11



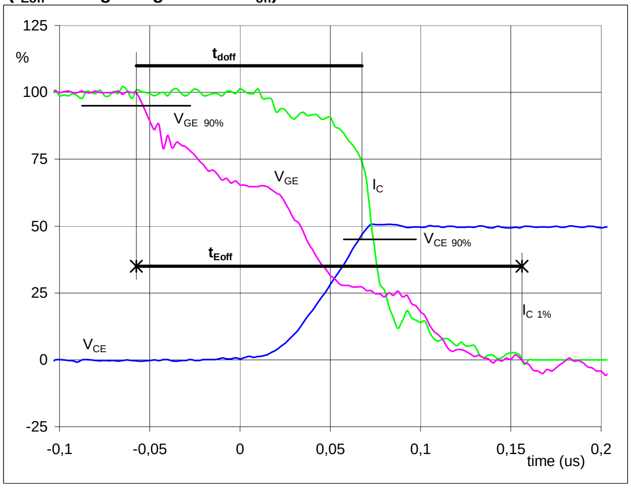
Switching Definitions Neutral Point IGBT

General conditions

T_j	**=**	**125 °C**
R_{gon}	**=**	**4 Ω**
R_{goff}	**=**	**4 Ω**

Figure 1 Neutral Point IGBT

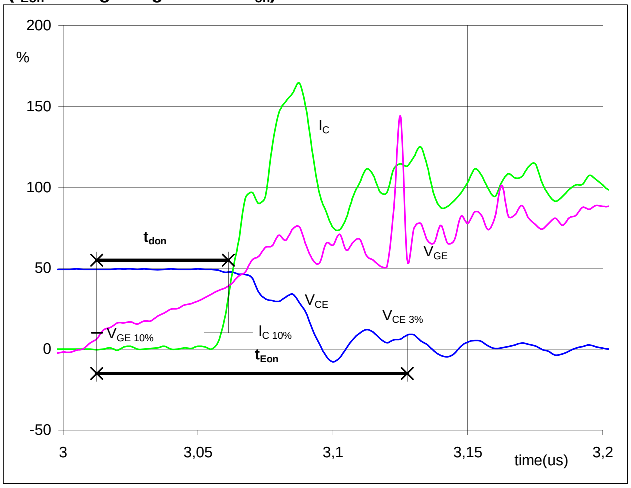
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	700	V
I_C (100%) =	44	A
t_{doff} =	0,10	μs
t_{Eoff} =	0,17	μs

Figure 2 Neutral Point IGBT

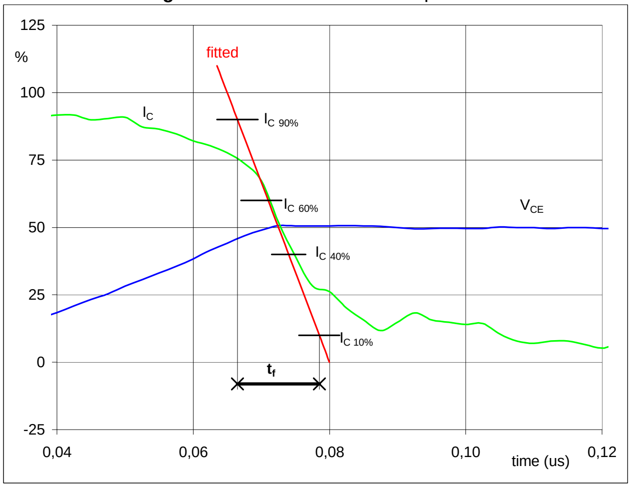
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	700	V
I_C (100%) =	44	A
t_{don} =	0,06	μs
t_{Eon} =	0,12	μs

