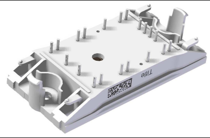
flowMNPC 0 — 1200 V / 80 A

Features

- mixed voltage component topology
- neutral point clamped inverter
- reactive power capability
- low inductance layout

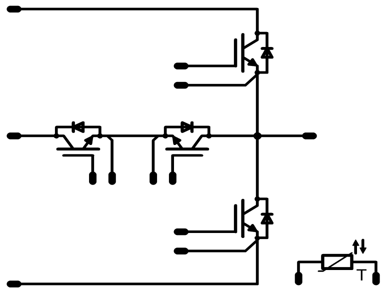
flow0 12mm housing



Target Applications

- solar inverter
- UPS

Schematic



Types

- 10-FZ12NMA080SH01-M260F
- 10-PZ12NMA080SH01-M260FY

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Half Bridge IGBT					
Collector-emitter break down voltage	V_{CE}			1200	V
DC collector current	I_C	T_j=Tjmax	T_h=80°C T_c=80°C	69 88	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		240	A
Power dissipation	P_{tot}	T_j=Tjmax	T_h=80°C T_c=80°C	158 239	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150°C V_{GE}=15V		10 800	μs V
Turn off safe operating area (RBSOA)	I_{cmax}	V_{CE} max = 1200V T_{vj} max≤ 150°C		160	A
Maximum Junction Temperature	T_{jmax}			175	°C
Neutral Point FWD					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
DC forward current	I_F	T_j=Tjmax	T_h=80°C T_c=80°C	47 62	A
Surge forward current	I_{FSM}	t_p=8,3ms , sin 180°	T_c=25°C	600	A
I2t-value	I^2t	t_p=8,3ms , sin 180°	T_c=25°C	1490	A2s
Repetitive peak forward current	I_{FRM}	Square wave, 20 kHz		120	A
Power dissipation	P_{tot}	T_j=Tjmax	T_h=80°C T_c=80°C	58 88	W
Maximum Junction Temperature	T_{jmax}			175	°C

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Neutral Point IGBT					
Collector-emitter break down voltage	V_{CE}			600	V
DC collector current	I_C	T_j=Tjmax	T_h=80°C T_c=80°C	52 68	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		225	A
Power dissipation	P_{tot}	T_j=Tjmax	T_h=80°C T_c=80°C	72 109	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150°C V_{GE}=15V		6 360	μs V
Turn off safe operating area (RBSOA)	I_{cmax}	V_{CE} max = 600V T_{vj} max≤ 150°C		150	A
Maximum Junction Temperature	T_{jmax}			175	°C
Half Bridge FWD					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	T_j=Tjmax	T_h=80°C T_c=80°C	47 62	A
Surge forward current	I_{FSM}	t_p=10ms , sin 180°	T_j=125°C	335	A
I2t-value	I^2t			560	A2s
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		100	A
Power dissipation	P_{tot}	T_j=Tjmax	T_h=80°C T_c=80°C	79 119	W
Maximum Junction Temperature	T_{jmax}			175	°C
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				8,95	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	
Half Bridge IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,003	Tj=25°C Tj=125°C	5,2	5,8	6,4	V
Collector-emitter saturation voltage	V_{CEsat}		15		80	Tj=25°C Tj=125°C	1,7	1,99 2,33	2,5	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	1200		Tj=25°C Tj=125°C			0,02	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=125°C			240	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=4 Ω Rgon=4 Ω	±15	350	56	Tj=25°C Tj=125°C		77 78		ns
Rise time	t_r					Tj=25°C Tj=125°C		12 16		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=125°C		173 225		
Fall time	t_f					Tj=25°C Tj=125°C		49 67		
Turn-on energy loss	E_{on}					Tj=25°C Tj=125°C		0,46 0,96		mWs
Turn-off energy loss	E_{off}					Tj=25°C Tj=125°C		1,34 2,24		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		4660		pF
Output capacitance	C_{oss}							300		
Reverse transfer capacitance	C_{rss}							260		
Gate charge	Q_G		±15	960	80	Tj=25°C		370		nC
Thermal resistance chip to heatsink	$R_{th(j-s)}$	Thermal grease thickness≤50um λ = 1 W/mK						0,60		K/W
Neutral Point FWD										
Diode forward voltage	V_F				60	Tj=25°C Tj=125°C		2,27 1,68	2,8	V
Peak reverse recovery current	I_r			600		Tj=25°C Tj=125°C		64 83		A
Reverse recovery time	t_{rr}	Rgon=4 Ω	±15	350	56	Tj=25°C Tj=125°C		29 74		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=125°C		1 3		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					Tj=25°C Tj=125°C		8651 3565		A/µs
Reverse recovered energy	E_{rec}					Tj=25°C Tj=125°C		0,18 0,53		mWs
Thermal resistance chip to heatsink	$R_{th(j-s)}$	Thermal grease thickness≤50um λ = 1 W/mK						1,63		K/W

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	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,0012	Tj=25°C Tj=125°C	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		75	Tj=25°C Tj=125°C	1,05	1,45 1,59	1,85	V
Collector-emitter cut-off incl diode	I_{CES}		0	600		Tj=25°C Tj=125°C			15	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=125°C			600	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=4 Ω Rgon=4 Ω	±15	350	56	Tj=25°C Tj=125°C		84 85		ns
Rise time	t_r					Tj=25°C Tj=125°C		11 12		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=125°C		177 205		
Fall time	t_f					Tj=25°C Tj=125°C		87 105		
Turn-on energy loss	E_{on}					Tj=25°C Tj=125°C		0,53 0,75		mWs
Turn-off energy loss	E_{off}					Tj=25°C Tj=125°C		1,86 2,50		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		4620		pF
Output capacitance	C_{oss}							288		
Reverse transfer capacitance	C_{rss}							137		
Gate charge	Q_G		±15	480	75	Tj=25°C		470		nC
Thermal resistance chip to heatsink	$R_{th(j-s)}$	Thermal grease thickness≤50um λ = 1 W/mK						1,32		K/W
Half Bridge FWD										
Diode forward voltage	V_F				50	Tj=25°C Tj=125°C	1,35	1,73 1,70	2,1	V
Reverse leakage current	I_r			1200		Tj=25°C Tj=125°C			10	μA
Peak reverse recovery current	I_{RRM}		±15	350	56	Tj=25°C Tj=125°C		106 118		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		102 148		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=125°C		5,32 8,22		μC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					Tj=25°C Tj=125°C		6904 4951		A/μs
Reverse recovery energy	E_{rec}					Tj=25°C Tj=125°C		1,55 2,42		mWs
Thermal resistance chip to heatsink	$R_{th(j-s)}$	Thermal grease thickness≤50um λ = 1 W/mK						1,21		K/W
Rated resistance										
Rated resistance	R					Tj=25°C		22000		Ω
Deviation of R100	$\Delta_{R/R}$	R100=1486Ω				Tj=100°C	-12		11	%
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	

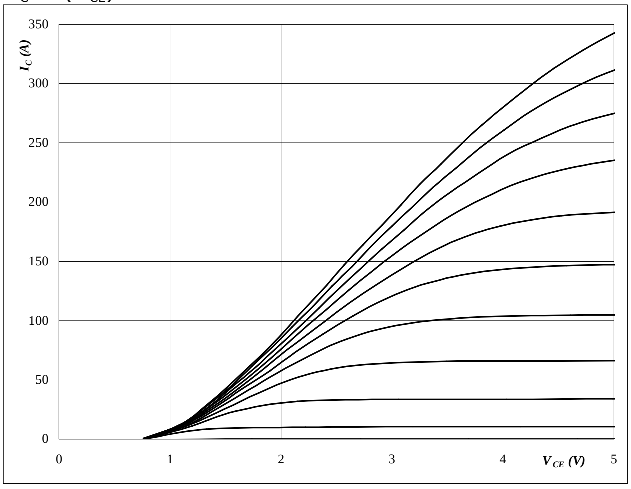
Half Bridge

Half Bridge IGBT and **Neutral Point FWD**

Figure 1	IGBT

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

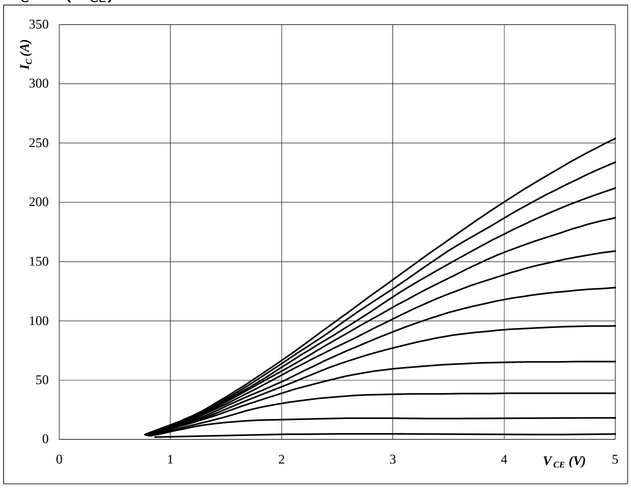
T_j = 25 °C

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

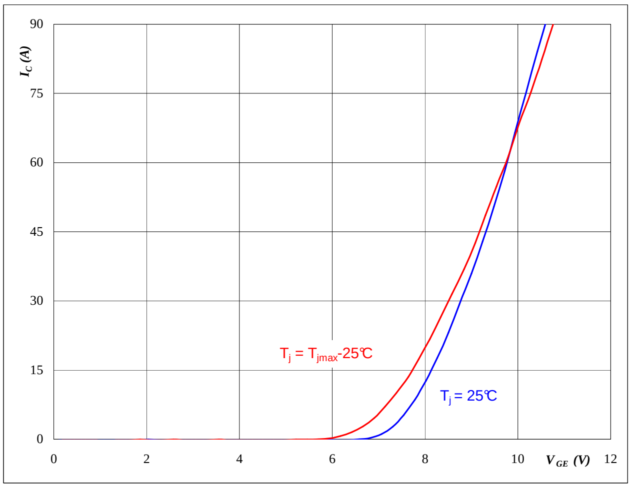
T_j = 125 °C

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

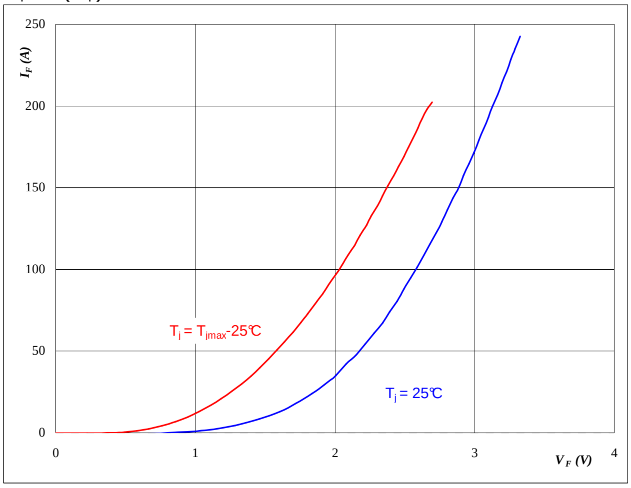
t_p = 250 µs

V_{CE} = 10 V

Figure 4	FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

t_p = 250 µs

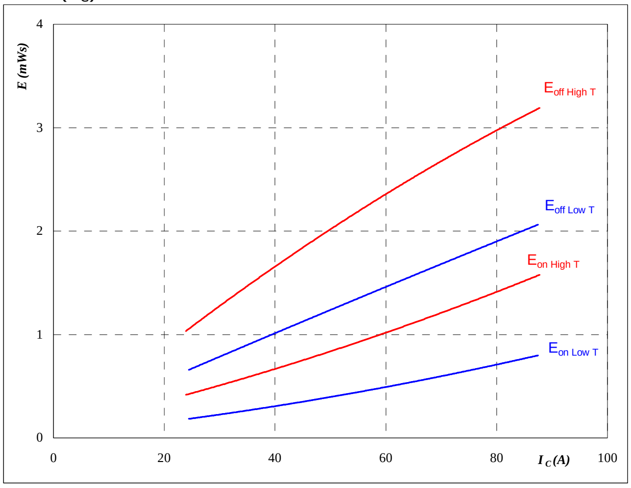
Half Bridge

Half Bridge IGBT and Neutral Point FWD

Figure 5 IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



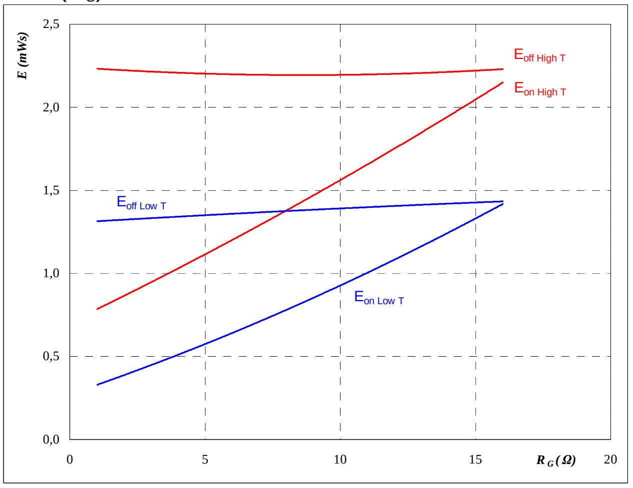
With an inductive load at

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

$E = f(R_G)$



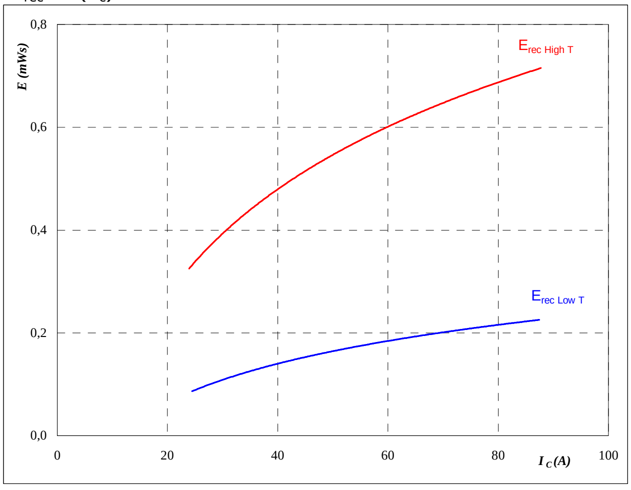
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	56	A

