flow 3xBOOST0-SiC **1200V/80mΩ**

Features

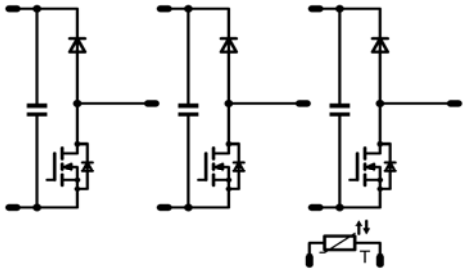
- SiC-Power MOSFET´s and Schottky Diodes
- 3 channel boost topology
- Ultra Low Inductance with integrated DC-capacitors
- Switching frequency >100kHz
- Temperature sensor

flow 0 12mm housing

Target Applications

- solar inverter
- Power Supply

Schematic



Types

- 10-PZ123BA080ME-M909L18Y

Maximum Ratings

Tj=25℃, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Booster Configuration MOSFET					
Drain to source breakdown voltage	V_{DS}			1200	V
DC drain current	I_D	T_j=$T_j$max	T_h=80℃ T_c=80℃	16 20	A
Pulsed drain current	I_{Dpulse}	t_p limited by $T_j$max		60	A
Power dissipation	P_{tot}	T_j=$T_j$max	T_h=80℃ T_c=80℃	41 62	W
Gate-source peak voltage	V_{GS}			-10/25	V
Maximum Junction Temperature	$T_j$max			150	℃
Booster Configuration FWD					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
Forward average current	I_{FAV}	T_j=$T_j$max	T_h=80℃ T_c=80℃	17 21	A
Non-Repetitive Peak Forward Surge Current	I_{FSM}	t_p=10ms	T_j=25℃	92	A
Repetitive Peak Forward Surge Current	I_{FRM}	t_p limited by $T_j$max		52	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80℃ T_c=80℃	50 76	W
Maximum Junction Temperature	$T_j$max			175	℃

Maximum Ratings

Tj=25℃, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
DC link Capacitor				
Max.DC voltage	V_{MAX}	Tc=25℃	1000	V
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	℃
Operation temperature under switching condition	T_{op}		-40…+(Tjmax - 25)	℃
Insulation Properties				
Insulation voltage		t=2s DC voltage	4000	V
Creepage distance			min 12,7	mm
Clearance			min 12,7	mm

Characteristic Values

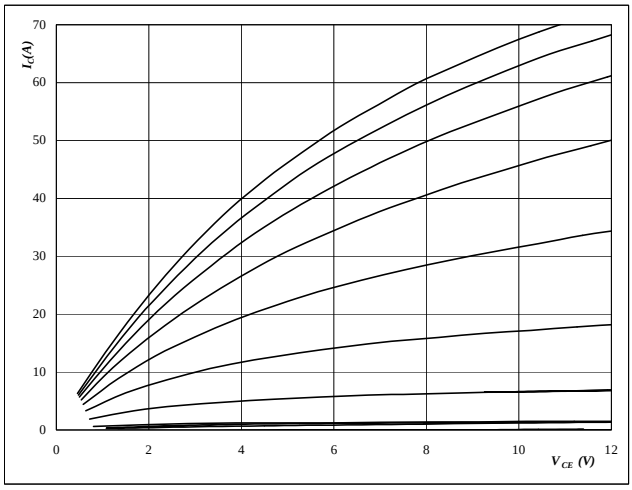
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
Input Boost MOSFET										
Static drain to source ON resistance	$R_{DS(on)}$		20		20	Tj=25℃ Tj=125℃		0,08 0,14		Ω
Gate threshold voltage	$V_{(GS)th}$	$V_{DS} = V_{GS}$		10	0,001	Tj=25℃ Tj=125℃	1,7	2,2		V
Gate to Source Leakage Current	I_{gss}		20	0		Tj=25℃ Tj=125℃			250	nA
Zero Gate Voltage Drain Current	I_{dss}		0	1200		Tj=25℃ Tj=125℃			100	µA
Internal Gate Resistance	R_G	f=1MHz; V_{AC}=25mV						4,6		Ω
Turn On Delay Time	$t_{d(ON)}$	Rgoff=4 Ω Rgon=4 Ω	16	700	16	Tj=25℃ Tj=125℃		12 10		ns
Rise Time	t_r					Tj=25℃ Tj=125℃		5 5		
Turn off delay time	$t_{d(OFF)}$					Tj=25℃ Tj=125℃		36 39		
Fall time	t_f					Tj=25℃ Tj=125℃		16 18		
Turn-on energy loss per pulse	E_{on}					Tj=25℃ Tj=125℃		0,126 0,108		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25℃ Tj=125℃		0,051 0,050		
Total gate charge	Q_g		0/20	800	20	Tj=25℃		49,2		nC
Gate to source charge	Q_{gs}							10,8		
Gate to drain charge	Q_{gd}							18		
Input capacitance	C_{iss}	f=1MHz	0	1000				950		pF
Output capacitance	C_{oss}							80		
Reverse transfer capacitance	C_{rss}							6,5		
Thermal resistance chip to heatsink per chip	R_{thJH}	Phase-Change Material						1,72		K/W
Input Boost FWD										
Forward voltage	V_F				10	Tj=25℃ Tj=125℃		1,46 1,80	1,8	V
Reverse leakage current	I_{rm}			1200		Tj=25℃ Tj=125℃			300	µA
Peak recovery current	I_{RRM}	Rgon=4 Ω	16	700	16	Tj=25℃ Tj=125℃		17 18		A
Reverse recovery time	t_{rr}					Tj=25℃ Tj=125℃		10 11		ns
Reverse recovery charge	Q_{rr}					Tj=25℃ Tj=125℃		0,102 0,103		µC
Reverse recovered energy	E_{rec}					Tj=25℃ Tj=125℃		0,028 0,031		mWs
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25℃ Tj=125℃		3666 3626		A/µs
Thermal resistance chip to heatsink per chip	R_{thJH}	Phase-Change Material						1,88		K/W
DC link Capacitor										
C value	C							47		nF
Thermistor										
Rated resistance	R					T=25℃		22000		Ω
Deviation of R25	ΔR/R	R100=1486 Ω				T=25℃	-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	

