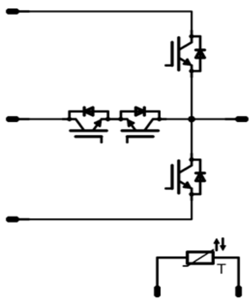
10-FZ12NMA080SH-M269F
datasheet

flowmMNPC0 — **1200V/80A & 600V/50A**

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-FZ12NMA080SH-M269F

Maximum Ratings

Tj=25℃, 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	$T_j=T_jmax$	T_h=80℃ T_c=80℃	66 84	A
Repetitive peak collector current	I_{Cpulse}	t_p limited by T_jmax		320	A
Power dissipation per IGBT	P_{tot}	$T_j=T_jmax$	T_h=80℃ T_c=80℃	158 240	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150℃ V_{GE}=15V		6 360	µs V
Maximum Junction Temperature	T_jmax			175	℃
Neutral Point FWD					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25℃		600	V
DC forward current	I_F	$T_j=T_jmax$	T_h=80℃ T_c=80℃	26 36	A
Surge forward current	I_{FSM}	t_p=8,3ms , sin 180°	T_c=25℃	300	A
I2t-value	I^2t			370	A^2s
Repetitive peak forward current	I_{FRM}	t_p limited by T_jmax		60	A
Power dissipation per Diode	P_{tot}	$T_j=T_jmax$	T_h=80℃ T_c=80℃	44 66	W
Maximum Junction Temperature	T_jmax			150	℃

Maximum Ratings

Tj=25℃, 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	$T_j=T_jmax$	$T_h=80℃$ $T_c=80℃$	36 46	A
Repetitive peak collector current	I_{Cpuls}	t_p limited by T_jmax		150	A
Power dissipation per IGBT	P_{tot}	$T_j=T_jmax$	$T_h=80℃$ $T_c=80℃$	56 85	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j≤150℃$ $V_{GE}=15V$		6 360	μs V
Maximum Junction Temperature	T_jmax			175	℃
Half Bridge FWD					
Peak Repetitive Reverse Voltage	V_{RRM}	$T_j=25℃$		1200	V
DC forward current	I_F	$T_j=T_jmax$	$T_h=80℃$ $T_c=80℃$	25 35	A
Surge forward current	I_{FSM}	$t_p=8{,}3ms$, sin 180°	$T_c=25℃$	325	A
I2t-value	I^2t			440	A^2s
Repetitive peak forward current	I_{FRM}	20kHz Square Wave		70	A
Power dissipation per Diode	P_{tot}	$T_j=T_jmax$	$T_h=80℃$ $T_c=80℃$	45 68	W
Maximum Junction Temperature	T_jmax			150	℃
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	℃
Operation temperature under switching condition	T_{op}			-40…+(Tjmax - 25)	℃
Insulation Properties					
Insulation voltage	V_{is}	t=2s	DC voltage	4000	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	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	$V_{GE(th)}$	VCE=VGE			0,002	Tj=25°C Tj=150°C	5	5,80	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		100	Tj=25°C Tj=150°C	1	2,10 2,43	2,5	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	1200		Tj=25°C Tj=150°C			500	uA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=150°C			1,2	uA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgon=8 Ω Rgoff=8 Ω	±15	350	40	Tj=25°C Tj=150°C		125 126		ns
Rise time	t_r					Tj=25°C Tj=150°C		20 23		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=150°C		219 282		
Fall time	t_f					Tj=25°C Tj=150°C		43 73		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=150°C		0,47 0,70		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=150°C		0,98 1,65		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		4660		pF
Output capacitance	C_{oss}							300		
Reverse transfer capacitance	C_{rss}							130		
Gate charge	Q_{Gate}		15	960	40	Tj=25°C		370		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,60		K/W
Neutral Point FWD										
Diode forward voltage	V_F				30	Tj=25°C Tj=125°C	1	2,46 1,86	2,8	V
Peak reverse recovery current	I_{RRM}	Rgon=8 Ω	±15	350	40	Tj=25°C Tj=125°C		31 43		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		18 38		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=125°C		0,30 0,95		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=125°C		7783 4120		A/µs
Reverse recovered energy	Erec					Tj=25°C Tj=125°C		0,02 0,12		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,61		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	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,0008	Tj=25℃ Tj=125℃	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		50	Tj=25℃ Tj=125℃	1,1	1,54 1,75	2	V
Collector-emitter cut-off incl diode	I_{CES}		0	600		Tj=25℃ Tj=125℃			100	uA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25℃ Tj=125℃			650	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgon=8 Ω Rgoff=8 Ω	±15	350	41	Tj=25℃ Tj=125℃		99 102		ns
Rise time	t_r					Tj=25℃ Tj=125℃		10 13		
Turn-off delay time	$t_{d(off)}$					Tj=25℃ Tj=125℃		183 206		
Fall time	t_f					Tj=25℃ Tj=125℃		80 99		
Turn-on energy loss per pulse	E_{on}					Tj=25℃ Tj=125℃		0,49 0,72		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25℃ Tj=125℃		1,16 1,50		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25℃		3140		pF
Output capacitance	C_{oss}							200		
Reverse transfer capacitance	C_{rss}							93		
Gate charge	Q_{Gate}		15	480	50	Tj=25℃		310		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,30		K/W
Half Bridge FWD										
Diode forward voltage	V_F				30	Tj=25℃ Tj=125℃	1,5	2,23 1,91	3,4	V
Reverse leakage current	I_r			1200		Tj=25℃ Tj=125℃			100	μA
Peak reverse recovery current	I_{RRM}	Rgon=8 Ω	±15	350	41	Tj=25℃ Tj=125℃		64 79		A
Reverse recovery time	t_{rr}					Tj=25℃ Tj=125℃		29 172		ns
Reverse recovered charge	Q_{rr}					Tj=25℃ Tj=125℃		2,7 6,1		μC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25℃ Tj=125℃		8246 4626		A/μs
Reverse recovery energy	E_{rec}					Tj=25℃ Tj=125℃		0,74 1,79		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,55		K/W
Thermistor										
Rated resistance	R					T=25℃		22000		Ω
Deviation of R100	ΔR/R	R100=1486 Ω				T=100℃	-5		5	%
Power dissipation	P					T=25℃		200		mW
Power dissipation constant						T=25℃		2		mW/K
B-value	B(25/50)	Tol. ±3%				T=25℃		3950		K
B-value	B(25/100)	Tol. ±3%				T=25℃		3996		K
Vincotech NTC Reference									B	

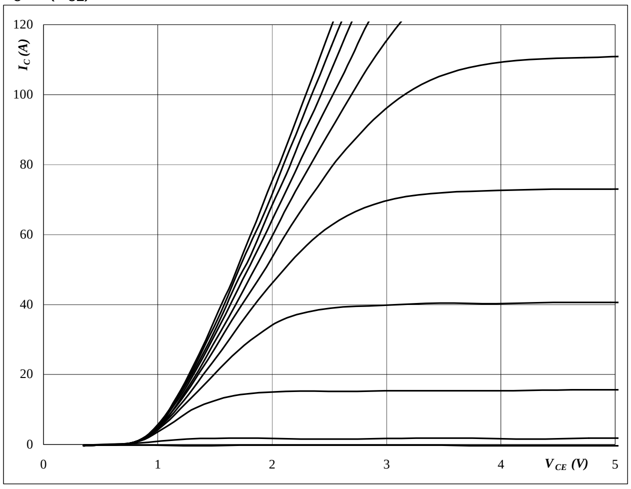
Buck

half bridge IGBT and **neutral point FRED**

Figure 1 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



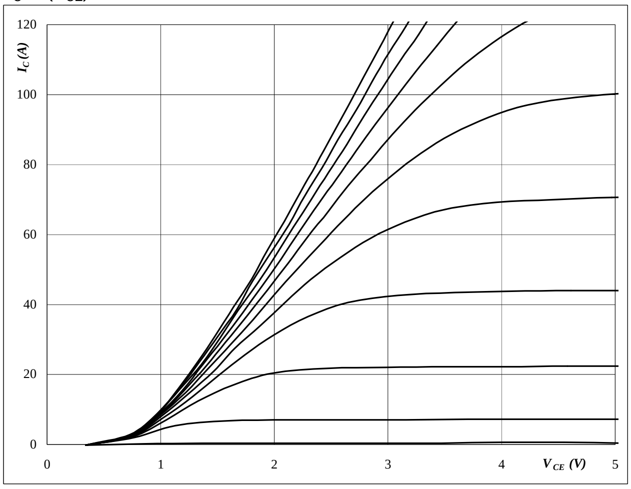
At

t_p =	250	µs
T_j =	25	℃
V_{GE} from	6 V to 16 V in steps of 1 V	

Figure 2 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



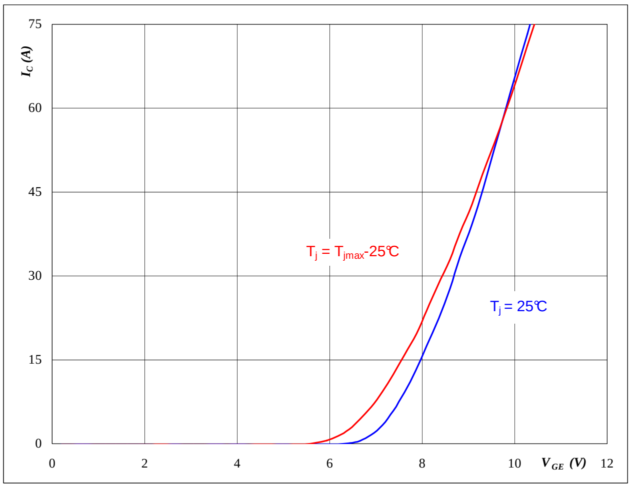
At

t_p =	250	µs
T_j =	125	℃
V_{GE} from	6 V to 16 V in steps of 1 V	

Figure 3 IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



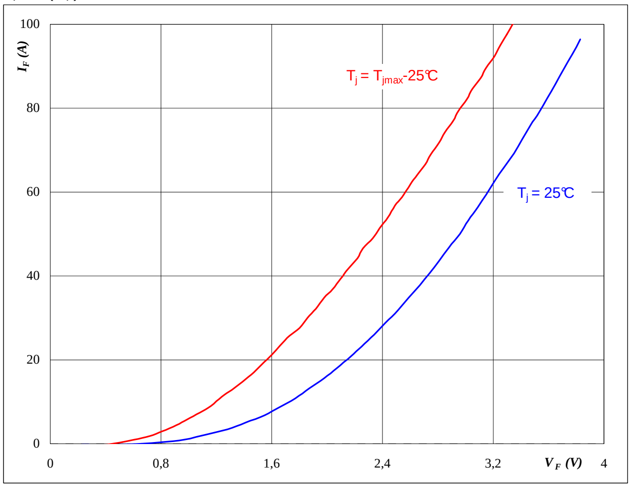
At

t_p =	250	µs
V_{CE} =	10	V

Figure 4 FRED

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

t_p =	250	µs

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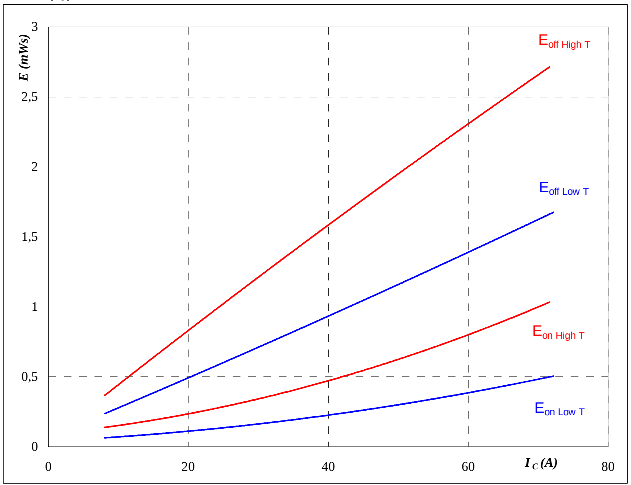
half bridge IGBT and **neutral point FRED**

