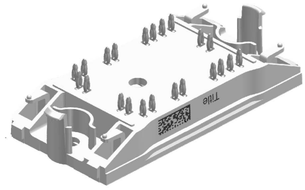
flow **SOL0-SiC** **1200 V / 40 mΩ**

Features

- **Cree**[TM] Silicon Carbide Power MOSFET
- **Cree**[TM] Silicon Carbide Power Schottky Diode
- Dual Boost Topology
- Ultra Low Inductance with Integrated DC-capacitors
- Extremely Fast Switching with No "Tail" Current
- Solderless Press-fit Mounting Technology
- Temperature sensor

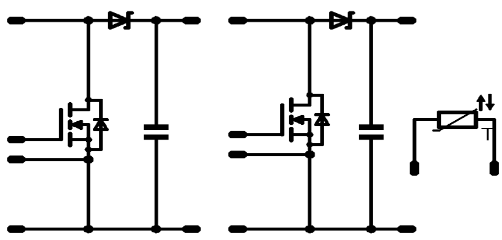
flow **0 12mm housing**



Target Applications

- High efficient solar inverters
- UPS

Schematic



Types

- 10-PZ12B2A040ME01-M330L63Y

Maximum Ratings

Tj=25℃, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Boost - Silicon Carbide Power MOSFET (T1 , T3)					
Drain to source breakdown voltage	V_{DS}			1200	V
DC drain current	I_D	$T_j=T_j$max	T_h=80℃	33	A
Pulsed drain current	I_{Dpulse}	t_p limited by $T_j$max		190	A
Power dissipation	P_{tot}	$T_j=T_j$max	T_h=80℃	81	W
Gate-source peak voltage	V_{GS}			-5/25	V
Maximum Junction Temperature	$T_j$max			150	℃
Protection Diode (D1 , D3)					
Peak Repetitive Reverse Voltage	V_{RRM}			1600	V
DC forward current	I_F	$T_j=T_j$max	T_h=80℃	47	A
Surge forward current	I_{FSM}	10ms sin 180°	T_j=25℃	370	A
Power dissipation per Diode	P_{tot}	$T_j=T_j$max	T_h=80℃	65	W
Maximum Junction Temperature	$T_j$max			150	℃

Maximum Ratings

Tj=25℃, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost - Silicon Carbide Power Schottky Diode (D2 , D4)				
Peak Repetitive Reverse Voltage	V_{RRM}		1200	V
DC forward current	I_F	$T_j=T_j$max T_h=80℃	35	A
Surge repetitive forward current	I_{FSM}	t_p limited by $T_j$max	104	A
Power dissipation	P_{tot}	$T_j=T_j$max T_h=80℃	94	W
Maximum Junction Temperature	$T_j$max		175	℃
DC link Capacitor (C1 , C2)				
Max.DC voltage	V_{MAX}		1000	V
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 9,16	mm

Characteristic Values

Parameter	Symbol	Conditions	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	Unit
Boost - Silicon Carbide Power MOSFET (T1 , T3)										
Static drain to source ON resistance	$R_{DS(on)}$		18		72	Tj=25℃ Tj=125℃		52 78		mΩ
Gate threshold voltage	$V_{(GS)th}$				0,002	Tj=25℃ Tj=125℃		2,25		V
Gate to Source Leakage Current	I_{gss}		20			Tj=25℃ Tj=125℃			500	nA
Zero Gate Voltage Drain Current	I_{dss}		0	1200		Tj=25℃ Tj=150℃		2 20	200 500	nA
Turn On Delay Time	$t_{d(ON)}$	Rgoff=2 Ω Rgon=2 Ω	0/16	700	32	Tj=25℃ Tj=125℃		13 12		ns
Rise Time	t_r					Tj=25℃ Tj=125℃		5 5		
Turn off delay time	$t_{d(OFF)}$					Tj=25℃ Tj=125℃		50 53		
Fall time	t_f					Tj=25℃ Tj=125℃		12 12		
Turn-on energy loss per pulse	E_{on}					Tj=25℃ Tj=125℃		0,25 0,24		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25℃ Tj=125℃		0,10 0,09		
Total gate charge	Q_g		0/20	800	40	Tj=25℃ Tj=125℃		98,4		nC
Gate to source charge	Q_{gs}					Tj=25℃ Tj=125℃		21,6		
Gate to drain charge	Q_{gd}					Tj=25℃ Tj=125℃		36		
Input capacitance	C_{iss}	f=1MHz	0	1000		Tj=25℃		1900		pF
Output capacitance	C_{oss}							160		
Reverse transfer capacitance	C_{rss}							13		
Thermal resistance chip to heatsink per chip	R_{thJH}	Phase-Change Material						0,86		K/W
Protection Diode (D1 , D3)										
Diode forward voltage	V_F				35	Tj=25℃ Tj=125℃		1,24 1,23		V
Reverse leakage current	I_{rm}					Tj=25℃ Tj=125℃			0,05	mA
Thermal resistance chip to heatsink per chip	R_{thJH}	Phase-Change Material						1,07		K/W
Boost - Silicon Carbide Power Schottky Diod										
Forward voltage	V_F				20	Tj=25℃ Tj=150℃		1,43 1,72		V
Reverse leakage current	I_{rm}			1200		Tj=25℃ Tj=175℃		80 160	600 1200	µA
Peak recovery current	I_{RRM}	Rgon=2 Ω	0	700	32	Tj=25℃ Tj=150℃		35 38		A
Reverse recovery time	t_{rr}					Tj=25℃ Tj=150℃		9 9		ns
Reverse recovery charge	Q_{rr}					Tj=25℃ Tj=150℃		0,15 0,14		µC
Reverse recovered energy	E_{rec}					Tj=25℃ Tj=150℃		0,03 0,01		mWs
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25℃ Tj=150℃		13071 14558		A/µs
Thermal resistance chip to heatsink per chip	R_{thJH}	Phase-Change Material						1,01		K/W

Characteristic Values

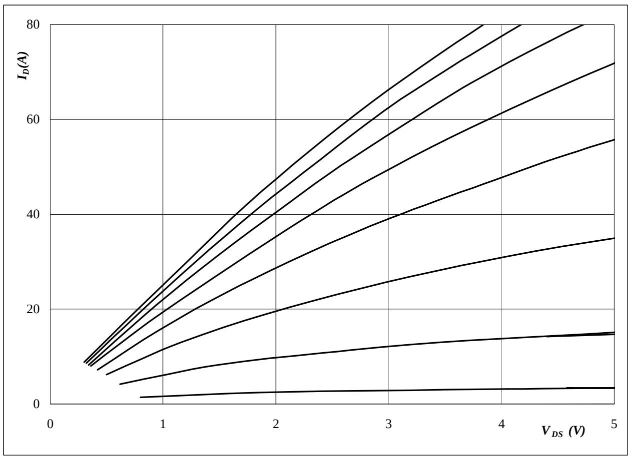
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
DC link Capacitor (C1 , C2)										
C value	C							100		nF
Thermistor										
Rated resistance	R					Tj=25℃		22000		Ω
Deviation of R25	ΔR/R	R100=1486 Ω				Tc=100℃	-5		+5	%
Power dissipation	P					Tj=25℃		200		mW
Power dissipation constant						Tj=25℃		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				Tj=25℃		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				Tj=25℃		3996		K
Vincotech NTC Reference						Tj=25℃			B	

