*flow*BOOST 0 — 650 V / 75 A

Features

- symmetric booster
- ultra high switching frequency
- low inductance layout

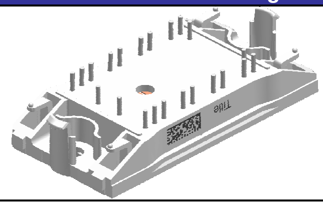
Target Applications

- solar inverter
- UPS

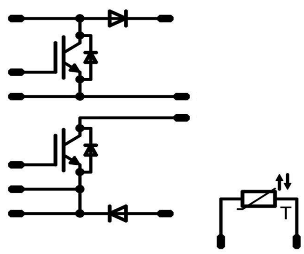
Types

- 10-FZ07NBA075SG10-M304L58

flow 0 12 mm housing



Schematic



Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Boost IGBT (T1, T2)					
Collector-emitter break down voltage	V_{CES}			650	V
DC collector current	I_C	$T_j=T_jmax$	$T_h=80°C$ $T_c=80°C$	59 78	A
Pulsed collector current	I_{Cpuls}	t_p limited by T_jmax		225	A
Turn off safe operating area		$T_j≤150°C$ $V_{CE}<=V_{CES}$		225	A
Power dissipation	P_{tot}	$T_j=T_jmax$	$T_h=80°C$ $T_c=80°C$	107 162	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_jmax			175	°C
Boost Inverse Diode (D10, D20)					
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
Forward average current	I_{FAV}	$T_j=T_jmax$	$T_h=80°C$ $T_c=80°C$	18 12	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_jmax		20	A
Power dissipation	P_{tot}	$T_j=T_jmax$	$T_h=80°C$ $T_c=80°C$	33 50	W
Maximum Junction Temperature	T_jmax			175	°C

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Boost FWD (D1, D2)					
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
Forward average current	I_{FAV}	$T_j=T_jmax$	T_h=80°C T_c=80°C	73 80	A
Surge forward current	I_{FSM}	t_p=10ms	T_j=25°C	700	A
I2t-value	I^2t			2450	A^2s
Repetitive peak forward current	I_{FRM}	t_p limited by T_jmax		200	A
Power dissipation	P_{tot}	$T_j=T_jmax$	T_h=80°C T_c=80°C	102 155	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		t=2s	DC voltage	4000	V
Creepage distance				min 12,7	mm
Clearance				min 9,54	mm

Characteristic Values

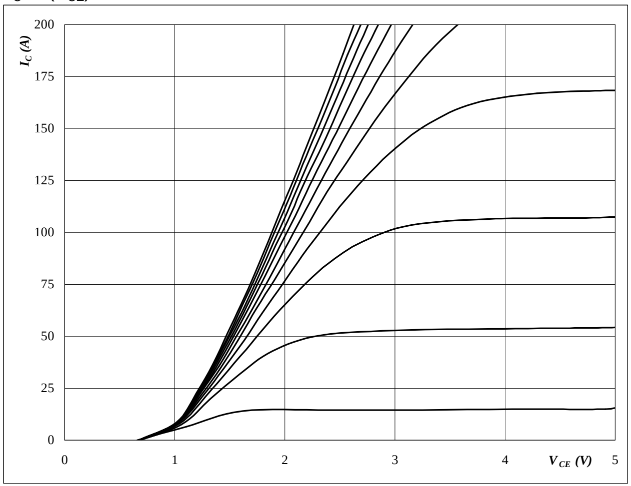
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
Boost IGBT (T1, T2)										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,0012	Tj=25°C Tj=125°C	4,1	5,1	5,7	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		75	Tj=25°C Tj=125°C	1,38	1,72 1,91	2,22	V
Collector-emitter cut-off incl diode	I_{CES}		0	650		Tj=25°C Tj=125°C			0,040	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=125°C			150	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=8 Ω Rgon=8 Ω	±15	350	75	Tj=25°C Tj=125°C		27 25		ns
Rise time	t_r					Tj=25°C Tj=125°C		32 34		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=125°C		402 436		
Fall time	t_f					Tj=25°C Tj=125°C		16 14		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=125°C		1,670 2,650		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=125°C		1,140 1,490		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		4620		pF
Output capacitance	C_{oss}							240		
Reverse transfer capacitance	C_{rss}							138		
Gate charge	Q_{Gate}		15	480	75	Tj=25°C		470		nC
Thermal resistance chip to heatsink	R_{thJH}	Phase-Change Material						0,89		K/W
Boost Inverse Diode (D10, D20)										
Diode forward voltage	V_F				20	Tj=25°C Tj=125°C	1,20	1,73 1,60	2,00	V
Thermal resistance chip to heatsink	R_{thJH}	Phase-Change Material						2,87		K/W
Boost FWD (D1, D2)										
Diode forward voltage	V_F				75	Tj=25°C Tj=125°C		2,29 1,69		V
Reverse leakage current	I_r			650		Tj=25°C Tj=125°C			20	µA
Peak reverse recovery current	I_{RRM}	Rgon=8 Ω	±15	350	75	Tj=25°C Tj=125°C		39 71		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		28 115,2		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=125°C		0,8 3,7		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=125°C		5381 2500		A/µs
Reverse recovery energy	E_{rec}					Tj=25°C Tj=125°C		0,07 0,53		mWs
Thermal resistance chip to heatsink	R_{thJH}	Phase-Change Material						0,93		K/W
Thermistor										
Rated resistance	R					Tj=25°C		22000		Ω
Deviation of R100	ΔR/R	R100=1486 Ω				Tj=100°C	-12		+14	%
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	

Boost IGBT (T1, T2) / Boost FWD (D1, D2)