Figure 3 Neutral Point IGBT

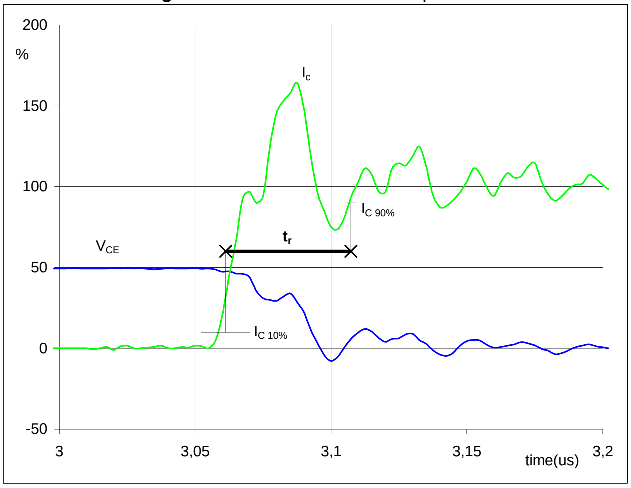
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	700	V
I_C (100%) =	44	A
t_f =	0,015	μs

Figure 4 Neutral Point IGBT

Turn-on Switching Waveforms & definition of t_r

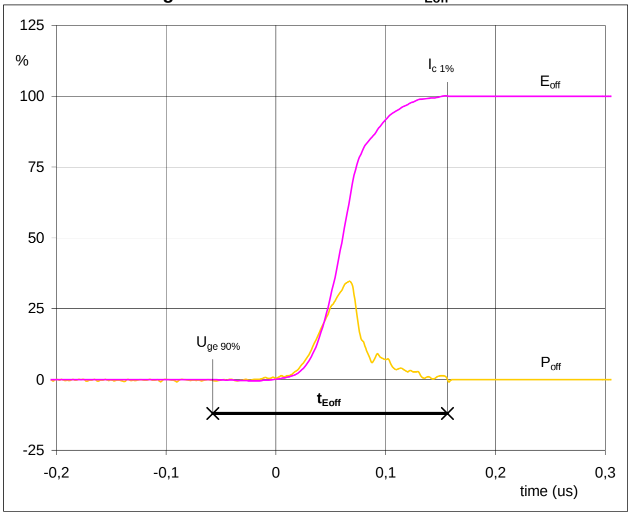


V_C (100%) =	700	V
I_C (100%) =	44	A
t_r =	0,009	μs

Switching Definitions Neutral Point IGBT

Figure 5 Neutral Point IGBT

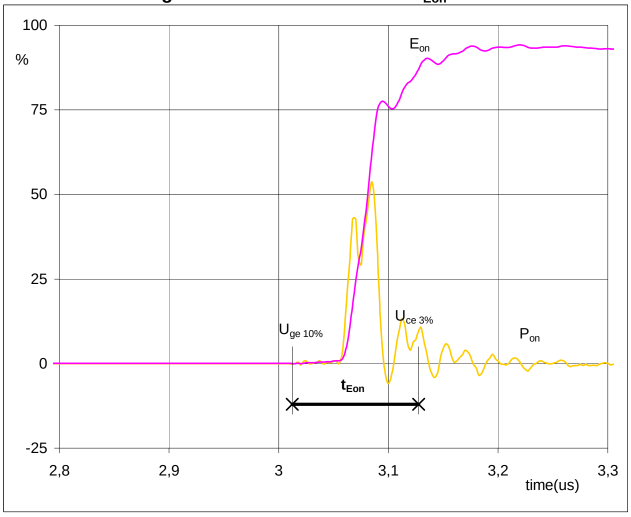
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	30,78	kW
E_{off} (100%) =	0,57	mJ
t_{Eoff} =	0,17	µs