Figure 5 IGBT

Typical switching energy losses
as a function of collector current

$E = f(I_C)$



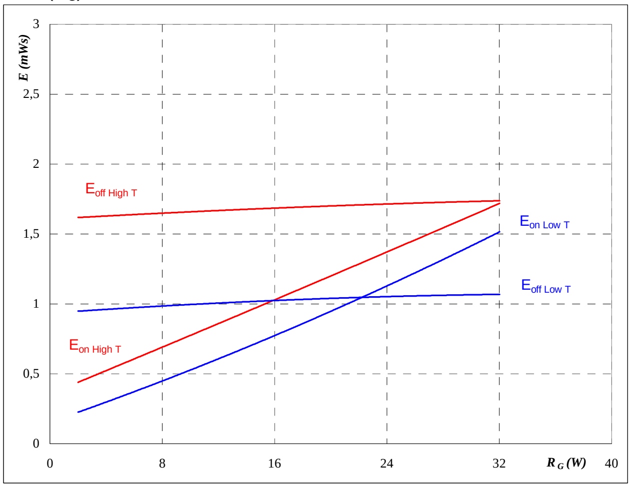
With an inductive load at

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 6 IGBT

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



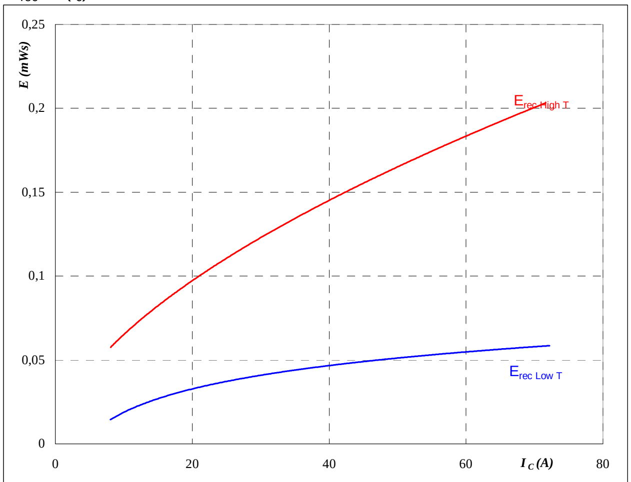
With an inductive load at

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	40	A

Figure 7 FRED

Typical reverse recovery energy loss
as a function of collector current

$E_{rec} = f(I_c)$



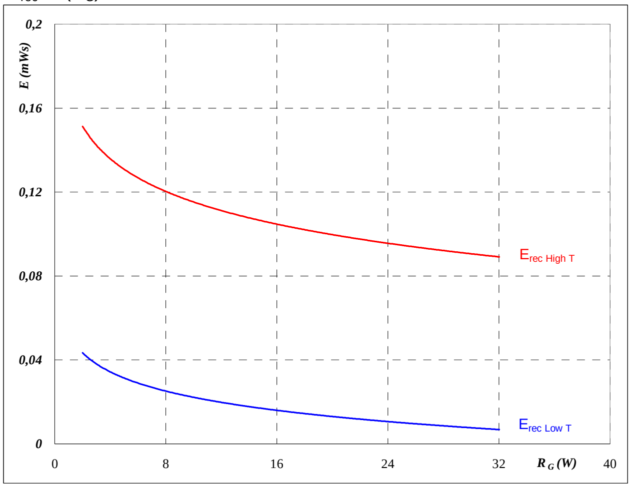
With an inductive load at

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

Figure 8 FRED

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	℃
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	40	A

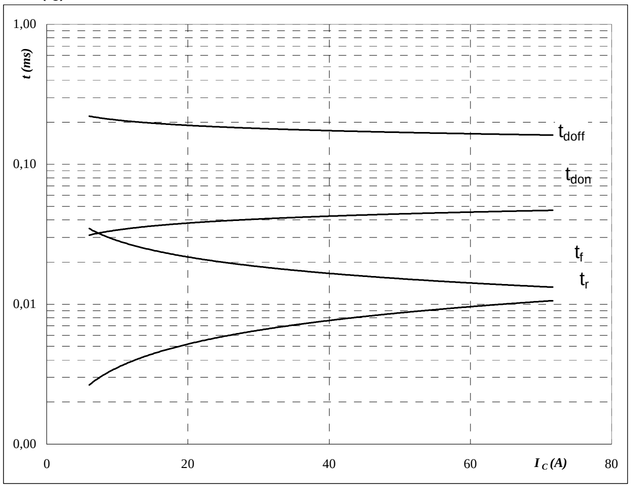
Buck

half bridge IGBT and **neutral point FRED**

Figure 9 IGBT

Typical switching times as a function of collector current

t = f(I_C)



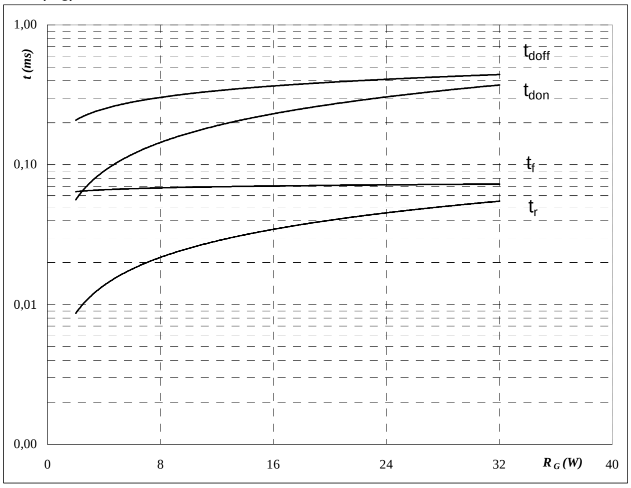
With an inductive load at

T_j =	125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 10 IGBT

Typical switching times as a function of gate resistor

t = f(R_G)



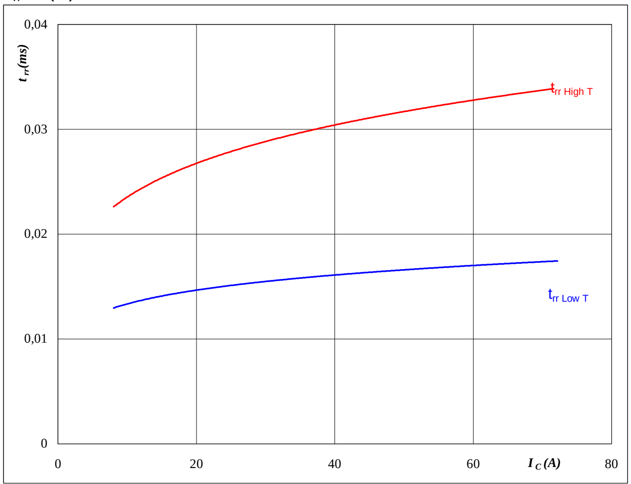
With an inductive load at

T_j =	125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	40	A

Figure 11 FRED

Typical reverse recovery time as a function of collector current

t_{rr} = f(Ic)



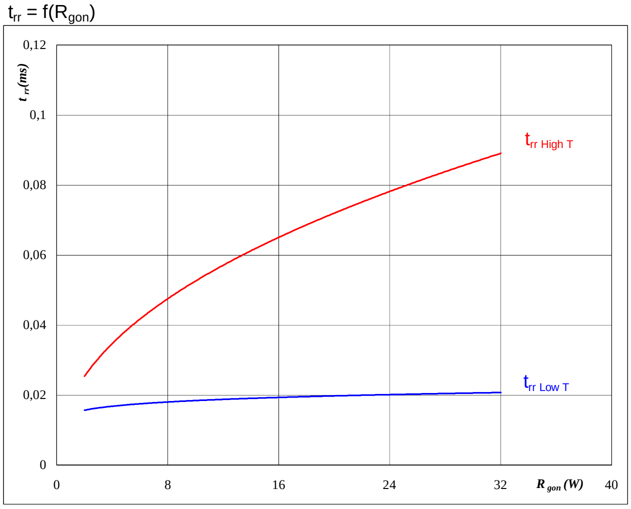
At

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

Figure 12 FRED

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

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



At

T_j =	25/125	℃
V_R =	350	V
I_F =	40	A
V_{GE} =	±15	V

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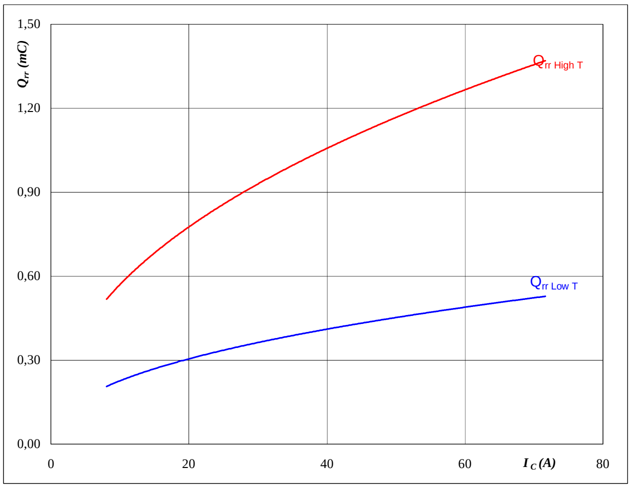
half bridge IGBT and **neutral point FRED**