Figure 1 T1,T2

Typical output characteristics

$I_C = f(V_{CE})$



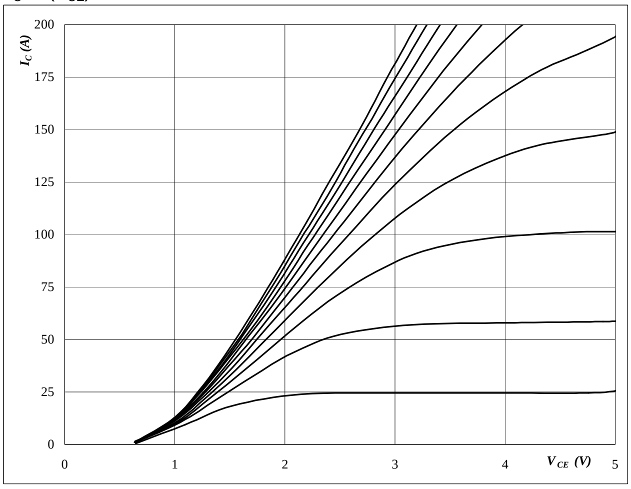
At

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

Figure 2 T1,T2

Typical output characteristics

$I_C = f(V_{CE})$



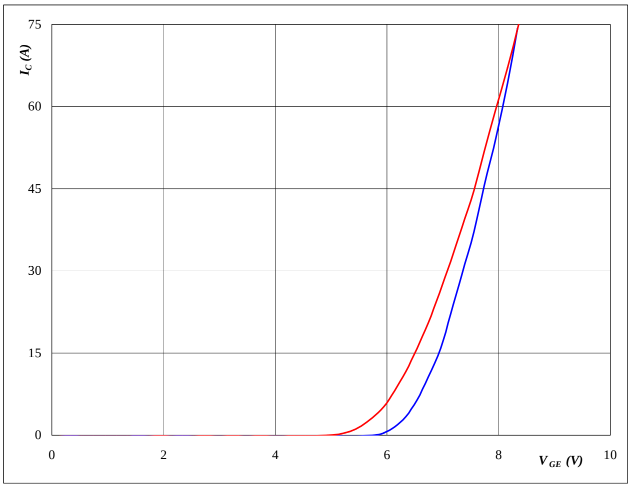
At

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

Figure 3 T1,T2

Typical transfer characteristics

$I_C = f(V_{GE})$



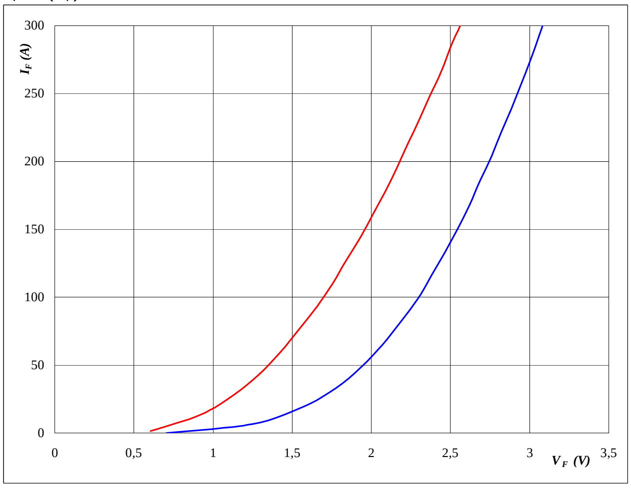
At

Tj =	25/125	°C
t_p =	250	µs
V_{CE} =	10	V

Figure 4 D1,D2 FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



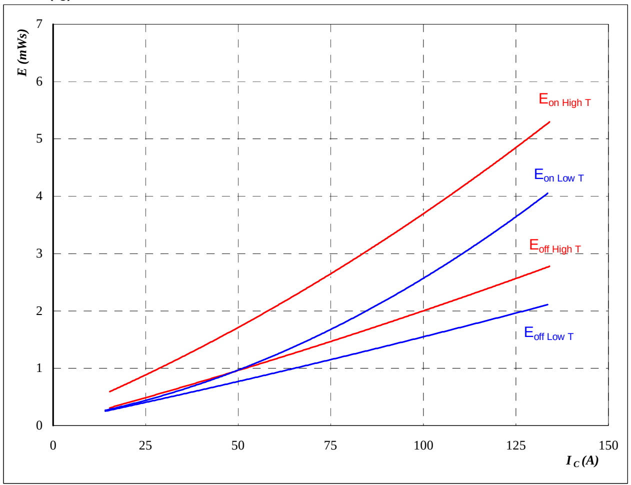
At

Tj =	25/125	°C
t_p =	250	µs

Boost IGBT (T1, T2) / Boost FWD (D1, D2)

Figure 5 T1,T2

Typical switching energy losses
as a function of collector current
$E = f(I_C)$

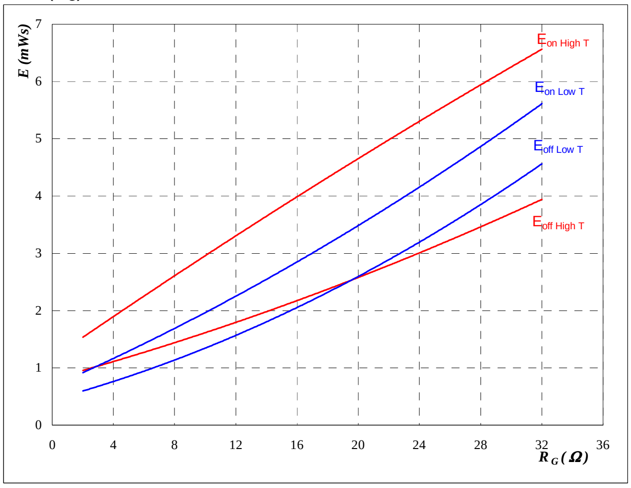


With an inductive load at

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

Figure 6 T1,T2

Typical switching energy losses
as a function of gate resistor
$E = f(R_G)$

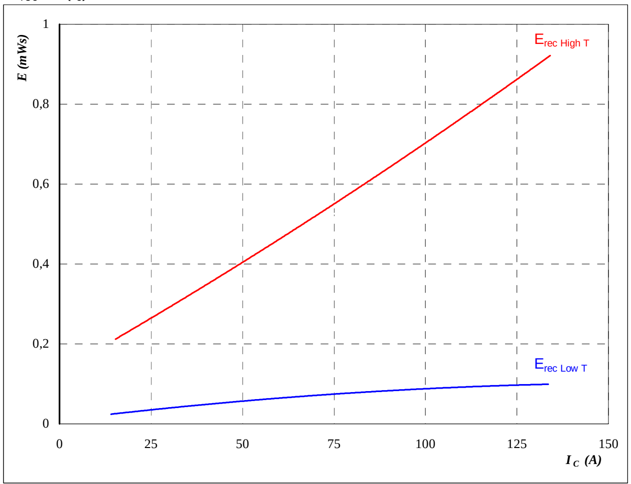


With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	15	V
I_C =	75	A

Figure 7 D1,D2 FWD

Typical reverse recovery energy loss
as a function of collector current
$E_{rec} = f(I_c)$

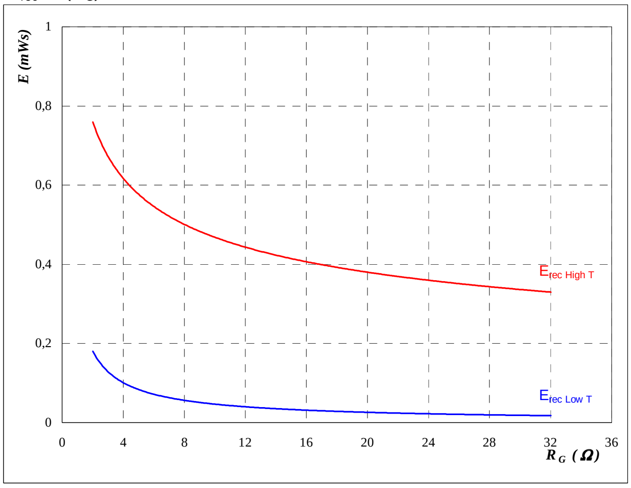


With an inductive load at

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

Figure 8 D1,D2 FWD

Typical reverse recovery energy loss
as a function of gate resistor
$E_{rec} = f(R_G)$