Figure 7 FWD

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_c)$



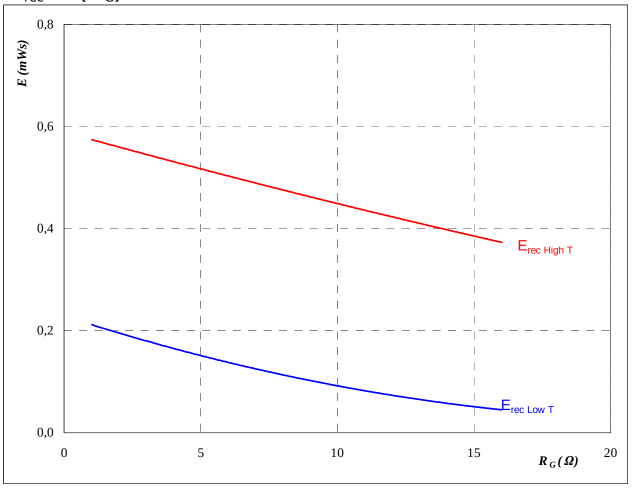
With an inductive load at

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 =	56	A

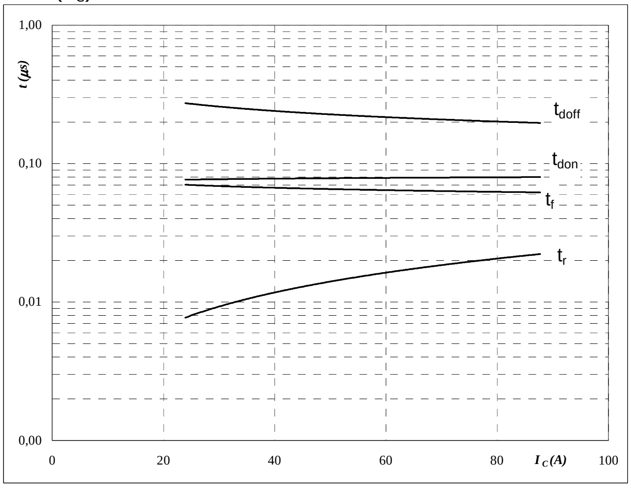
Half Bridge

Half Bridge IGBT and Neutral Point FWD

Figure 9 IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



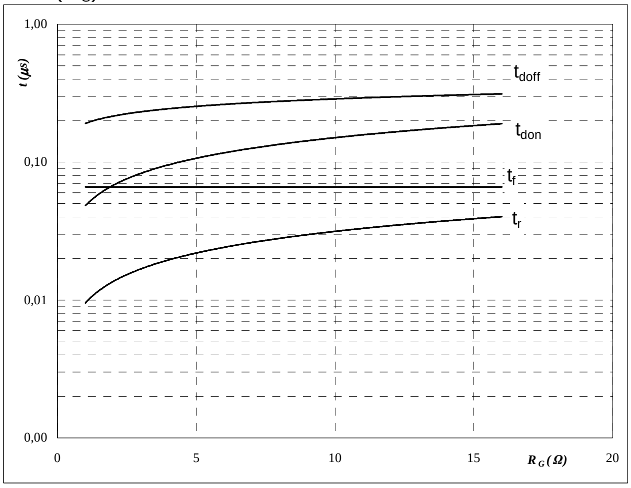
With an inductive load at

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

$t = f(R_G)$



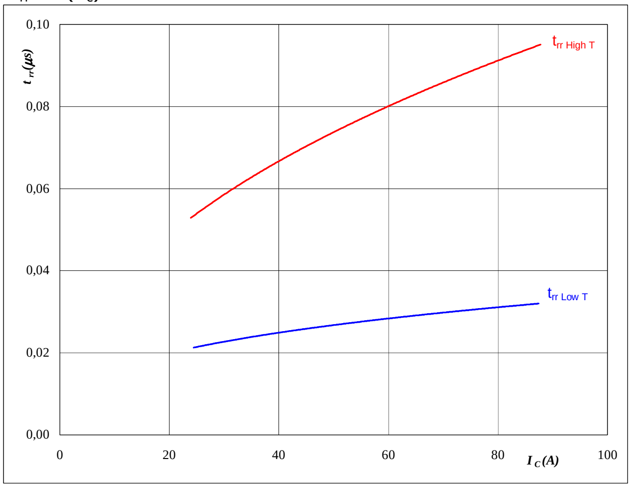
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	56	A