INPUT BOOST

Figure 1 BOOST MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 250 µs

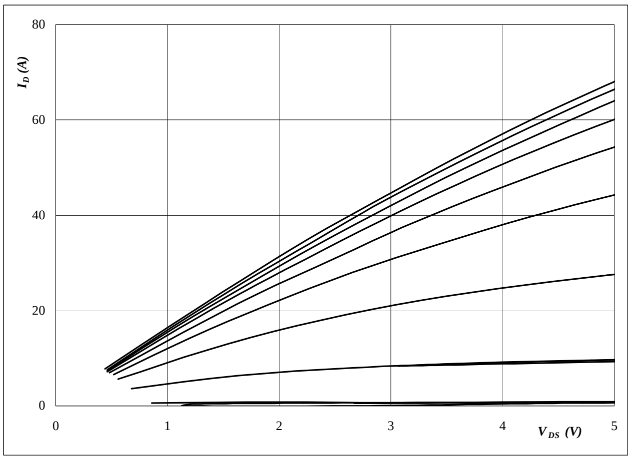
T_j = 25 °C

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

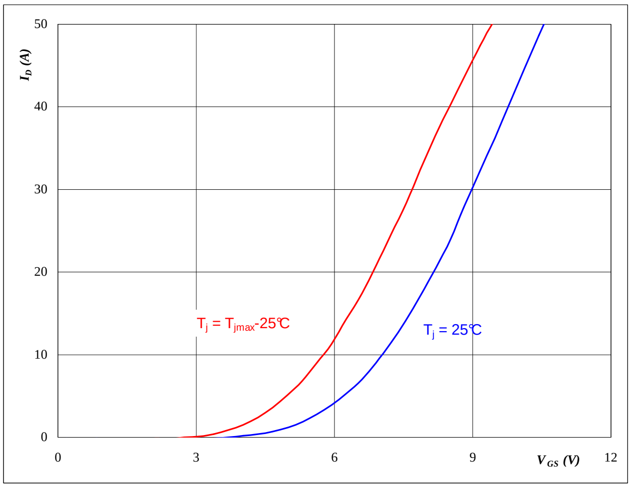
T_j = 125 °C

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

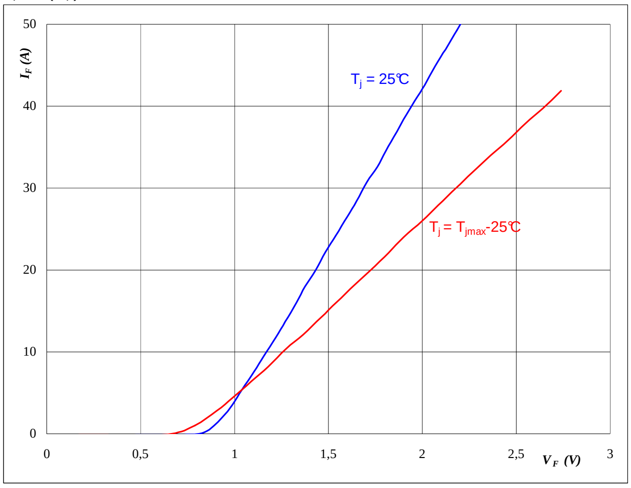
t_p = 250 µs

V_{DS} = 10 V

Figure 4 BOOST FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

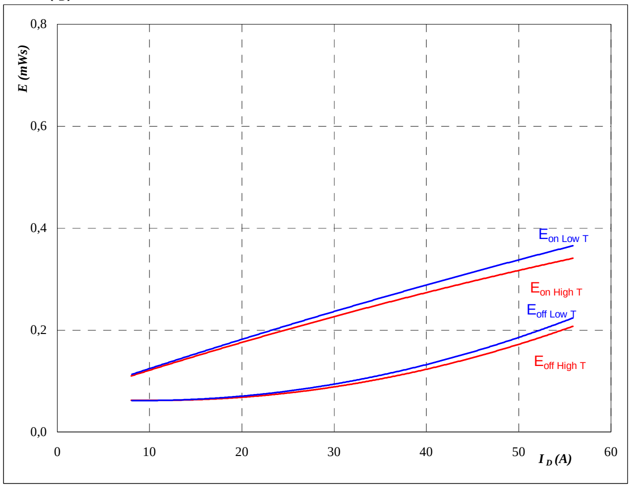
t_p = 250 µs

INPUT BOOST

Figure 5 BOOST MOSFET

Typical switching energy losses
as a function of drain current

$E = f(I_D)$



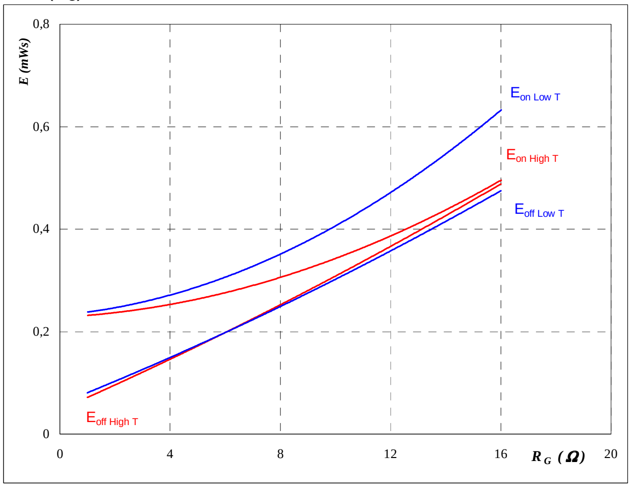
With an inductive load at

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	0/16	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 6 BOOST MOSFET

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



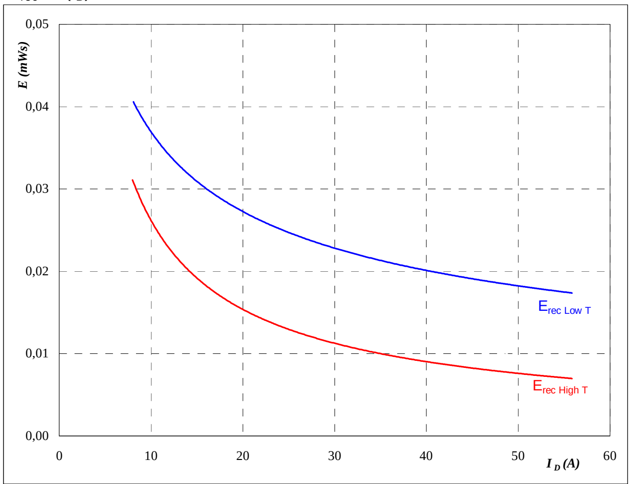
With an inductive load at

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	0/16	V
I_D =	32	A

Figure 7 BOOST FWD

Typical reverse recovery energy loss
as a function of drain current

$E_{rec} = f(I_D)$



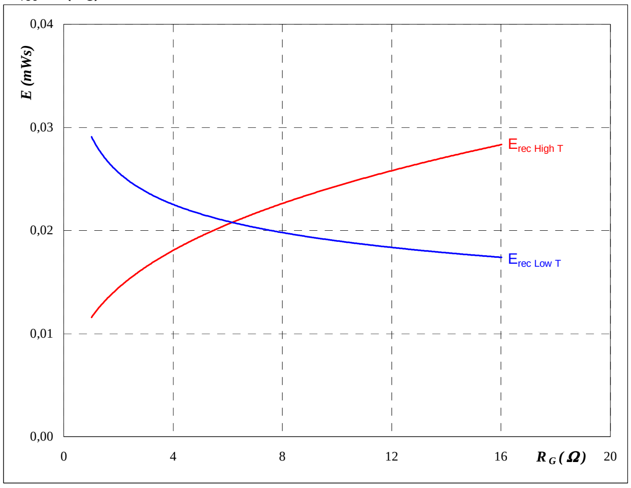
With an inductive load at

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	0/16	V
R_{gon} =	2	Ω
R_{goff} =	2	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