INPUT BOOST

Figure 1 BOOST MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 250 µs

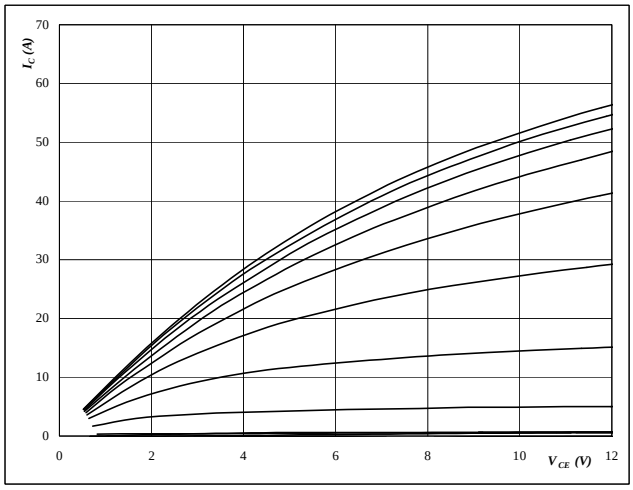
T_j = 25 ℃

V_{GS} from 0 V to 20 V in steps of 2 V

Figure 2 BOOST MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 250 µs

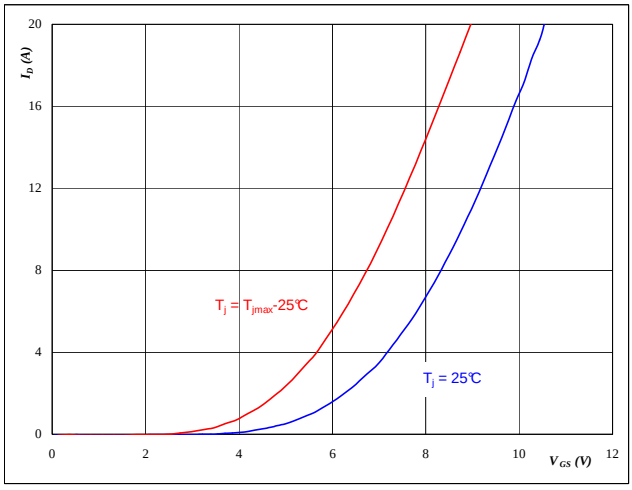
T_j = 126 ℃

V_{GS} from 0 V to 20 V in steps of 2 V

Figure 3 BOOST MOSFET

Typical transfer characteristics

$I_D = f(V_{GS})$



At

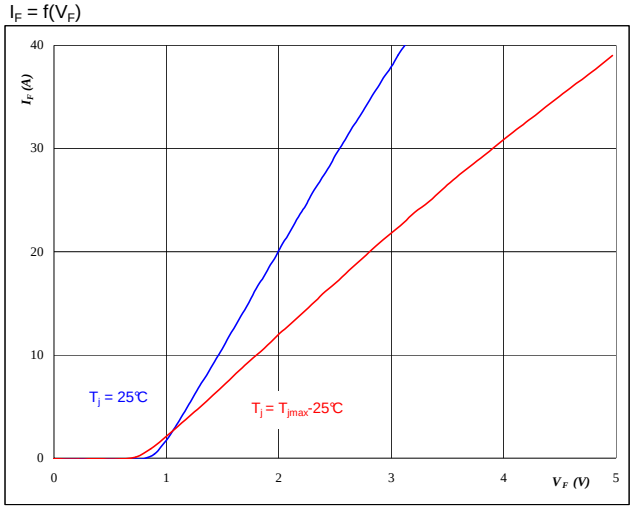
t_p = 250 µs

V_{DS} = 10 V

Figure 4 BOOST FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



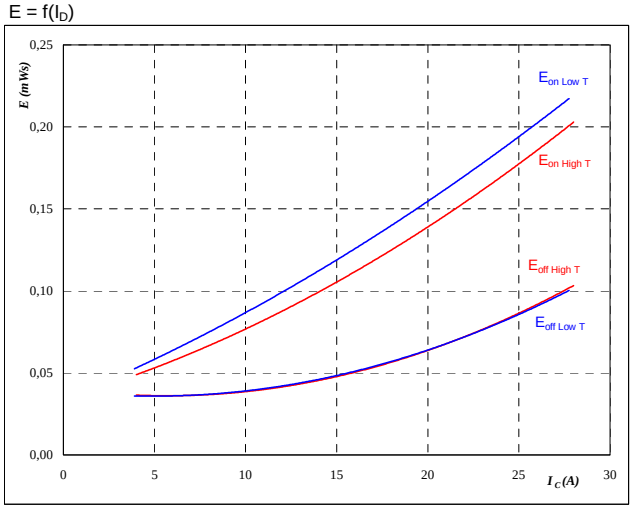
At

t_p = 250 µs

INPUT BOOST

Figure 5 BOOST MOSFET

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

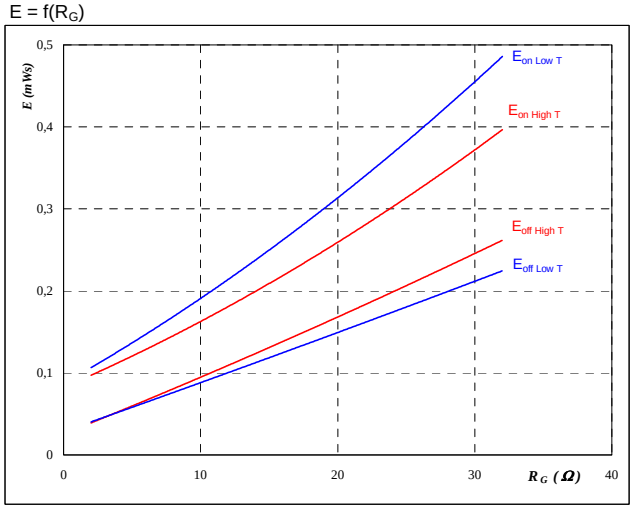


With an inductive load at

T_j =	25/125	℃
V_{DS} =	700	V
V_{GS} =	16	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 6 BOOST MOSFET

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

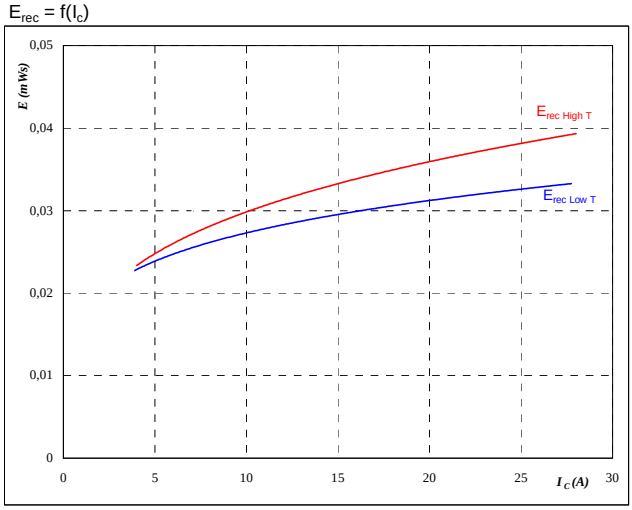


With an inductive load at

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

Figure 7 BOOST FWD

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

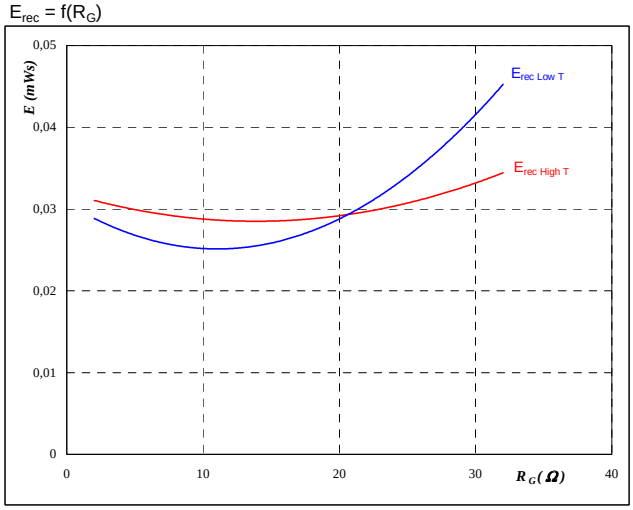


With an inductive load at

T_j =	25/125	℃
V_{DS} =	700	V
V_{GS} =	16	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 8 BOOST FWD