Figure 11 FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_c)$



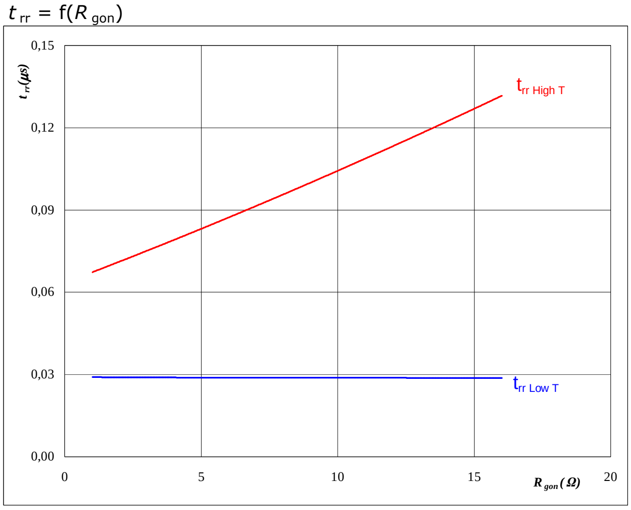
At

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 =	56	A
V_{GE} =	±15	V

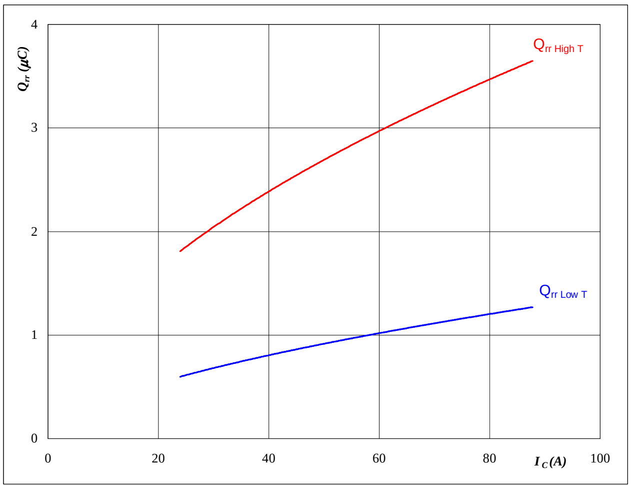
Half Bridge

Half Bridge IGBT and Neutral Point FWD

Figure 13 FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



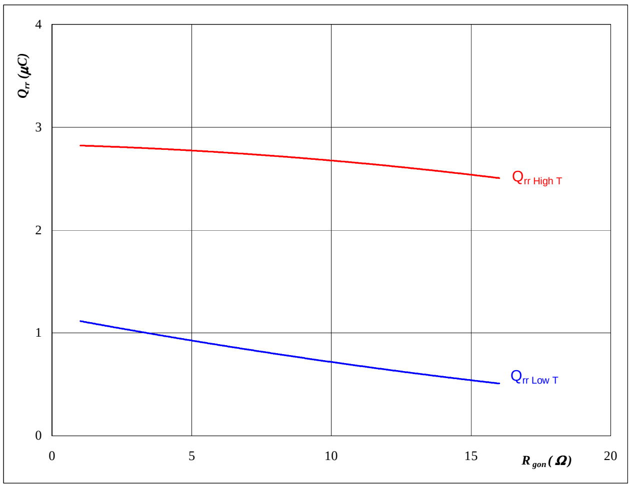
At

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

Figure 14 FWD

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

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



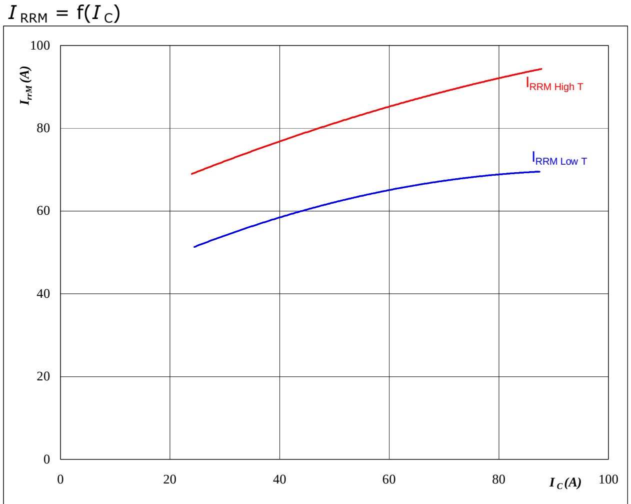
At

T_j =	25/125	°C
V_R =	350	V
I_F =	56	A
V_{GE} =	±15	V

Figure 15 FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



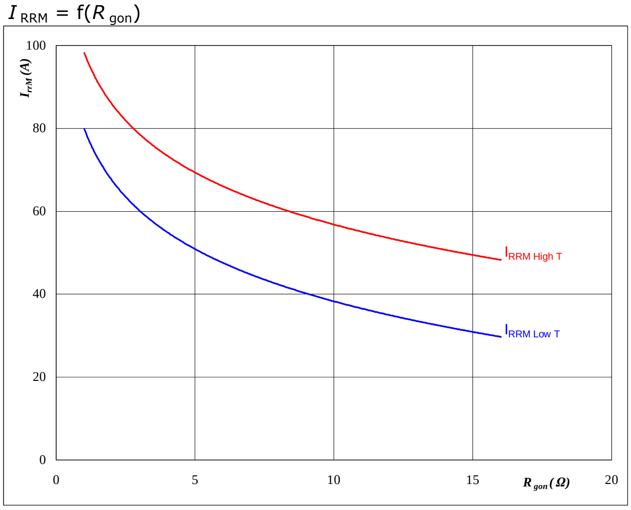
At

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 =	56	A
V_{GE} =	±15	V

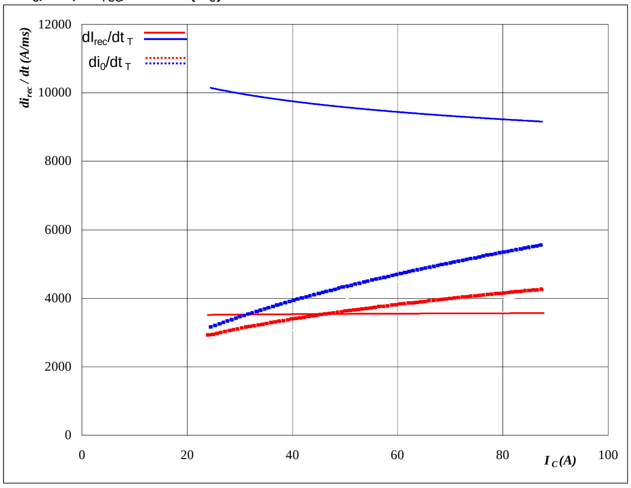
Half Bridge

Half Bridge IGBT and Neutral Point FWD

Figure 17 FWD

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

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



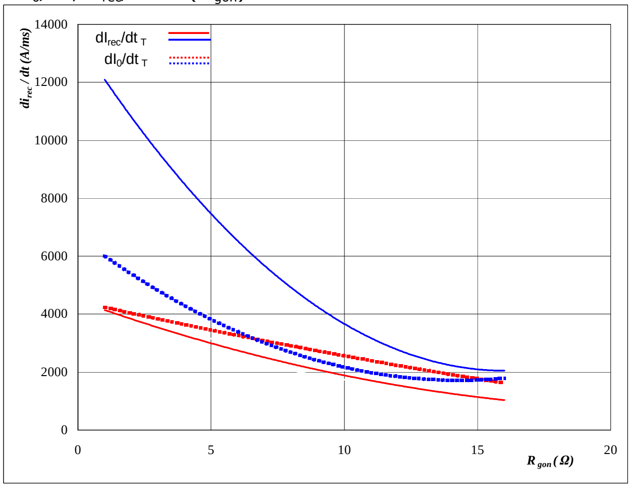
At

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

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



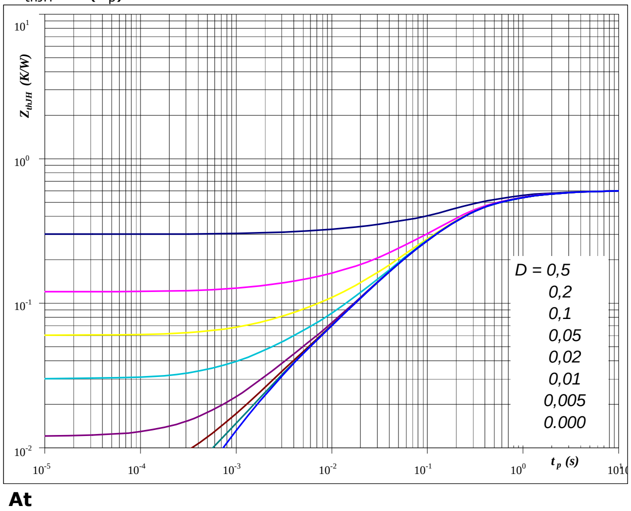
At

T_j =	25/125	°C
V_R =	350	V
I_F =	56	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 =	t_p / T	
R_{thJH} =	0,60	K/W

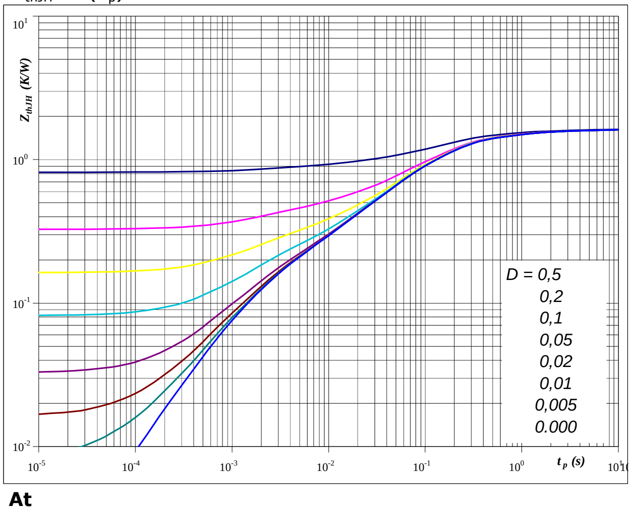
IGBT thermal model values

R (K/W)	Tau (s)
0,10	1,8E+00
0,23	2,9E-01
0,21	1,0E-01
0,05	1,4E-02
0,01	1,7E-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} =	1,63	K/W

FWD thermal model values

R (K/W)	Tau (s)
0,07	5,7E+00
0,17	1,2E+00
0,65	2,0E-01
0,51	6,6E-02
0,13	9,1E-03
0,11	1,5E-03

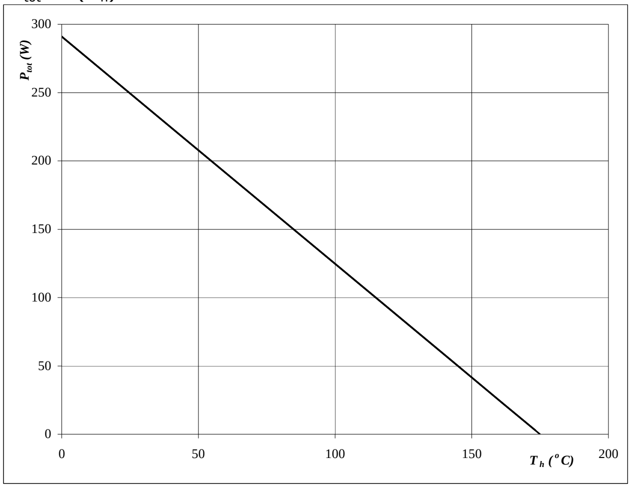
Half Bridge

Half Bridge IGBT and Neutral Point FWD

Figure 21 IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



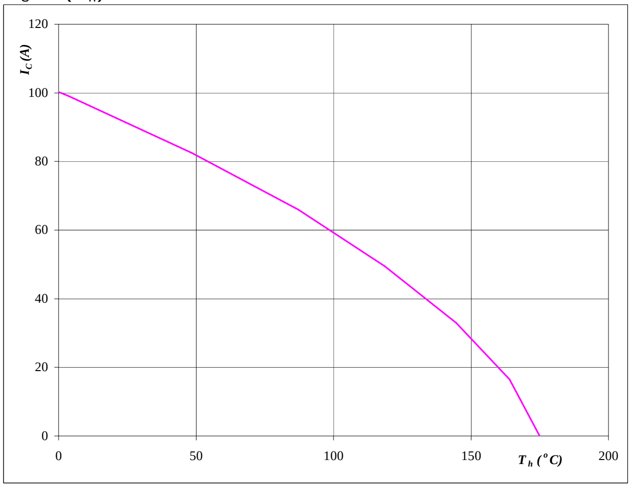
At

T_j = 175 °C

Figure 22 IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

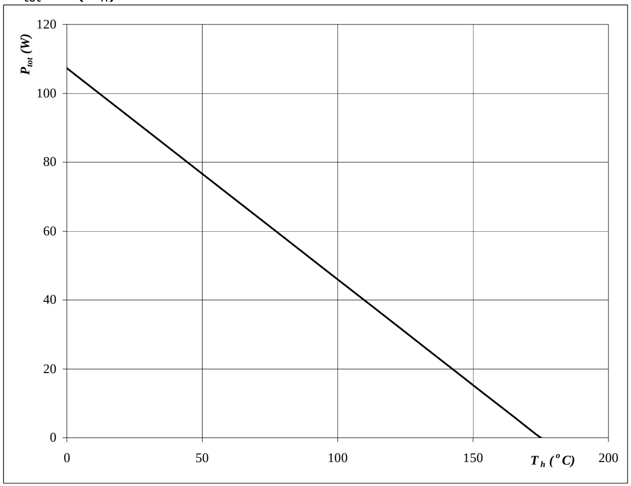
T_j = 175 °C

V_{GE} = 15 V

Figure 23 FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



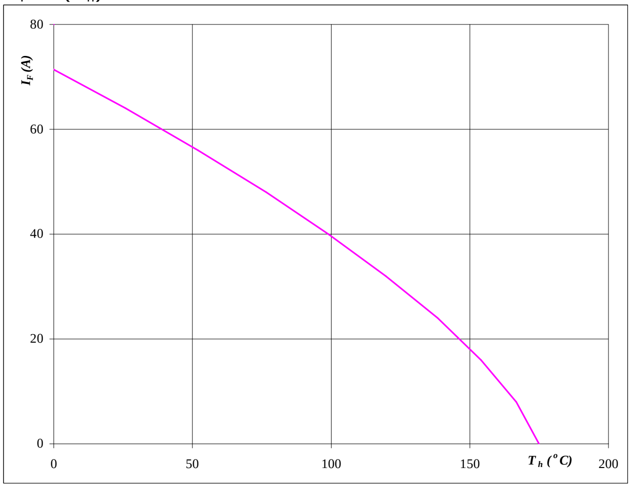
At

T_j = 175 °C

Figure 24 FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

T_j = 175 °C

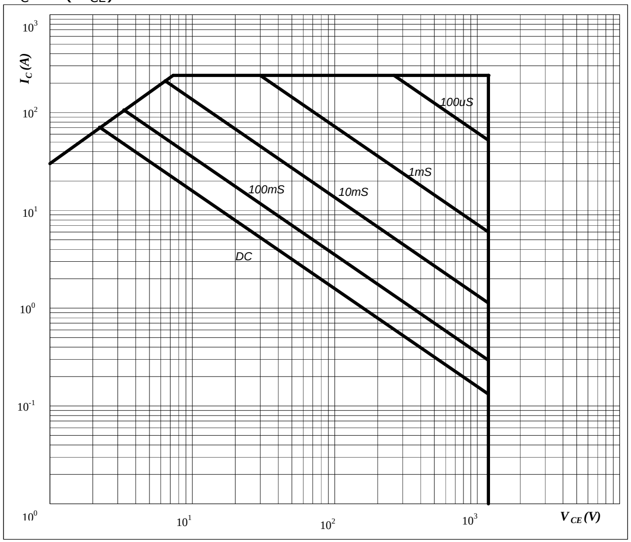
Half Bridge

Half Bridge IGBT and Neutral Point FWD

Figure 25 IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



At

D = single pulse

T_h = 80 ºC

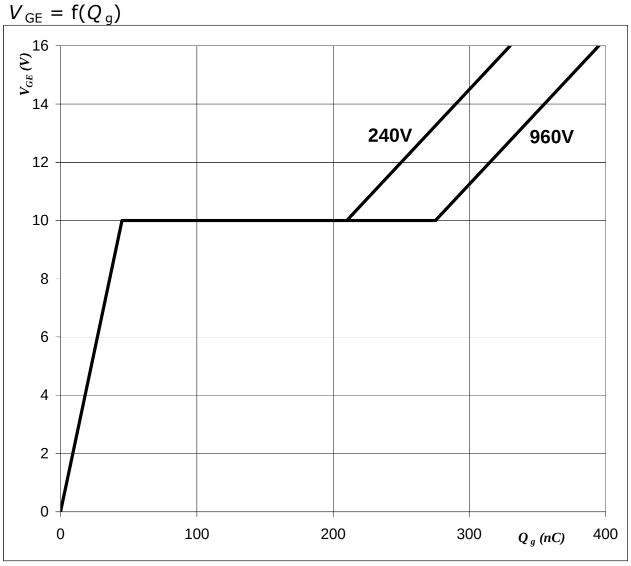
V_{GE} = ±15 V

T_j = T_{jmax} ºC

Figure 26 IGBT

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



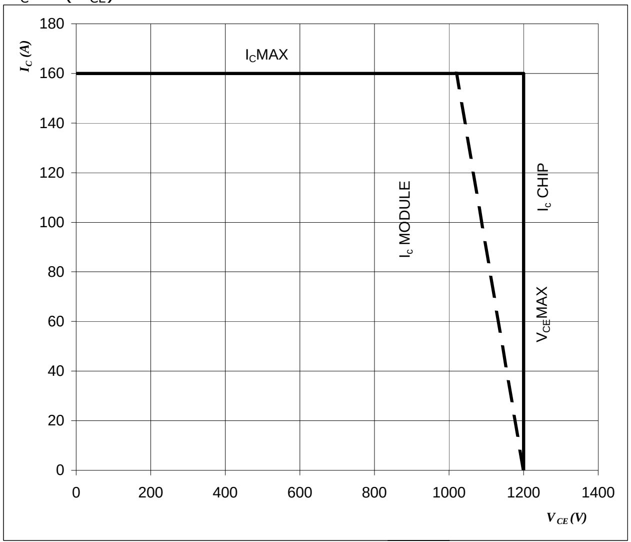
At

I_C = 80 A

Figure 27 IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j = T_{jmax}-25 ºC