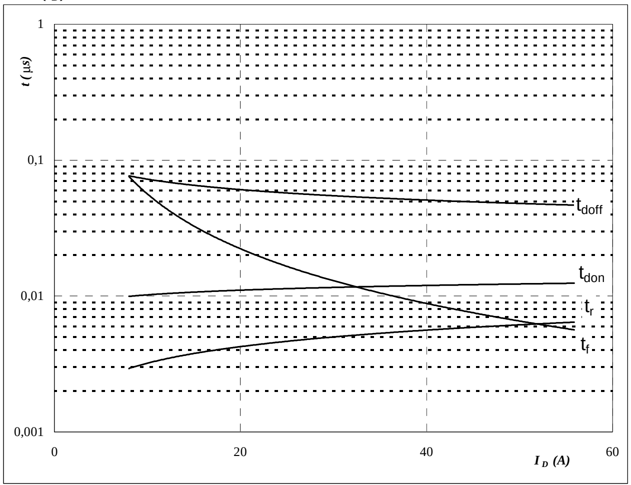
T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	0/16	V
I_D =	32	A

INPUT BOOST

Figure 9 BOOST MOSFET

Typical switching times as a function of drain current

t = f(I_D)



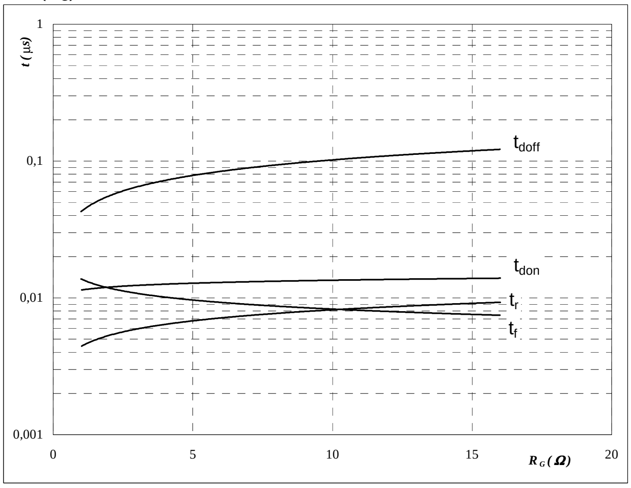
With an inductive load at

T_j =	125	℃
V_{DS} =	700	V
V_{GS} =	0/16	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 10 BOOST MOSFET

Typical switching times as a function of gate resistor

t = f(R_G)



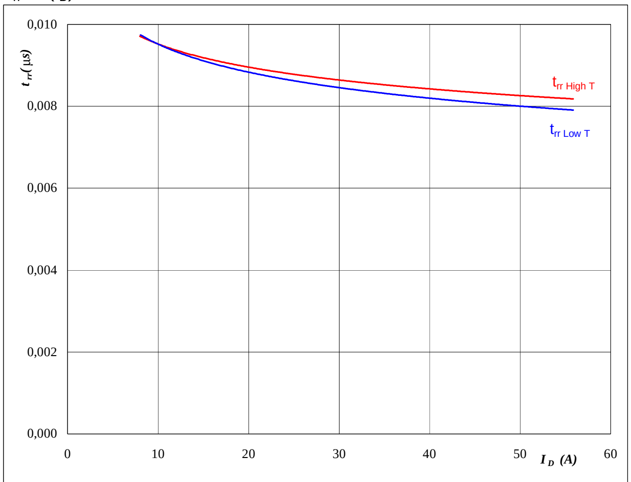
With an inductive load at

T_j =	125	℃
V_{DS} =	700	V
V_{GS} =	0/16	V
I_D =	32	A

Figure 11 BOOST FWD

Typical reverse recovery time as a function of drain current

t_{rr} = f(I_D)



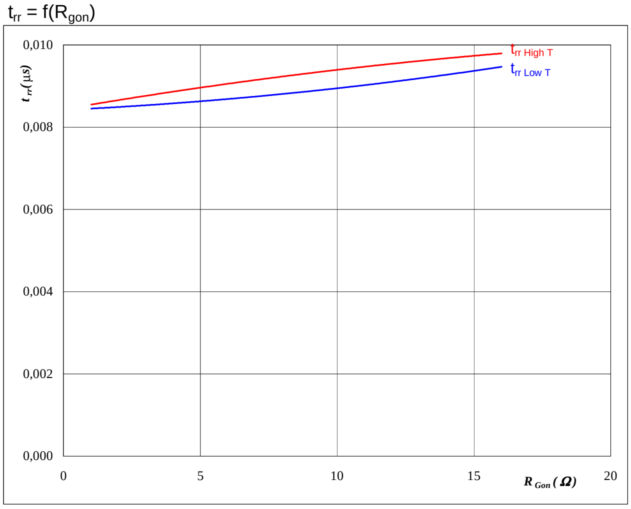
At

T_j =	25/125	℃
V_{DS} =	700	V
V_{GS} =	0/16	V
R_{gon} =	2	Ω

Figure 12 BOOST FWD

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

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



At

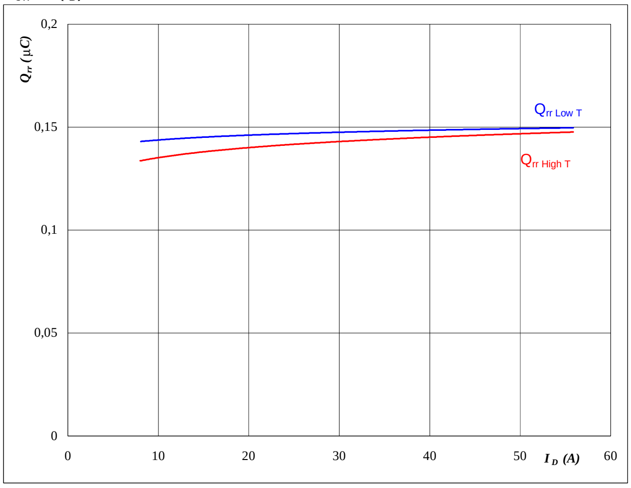
T_j =	25/125	℃
V_R =	700	V
I_F =	32	A
V_{GS} =	0/16	V