Figure 6 Neutral Point IGBT

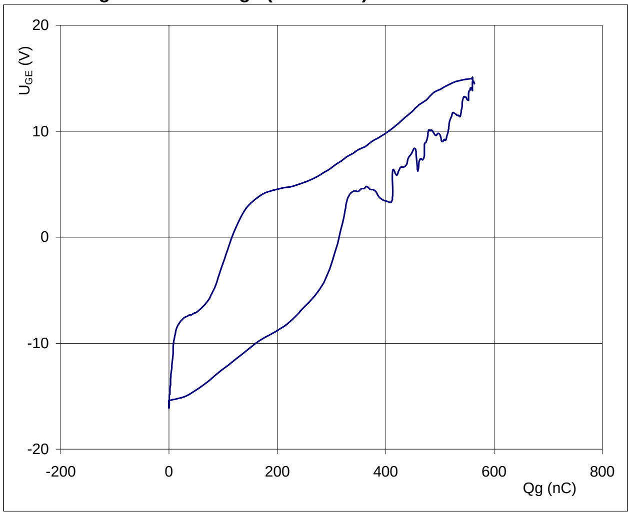
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	30,7818	kW
E_{on} (100%) =	0,38	mJ
t_{Eon} =	0,12	µs

Figure 7 Neutral Point IGBT

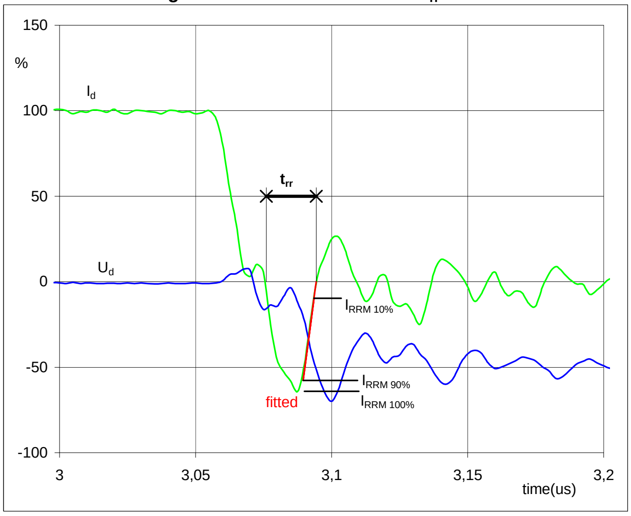
Gate voltage vs Gate charge (measured)



V_{GEoff} =	-15	V
V_{GEon} =	15	V
V_C (100%) =	700	V
I_C (100%) =	44	A
Q_g =	3441,54	nC