DC link $_{minus}$=DC link plus

Switching mode : 3 level switching

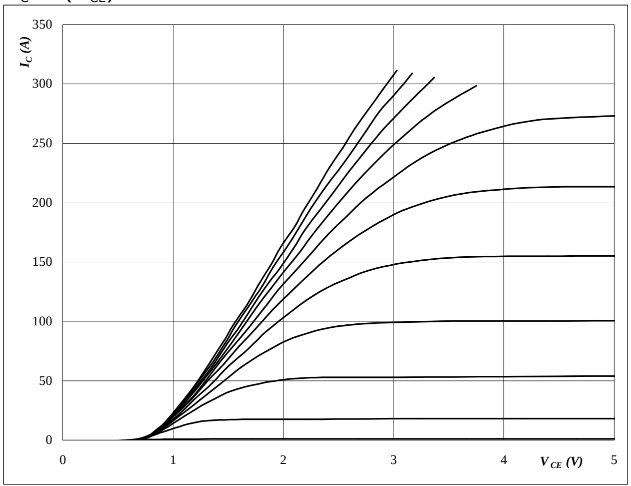
Neutral point

Neutral Point IGBT and **Half Bridge FWD**

Figure 1 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

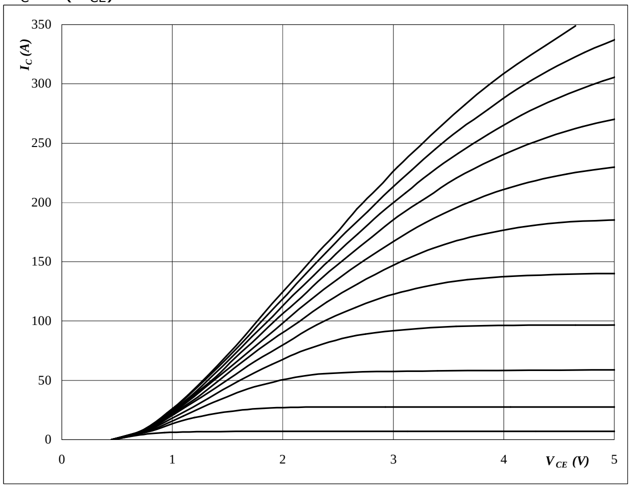
T_j = 25 °C

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

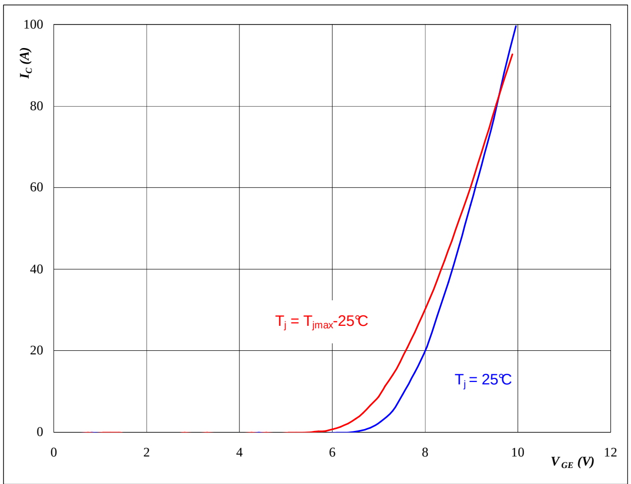
T_j = 125 °C

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

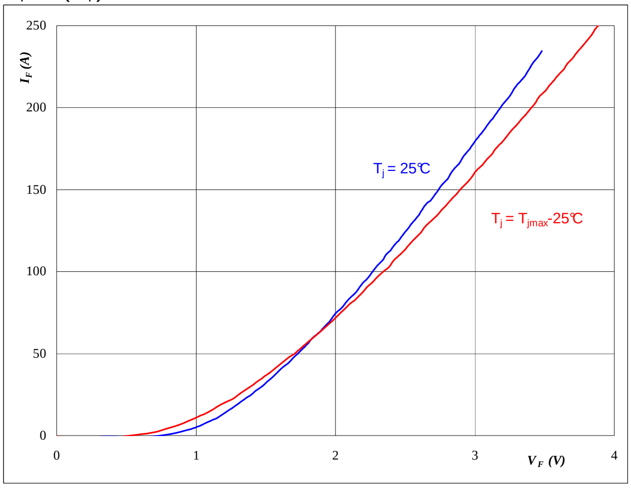
t_p = 250 µs

V_{CE} = 10 V

Figure 4 FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

t_p = 250 µs

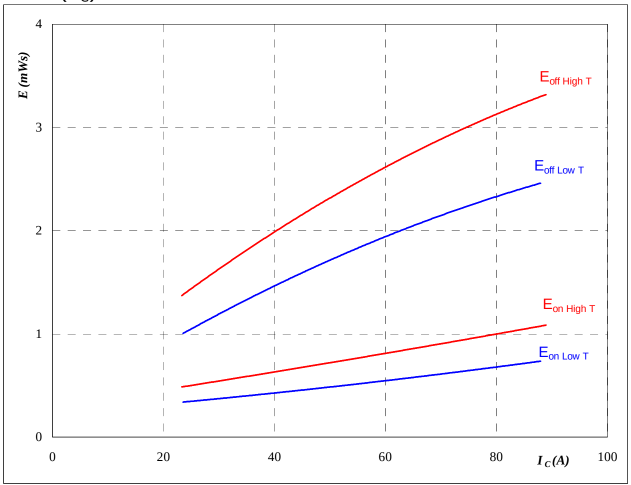
Neutral point

Neutral Point IGBT and Half Bridge FWD

Figure 5 IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



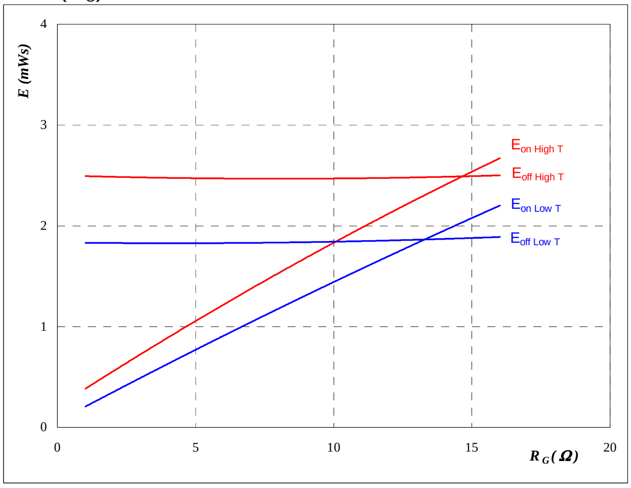
With an inductive load at

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

$E = f(R_G)$



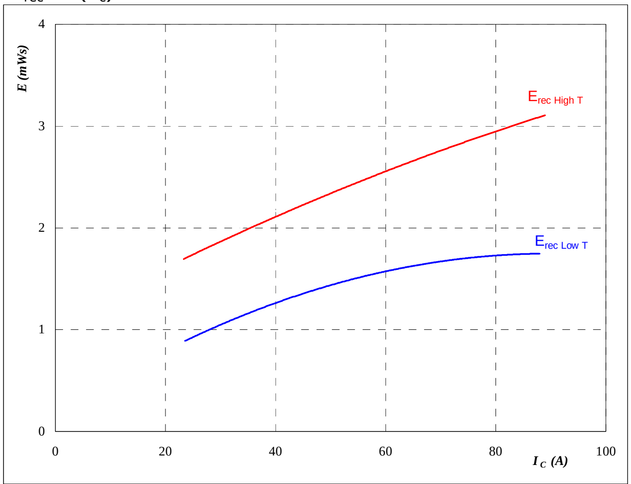
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	56	A

Figure 7 FWD

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_C)$



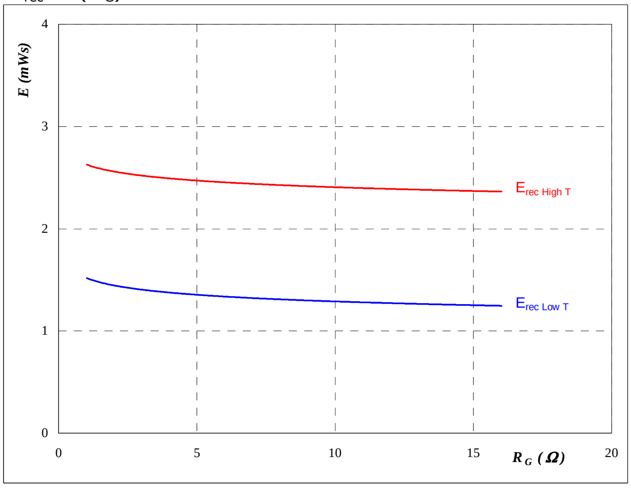
With an inductive load at

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 =	56	A

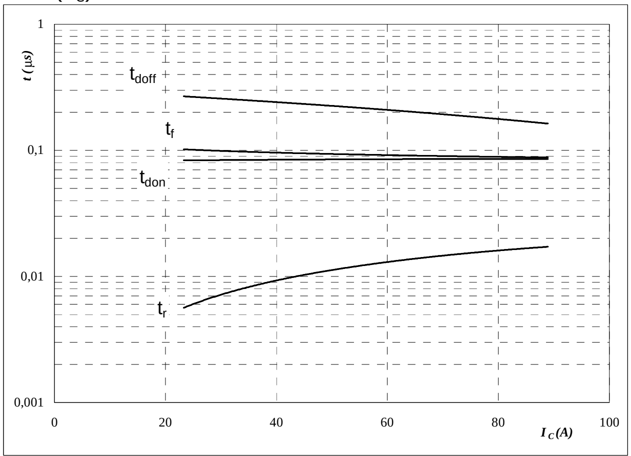
Neutral point

Neutral Point IGBT and Half Bridge FWD

Figure 9 IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



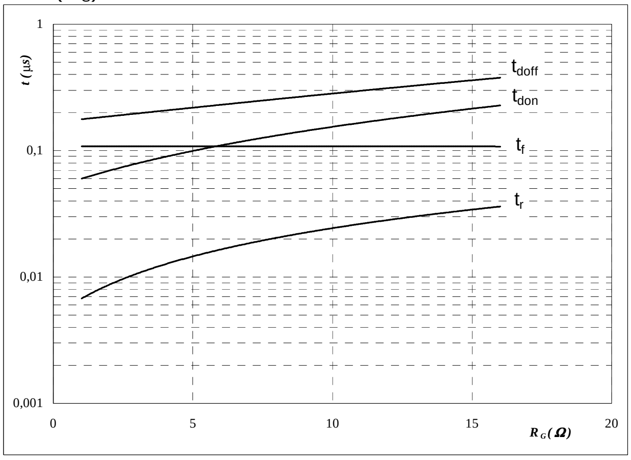
With an inductive load at

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

$t = f(R_G)$



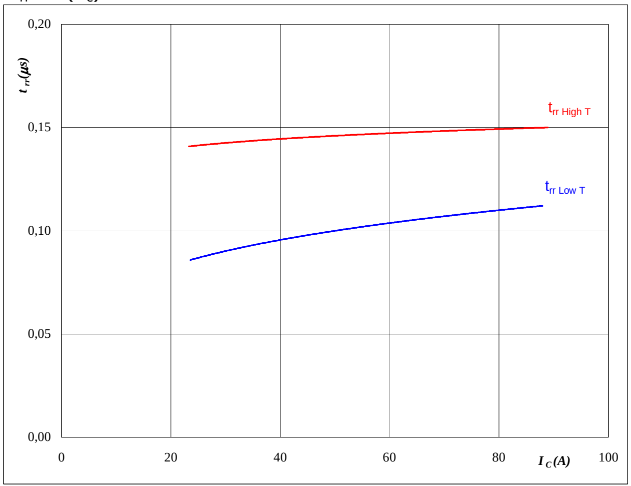
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	56	A