INPUT BOOST

Figure 13 BOOST FWD

Typical reverse recovery charge as a function of drain current

$Q_{rr} = f(I_D)$



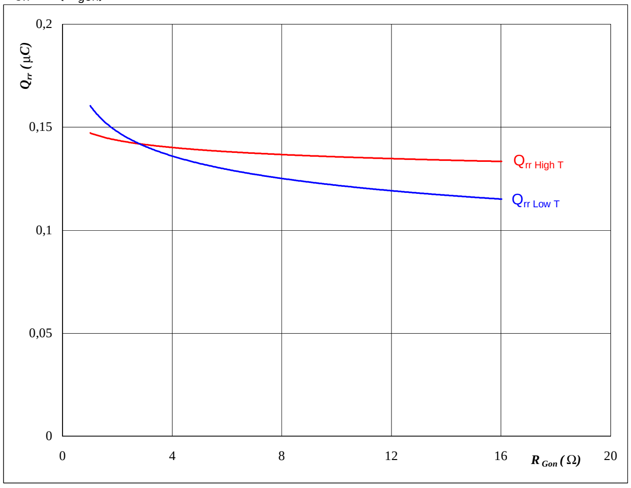
At

T_j =	25/125	℃
V_{DS} =	700	V
V_{GS} =	0/16	V
R_{gon} =	2	Ω

Figure 14 BOOST FWD

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

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



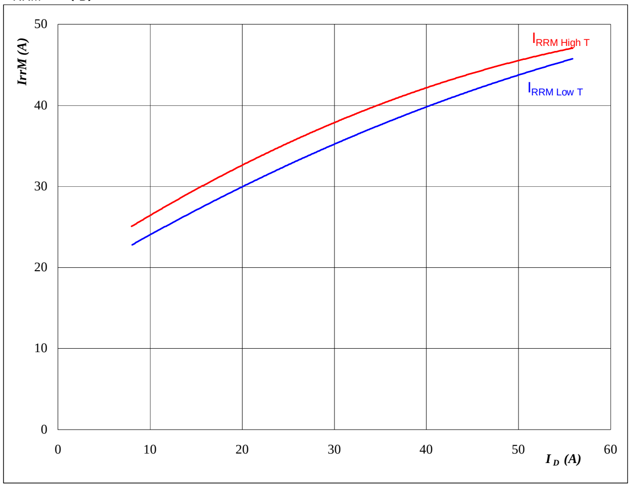
At

T_j =	25/125	℃
V_R =	700	V
I_F =	32	A
V_{GS} =	0/16	V

Figure 15 BOOST FWD

Typical reverse recovery current as a function of drain current

$I_{RRM} = f(I_D)$



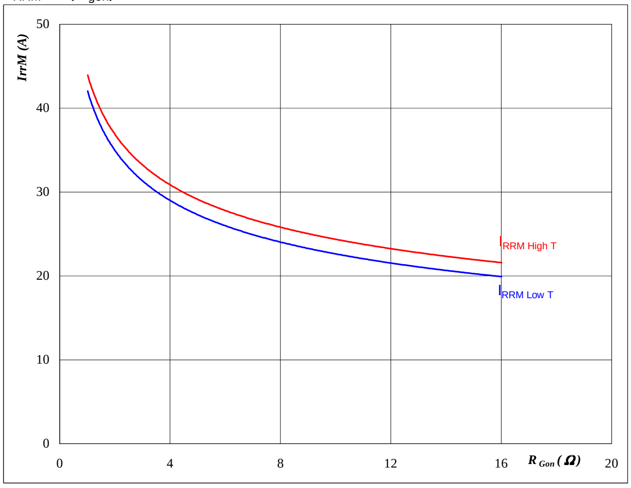
At

T_j =	25/125	℃
V_{DS} =	700	V
V_{GS} =	0/16	V
R_{gon} =	2	Ω

Figure 16 BOOST FWD

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

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



At

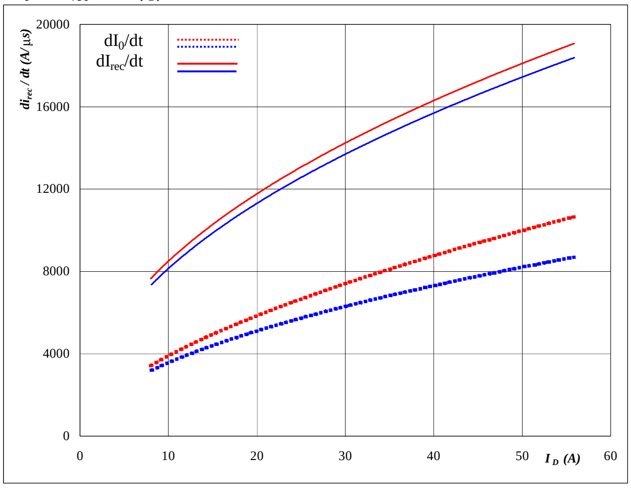
T_j =	25/125	℃
V_R =	700	V
I_F =	32	A
V_{GS} =	0/16	V

INPUT BOOST

Figure 17 BOOST FWD

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

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



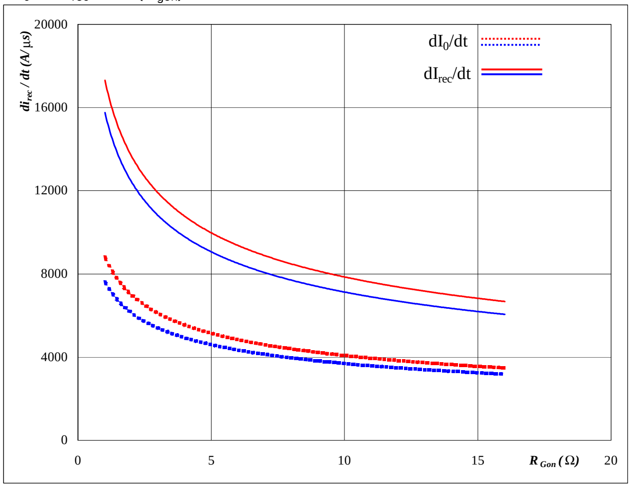
At

T_j =	25/125	°C
V_{DS} =	700	V
V_{GS} =	0/16	V
R_{gon} =	2	Ω

Figure 18 BOOST FWD

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

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



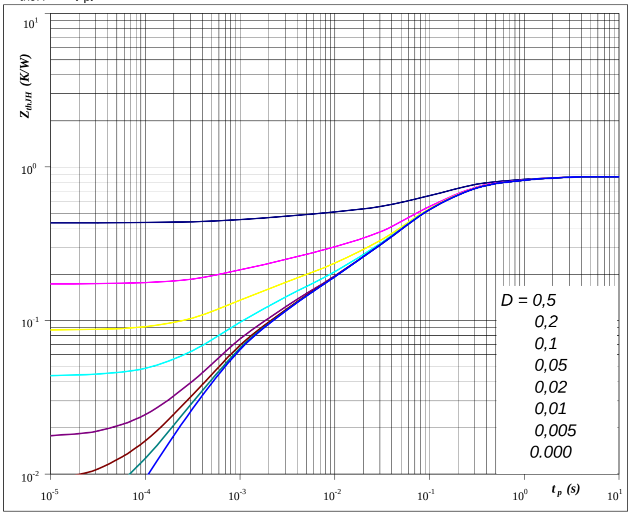
At

T_j =	25/125	°C
V_R =	700	V
I_F =	32	A
V_{GS} =	0/16	V

Figure 19 BOOST MOSFET

MOSFET transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	0,86	K/W

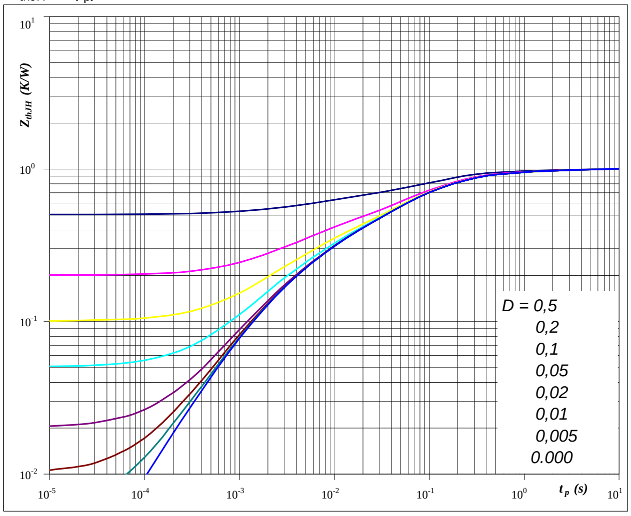
IGBT thermal model values

R (K/W)	Tau (s)
1,34E-01	8,84E-01
3,81E-01	1,39E-01
2,07E-01	5,28E-02
7,72E-02	5,60E-03
6,49E-02	8,44E-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} =	1,01	K/W