Figure 13	FRED

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



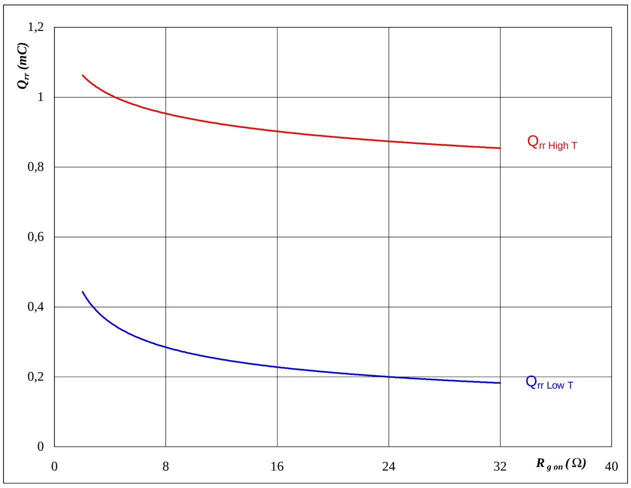
At

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

Figure 14	FRED

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

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



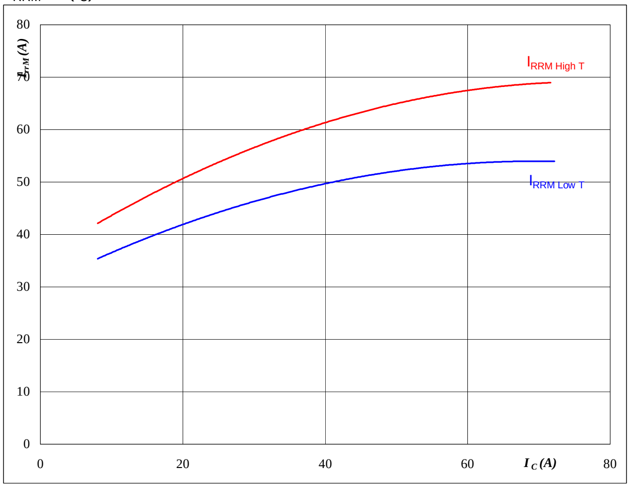
At

T_j =	25/125	℃
V_R =	350	V
I_F =	40	A
V_{GE} =	±15	V

Figure 15	FRED

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



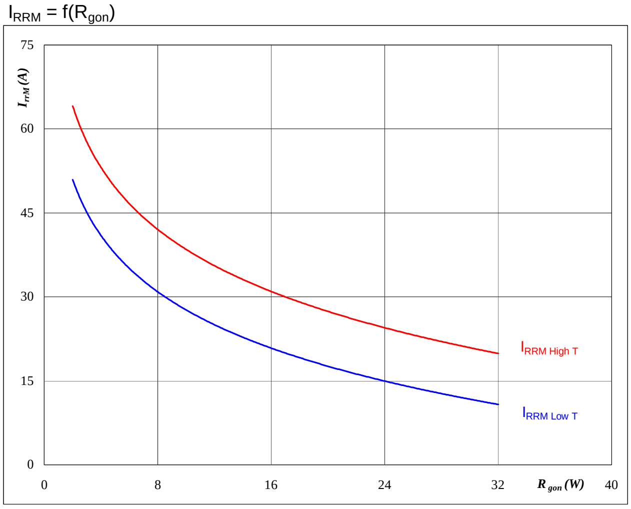
At

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

Figure 16	FRED

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

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



At

T_j =	25/125	℃
V_R =	350	V
I_F =	40	A
V_{GE} =	±15	V

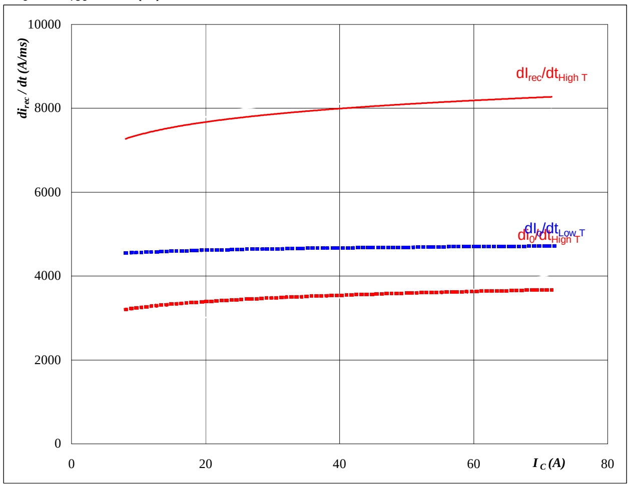
Buck

half bridge IGBT and **neutral point FRED**

Figure 17 FRED

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

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



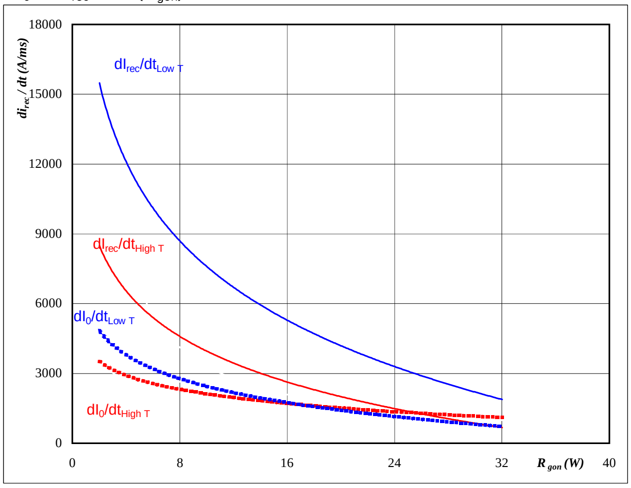
At

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

Figure 18 FRED

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

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



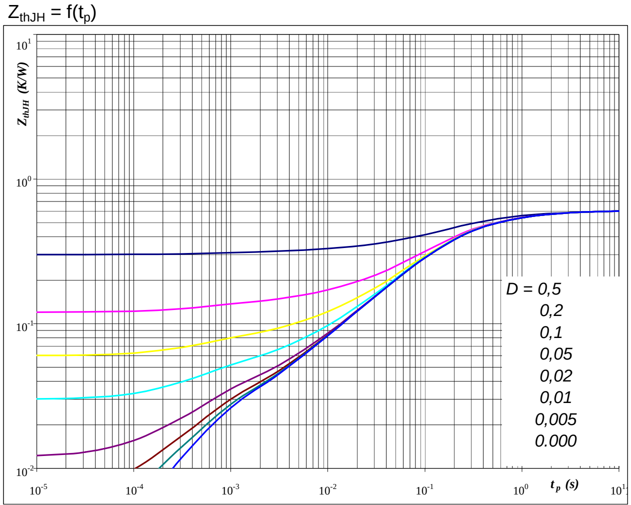
At

T_j =	25/125	℃
V_R =	350	V
I_F =	40	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

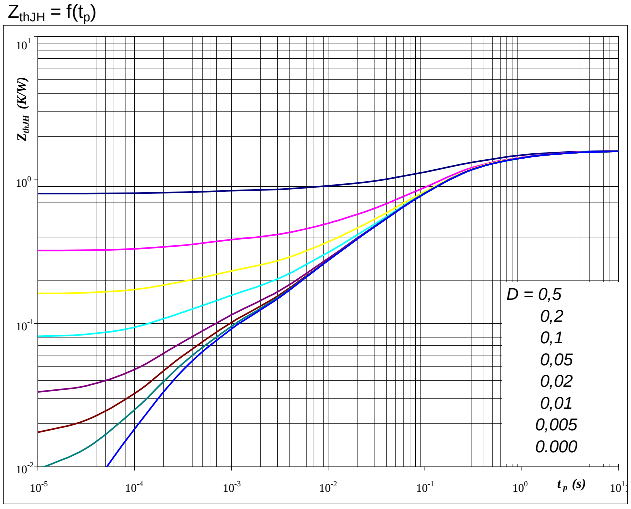
IGBT thermal model values

R (C/W)	Tau (s)
0,10	1,7E+00
0,28	2,4E-01
0,16	6,7E-02
0,04	8,5E-03
0,02	5,6E-04

Figure 20 FRED

FRED transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	1,61	K/W

FRED thermal model values

R (C/W)	Tau (s)
0,06	9,8E+00
0,30	1,1E+00
0,80	1,8E-01
0,28	3,3E-02
0,11	5,6E-03
0,07	3,8E-04