Figure 11 FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_c)$



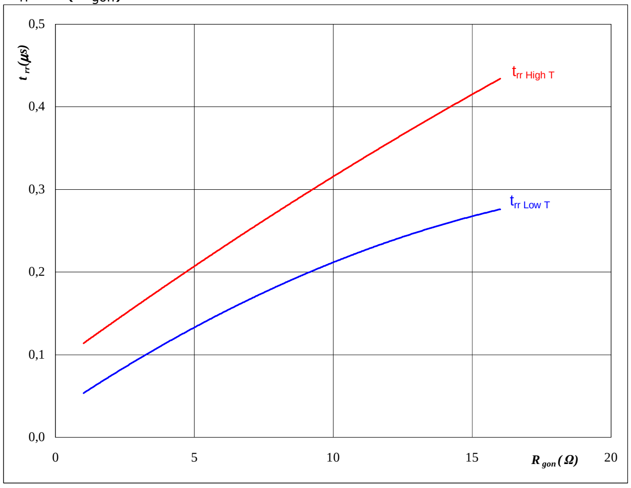
At

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 =	56	A
V_{GE} =	±15	V

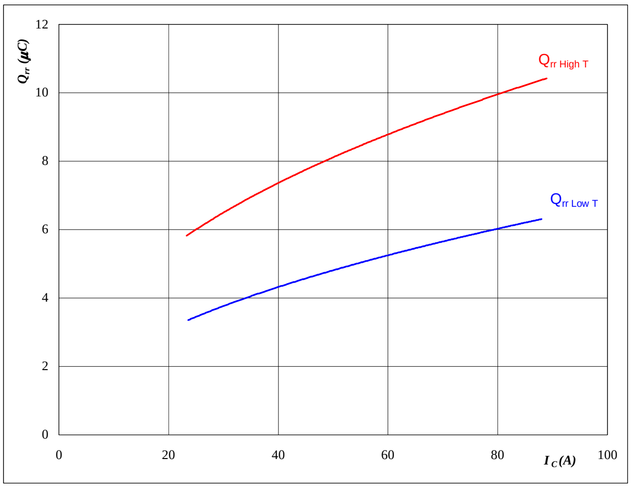
Neutral point

Neutral Point IGBT and Half Bridge FWD

Figure 13 FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



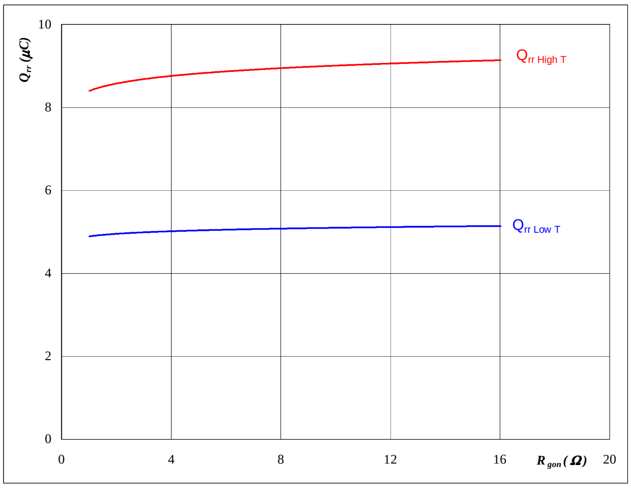
At

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

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



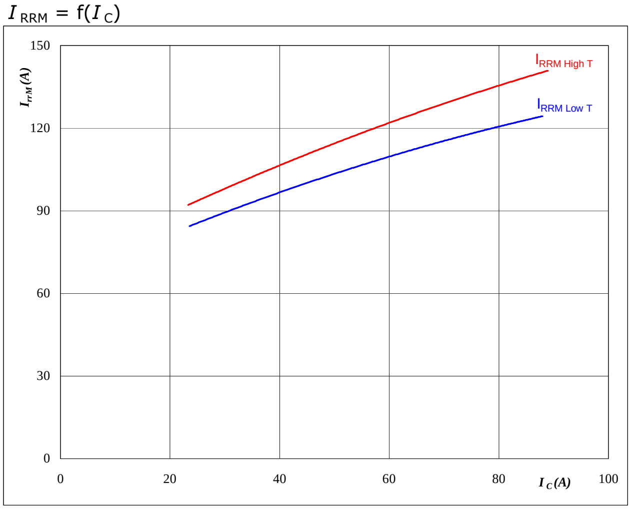
At

T_j =	25/125	°C
V_R =	350	V
I_F =	56	A
V_{GE} =	±15	V

Figure 15 FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



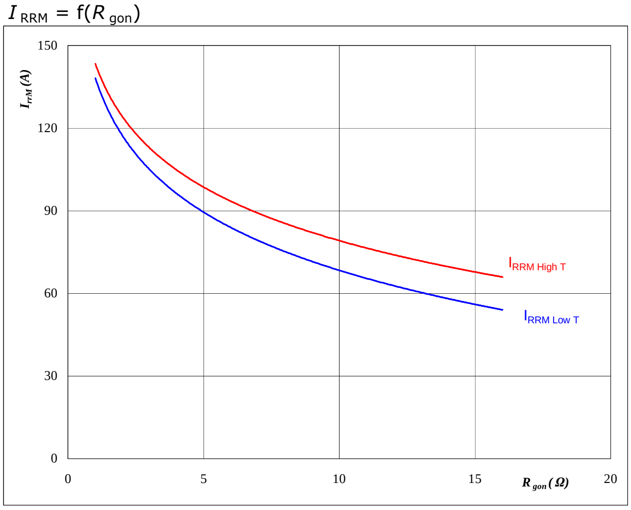
At

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 =	56	A
V_{GE} =	±15	V

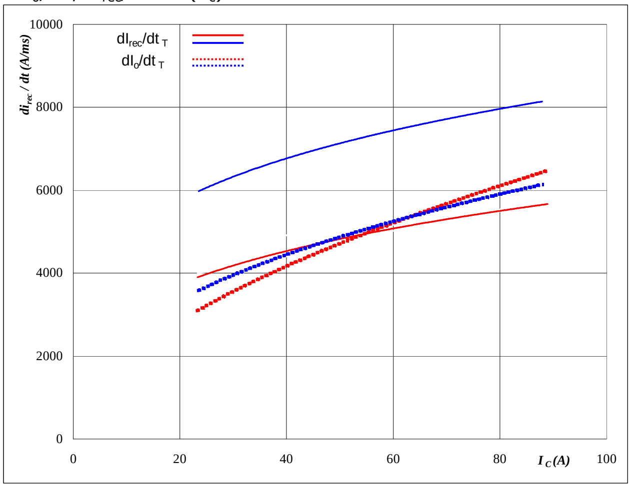
Neutral point

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

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



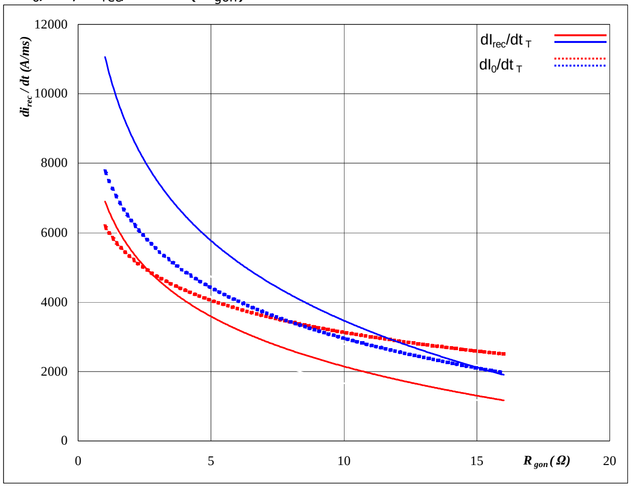
At

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

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



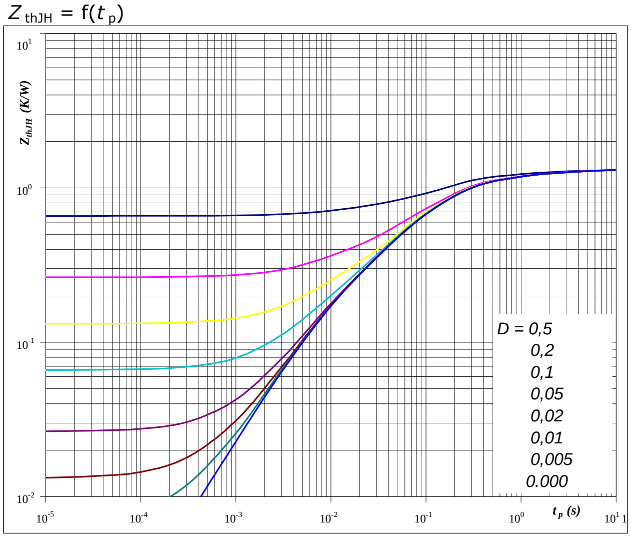
At

T_j =	25/125	°C
V_R =	350	V
I_F =	56	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 =	t_p / T	
R_{thJH} =	1,32	K/W

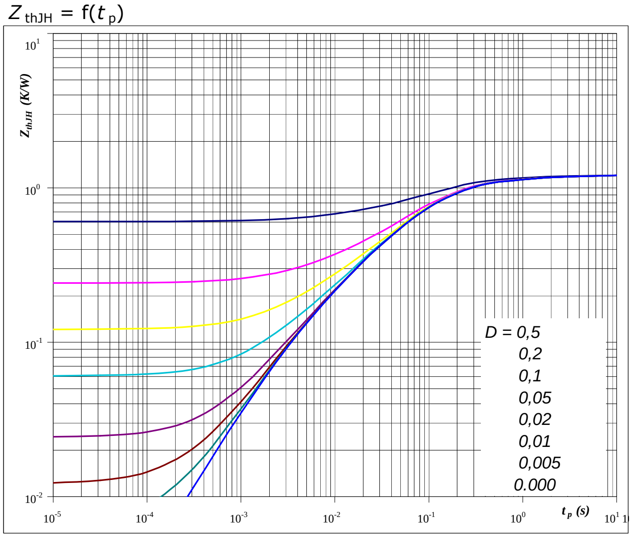
IGBT thermal model values

R (K/W)	Tau (s)
0,06	6,4E+00
0,17	1,3E+00
0,35	2,5E-01
0,60	8,5E-02
0,13	8,9E-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} =	1,21	K/W

FWD thermal model values

R (K/W)	Tau (s)
0,03	6,2E+00
0,11	1,1E+00
0,34	2,0E-01
0,54	6,8E-02
0,14	1,2E-02
0,05	2,8E-03