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



With an inductive load at

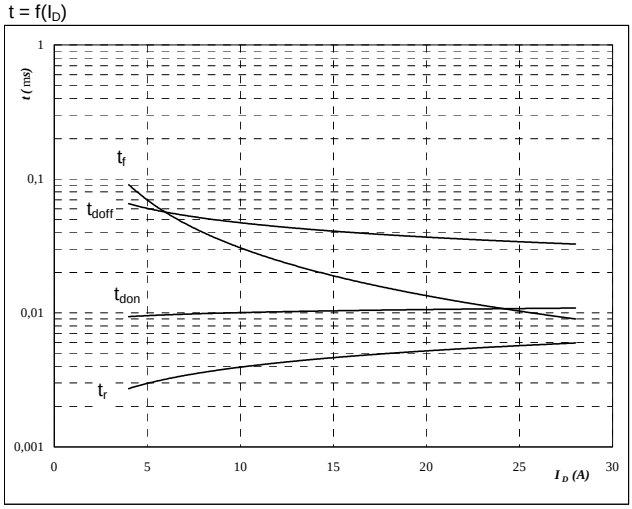
T_j =	25/125	℃
V_{DS} =	700	V
V_{GS} =	16	V
I_D =	16	A

INPUT BOOST

Figure 9 BOOST MOSFET

Typical switching times as a function of collector current

t = f(I_D)



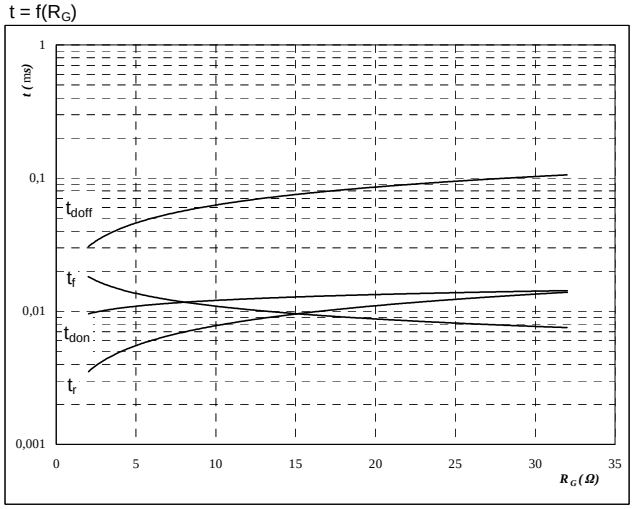
With an inductive load at

T_j =	125	℃
V_{DS} =	700	V
V_{GS} =	16	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 10 BOOST MOSFET

Typical switching times as a function of gate resistor

t = f(R_G)



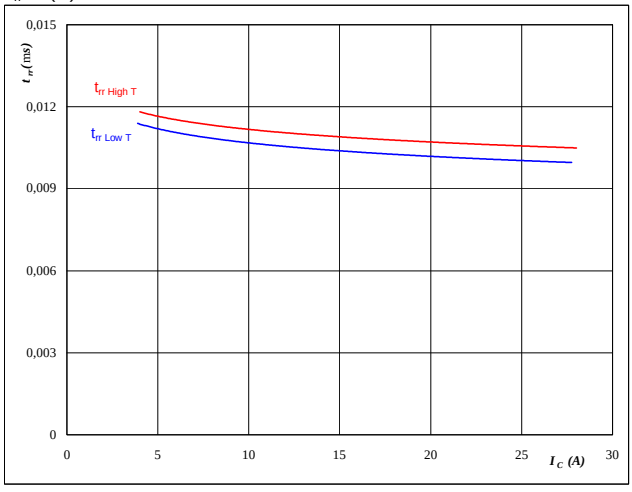
With an inductive load at

T_j =	125	℃
V_{DS} =	700	V
V_{GS} =	16	V
I_C =	16	A

Figure 11 BOOST FWD

Typical reverse recovery time as a function of collector current

t_{rr} = f(Ic)



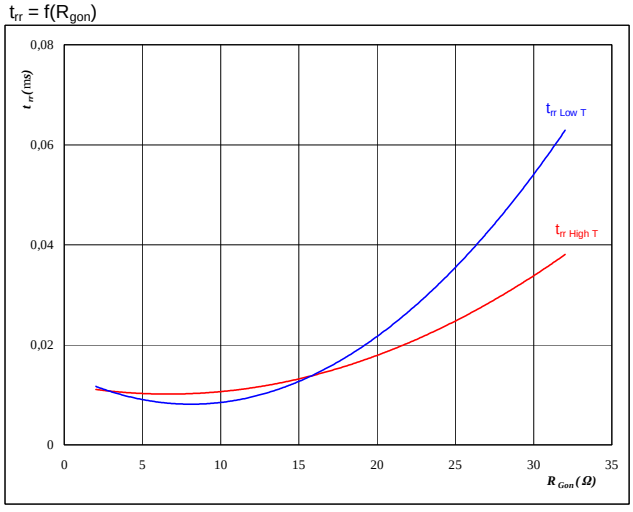
At

T_j =	25/125	℃
V_{CE} =	700	V
V_{GE} =	16	V
R_{gon} =	4	Ω

Figure 12 BOOST FWD

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

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



At

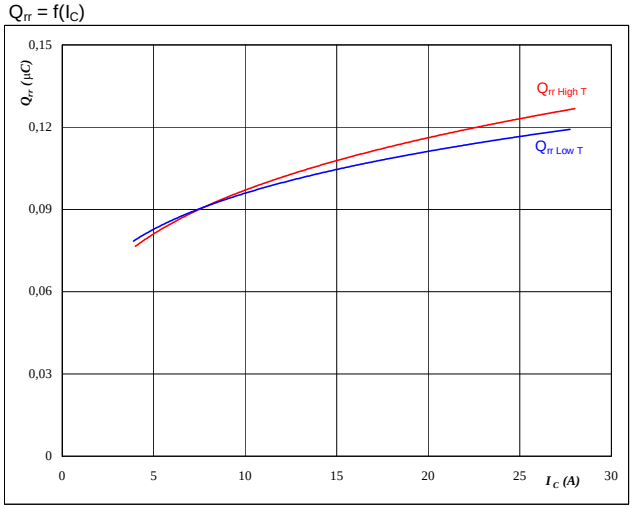
T_j =	25/125	℃
V_R =	700	V
I_F =	16	A
V_{GS} =	16	V