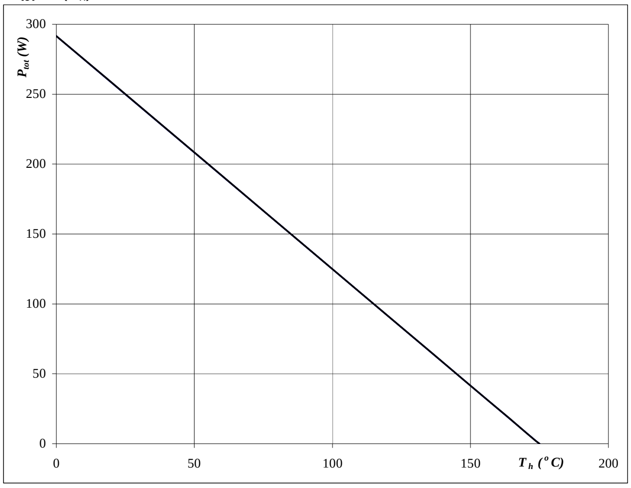
Buck

half bridge IGBT and **neutral point FRED**

Figure 21	IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



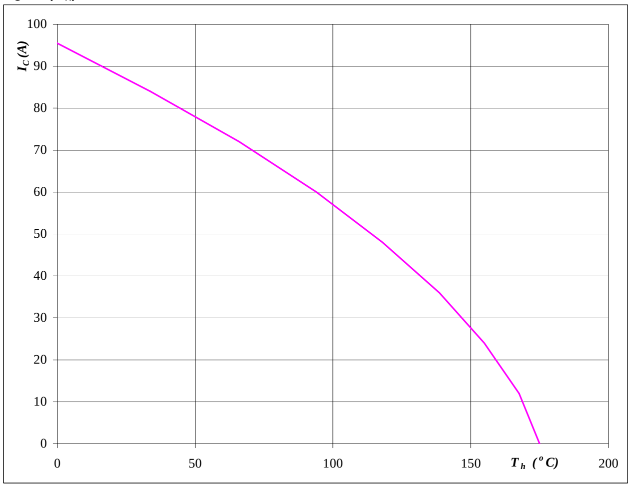
At

T_j = 175 ℃

Figure 22	IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

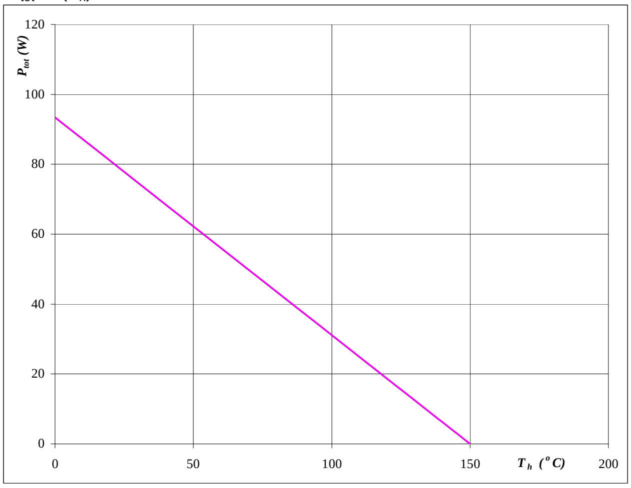
T_j = 175 ℃

V_{GE} = 15 V

Figure 23	FRED

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



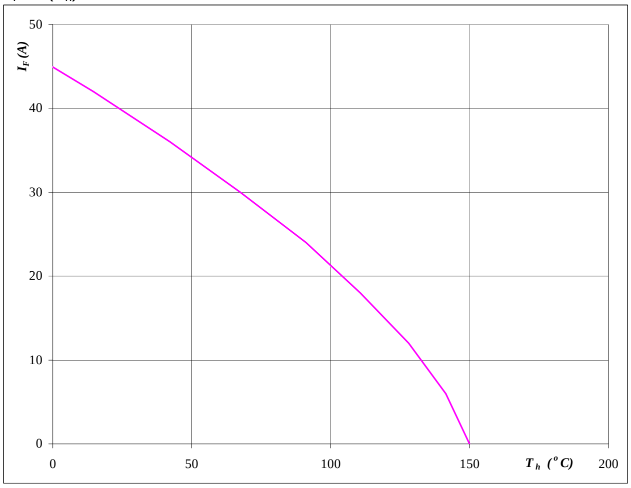
At

T_j = 150 ℃

Figure 24	FRED

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

T_j = 150 ℃

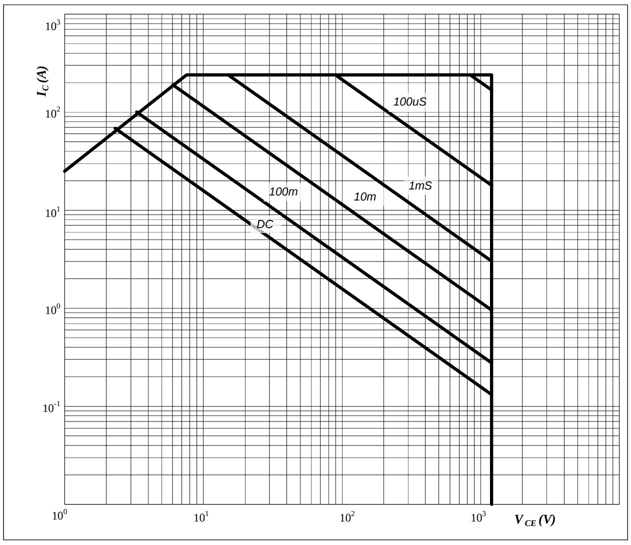
Buck

half bridge IGBT and **neutral point FRED**

Figure 25	IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



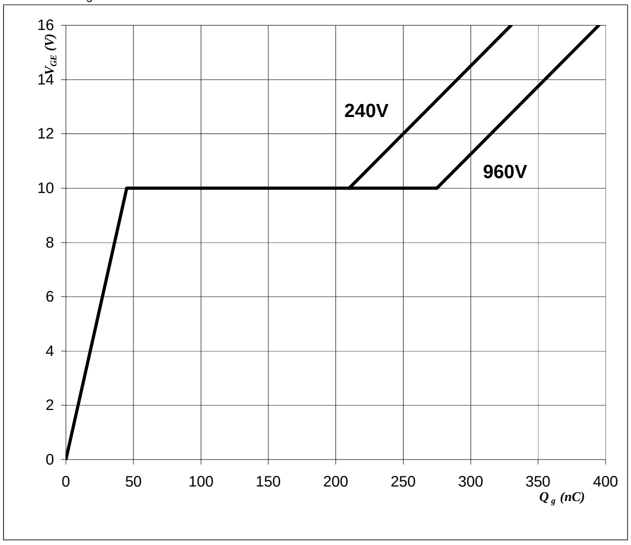
At

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

Figure 26	IGBT

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



At

I_C =	40	A

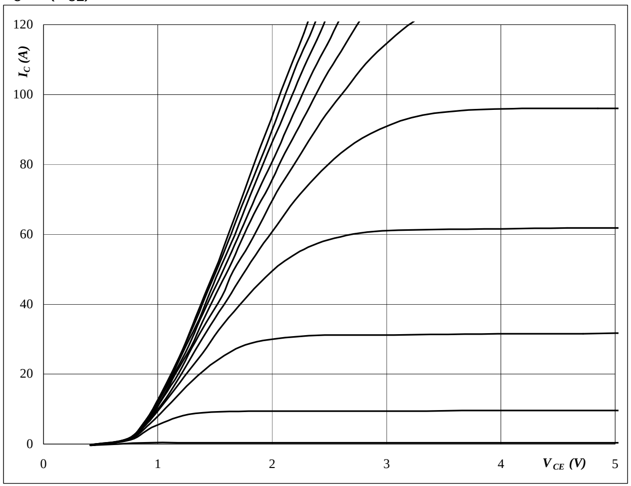
Boost

neutral point IGBT and **half bridge FRED**

Figure 1 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



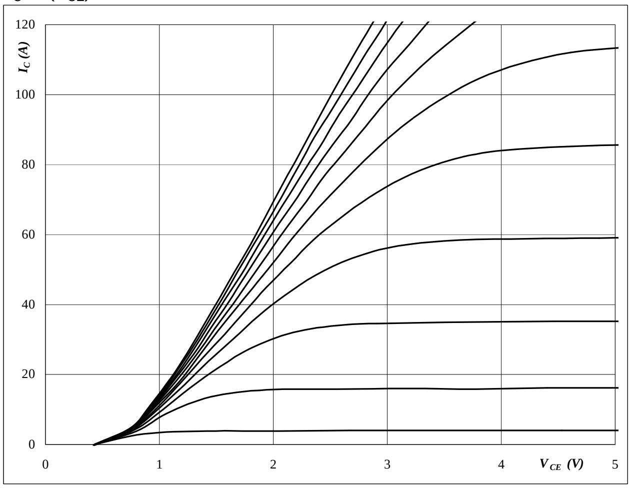
At

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

Figure 2 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



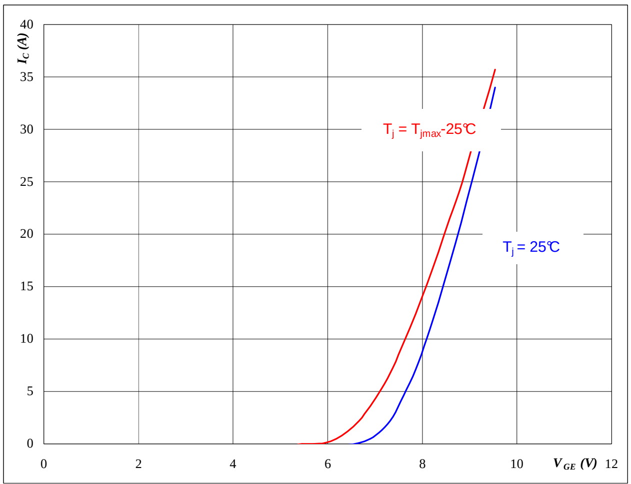
At

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

Figure 3 IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



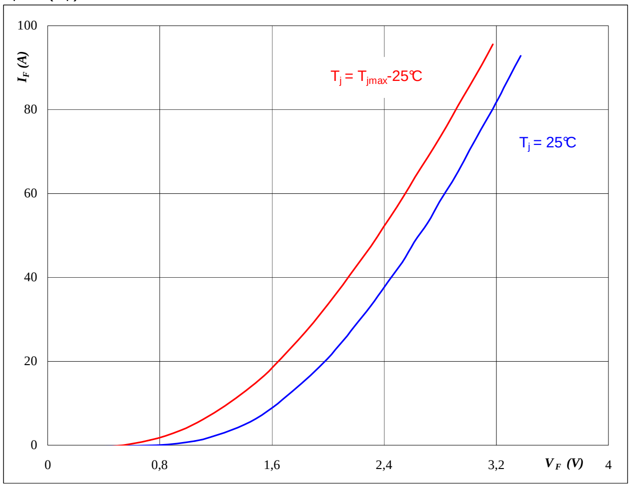
At

t_p =	250	μs
V_{CE} =	10	V

Figure 4 FRED

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

t_p =	250	μs

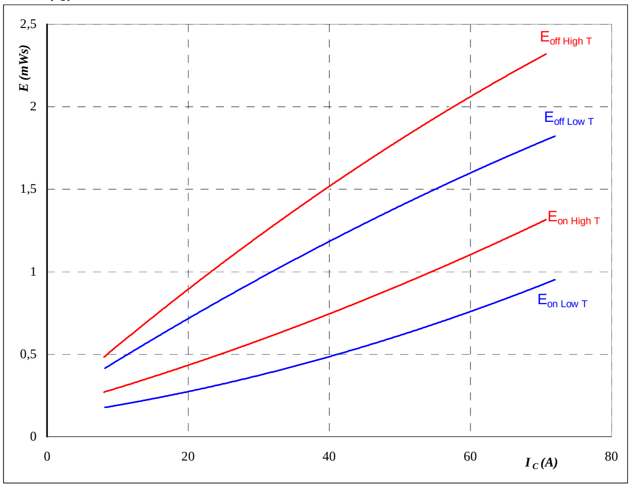
Boost

neutral point IGBT and **half bridge FRED**

Figure 5 IGBT

Typical switching energy losses
as a function of collector current

$E = f(I_C)$



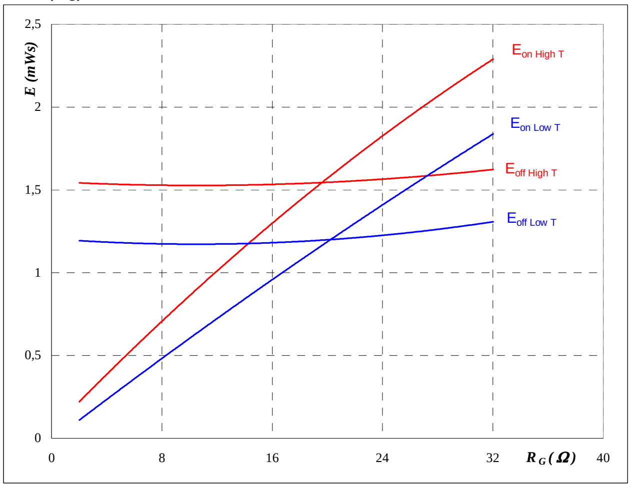
With an inductive load at

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

Figure 6 IGBT

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



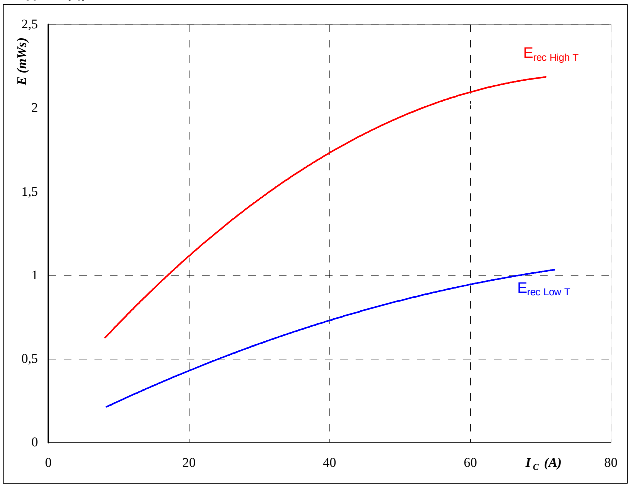
With an inductive load at

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	41	A

Figure 7 IGBT

Typical reverse recovery energy loss
as a function of collector current

$E_{rec} = f(I_c)$



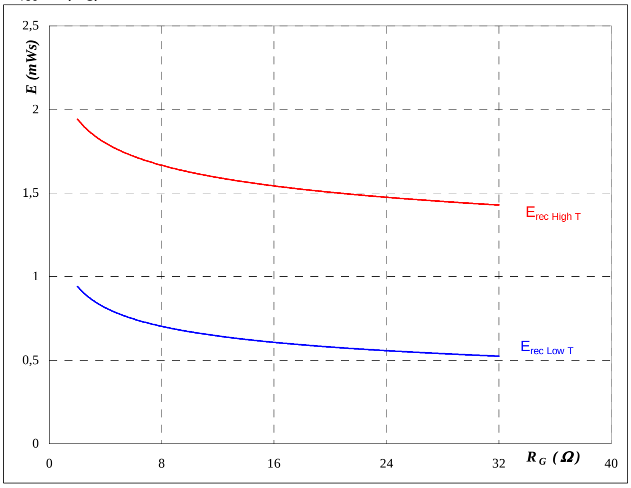
With an inductive load at

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω

Figure 8 IGBT

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	℃
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	41	A