Figure 8 Half Bridge FWD

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

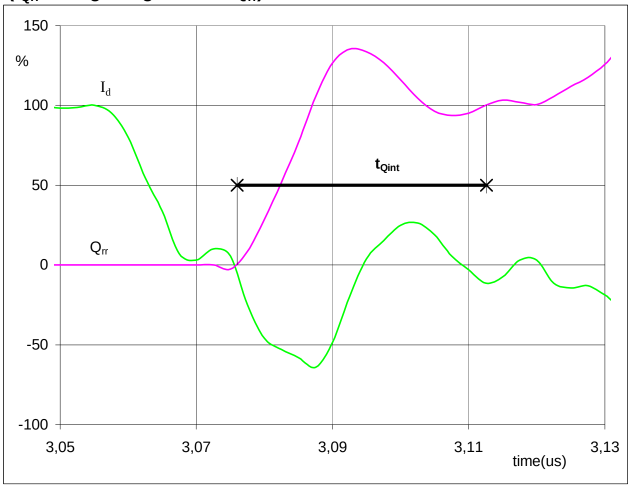


V_d (100%) =	700	V
I_d (100%) =	44	A
I_{RRM} (100%) =	-29	A
t_{rr} =	0,04	µs

Switching Definitions Neutral Point IGBT

Figure 9	Half Bridge FWD

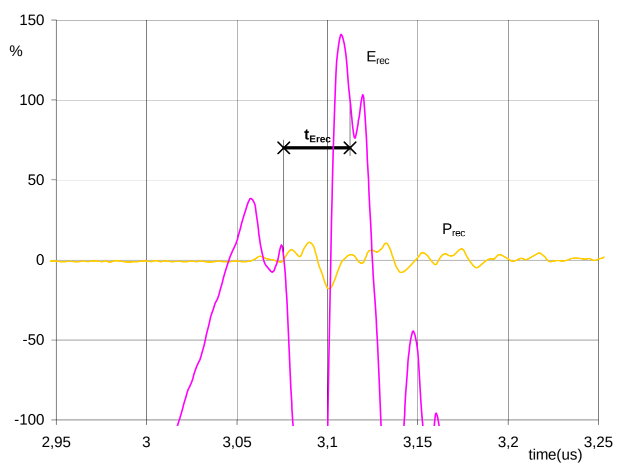
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr}= integrating time for Q_{rr})



I_d (100%) =	44	A
Q_{rr} (100%) =	0,25	μC
t_{Qint} =	0,09	μs

Figure 10	Half Bridge FWD

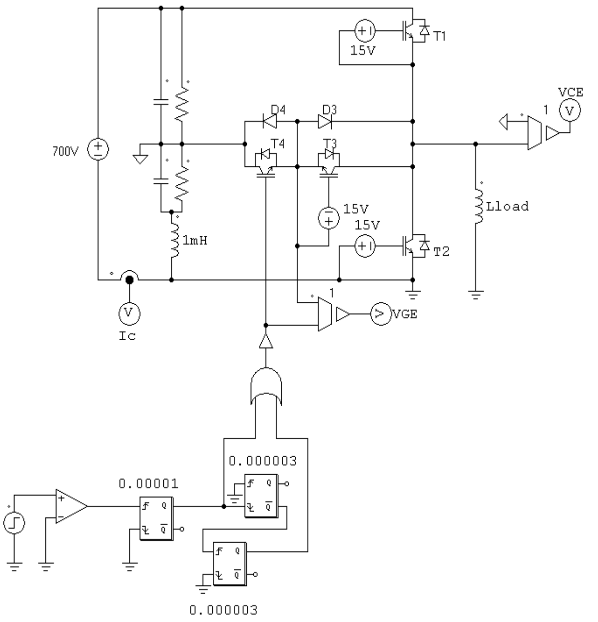
Turn-on Switching Waveforms & definition of t_{Erec}
(t_{Erec}= integrating time for E_{rec})



P_{rec} (100%) =	30,78	kW
E_{rec} (100%) =	0,03	mJ
t_{Erec} =	0,09	μs

Neutral Point IGBT switching measurement circuit

Figure 11



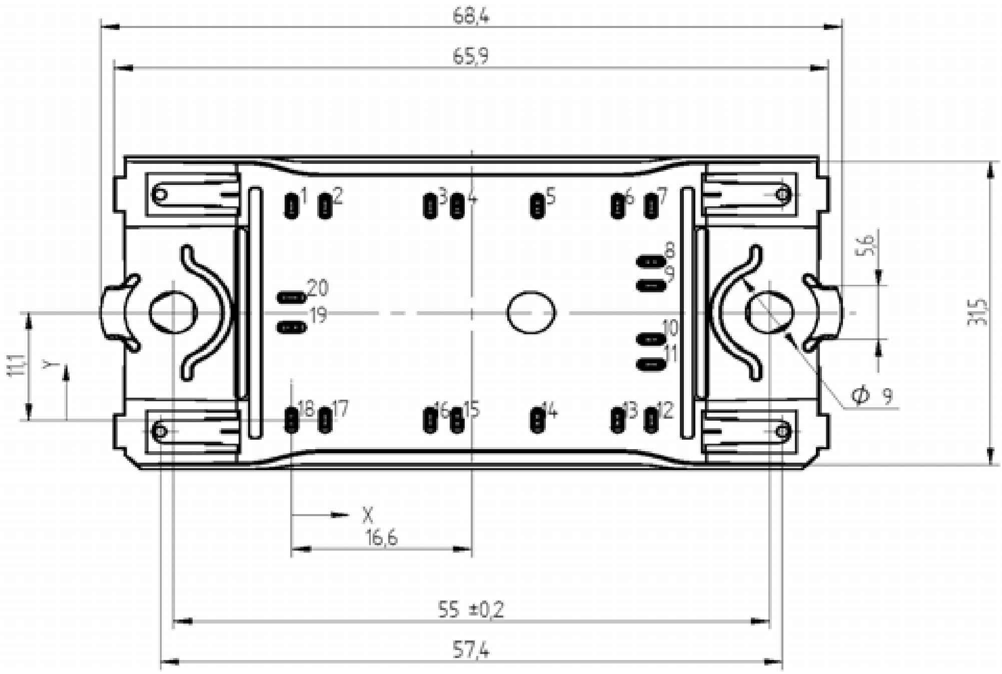
Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