With an inductive load at

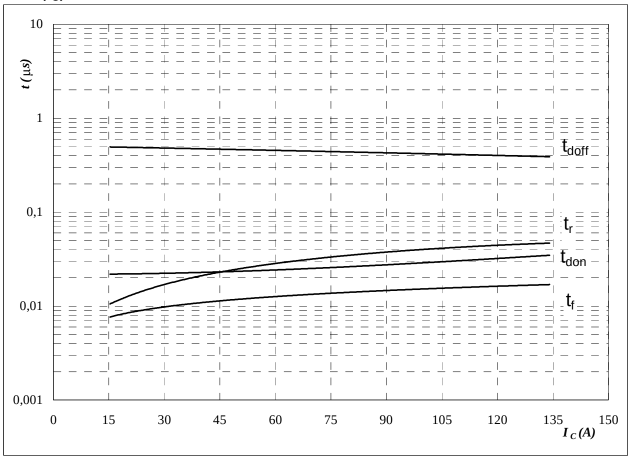
T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	15	V
I_C =	75	A

Boost IGBT (T1, T2) / Boost FWD (D1, D2)

Figure 9 T1,T2

Typical switching times as a function of collector current

t = f(I_C)



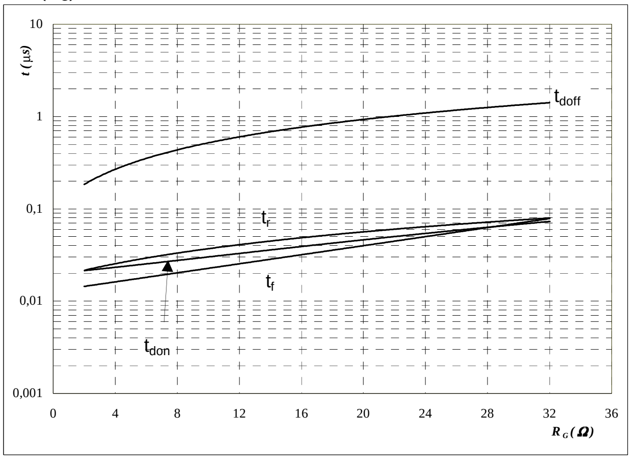
With an inductive load at

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

Figure 10 T1,T2

Typical switching times as a function of gate resistor

t = f(R_G)



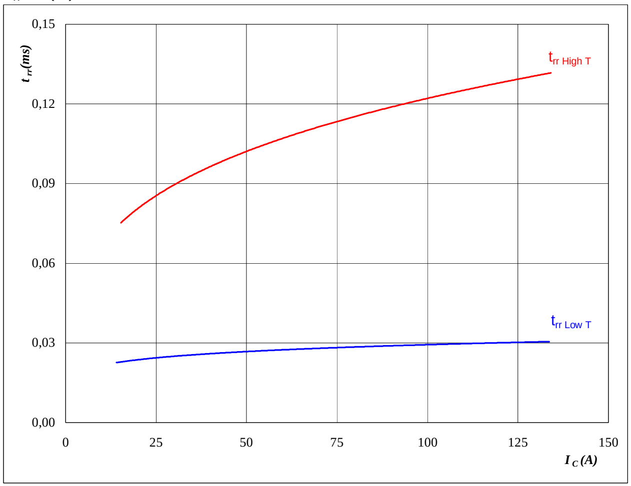
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	15	V
I_C =	75	A

Figure 11 D1,D2 FWD

Typical reverse recovery time as a function of collector current

t_{rr} = f(Ic)



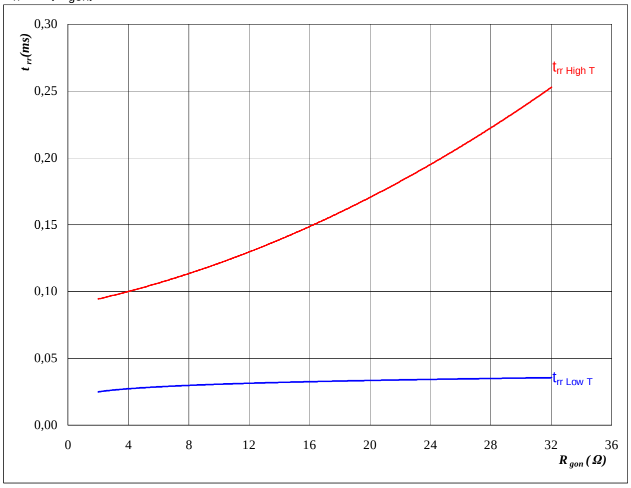
At

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

Figure 12 D1,D2 FWD

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

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



At

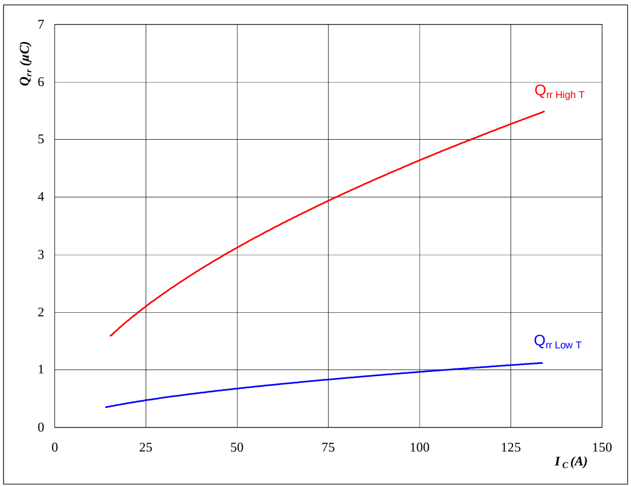
T_j =	25/125	°C
V_R =	350	V
I_F =	75	A
V_{GE} =	15	V

Boost IGBT (T1, T2) / Boost FWD (D1, D2)