FWD thermal model values

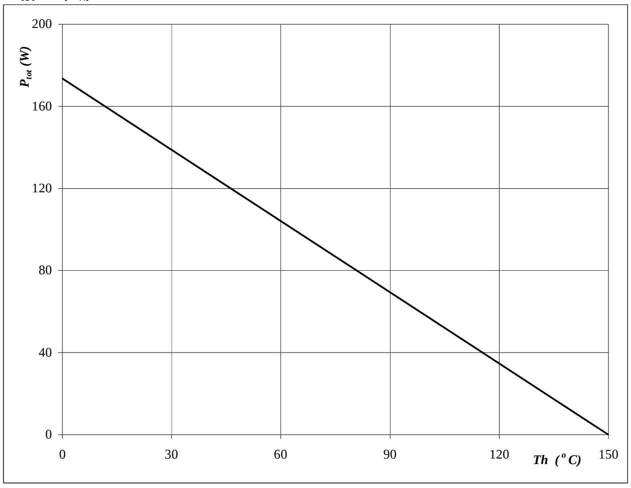
R (K/W)	Tau (s)
5,83E-02	3,01E+00
1,31E-01	4,50E-01
4,46E-01	8,80E-02
1,27E-01	2,30E-02
1,77E-01	5,54E-03

INPUT BOOST

Figure 21 BOOST MOSFET

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



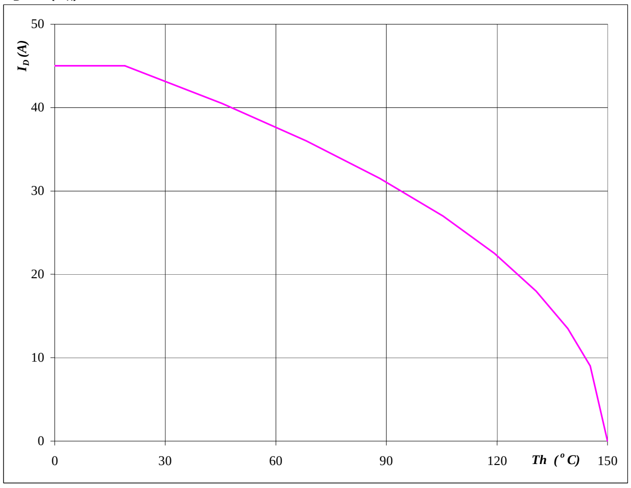
At

T_j = 150 ºC

Figure 22 BOOST MOSFET

Drain current as a function of heatsink temperature

$I_D = f(T_h)$



At

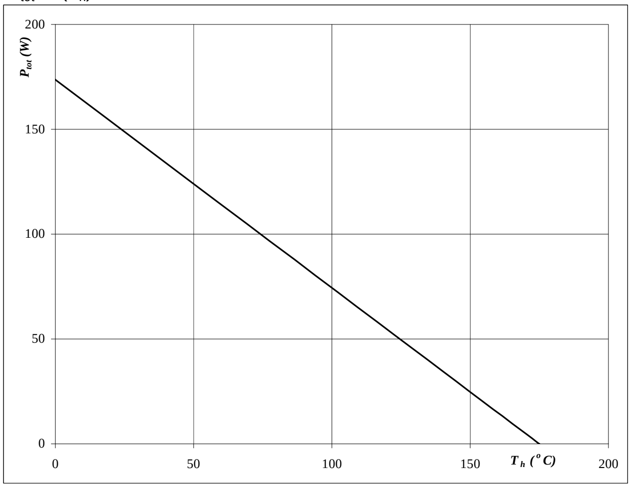
T_j = 150 ºC

V_{GS} = 18 V

Figure 23 BOOST FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



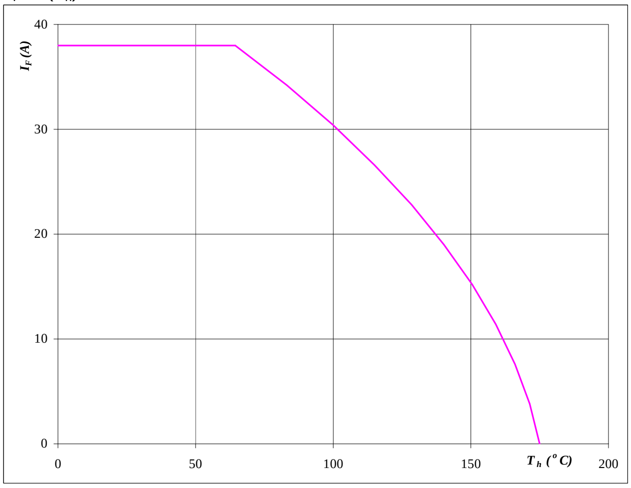
At

T_j = 175 ºC

Figure 24 BOOST FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

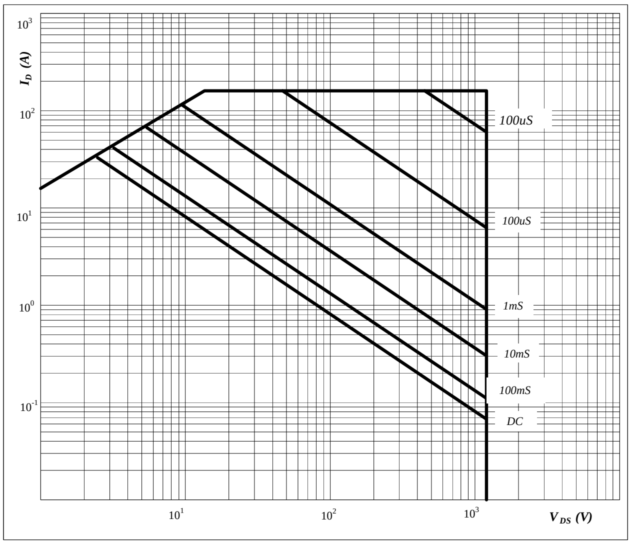
T_j = 175 ºC

INPUT BOOST

Figure 25	BOOST MOSFET

Safe operating area as a function of drain-source voltage

$I_D = f(V_{DS})$



At

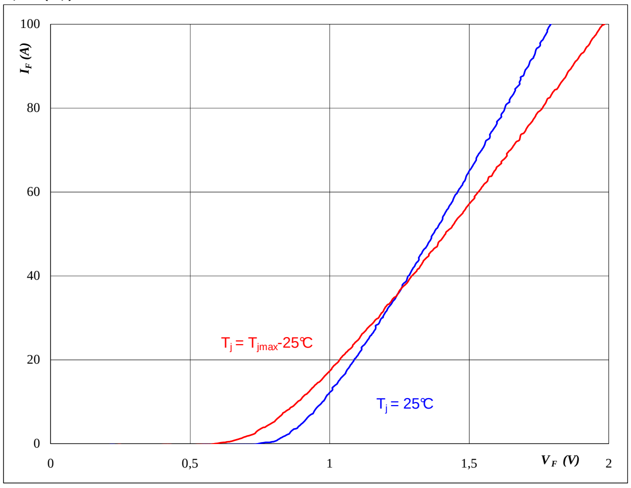
D =	single pulse	
T_h =	80	ºC
V_{GS} =	0/16	V
T_j =	T_{jmax}	ºC