INPUT BOOST

Figure 13 BOOST FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



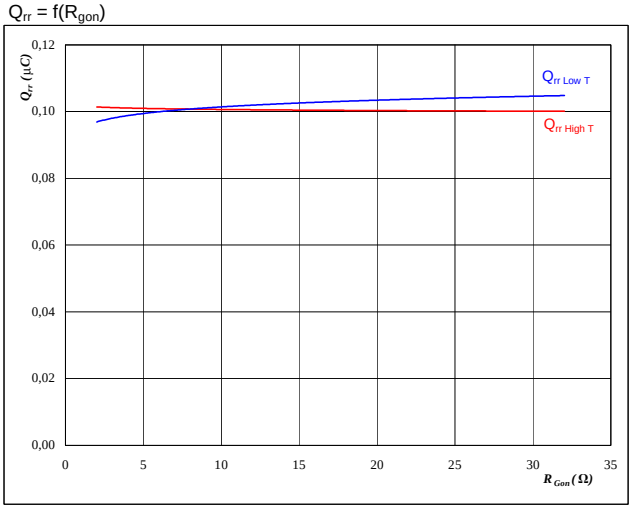
At

T_j =	25/125	℃
V_{CE} =	700	V
V_{GE} =	16	V
R_{gon} =	4	Ω

Figure 14 BOOST FWD

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

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



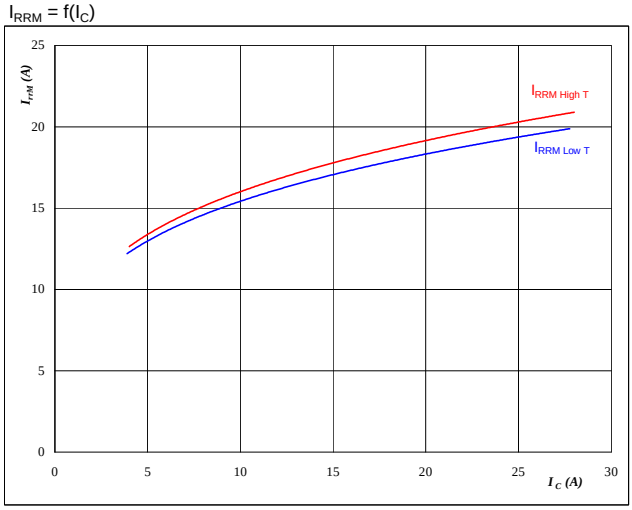
At

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

Figure 15 BOOST FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



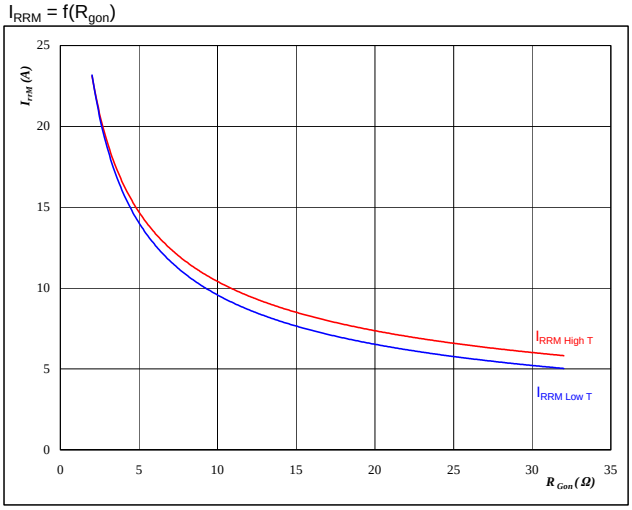
At

T_j =	25/125	℃
V_{CE} =	700	V
V_{GE} =	16	V
R_{gon} =	4	Ω

Figure 16 BOOST FWD

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

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



At

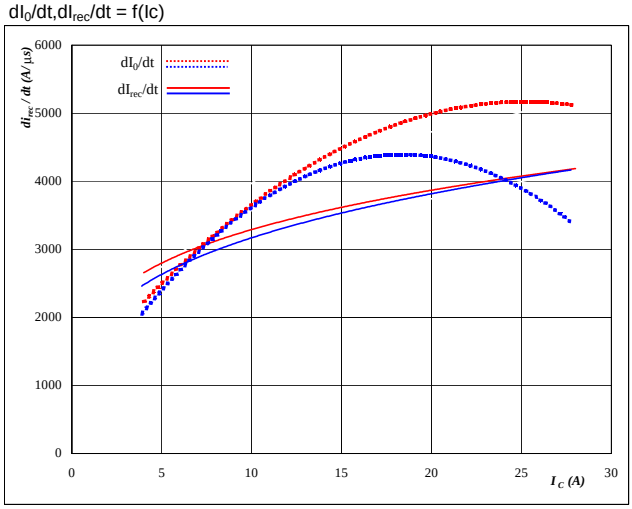
T_j =	25/125	℃
V_R =	700	V
I_F =	16	A
V_{GS} =	16	V