Figure 13 D1,D2 FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



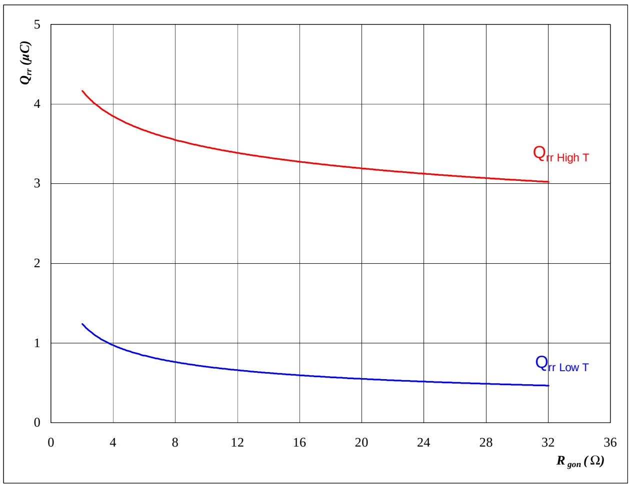
At

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

Figure 14 D1,D2 FWD

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

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



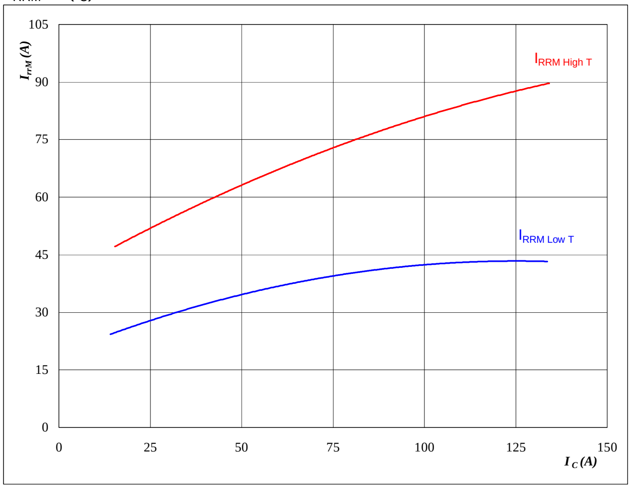
At

T_j =	25/125	°C
V_R =	350	V
I_F =	75	A
V_{GE} =	15	V

Figure 15 D1,D2 FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



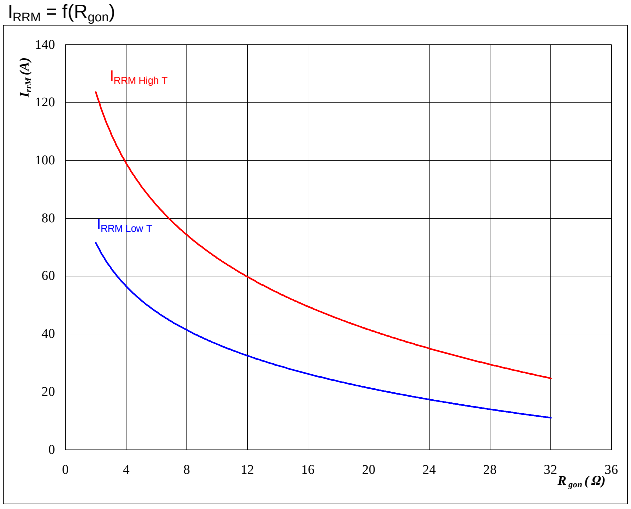
At

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

Figure 16 D1,D2 FWD

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

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



At

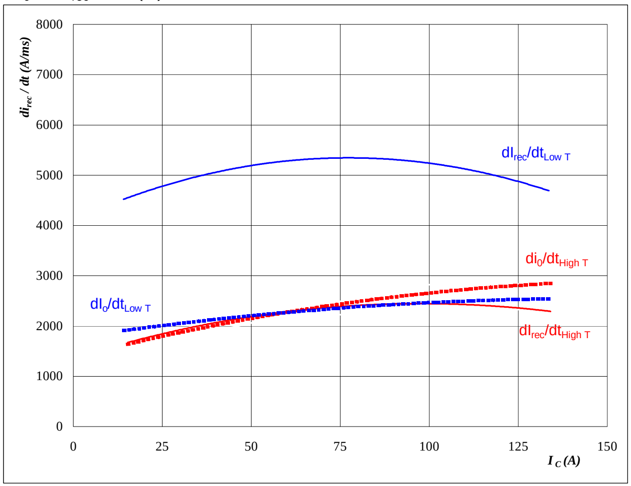
T_j =	25/125	°C
V_R =	350	V
I_F =	75	A
V_{GE} =	15	V

Boost IGBT (T1, T2) / Boost FWD (D1, D2)

Figure 17	D1,D2 FWD

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

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



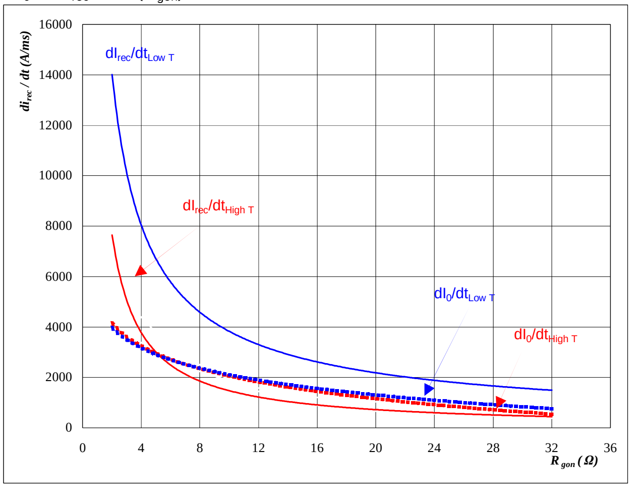
At

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

Figure 18	D1,D2 FWD

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

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



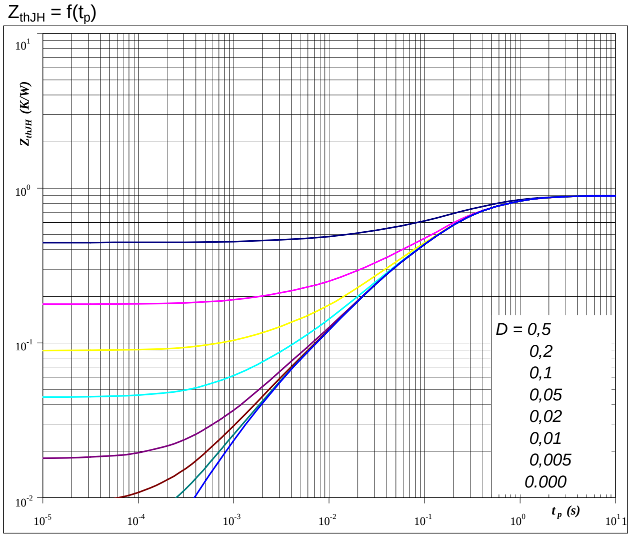
At

T_j =	25/125	°C
V_R =	350	V
I_F =	75	A
V_{GE} =	15	V

Figure 19	T1,T2

IGBT transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	tp / T	
R_{thJH} =	0,89	K/W