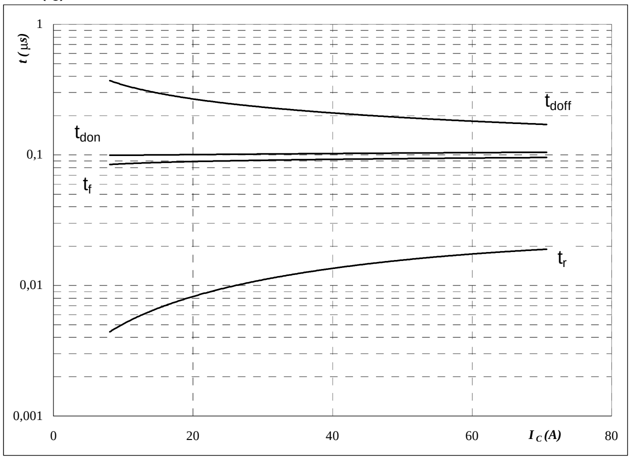
Boost

neutral point IGBT and **half bridge FRED**

Figure 9	IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



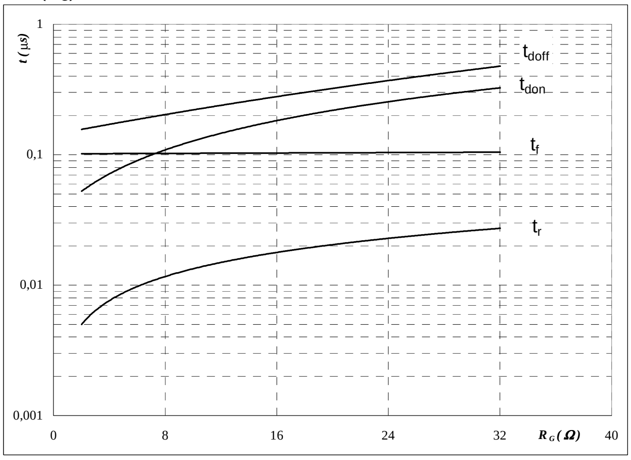
With an inductive load at

T_j =	125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

Figure 10	IGBT

Typical switching times as a function of gate resistor

$t = f(R_G)$



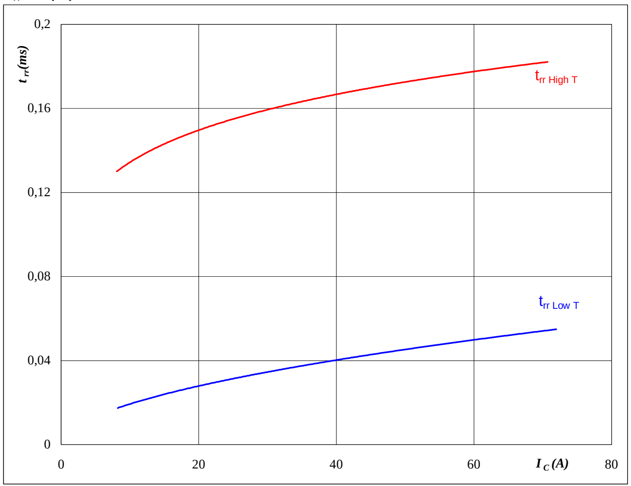
With an inductive load at

T_j =	125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	41	A

Figure 11	FRED

Typical reverse recovery time as a function of collector current

$t_{rr} = f(Ic)$



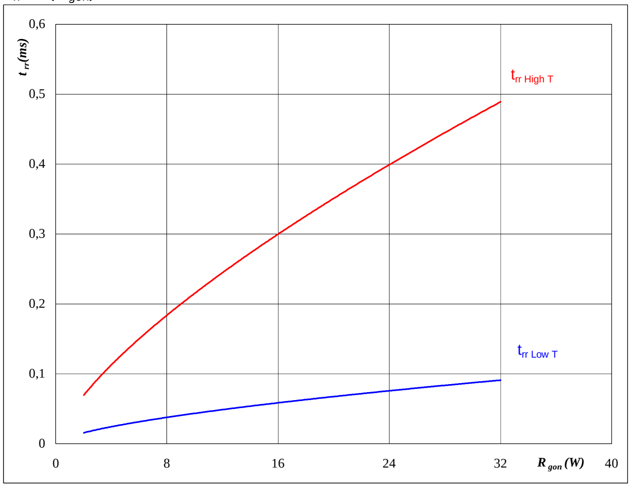
At

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω

Figure 12	FRED

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

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



At

T_j =	25/125	℃
V_R =	350	V
I_F =	41	A
V_{GE} =	±15	V

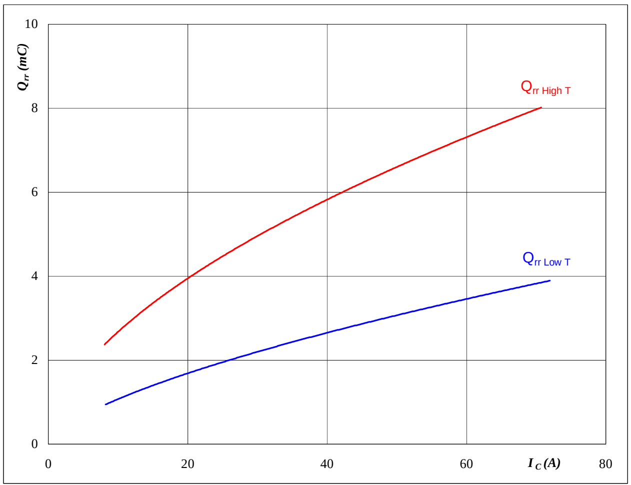
Boost

neutral point IGBT and **half bridge FRED**

Figure 13 FRED

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



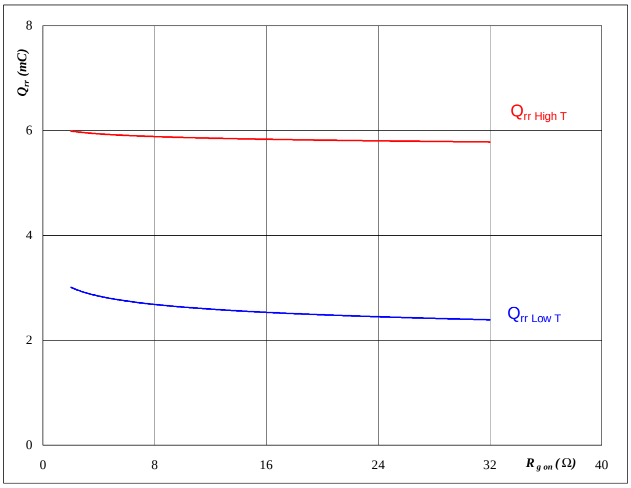
At

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω

Figure 14 FRED

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

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



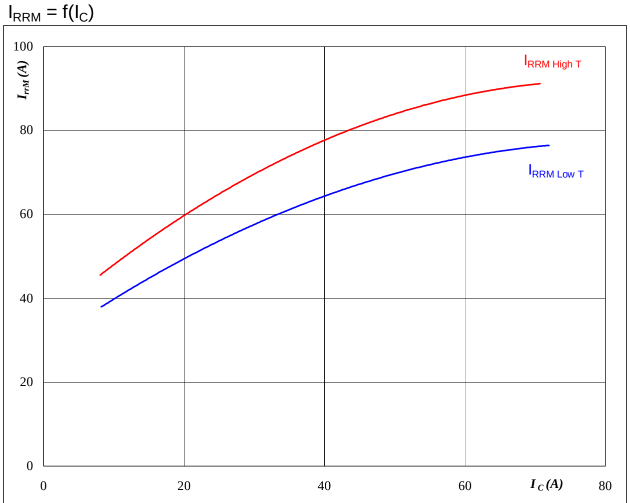
At

T_j =	25/125	℃
V_R =	350	V
I_F =	41	A
V_{GE} =	±15	V

Figure 15 FRED

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



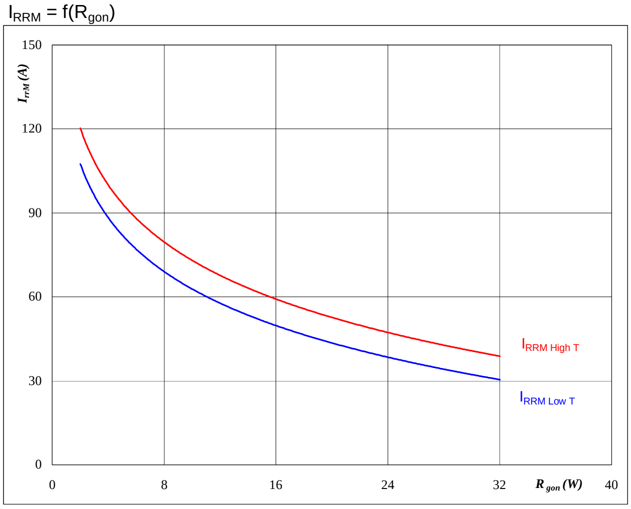
At

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω

Figure 16 FRED

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

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



At

T_j =	25/125	℃
V_R =	350	V
I_F =	41	A
V_{GE} =	±15	V

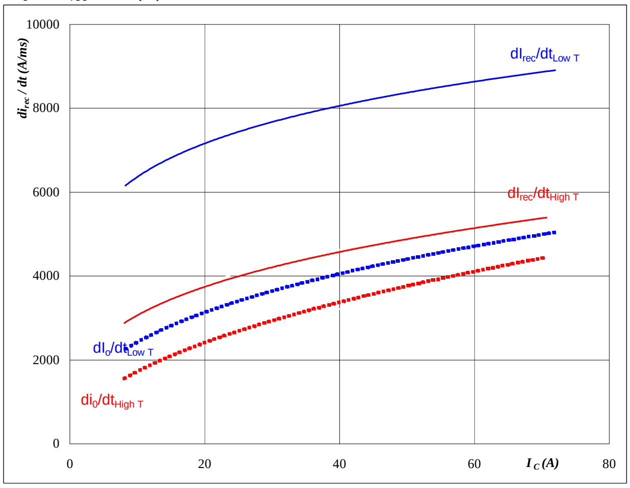
Boost

neutral point IGBT and **half bridge FRED**

Figure 17 FRED

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

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



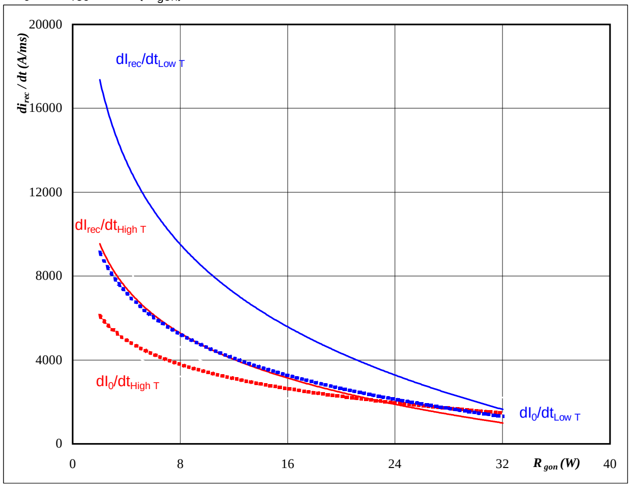
At

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω

Figure 18 FRED

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

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



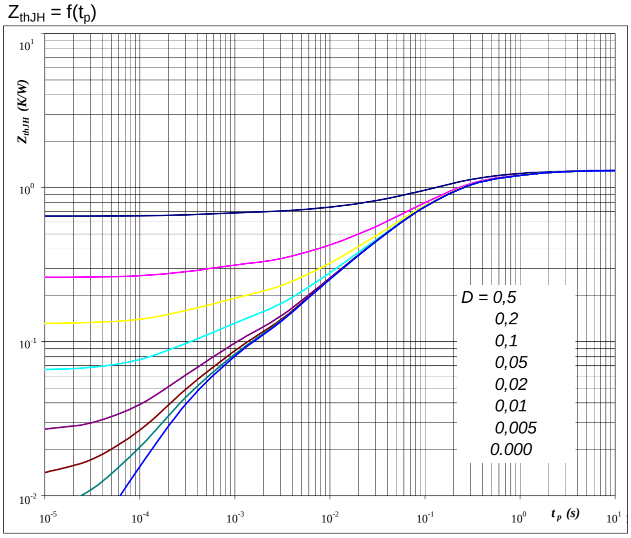
At

T_j =	25/125	℃
V_R =	350	V
I_F =	41	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} =	1,30	K/W

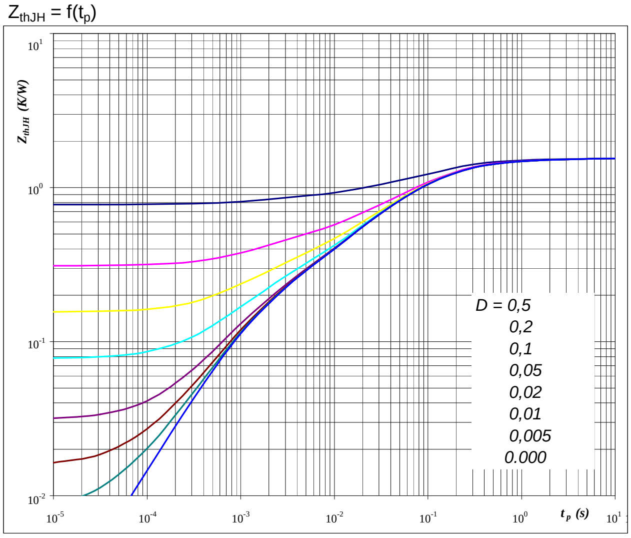
IGBT thermal model values

R (C/W)	Tau (s)
0,04	9,0E+00
0,17	1,1E+00
0,62	1,7E-01
0,31	3,9E-02
0,12	6,7E-03
0,06	4,1E-04

Figure 20 FRED

FRED transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	tp / T	
R_{thJH} =	1,55	K/W