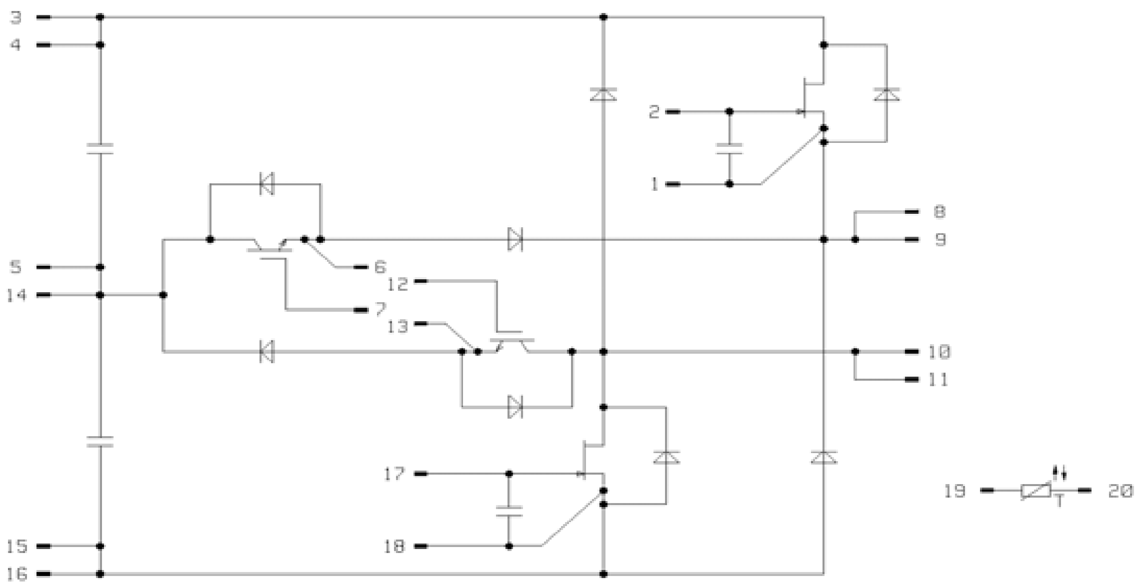
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-PZ12NMA030MR-M340F18Y	M340F18Y	M340F18Y

Outline

Pin table		
Pin	X	Y
1	0	22,2
2	3,1	22,2
3	12,8	22,2
4	15,3	22,2
5	22,7	22,2
6	30,1	22,2
7	33,2	22,2
8	33,2	16,4
9	33,2	13,9
10	33,2	8,3
11	33,2	5,8
12	33,2	0
13	30,1	0
14	22,7	0
15	15,3	0
16	12,8	0
17	3,1	0
18	0	0
19	0	9,55
20	0	12,65



Pinout



PRODUCT STATUS DEFINITIONS

Datasheet Status	Product Status	Definition
Target	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. The data contained is exclusively intended for technically trained staff.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data may be published at a later date. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff.
Final	Full Production	This datasheet contains final specifications. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff.

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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.