INP.BOOST INVERSE DIODE

Figure 1 Bost inv. diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



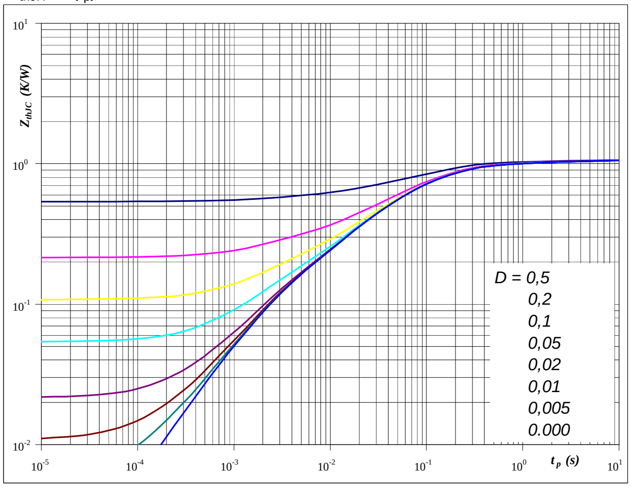
At

t_p = 250 µs

Figure 2 Boost inv. diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

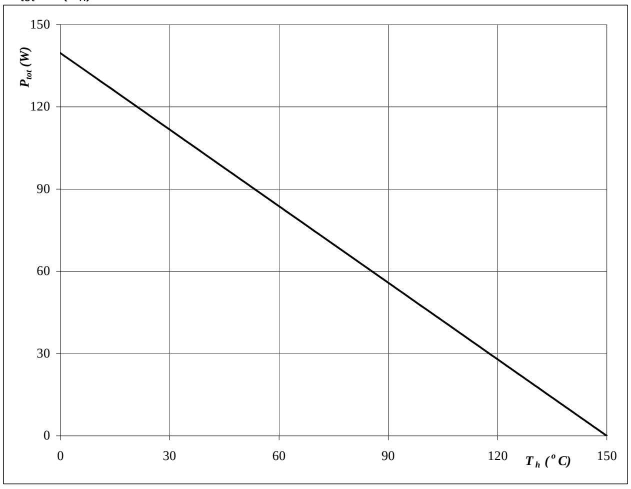
D = t_p / T

R_{thJH} = 1,07 K/W

Figure 3 Boost inv. diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



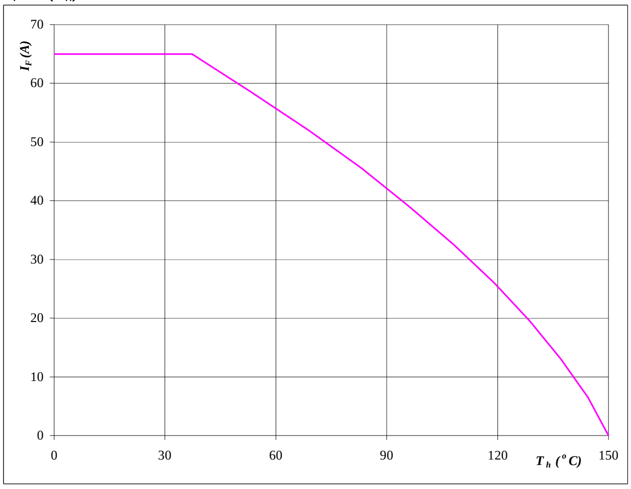
At

T_j = 150 ºC

Figure 4 Boost inv. diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



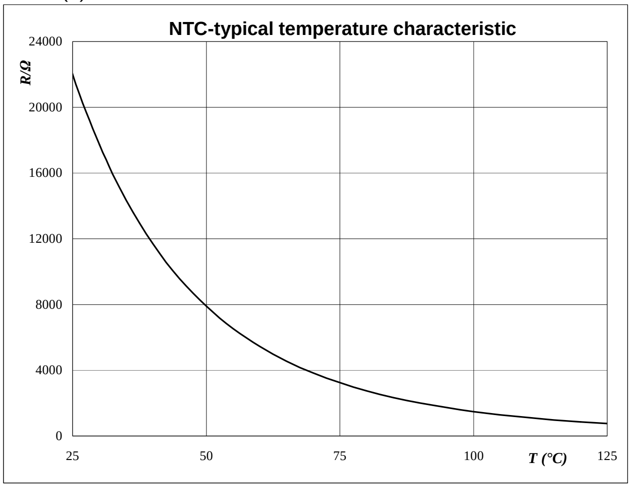
At

T_j = 150 ºC

Thermistor

Figure 1	Thermistor

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



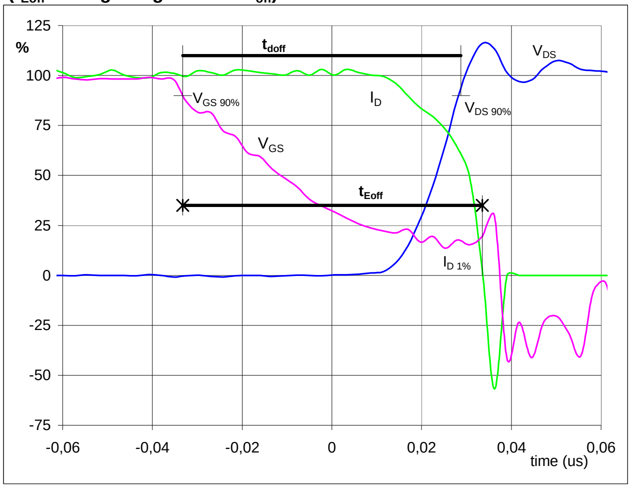
Switching Definition BOOST MOSFET

General conditions

T_j	=	150 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

Figure 1 BOOST MOSFET

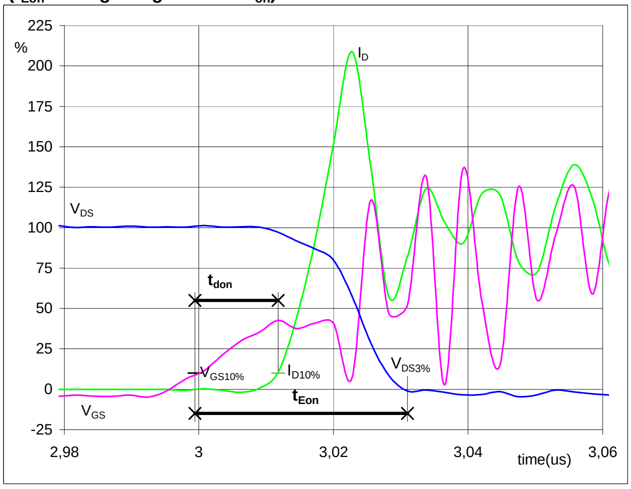
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GS} (0%) =	-15	V
V_{GS} (100%) =	16	V
V_D (100%) =	350	V
I_D (100%) =	32	A
t_{doff} =	0,06	μs
t_{Eoff} =	0,07	μs