INPUT BOOST

Figure 17 BOOST FWD

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

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



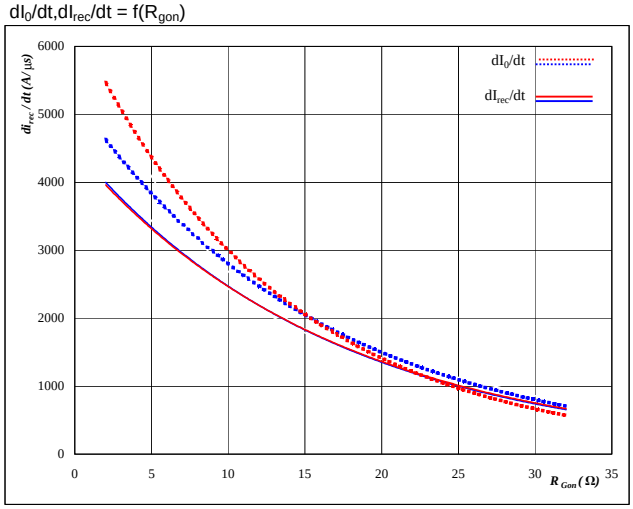
At

T_j =	25/125	℃
V_{CE} =	700	V
V_{GE} =	16	V
R_{gon} =	4	Ω

Figure 18 BOOST FWD

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

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



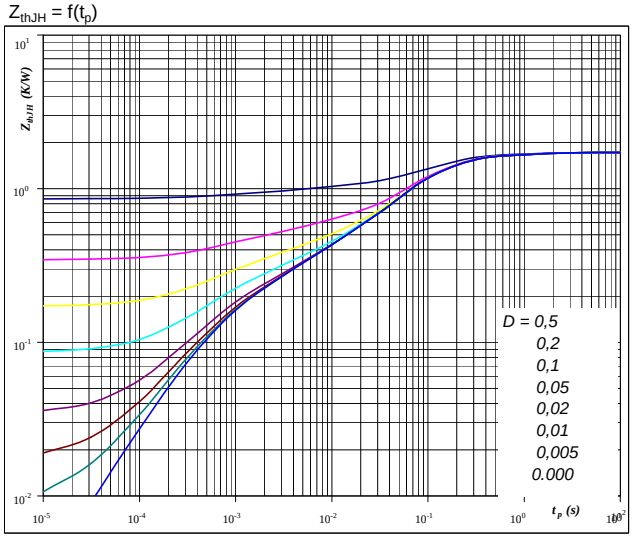
At

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

Figure 19 BOOST MOSFET

IGBT/MOSFET transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	1,72	K/W

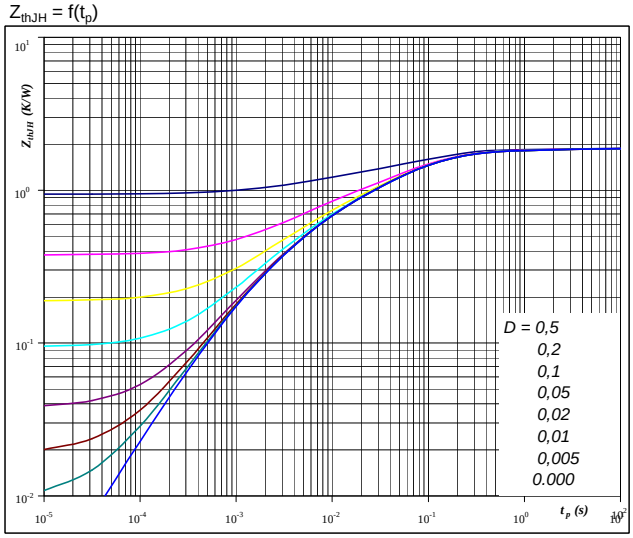
IGBT thermal model values

R (C/W)	Tau (s)
1,42E-01	1,02E+00
7,14E-01	1,29E-01
5,71E-01	5,47E-02
1,68E-01	3,53E-03
1,23E-01	5,32E-04

Figure 20 BOOST FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	1,88	K/W

FWD thermal model values

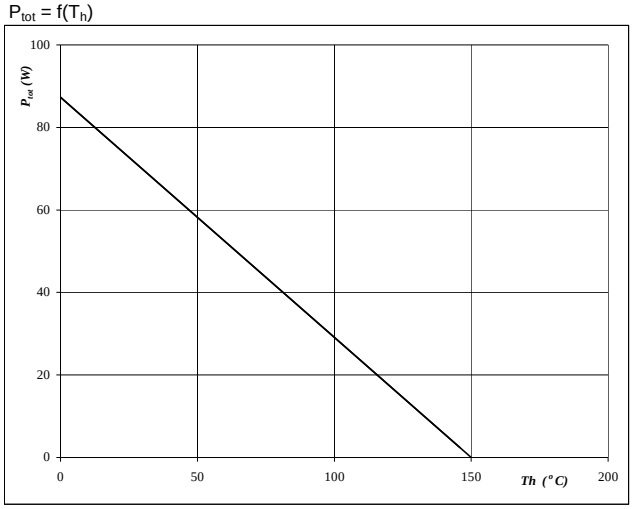
R (C/W)	Tau (s)
5,58E-02	6,96E+00
1,47E-01	5,43E-01
8,94E-01	7,92E-02
4,33E-01	1,33E-02
2,94E-01	3,03E-03
5,99E-02	6,32E-04