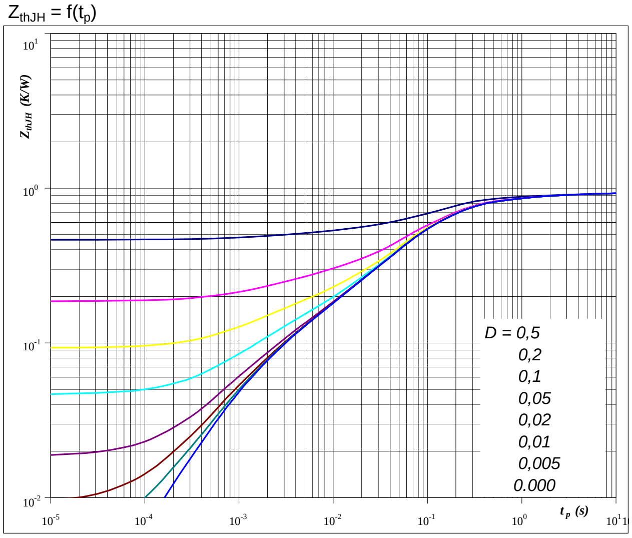
IGBT thermal model values

R (C/W)	Tau (s)
0,17	9,7E-01
0,43	2,1E-01
0,16	6,2E-02
0,10	1,4E-02
0,03	1,7E-03

Figure 20	D1,D2 FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	tp / T	
R_{thJH} =	0,93	K/W

FWD thermal model values

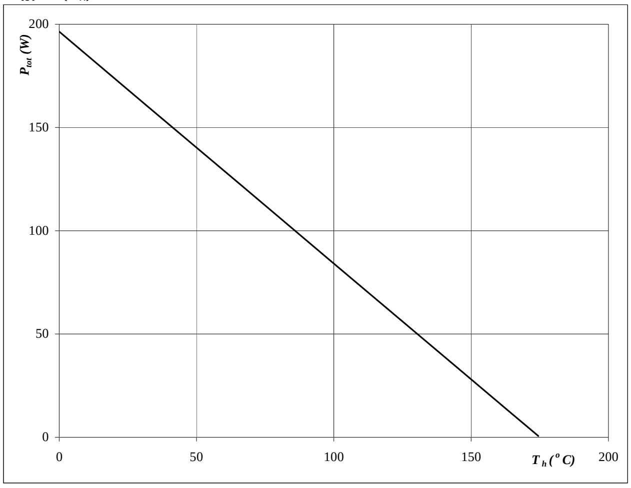
R (C/W)	Tau (s)
0,07	3,0E+00
0,16	4,8E-01
0,50	9,7E-02
0,08	2,5E-02
0,07	4,9E-03
0,04	1,0E-03

Boost IGBT (T1, T2) / Boost FWD (D1, D2)

Figure 21 T1,T2

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



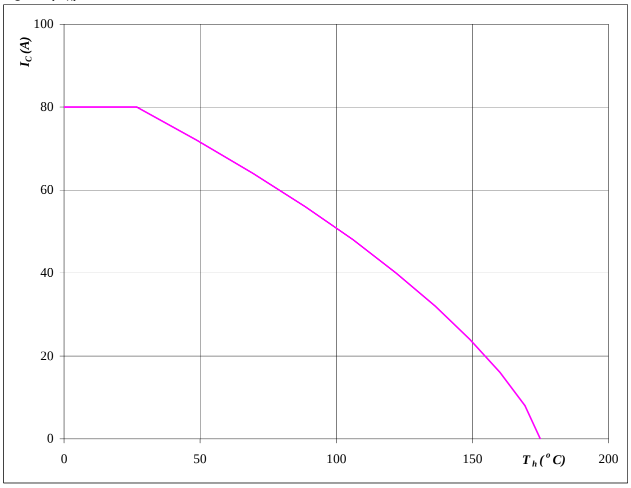
At

T_j =	175	ºC

Figure 22 T1,T2

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



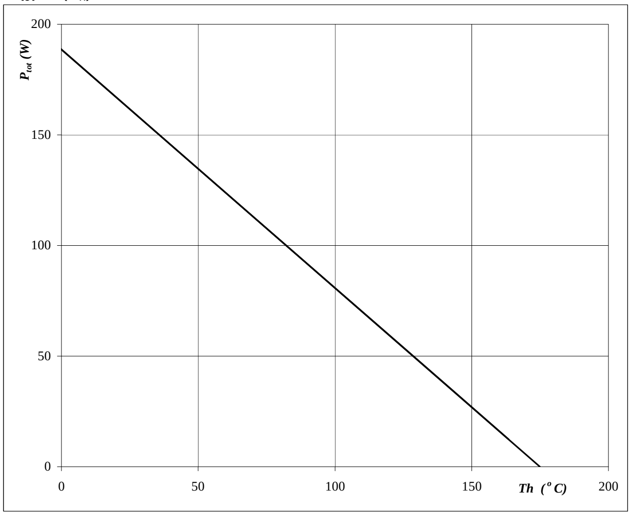
At

T_j =	175	ºC
V_{GE} =	15	V

Figure 23 D1,D2 FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



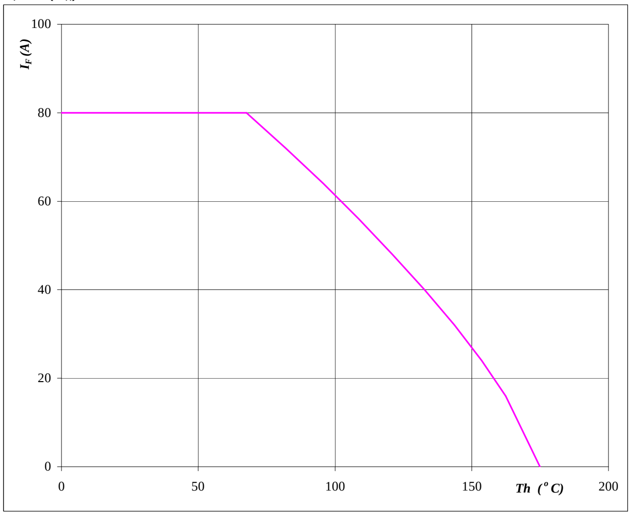
At

T_j =	175	ºC

Figure 24 D1,D2 FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

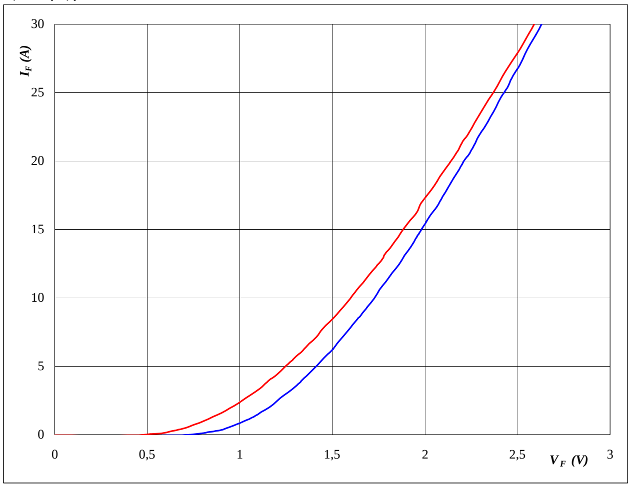
T_j =	175	ºC

Boost Inverse Diode (D10, D20)