FRED thermal model values

R (C/W)	Tau (s)
0,06	3,9E+00
0,30	3,8E-01
0,77	7,8E-02
0,28	1,2E-02
0,14	1,2E-03

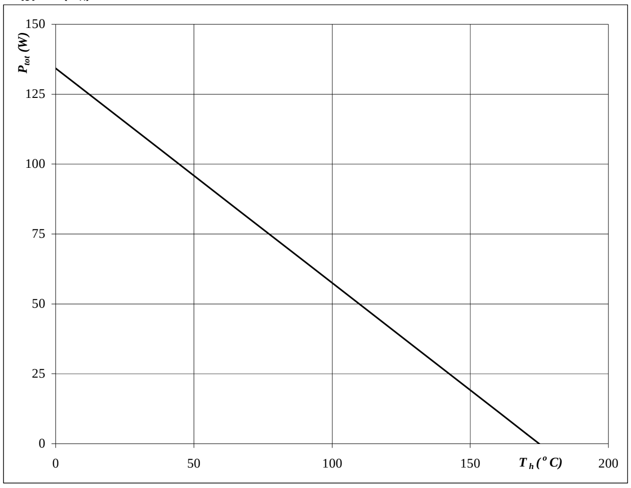
Boost

neutral point IGBT and **half bridge FRED**

Figure 21 IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



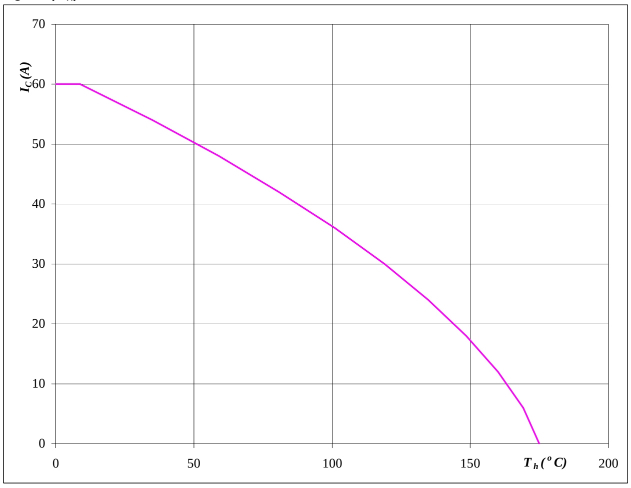
At

T_j =	175	ºC

Figure 22 IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



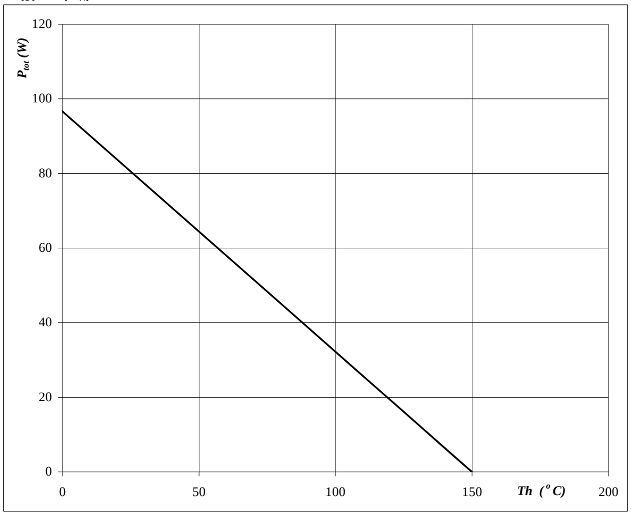
At

T_j =	175	ºC
V_{GE} =	15	V

Figure 23 FRED

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



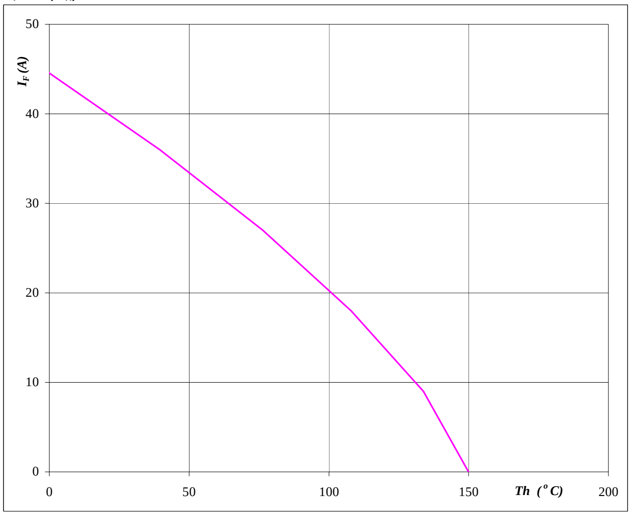
At

T_j =	150	ºC

Figure 24 FRED

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

$R_T = f(T)$

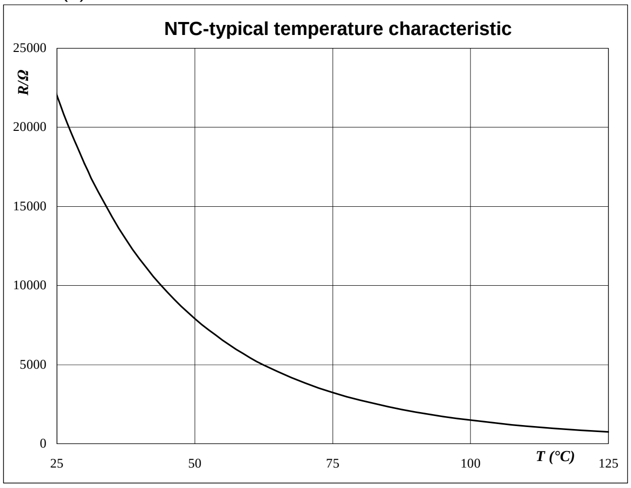


Figure 2 Thermistor

Typical NTC resistance values

$$R(T) = R_{25} \cdot e^{\left(B_{25/100} \cdot \left(\frac{1}{T} - \frac{1}{T_{25}}\right)\right)} \quad [\Omega]$$

T [°C]	R [Ω]	T [°C]	R [Ω]
-55	3006477	30	17635
-50	1993973	40	11574
-45	1346473	50	7796
-40	924676	55	6457
-35	645112	60	5378
-30	456784	65	4503
-25	327965	70	3791
-20	238577	75	3207
-15	175705	80	2726
-10	130914	85	2327
-5	98618	90	1996
0	75063	95	1718
5	57698	100	1486
10	44764	105	1289
15	35037	110	1123
20	27654	115	982
25	22000	120	861
30	17635	125	758

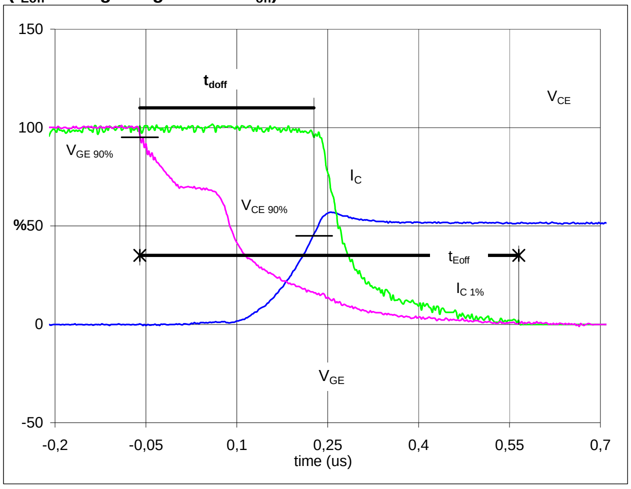
Switching Definitions BUCK IGBT

General conditions

T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

Figure 1 half bridge IGBT

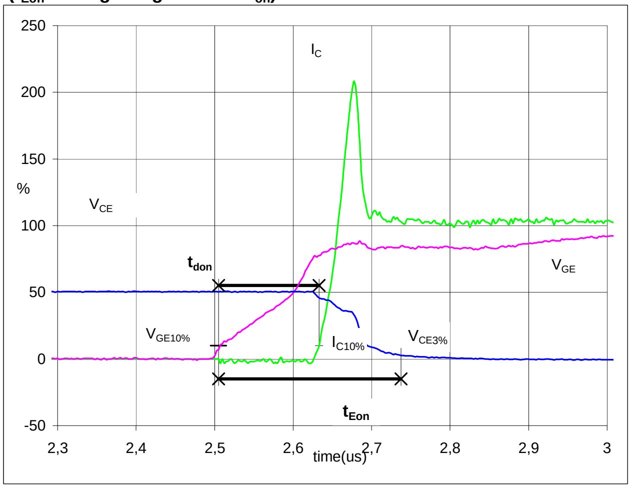
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	700	V
I_C (100%) =	40	A
t_{doff} =	0,28	μs
t_{Eoff} =	0,63	μs

Figure 2 half bridge IGBT

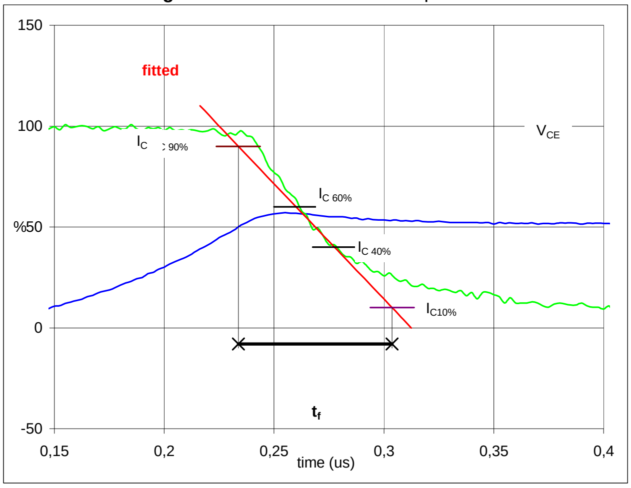
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	700	V
I_C (100%) =	40	A
t_{don} =	0,13	μs
t_{Eon} =	0,23	μs

Figure 3 half bridge IGBT

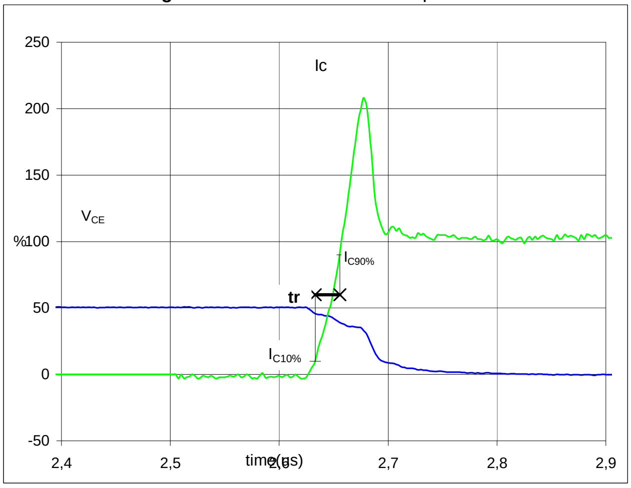
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	700	V
I_C (100%) =	40	A
t_f =	0,07	μs

Figure 4 half bridge IGBT

Turn-on Switching Waveforms & definition of t_r

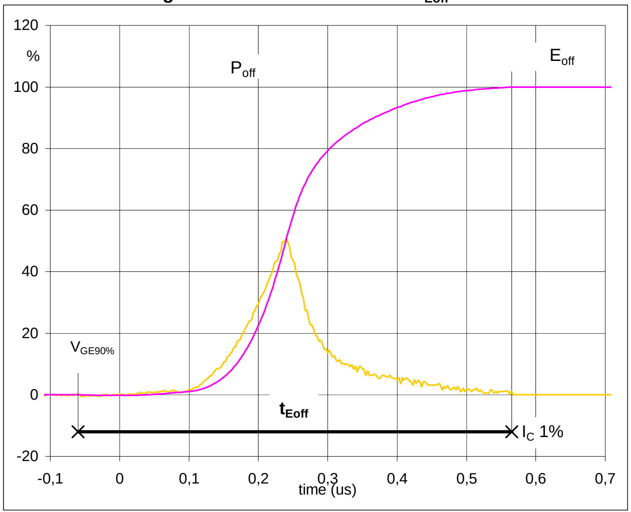


V_C (100%) =	700	V
I_C (100%) =	40	A
t_r =	0,02	μs

Switching Definitions BUCK IGBT

Figure 5 half bridge IGBT

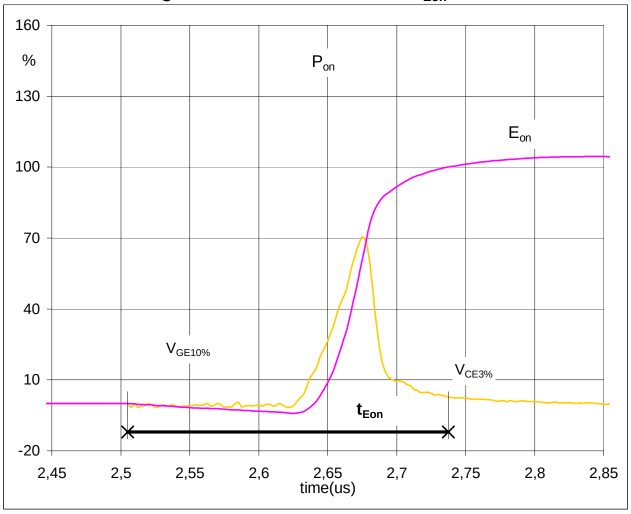
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	28,05	kW
E_{off} (100%) =	1,65	mJ
t_{Eoff} =	0,63	μs