INPUT BOOST

Figure 21 BOOST MOSFET

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



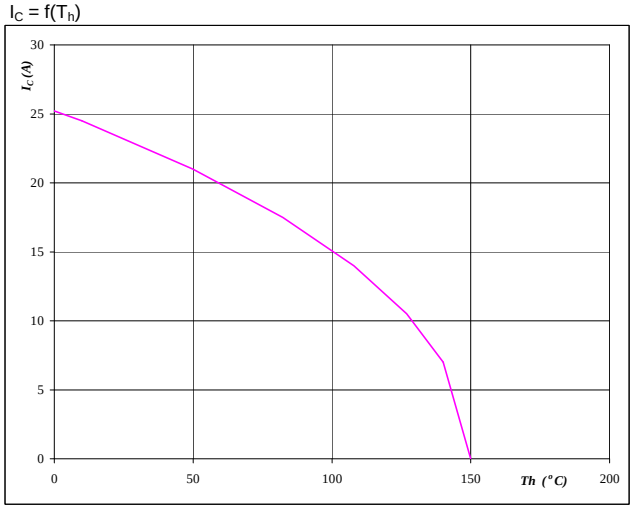
At

T_j = 150 ºC

Figure 22 BOOST MOSFET

Collector/Drain current as a function of heatsink temperature

$I_C = f(T_h)$



At

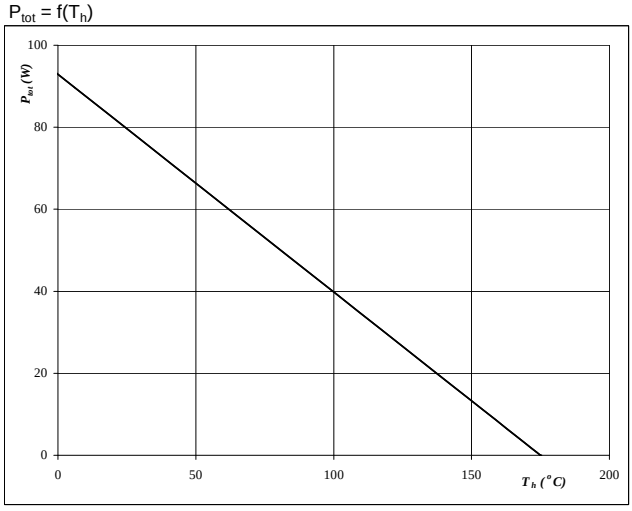
T_j = 150 ºC

V_{GS} = 20 V

Figure 23 BOOST FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



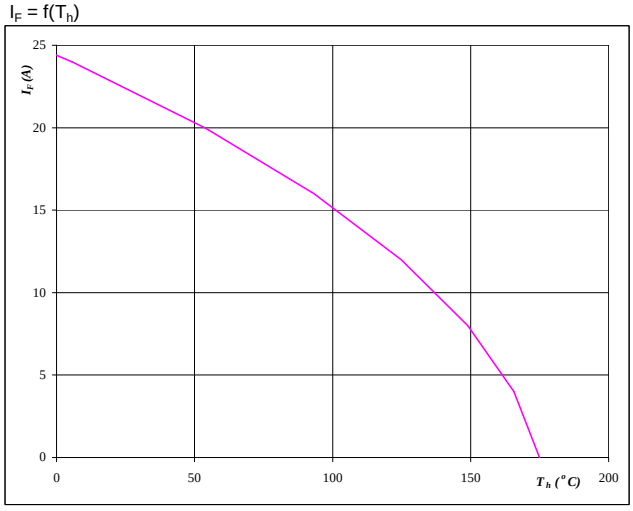
At

T_j = 175 ºC

Figure 24 BOOST FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

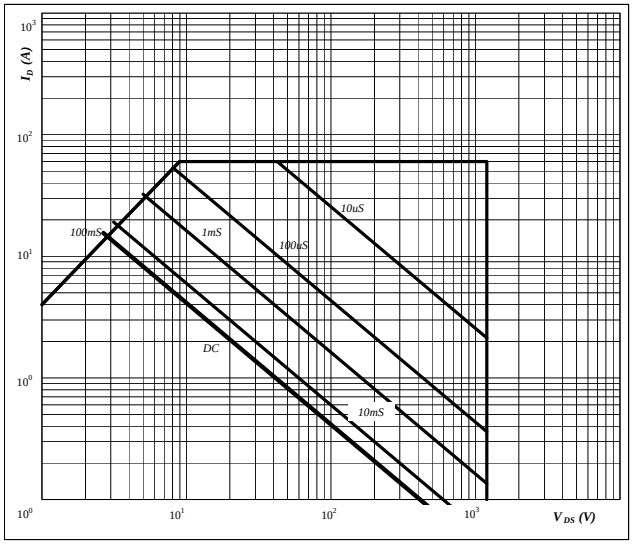
T_j = 175 ºC

INPUT BOOST

Figure 25 BOOST MOSFET

Safe operating area as a function of drain-source voltage

$I_D = f(V_{DS})$



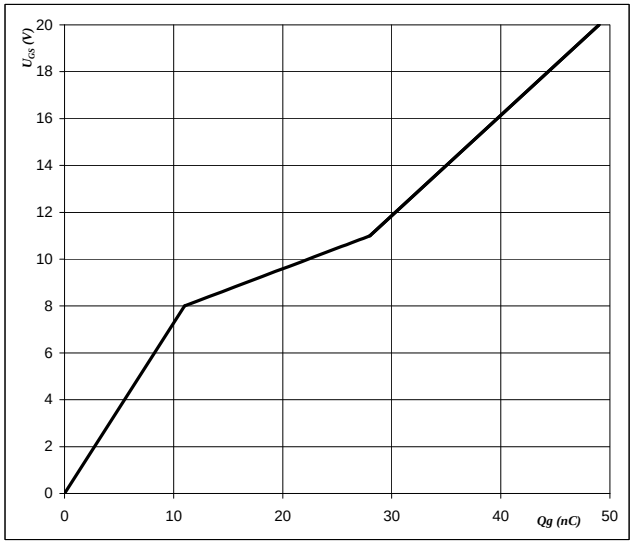
At

D =	single pulse	
T_h =	80	ºC
V_{GS} =	16	V
T_j =	T_{jmax}	ºC

Figure 26 BOOST MOSFET

Gate voltage vs Gate charge

$V_{GS} = f(Qg)$



At

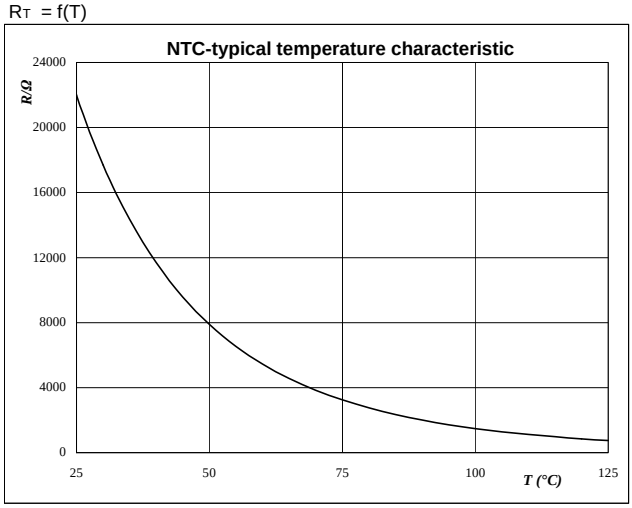
I_{DS} =	20	A
V_{DS}=	800	V
I_{GS}=	10	mA
T_j =	25	ºC

Thermistor

Figure 1 Thermistor

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$



Switching Definitions BOOST

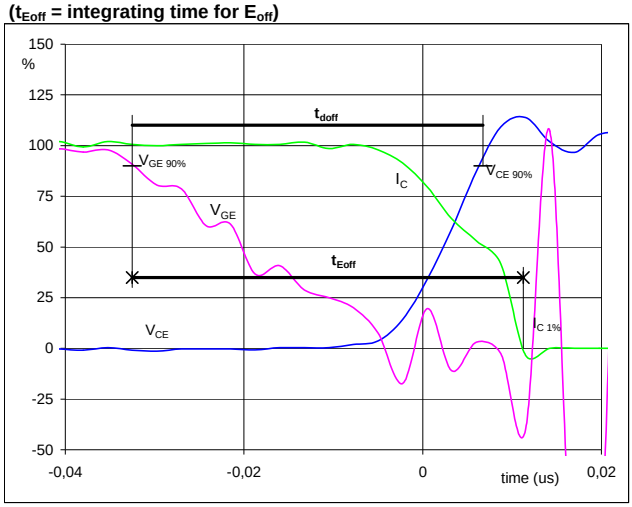
General conditions

T_j	=	125 ℃
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

Figure 1 BOOST MOSFET

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

(t_{Eoff} = integrating time for E_{off})

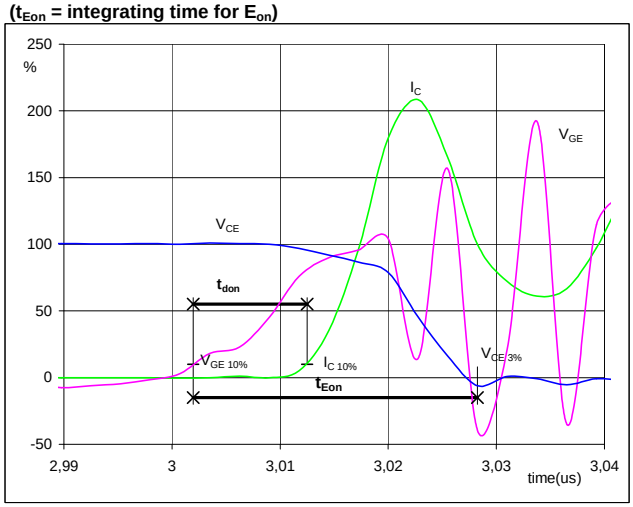


V_{GE} (0%) =	0	V
V_{GE} (100%) =	16	V
V_C (100%) =	700	V
I_C (100%) =	16	A
t_{doff} =	0,04	µs
t_{Eoff} =	0,04	µs

Figure 2 BOOST MOSFET

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

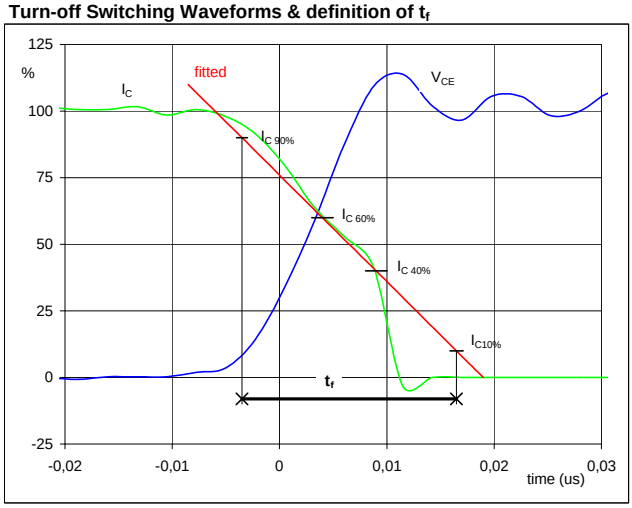
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	16	V
V_C (100%) =	700	V
I_C (100%) =	16	A
t_{don} =	0,01	µs
t_{Eon} =	0,03	µs

Figure 3 BOOST MOSFET

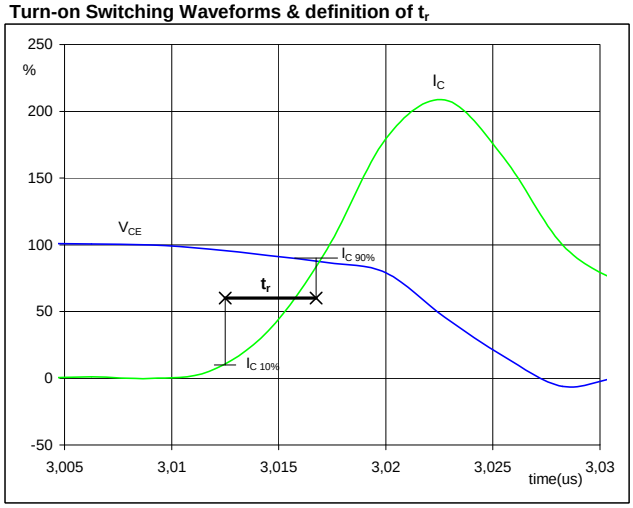
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	700	V
I_C (100%) =	16	A
t_f =	0,02	µs