Figure 25 D10,D20

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



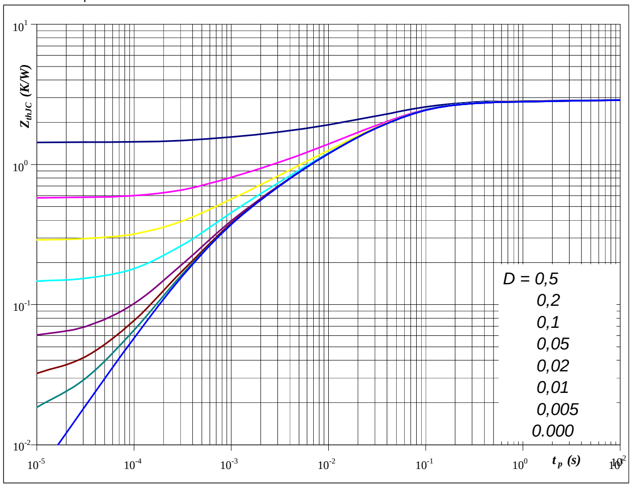
At

Tj =	25/125	°C
t_p =	250	μs

Figure 26 D10,D20

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



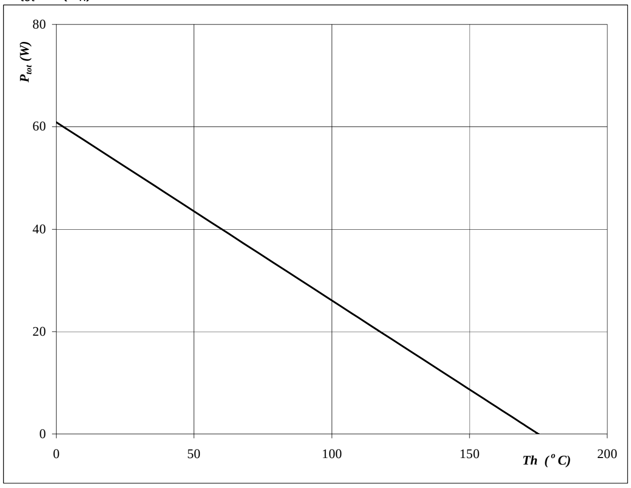
At

D =	tp / T	
R_{thJH} =	2,87	K/W

Figure 27 D10,D20

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



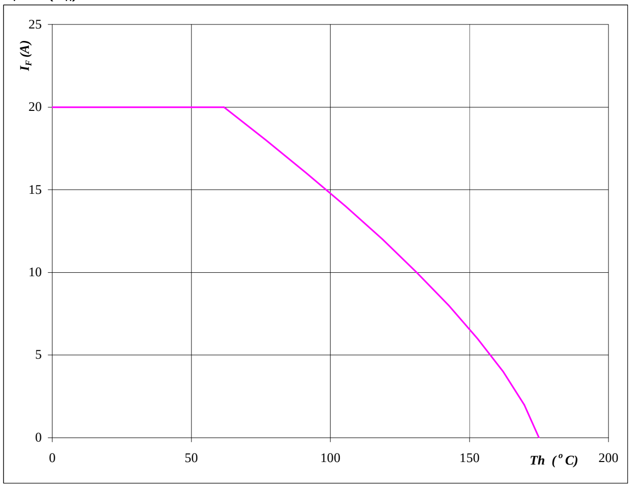
At

T_j =	175	ºC

Figure 28 D10,D20

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



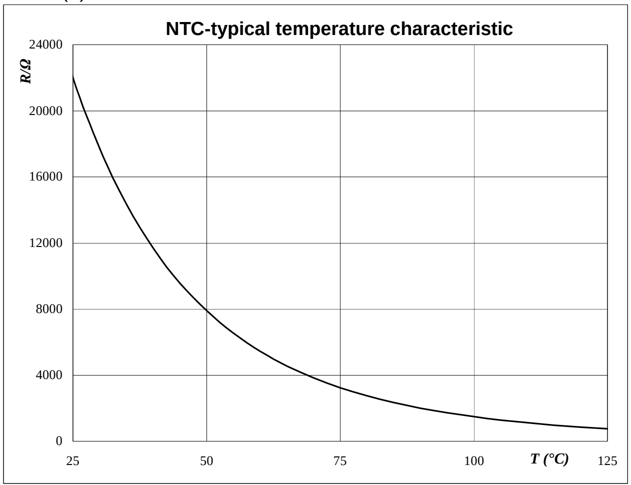
At

T_j =	175	ºC

Thermistor

Figure 1 Thermistor

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



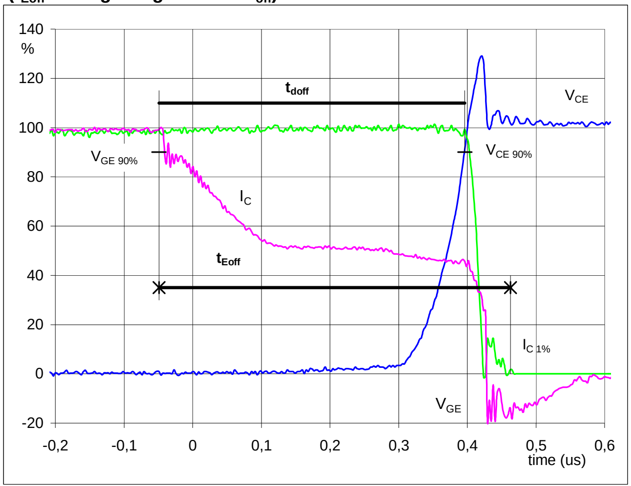
Switching Definitions Boost IGBT

General conditions

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

Figure 1 T1, T2

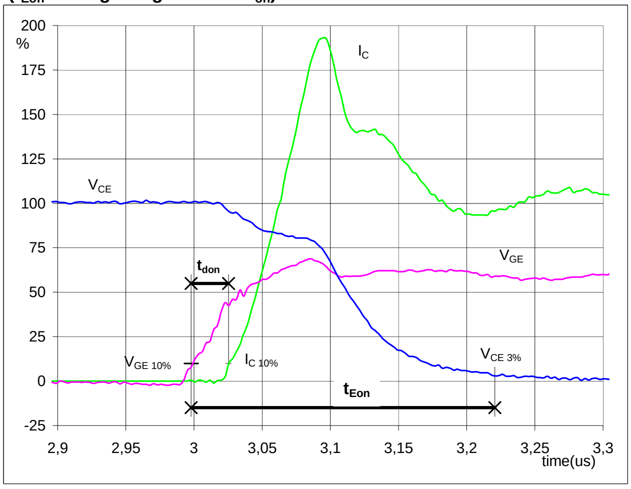
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	15	V
V_C (100%) =	350	V
I_C (100%) =	75	A
t_{doff} =	0,44	µs
t_{Eoff} =	0,51	µs