Figure 2 BOOST MOSFET

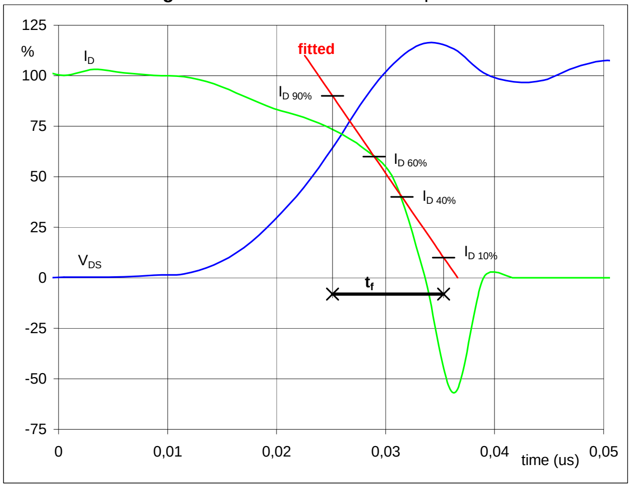
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GS} (0%) =	-15	V
V_{GS} (100%) =	16	V
V_D (100%) =	350	V
I_D (100%) =	32	A
t_{don} =	0,01	μs
t_{Eon} =	0,03	μs

Figure 3 BOOST MOSFET

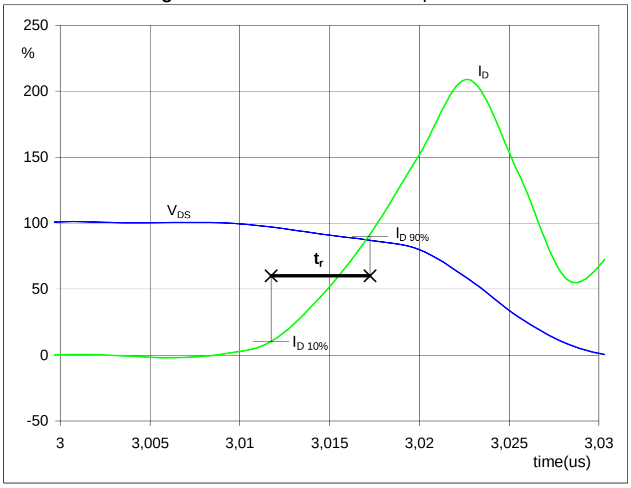
Turn-off Switching Waveforms & definition of t_f



V_D (100%) =	350	V
I_D (100%) =	32	A
t_f =	0,01	μs

Figure 4 BOOST MOSFET

Turn-on Switching Waveforms & definition of t_r

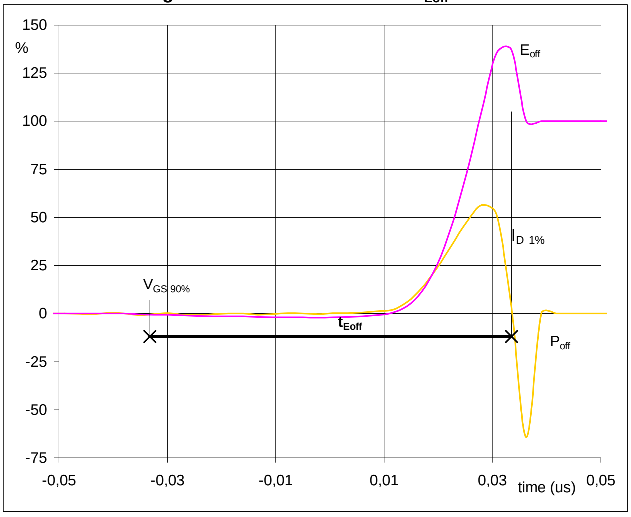


V_D (100%) =	350	V
I_D (100%) =	32	A
t_r =	0,005	μs

Switching Definition BOOST MOSFET

Figure 5 BOOST MOSFET

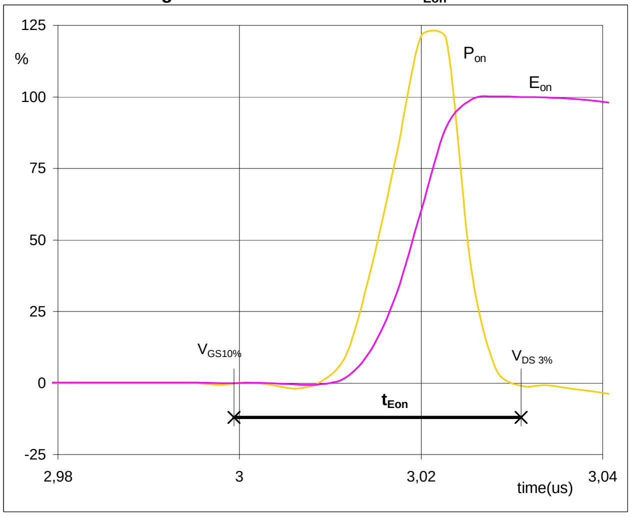
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	11,26	kW
E_{off} (100%) =	0,14	mJ
t_{Eoff} =	0,067	μs

Figure 6 BOOST MOSFET

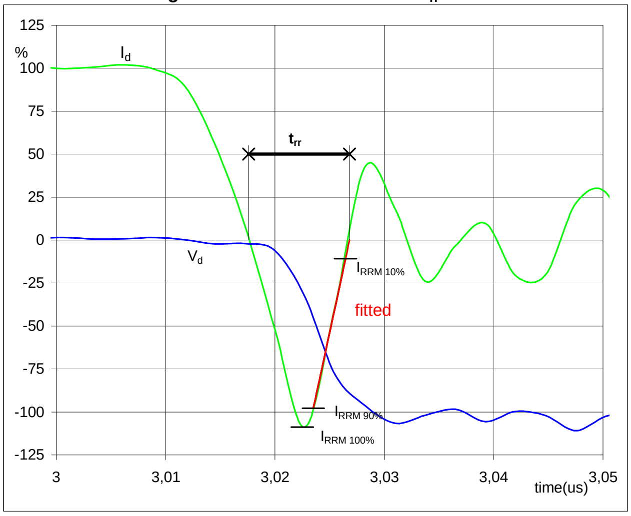
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	11,26	kW
E_{on} (100%) =	0,24	mJ
t_{Eon} =	0,03	μs