Figure 6 half bridge IGBT

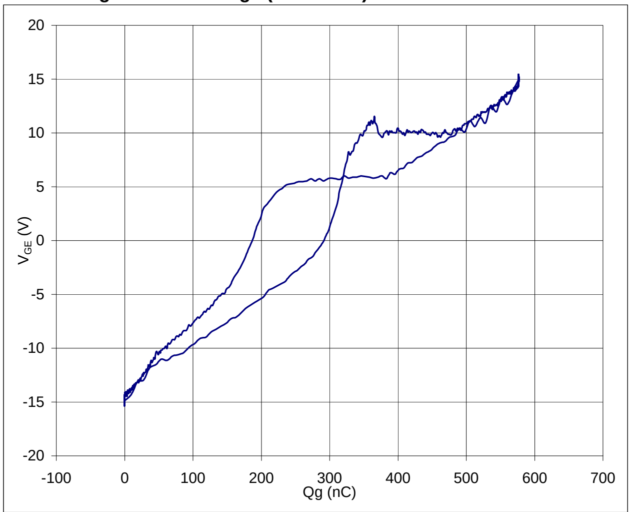
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	28,05	kW
E_{on} (100%) =	0,70	mJ
t_{Eon} =	0,23	μs

Figure 7 half bridge IGBT

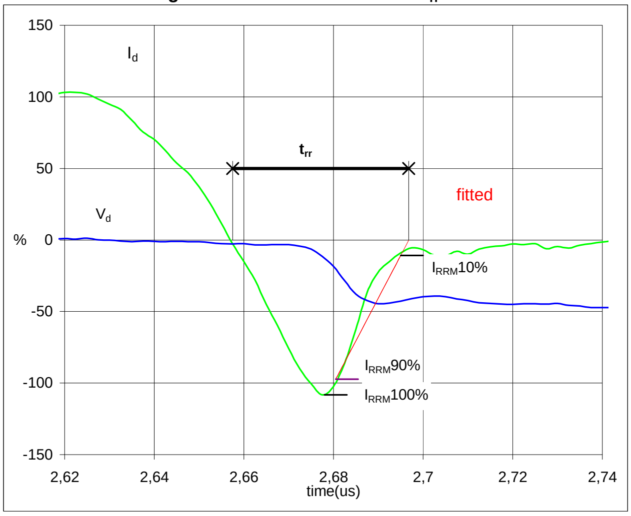
Gate voltage vs Gate charge (measured)



V_{GEoff} =	-15	V
V_{GEon} =	15	V
V_C (100%) =	700	V
I_C (100%) =	40	A
Q_g =	1556,37	nC

Figure 8 half bridge IGBT

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

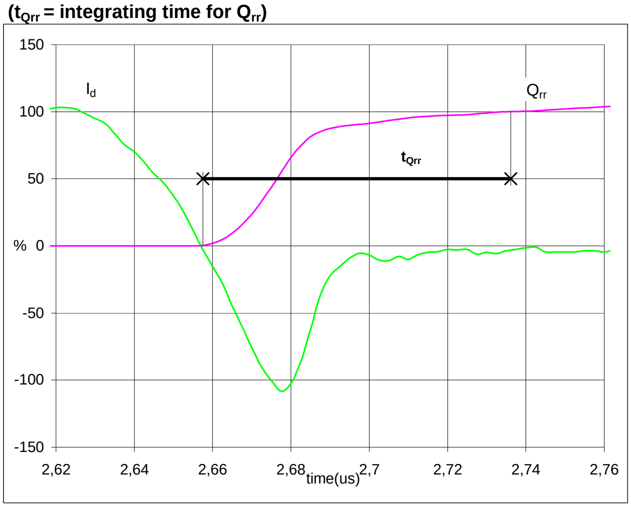


V_d (100%) =	700	V
I_d (100%) =	40	A
I_{RRM} (100%) =	-43	A
t_{rr} =	0,04	μs

Switching Definitions BUCK IGBT

Figure 9 neutral point FRED

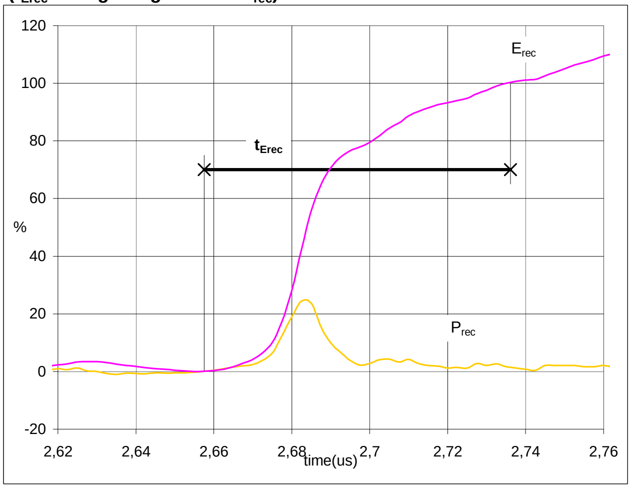
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	40	A
Q_{rr} (100%) =	0,95	μC
t_{Qrr} =	0,08	μs

Figure 10 neutral point FRED

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

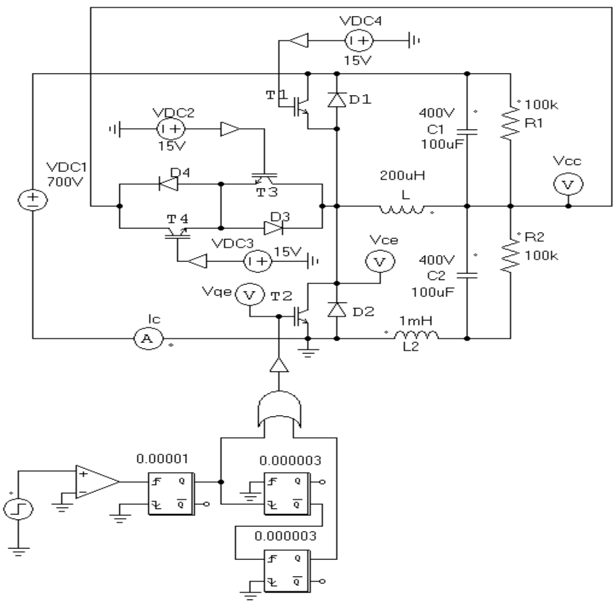


P_{rec} (100%) =	28,05	kW
E_{rec} (100%) =	0,12	mJ
t_{Erec} =	0,08	μs

Measurement circuit

Figure 11

BUCK stage switching measurement circuit



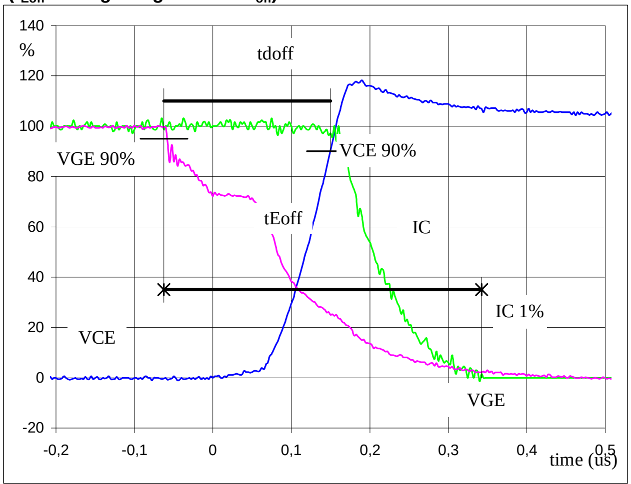
Switching Definitions BOOST IGBT

General conditions

T_j	=	125 ℃
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

Figure 1 neutral point IGBT

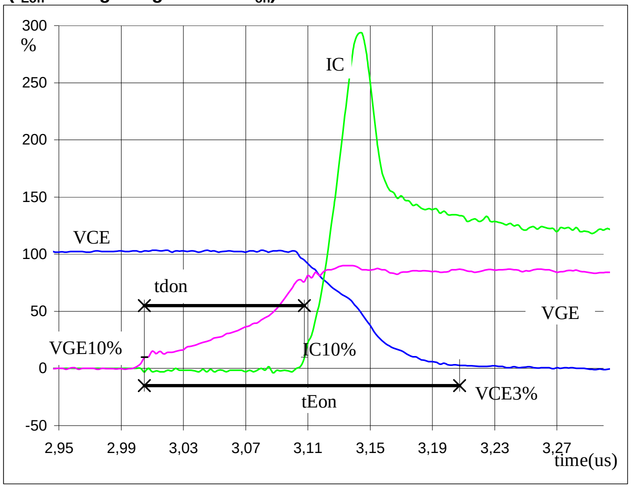
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	350	V
I_C (100%) =	40	A
t_{doff} =	0,21	μs
t_{Eoff} =	0,40	μs

Figure 2 neutral point IGBT

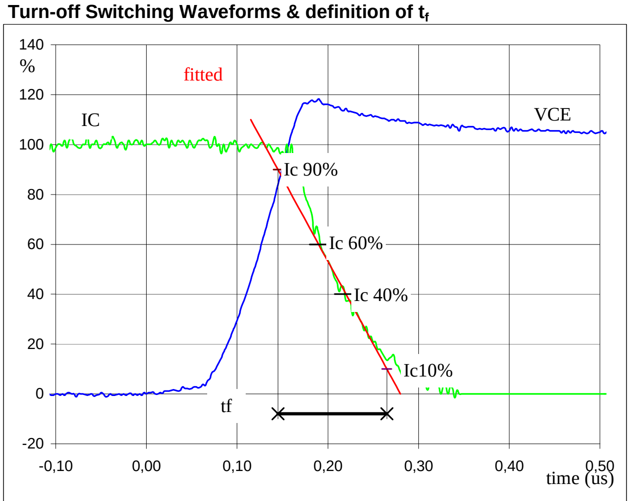
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	350	V
I_C (100%) =	40	A
t_{don} =	0,10	μs
t_{Eon} =	0,20	μs

Figure 3 neutral point IGBT

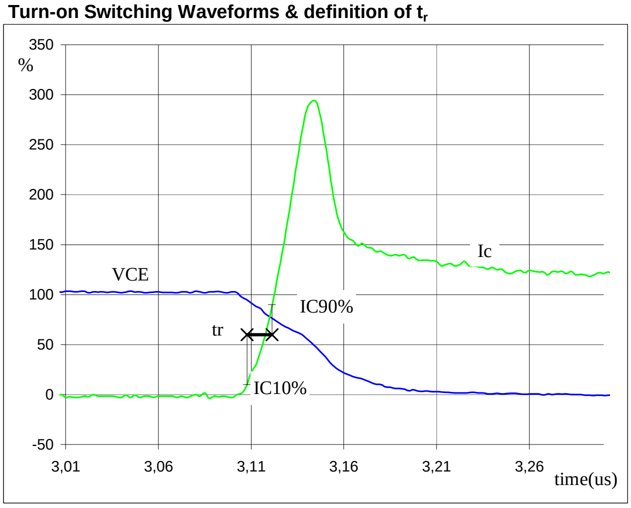
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	350	V
I_C (100%) =	40	A
t_f =	0,099	μs