Figure 2 T1, T2

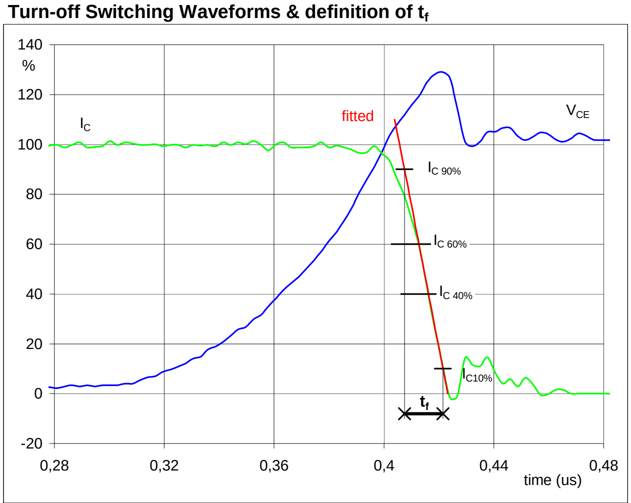
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	15	V
V_C (100%) =	350	V
I_C (100%) =	75	A
t_{don} =	0,03	µs
t_{Eon} =	0,22	µs

Figure 3 T1, T2

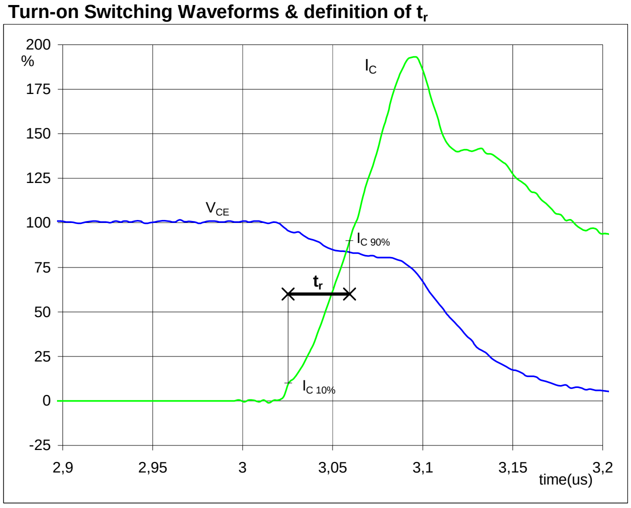
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	350	V
I_C (100%) =	75	A
t_f =	0,013	µs

Figure 4 T1, T2

Turn-on Switching Waveforms & definition of t_r

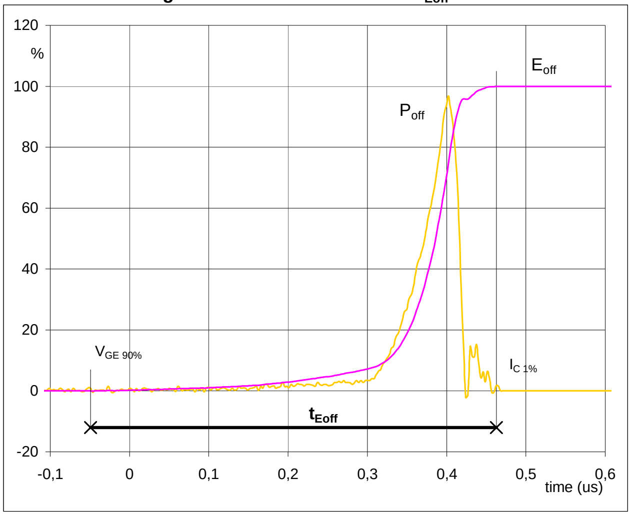


V_C (100%) =	350	V
I_C (100%) =	75	A
t_r =	0,034	µs

Switching Definitions Boost IGBT

Figure 5 T1, T2

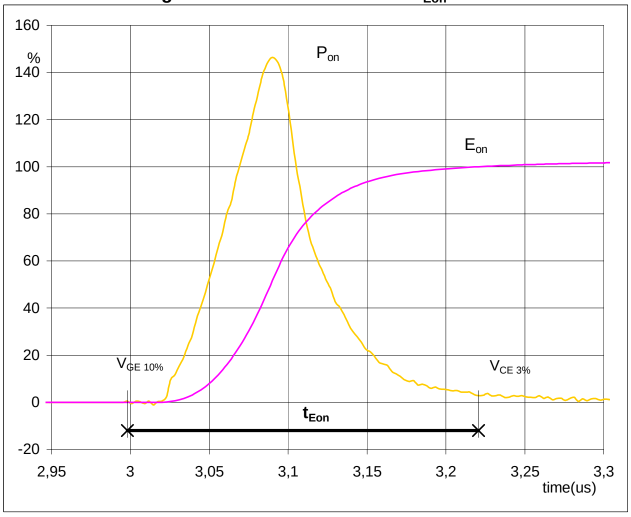
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	26,25	kW
E_{off} (100%) =	1,49	mJ
t_{Eoff} =	0,51	μs

Figure 6 T1, T2

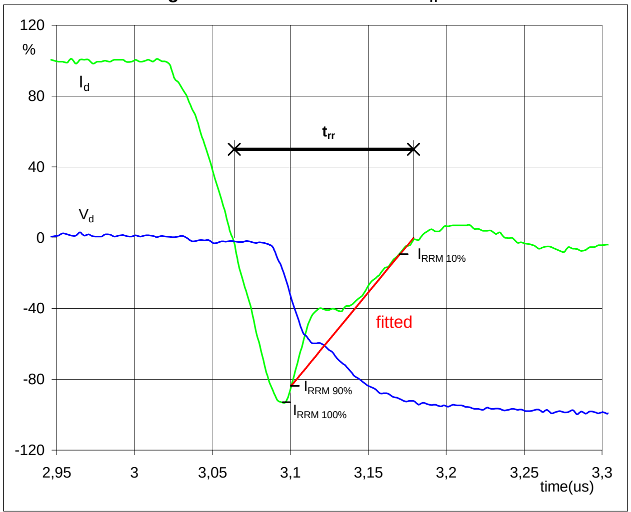
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	26,25	kW
E_{on} (100%) =	2,65	mJ
t_{Eon} =	0,22	μs