Figure 7 BOOST FWD

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

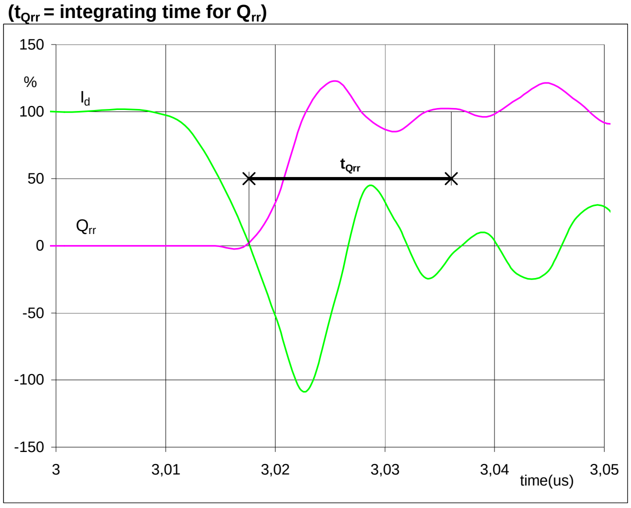


V_d (100%) =	350	V
I_d (100%) =	32	A
I_{RRM} (100%) =	10	A
t_{rr} =	0,009	μs

Switching Definition BOOST MOSFET

Figure 8 BOOST FWD

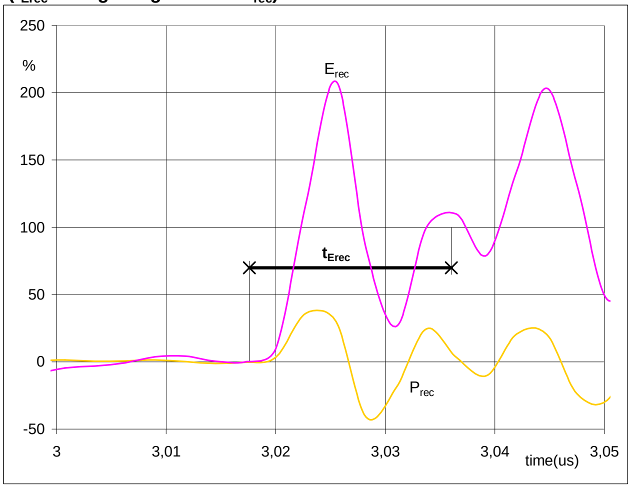
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	32	A
Q_{rr} (100%) =	0,15	µC
t_{Qrr} =	0,02	µs

Figure 9 BOOST FWD

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



P_{rec} (100%) =	11,26	kW
E_{rec} (100%) =	0,02	mJ
t_{Erec} =	0,02	µs

Ordering Code and Marking - Outline - Pinout

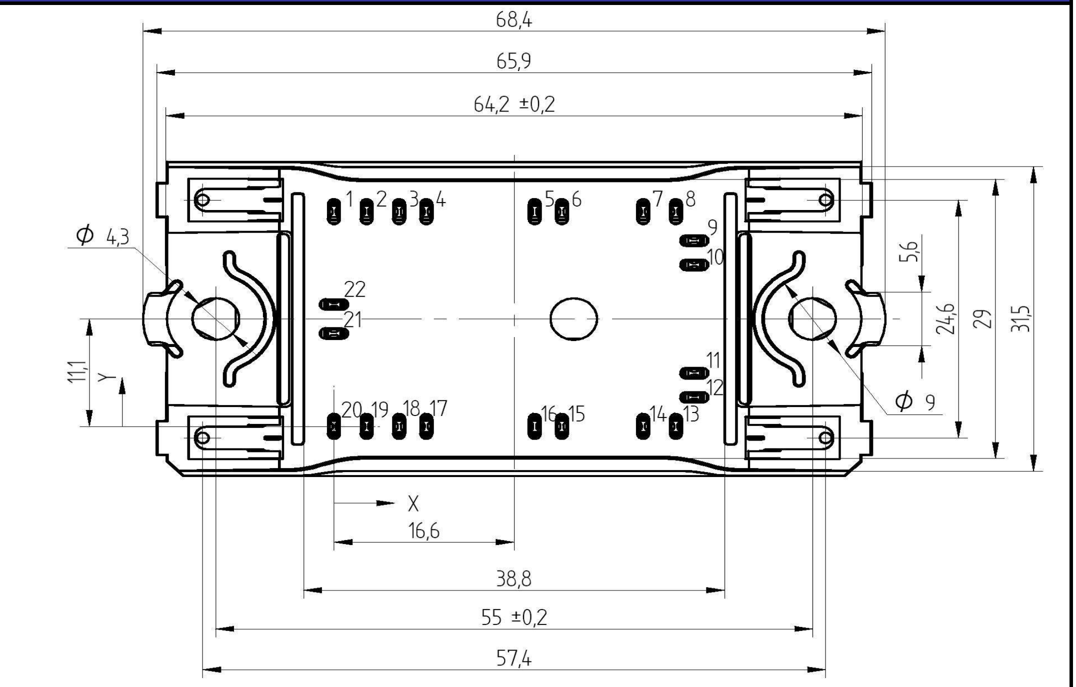
Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-PZ12B2A040ME01-M330L63Y	M330L63Y	M330L63Y

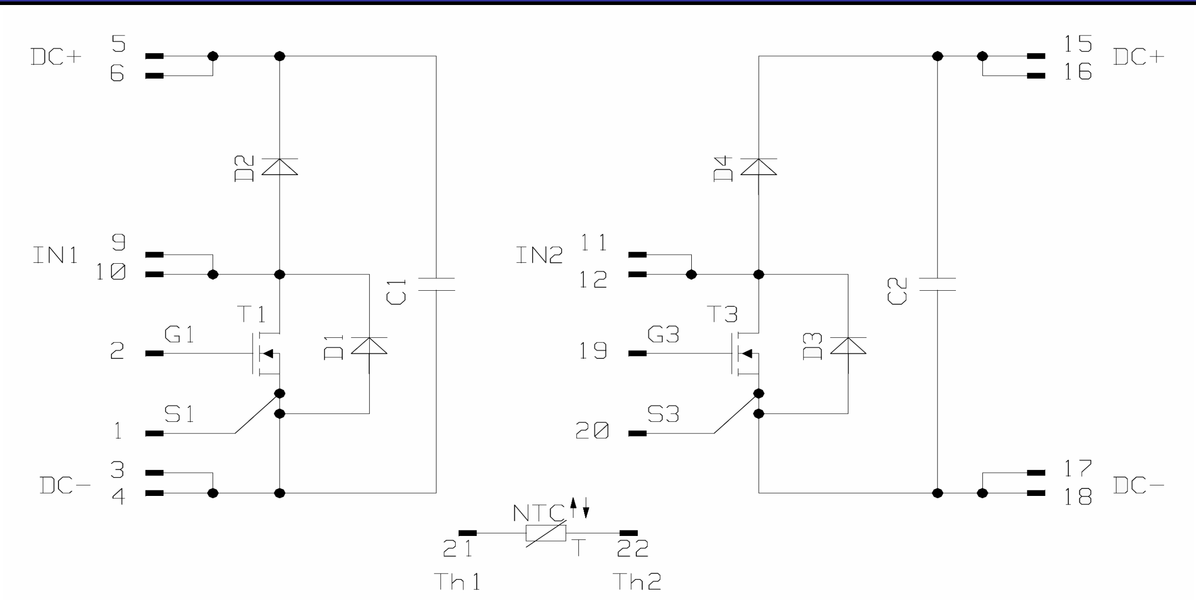
Outline

Pin table

Pin	X	Y
1	0	22,2
2	3	22,2
3	6	22,2
4	8,5	22,2
5	18,5	22,2
6	21	22,2
7	28,5	22,2
8	31,5	22,2
9	33,2	19,2
10	33,2	16,7
11	33,2	5,5
12	33,2	3
13	31,5	0
14	28,5	0
15	21	0
16	18,5	0
17	8,5	0
18	6	0
19	3	0
20	0	0
21	0	9,6
22	0	12,6



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.