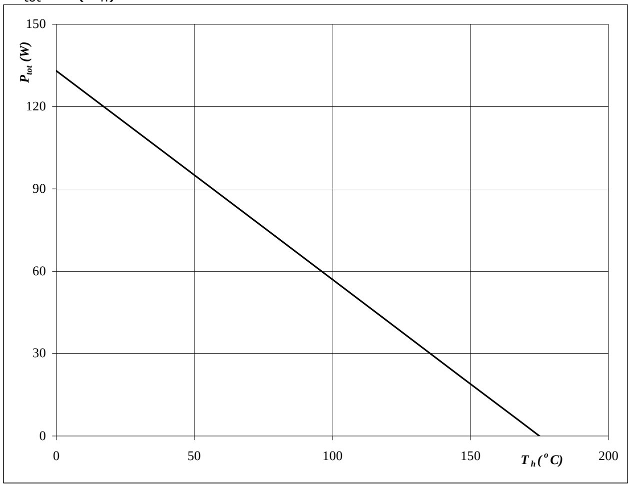
Neutral point

Neutral Point IGBT and Half Bridge FWD

Figure 21 IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



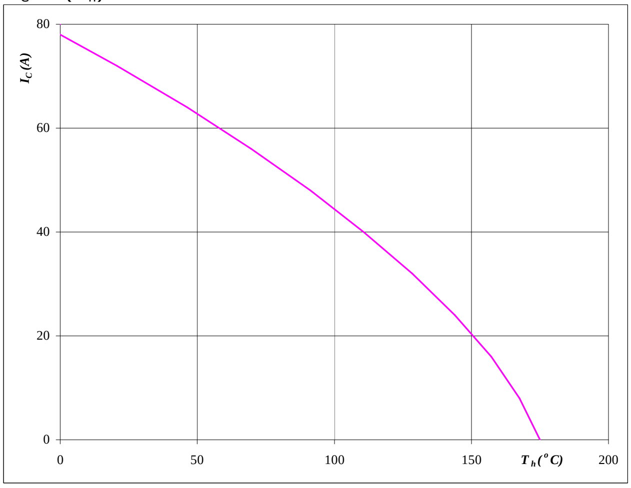
At

T_j = 175 ºC

Figure 22 IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

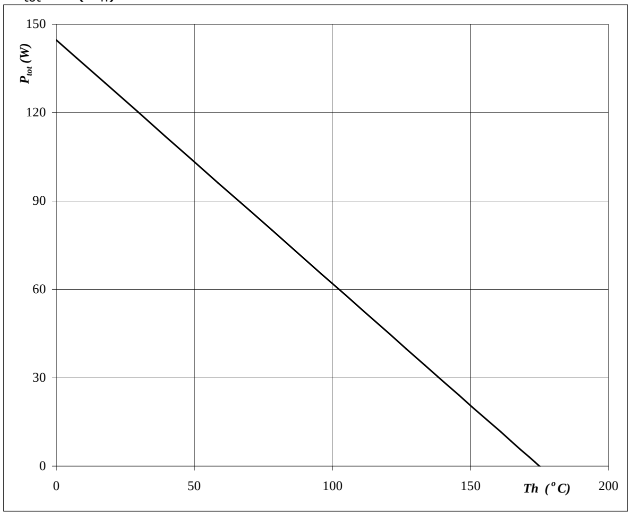
T_j = 175 ºC

V_{GE} = 15 V

Figure 23 FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



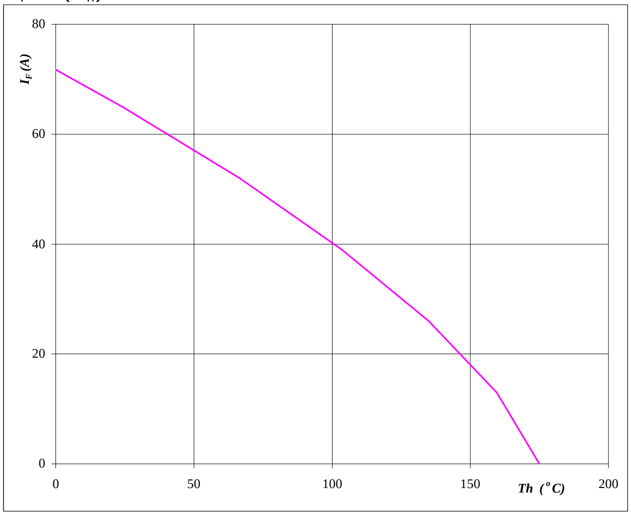
At

T_j = 175 ºC

Figure 24 FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

T_j = 175 ºC

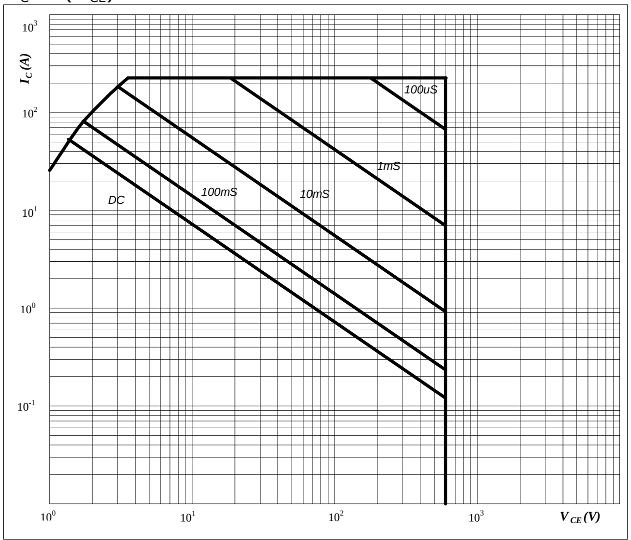
Neutral point

Neutral Point IGBT and Half Bridge FWD

Figure 25 IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



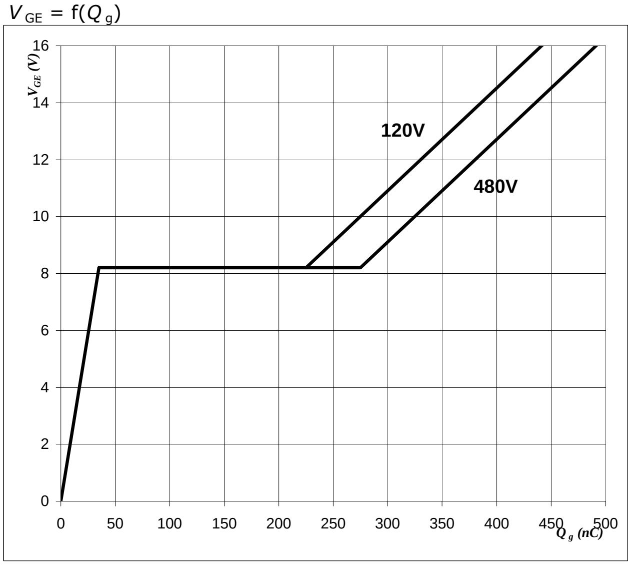
At

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

Figure 26 IGBT

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



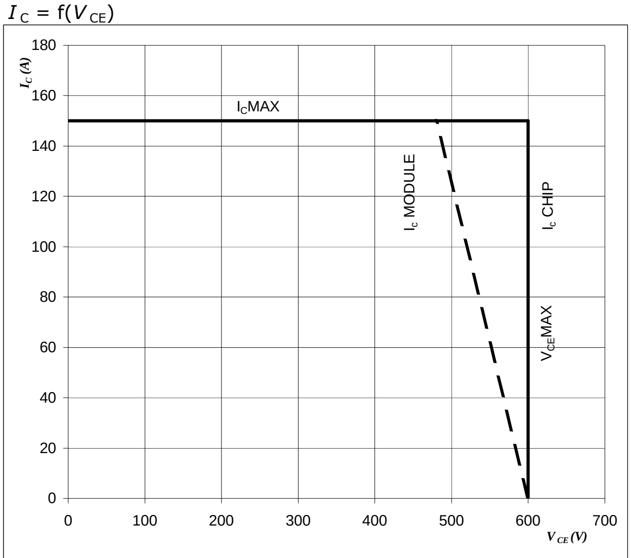
At

I_C = 75 A

Figure 27 IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



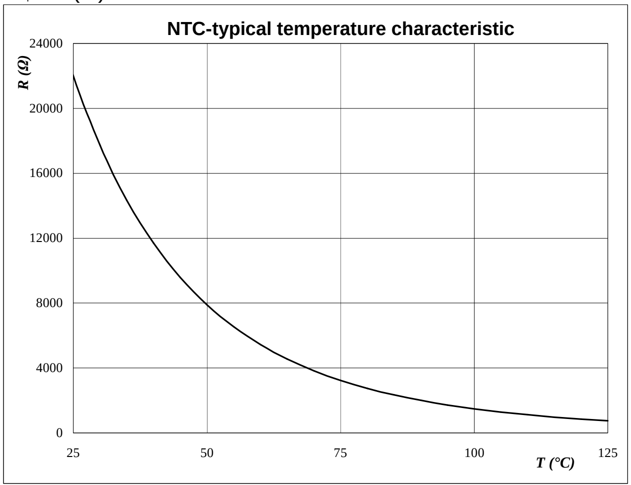
At

T_j = T_{jmax}-25 ºC
DC link $_{minus}$=DC link $_{plus}$
Switching mode : 3 level switching

Thermistor

Figure 1	Thermistor

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



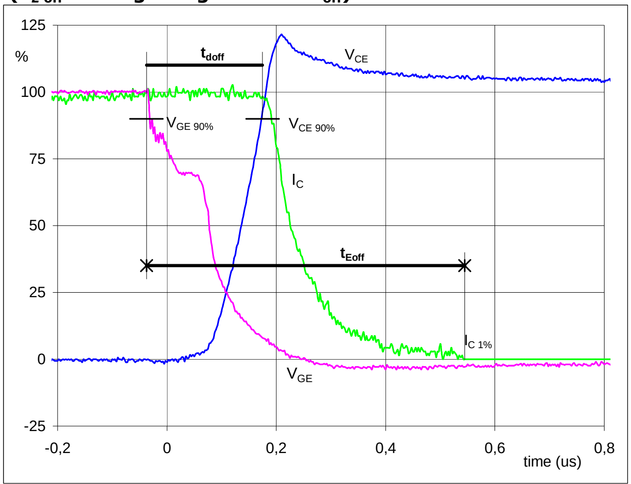
Switching Definitions Neutral point IGBT

General conditions

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

Figure 1 Neutral point IGBT

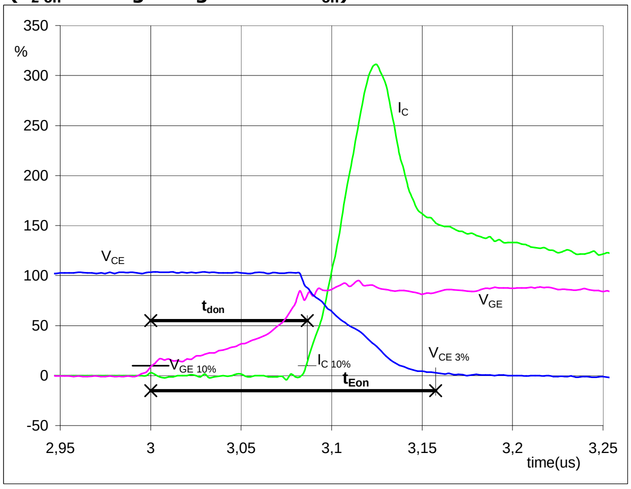
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E off}$ = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	350	V
I_C (100%) =	56	A
t_{doff} =	0,21	μs
$t_{E off}$ =	0,58	μs

Figure 2 Neutral point IGBT

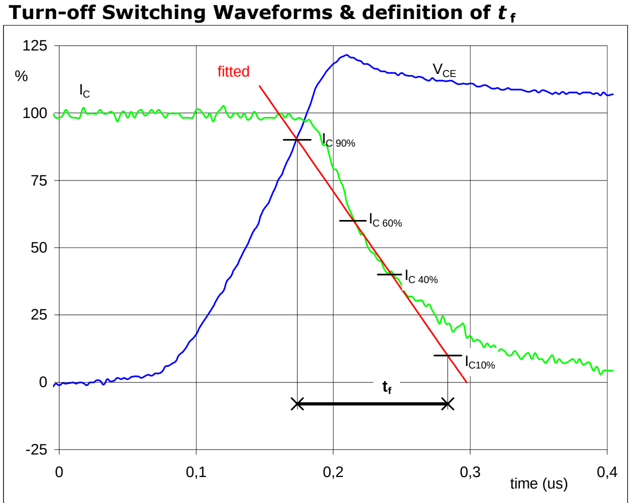
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E on}$ = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	350	V
I_C (100%) =	56	A
t_{don} =	0,09	μs
$t_{E on}$ =	0,16	μs

Figure 3 Neutral point IGBT

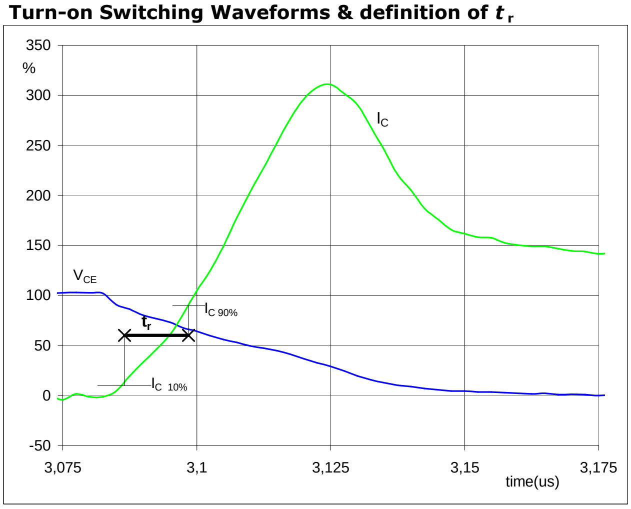
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	350	V
I_C (100%) =	56	A
t_f =	0,11	μs

Figure 4 Neutral point IGBT

Turn-on Switching Waveforms & definition of t_r

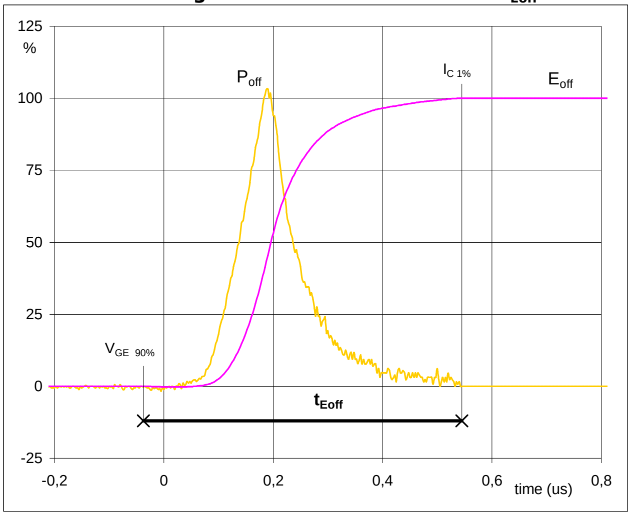


V_C (100%) =	350	V
I_C (100%) =	56	A
t_r =	0,01	μs

Switching Definitions Neutral point IGBT

Figure 5 Neutral point IGBT

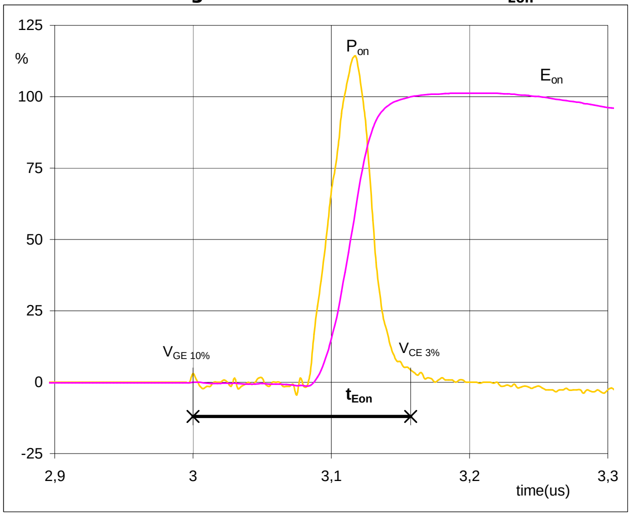
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	19,56	kW
E_{off} (100%) =	2,50	mJ
$t_{E\,off}$ =	0,58	μs