Figure 4 BOOST MOSFET

Turn-on Switching Waveforms & definition of t_r

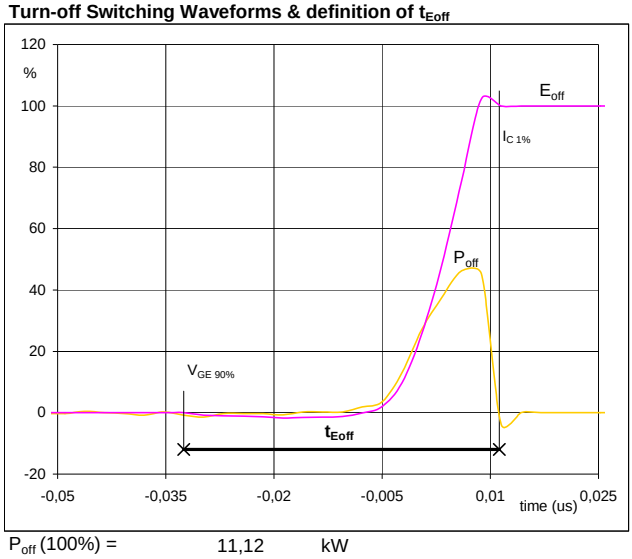


V_C (100%) =	700	V
I_C (100%) =	16	A
t_r =	0,01	µs

Switching Definitions BOOST

Figure 5 BOOST MOSFET

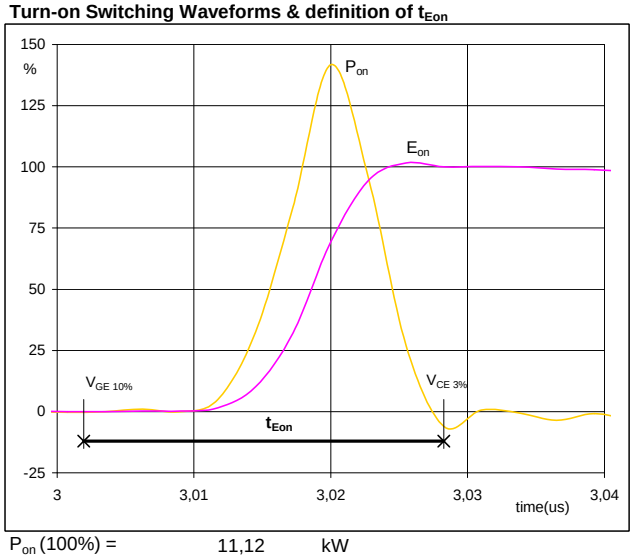
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	11,12	kW
E_{off} (100%) =	0,05	mJ
t_{Eoff} =	0,04	µs

Figure 6 BOOST MOSFET

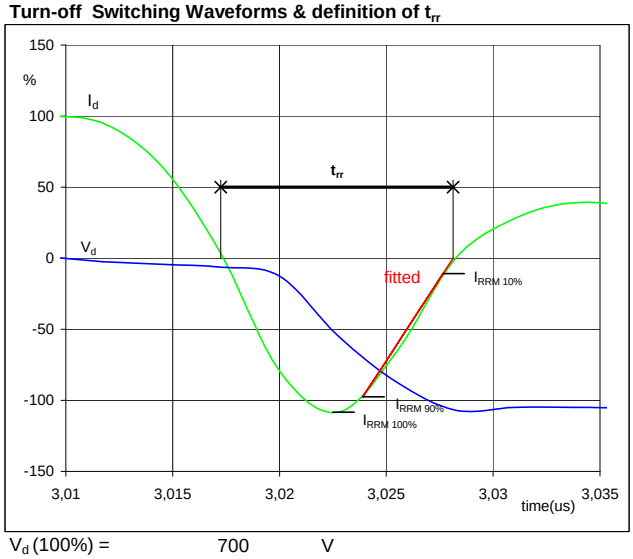
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	11,12	kW
E_{on} (100%) =	0,11	mJ
t_{Eon} =	0,03	µs

Figure 7 BOOST FWD

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

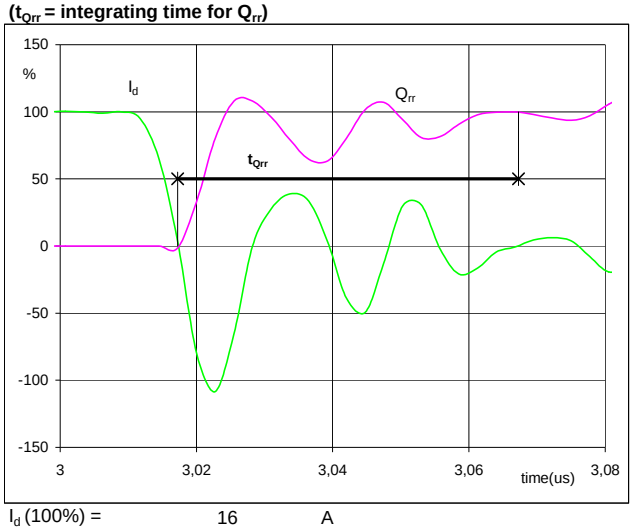


V_d (100%) =	700	V
I_d (100%) =	16	A
I_{RRM} (100%) =	-18	A
t_{rr} =	0,01	µs

Switching Definitions BOOST

Figure 8 FWD

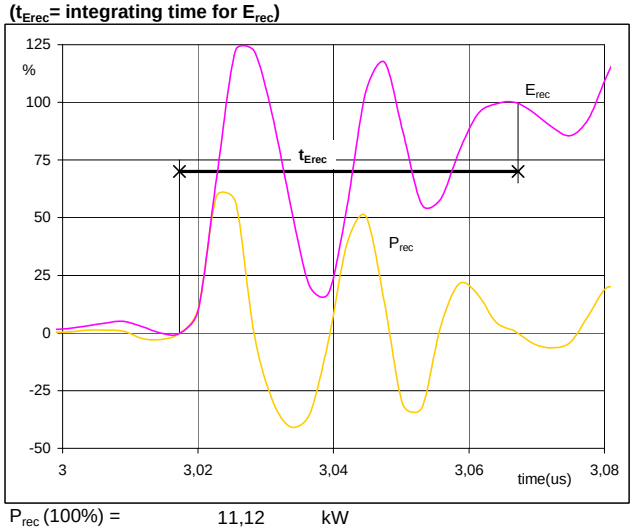
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	16	A
Q_{rr} (100%) =	0,10	µC
t_{Qrr} =	0,05	µs