Figure 4 neutral point IGBT

Turn-on Switching Waveforms & definition of t_r

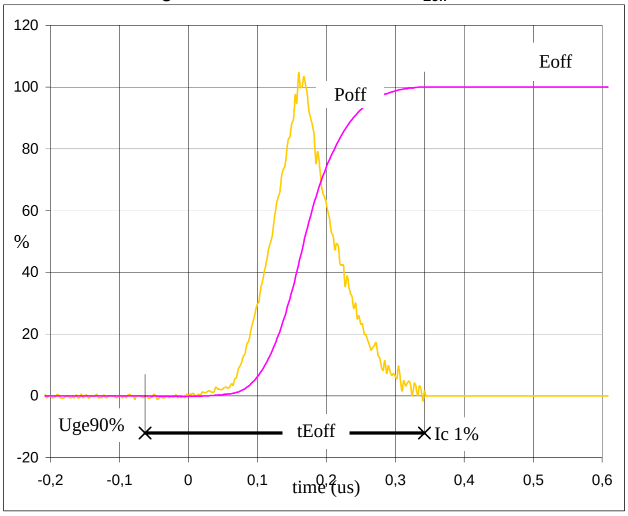


V_C (100%) =	350	V
I_C (100%) =	40	A
t_r =	0,013	μs

Switching Definitions BOOST IGBT

Figure 5 neutral point IGBT

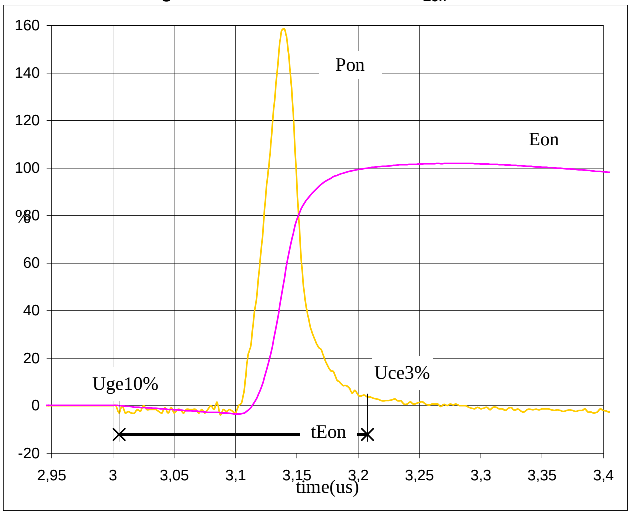
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	13,96	kW
E_{off} (100%) =	1,50	mJ
t_{Eoff} =	0,40	μs

Figure 6 neutral point IGBT

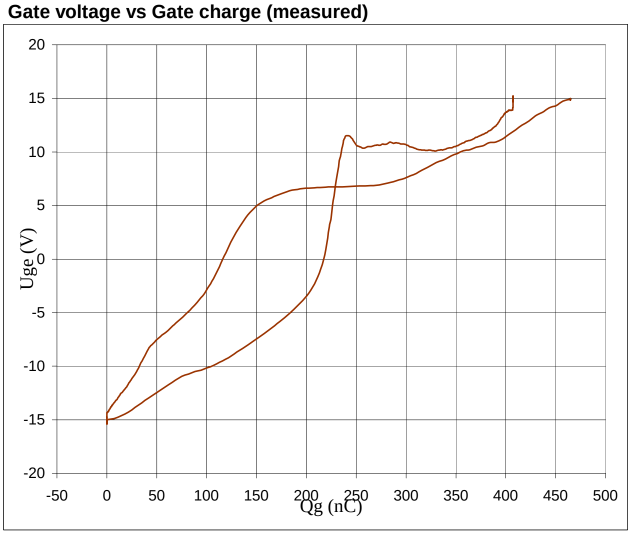
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	13,9552	kW
E_{on} (100%) =	0,72	mJ
t_{Eon} =	0,2025	μs

Figure 7 neutral point IGBT

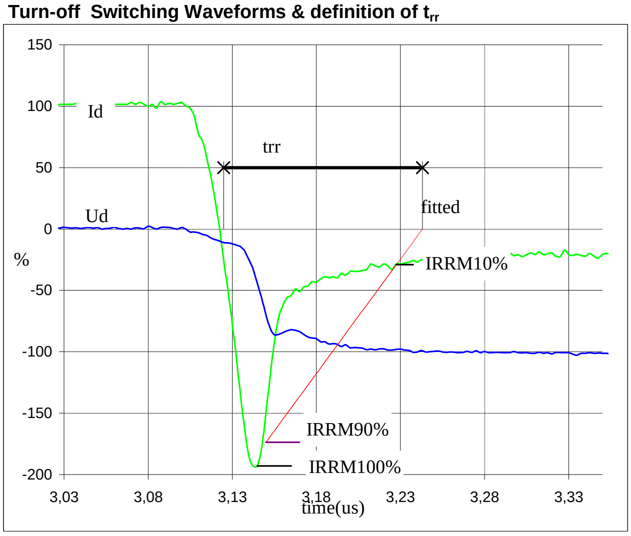
Gate voltage vs Gate charge (measured)



V_{GEoff} =	-15	V
V_{GEon} =	15	V
V_C (100%) =	350	V
I_C (100%) =	40	A
Q_g =	464,74	nC

Figure 8 half bridge FRED

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

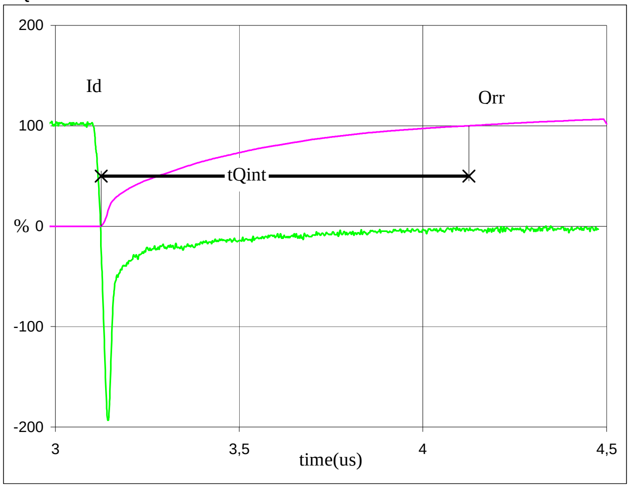


V_d (100%) =	350	V
I_d (100%) =	40	A
I_{RRM} (100%) =	-79	A
t_{rr} =	0,17	μs

Switching Definitions BOOST IGBT

Figure 9 half bridge FRED

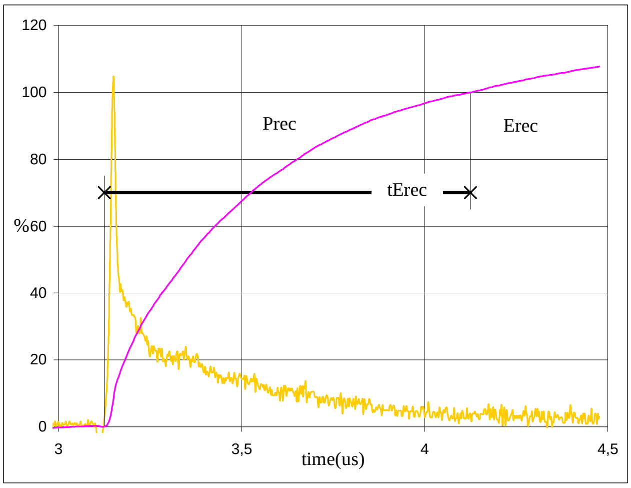
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr}= integrating time for Q_{rr})



I_d (100%) =	40	A
Q_{rr} (100%) =	6,14	μC
t_{Qint} =	1,00	μs

Figure 10 half bridge FRED

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

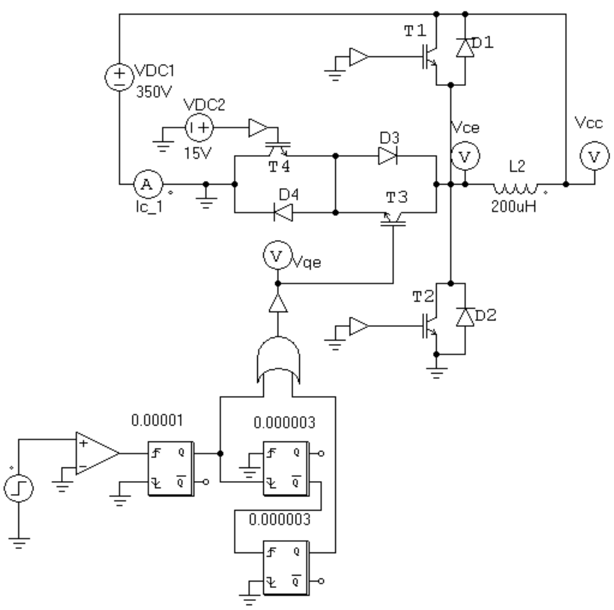


P_{rec} (100%) =	13,96	kW
E_{rec} (100%) =	1,79	mJ
t_{Erec} =	1,00	μs

Measurement circuit

Figure 11

BOOST stage switching measurement circuit



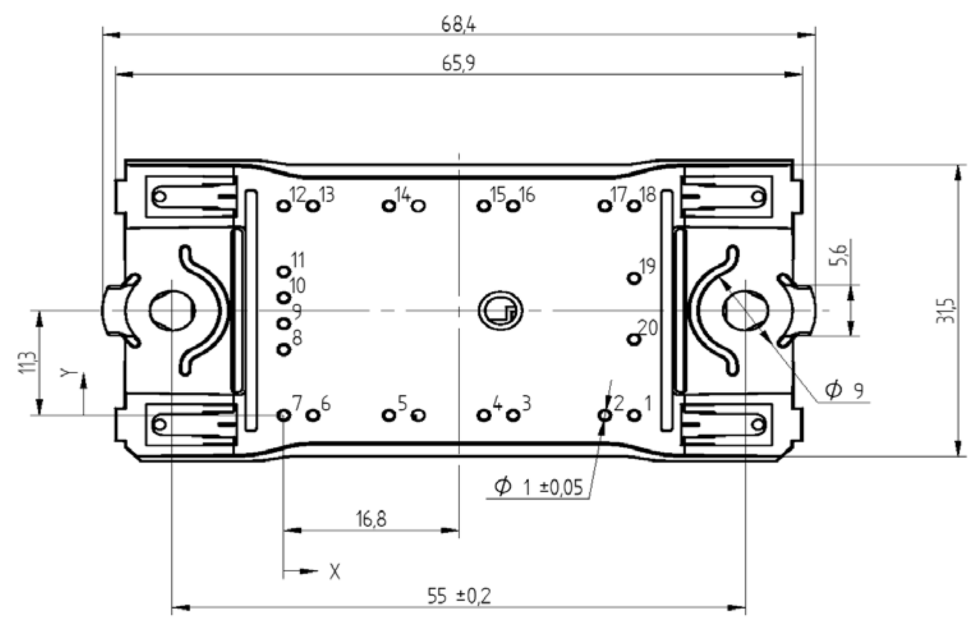
Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

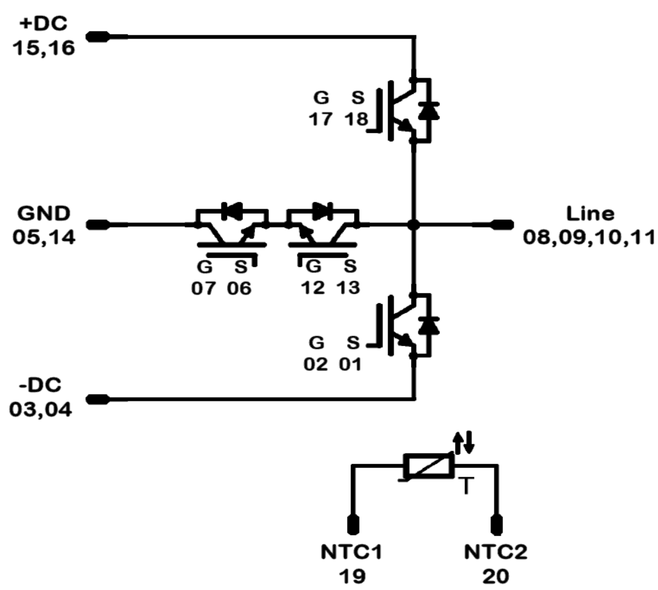
Version	Ordering Code	in DataMatrix as	in packaging barcode as
w/o thermal paste 12mm housing solder pin	10-FZ06NMA080SH-M269F	M269F	M269F

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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