Figure 6 Neutral point IGBT

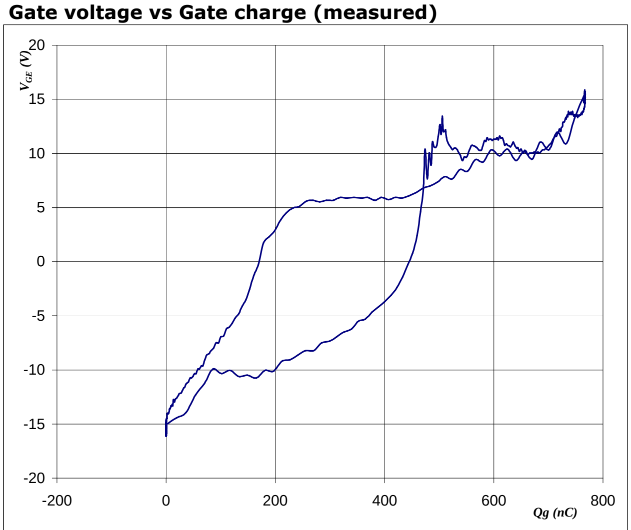
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	19,56	kW
E_{on} (100%) =	0,75	mJ
$t_{E\,on}$ =	0,16	μs

Figure 7 Neutral point IGBT

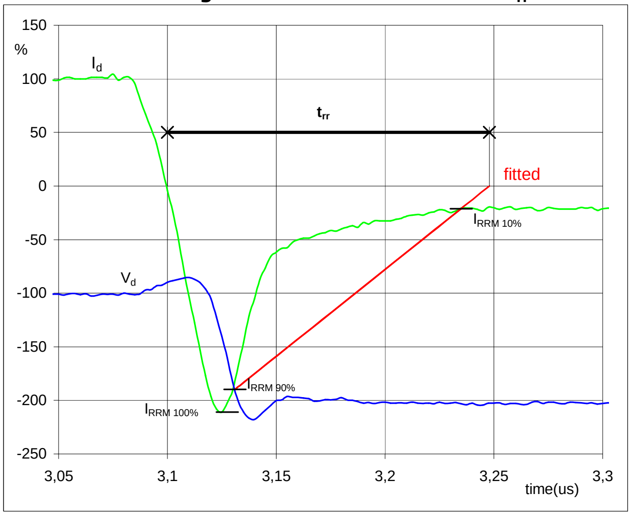
Gate voltage vs Gate charge (measured)



$V_{GE\,off}$ =	-15	V
$V_{GE\,on}$ =	15	V
V_C (100%) =	350	V
I_C (100%) =	56	A
Q_g =	775,97	nC

Figure 8 Neutral point FWD

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

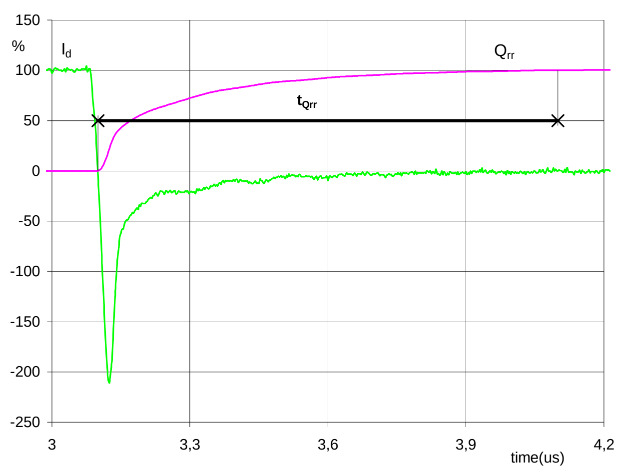


V_d (100%) =	350	V
I_d (100%) =	56	A
I_{RRM} (100%) =	-118	A
t_{rr} =	0,15	μs

Switching Definitions Neutral point IGBT

Figure 9 Neutral point IGBT

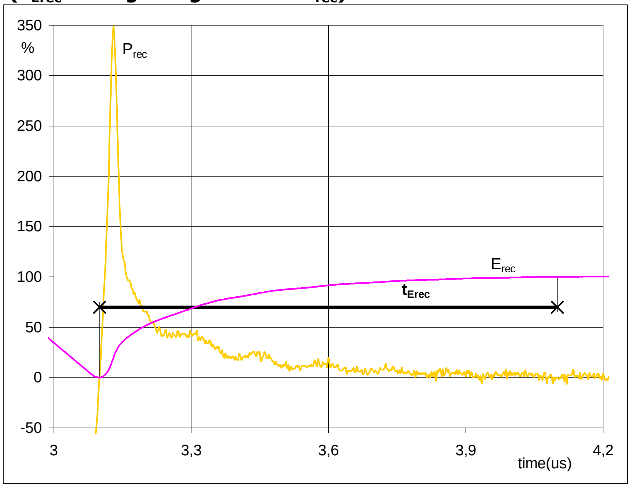
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	56	A
Q_{rr} (100%) =	8,22	µC
$t_{Q\,rr}$ =	1,00	µs

Figure 10 Neutral point IGBT

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

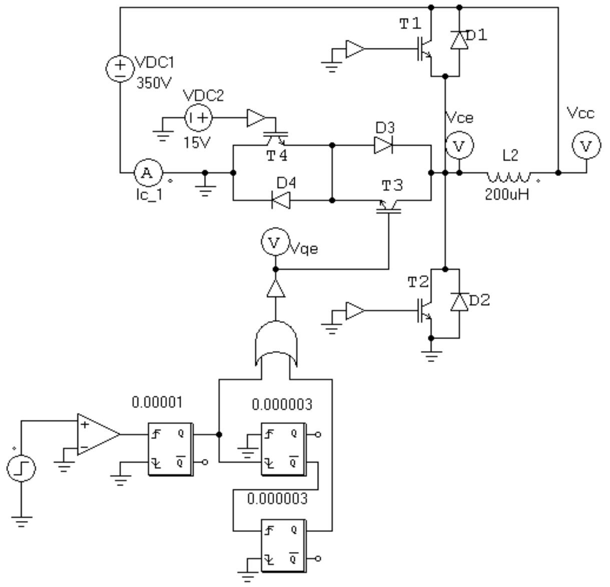


P_{rec} (100%) =	19,56	kW
E_{rec} (100%) =	2,42	mJ
$t_{E\,rec}$ =	1,00	µs

Measurement circuits

Figure 11

BOOST stage switching measurement circuit



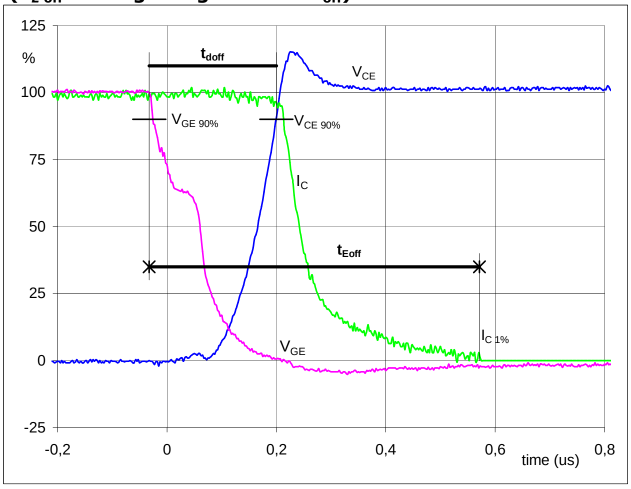
Switching Definitions Half Bridge IGBT

General conditions

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

Figure 1 Half Bridge IGBT

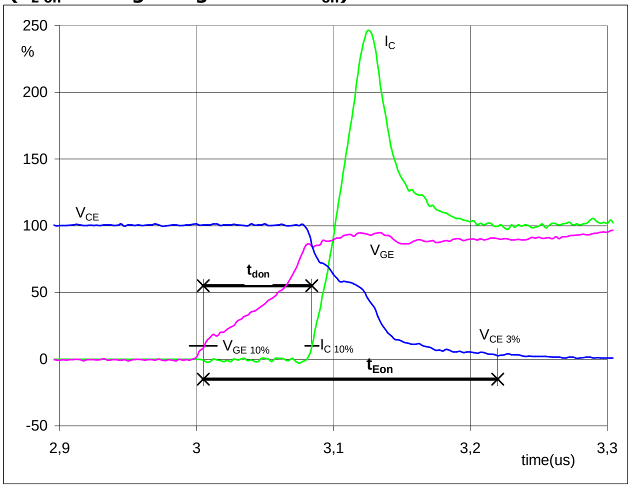
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} ($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	700	V
I_C (100%) =	56	A
t_{doff} =	0,23	μs
$t_{E\,off}$ =	0,60	μs

Figure 2 Half Bridge IGBT

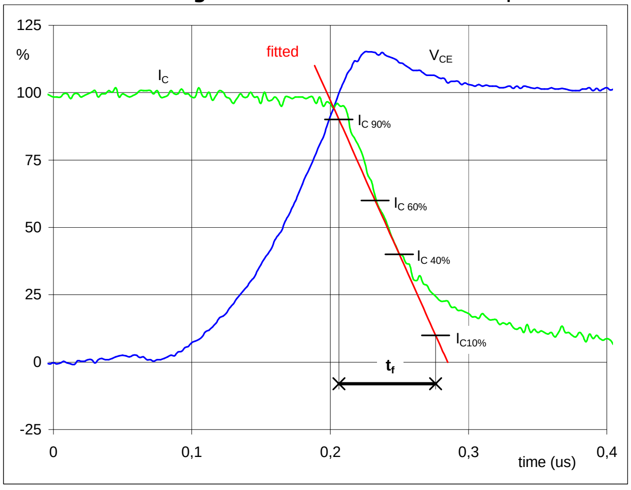
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} ($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	700	V
I_C (100%) =	56	A
t_{don} =	0,08	μs
$t_{E\,on}$ =	0,21	μs

Figure 3 Half Bridge IGBT

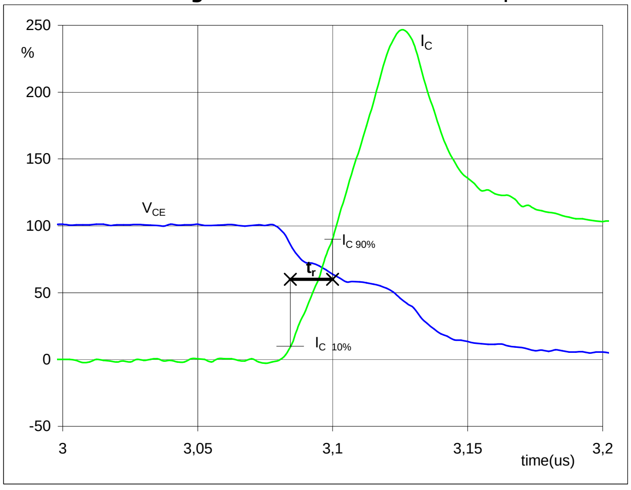
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	700	V
I_C (100%) =	56	A
t_f =	0,07	μs