Figure 10 FWD

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

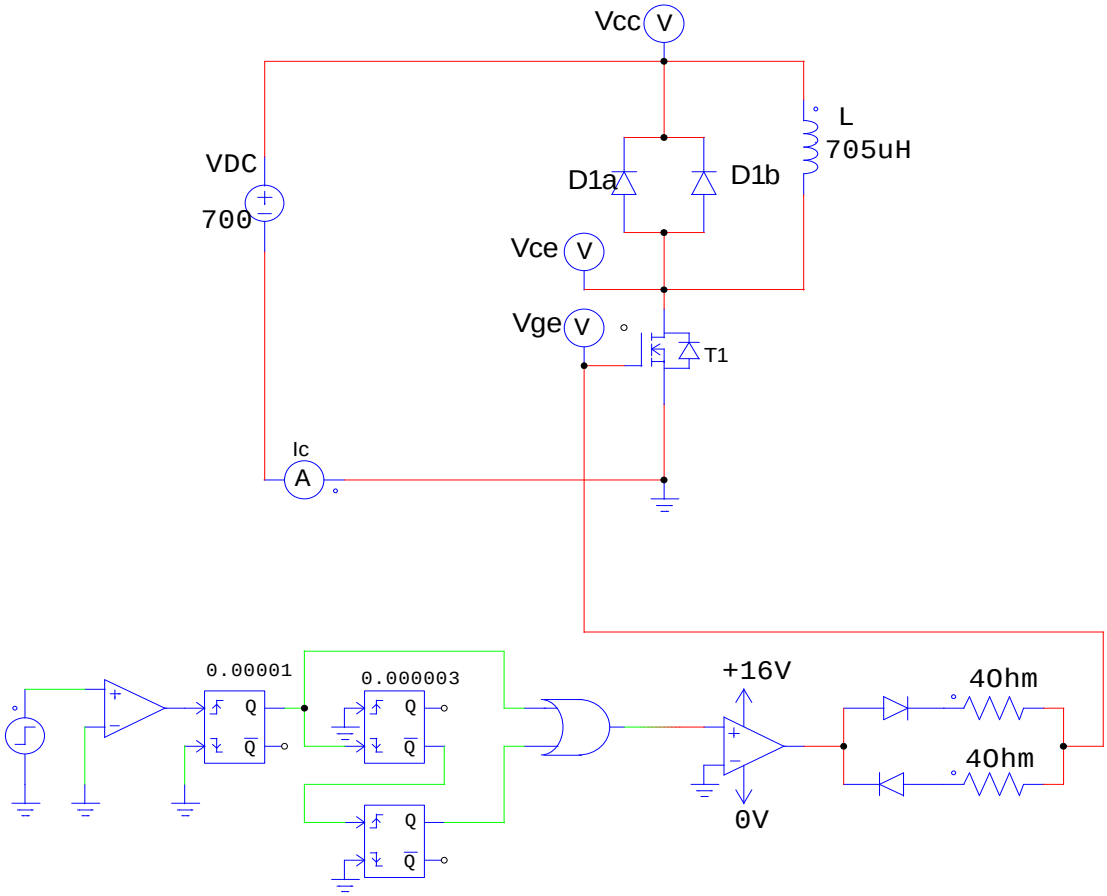


P_{rec} (100%) =	11,12	kW
E_{rec} (100%) =	0,03	mJ
t_{Erec} =	0,05	µs

Measurement circuit

Figure 11

BOOST stage switching measurement circuit



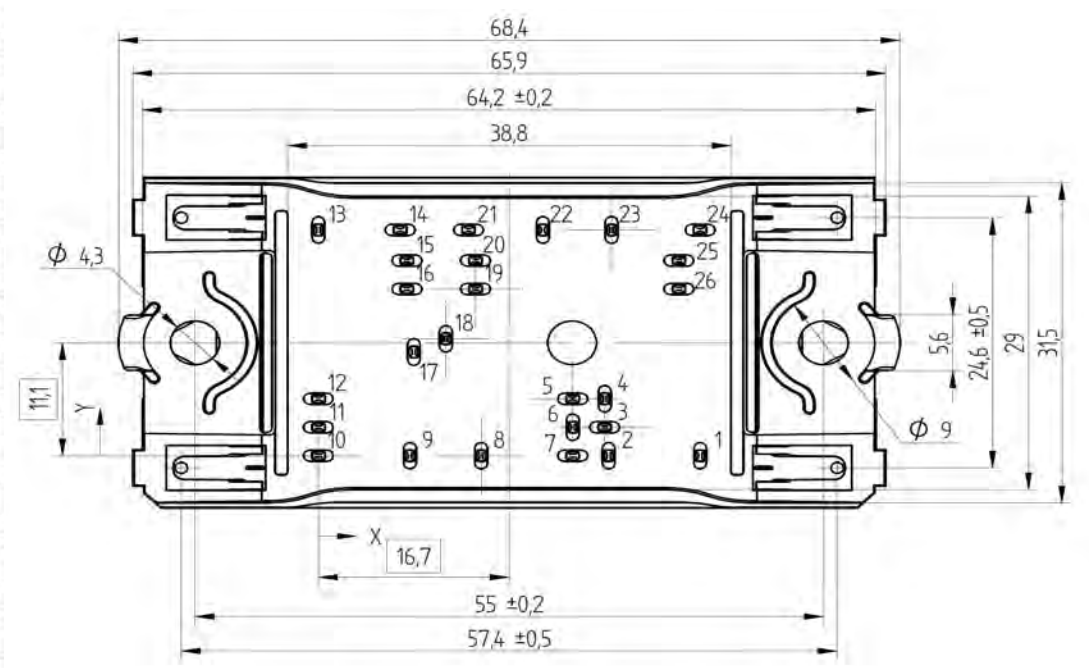
Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

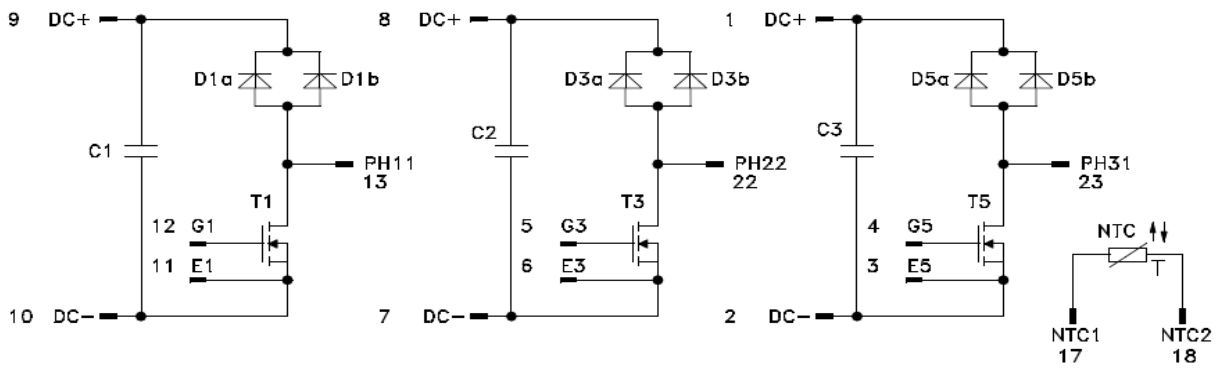
Version	Ordering Code	in DataMatrix as	in packaging barcode as
w/o thermal paste 12mm housing with Press-fit pin	10-PZ123BA080ME-M909L18Y	M909L18Y	M909L18Y

Outline

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



Pinout



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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.