Figure 7 T1, T2

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

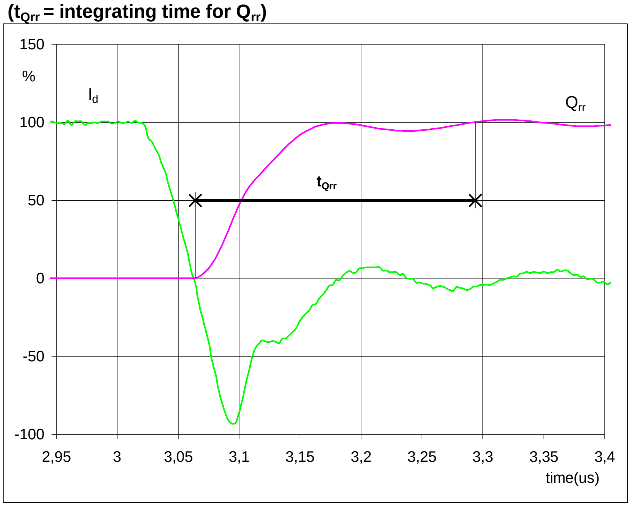


V_d (100%) =	350	V
I_d (100%) =	75	A
I_{RRM} (100%) =	-71	A
t_{rr} =	0,12	μs

Switching Definitions Boost IGBT

Figure 8 D1,D2 FWD

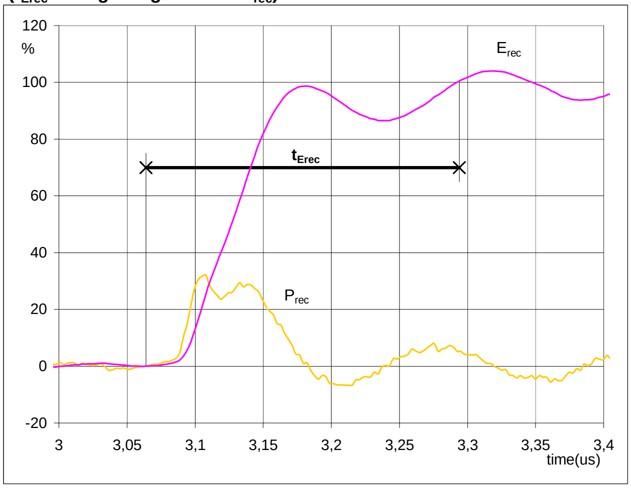
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	75	A
Q_{rr} (100%) =	3,70	μC
t_{Qrr} =	0,23	μs

Figure 9 D1,D2 FWD

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



P_{rec} (100%) =	26,25	kW
E_{rec} (100%) =	0,53	mJ
t_{Erec} =	0,23	μs

Ordering Code and Marking - Outline - Pinout

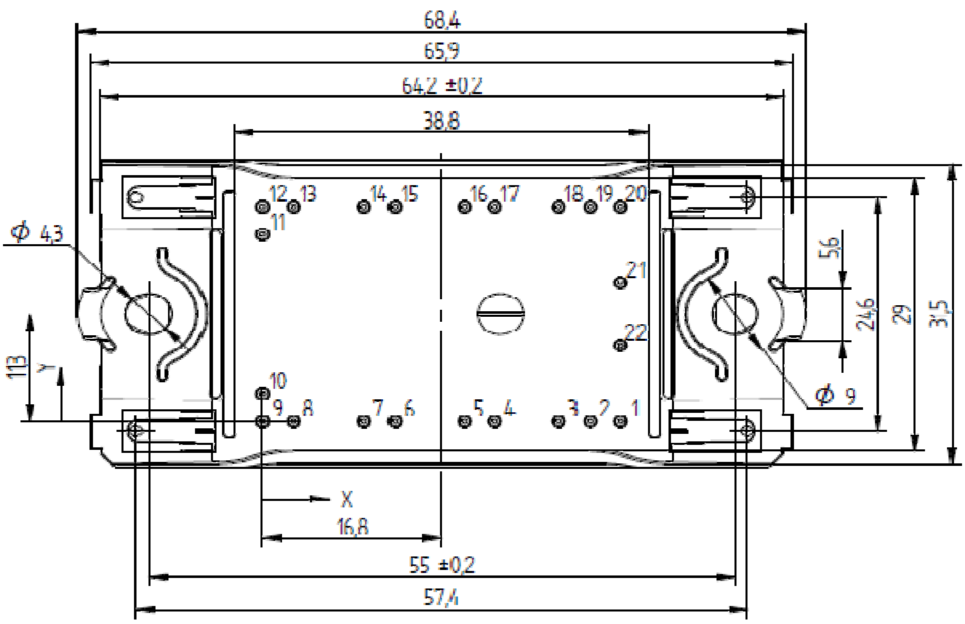
Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-FZ07NBA075SG10-M304L58	M304L58	M304L58

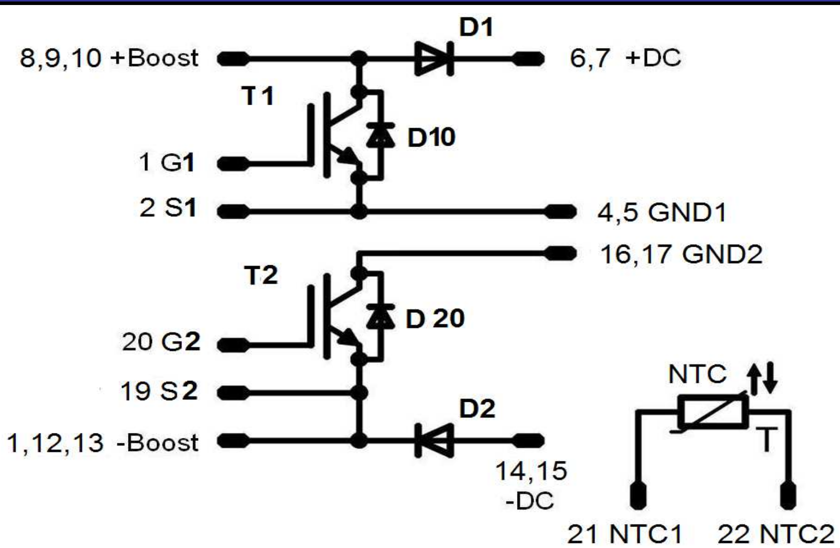
Outline

Pin table

Pin	X	Y
1	33,6	0
2	30,7	0
3	27,8	0
4	21,8	0
5	18,9	0
6	12,4	0
7	9,5	0
8	2,9	0
9	0	0
10	0	2,9
11	0	19,7
12	0	22,6
13	2,9	22,6
14	9,5	22,6
15	12,4	22,6
16	18,9	22,6
17	21,8	22,6
18	27,8	22,6
19	30,7	22,6
20	33,6	22,6
21	33,6	14,6
22	33,6	8



Pinout



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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.