Figure 4 Half Bridge IGBT

Turn-on Switching Waveforms & definition of t_r

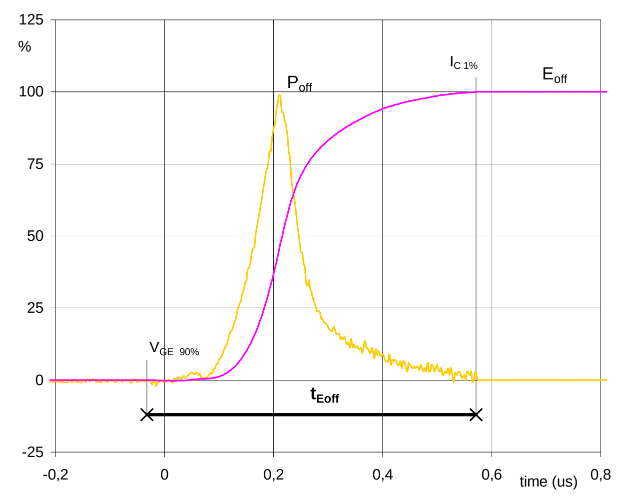


V_C (100%) =	700	V
I_C (100%) =	56	A
t_r =	0,02	μs

Switching Definitions Half Bridge IGBT

Figure 5 Half Bridge IGBT

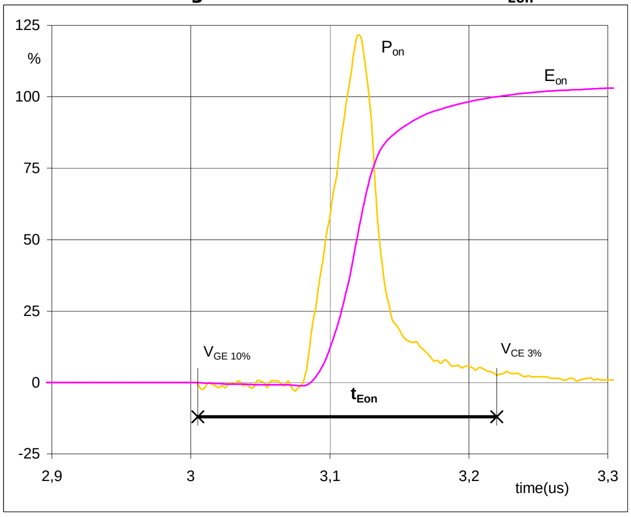
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	39,44	kW
E_{off} (100%) =	2,24	mJ
$t_{E\,off}$ =	0,60	μs

Figure 6 Half Bridge IGBT

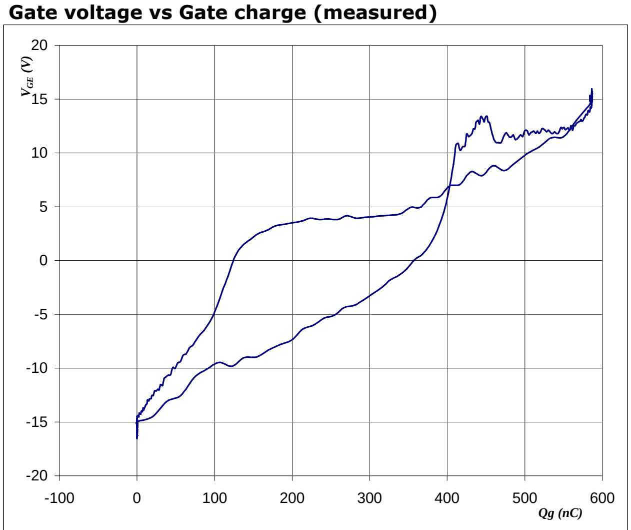
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	39,44	kW
E_{on} (100%) =	0,96	mJ
$t_{E\,on}$ =	0,21	μs

Figure 7 Half Bridge IGBT

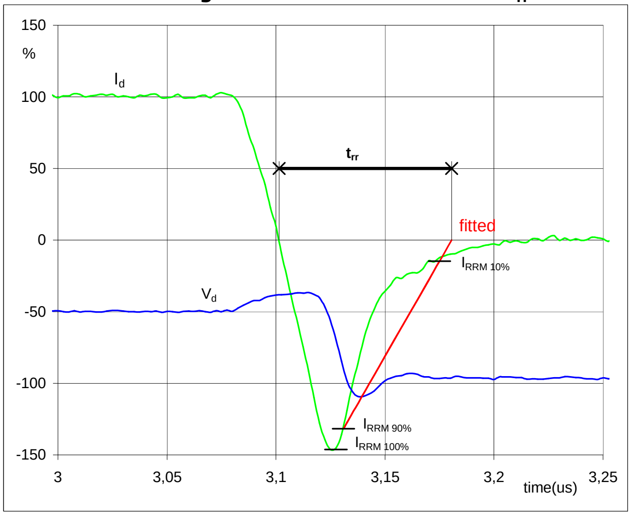
Gate voltage vs Gate charge (measured)



$V_{GE\,off}$ =	-15	V
$V_{GE\,on}$ =	15	V
V_C (100%) =	700	V
I_C (100%) =	56	A
Q_g =	596,49	nC

Figure 8 Half Bridge FWD

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

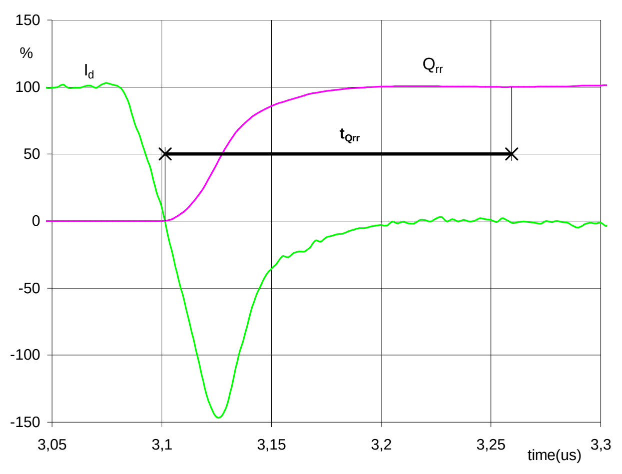


V_d (100%) =	700	V
I_d (100%) =	56	A
I_{RRM} (100%) =	-83	A
t_{rr} =	0,07	μs

Switching Definitions Half Bridge IGBT

Figure 9 Half Bridge IGBT

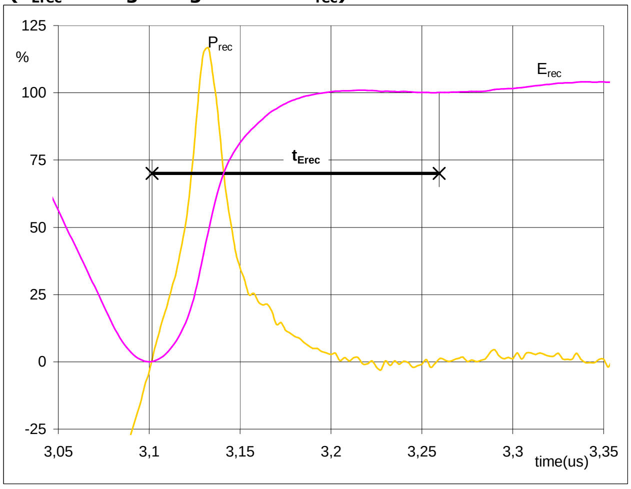
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	56	A
Q_{rr} (100%) =	2,74	μC
t_{Qrr} =	0,16	μs

Figure 10 Half Bridge IGBT

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

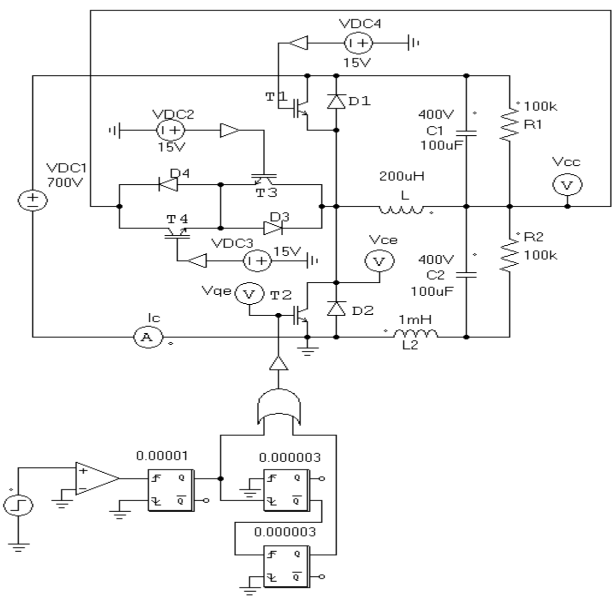


P_{rec} (100%) =	39,44	kW
E_{rec} (100%) =	0,53	mJ
t_{Erec} =	0,16	μs

Measurement circuits

Figure 11

BUCK stage switching measurement circuit



Ordering Code and Marking - Outline - Pinout

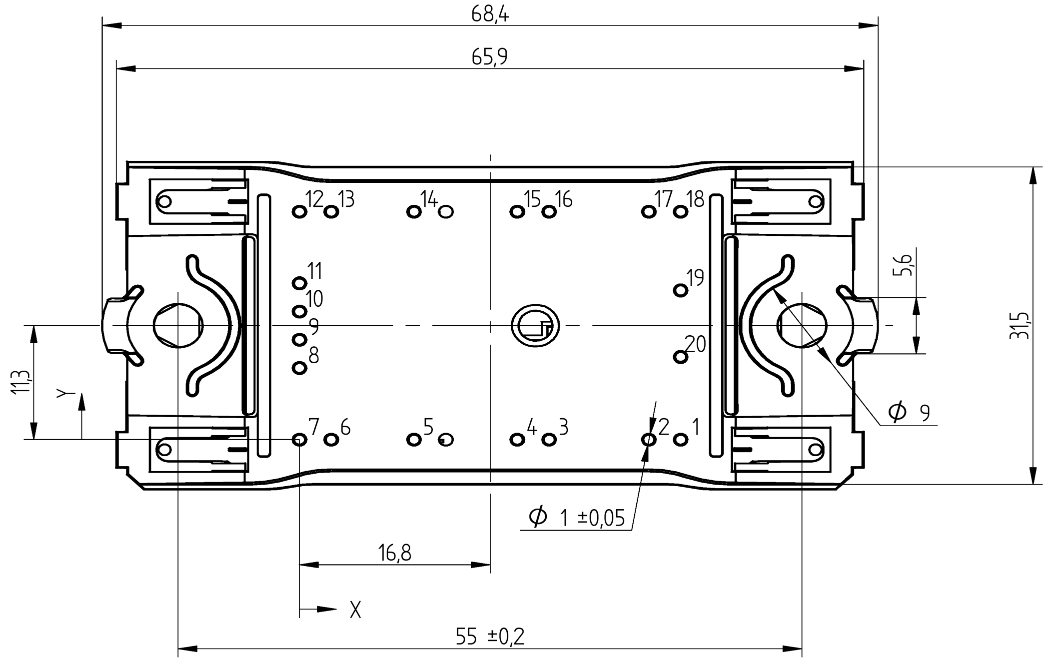
Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-FZ12NMA080SH01-M260F	M260F	M260F
without thermal paste 12mm housing	10-PZ12NMA080SH01-M260FY	M260FY	M260FY

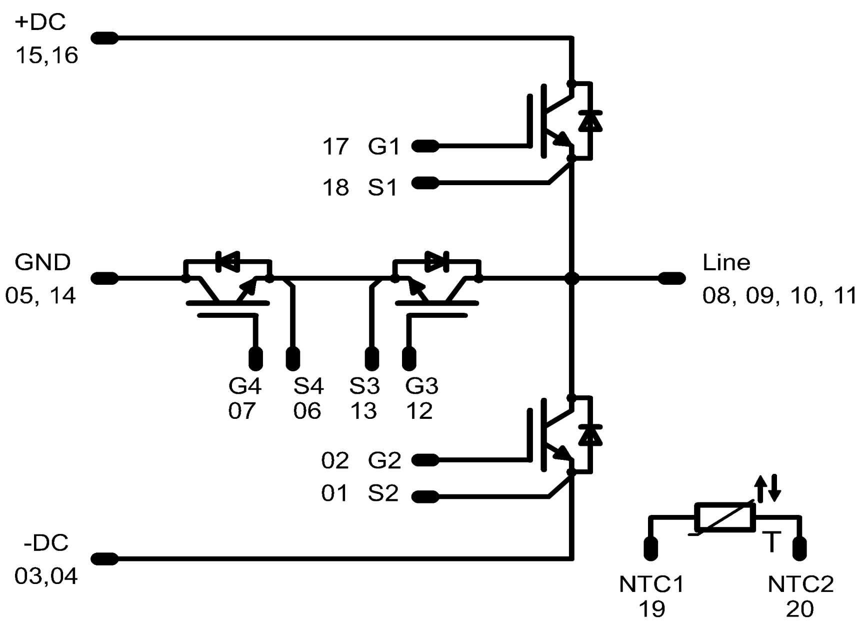
Outline

Pin table

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



Pinout



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