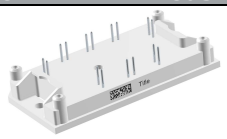
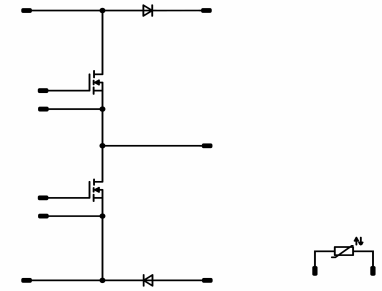
***flow* BOOST 1 symmetric** **600 V / 19 mΩ**

Features
- High efficiency symmetric boost
- Ultra fast switching frequency
- Low Inductance Layout

flow 1 17mm housing


Target Applications
- Solar
- UPS
- Power supply

Schematic


Types
- 10-F106BIB020FK-M285L

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Input Boost MOSFET				
Drain to source breakdown voltage	V_{DS}		650	V
DC drain current	I_D	$T_j=T_{jmax}$ $T_s=80°C$	80	A
Power dissipation	P_{tot}	$T_j=T_{jmax}$ $T_s=80°C$	172	W
Gate-source peak voltage	V_{GSS}		25	V
Maximum Junction Temperature	T_{jmax}		150	°C
Input Boost FWD				
Peak Repetitive Reverse Voltage	V_{RRM}		600	V
Forward average current	I_{FAV}	$T_j=T_{jmax}$ $T_s=80°C$	80	A
Power dissipation	P_{tot}	$T_j=T_{jmax}$ $T_s=80°C$	107	W
Maximum Junction Temperature	T_{jmax}		150	°C
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{op}		-40…+(T_{jmax} - 25)	°C
Insulation Properties				
Insulation voltage	V_{isol}	t=2s DC voltage	4000	V
Creepage distance			min 12,7	mm
Clearance			min 12,7	mm
Comparative Tracking Index	CTI		>200	

Characteristic Values

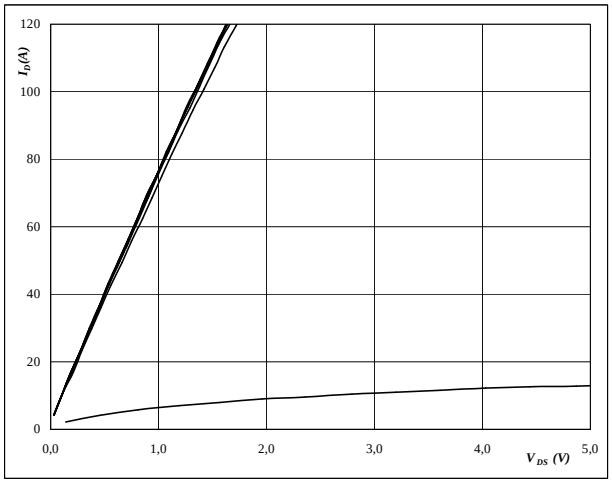
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j[°C]	Min	Typ	Max	
Input Boost MOSFET										
Static drain to source ON resistance	$r_{DS(on)}$		10		69	25 125		0,01 0,03	0,019	Ω
Gate threshold voltage	$V_{(GS)th}$		V_{DS}=V_{GS}		0,0005	25 125	3	4	5	V
Gate to Source Leakage Current	I_{GSS}		±25	0		25 125			200	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	650		25 125			2 200	µA
Integrated Gate resistor	r_g	f=1MHz				25 125		0,6		Ω
Turn On Delay Time	$t_{d(on)}$	R_{goff}=4 Ω R_{gon}=4 Ω	±10	400	69	25 125		158 157		ns
Rise Time	t_r					25 125		16 19		
Turn off delay time	$t_{d(off)}$					25 125		130 136		
Fall time	t_f					25 125		5 15		
Turn-on energy loss	E_{on}					25 125		1,126 2,152		mWs
Turn-off energy loss	E_{off}					25 125		0,060 0,150		
Total gate charge	Q_G	V_{DD}=520 V	±10		69	25 125		400		nC
Gate to source charge	Q_{GS}					25 125		120		
Gate to drain charge	Q_{GD}					25 125		140		
Input capacitance	C_{iss}	f=1MHz	0	100		25		19600		pF
Output capacitance	C_{oss}							400		
Reverse transfer capacitance	C_{rss}							12		
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase-change material λ=3,4W/mK						0,41		K/W
Input Boost FWD										
Forward voltage	V_F				120	25 125	1,4	1,43 1,26	1,83	V
Reverse leakage current	I_{rm}			600		25 125			20	µA
Peak recovery current	I_{RRM}	R_{gon}=4 Ω	±10	400	70	25 125		107 167		A
Reverse recovery time	t_{rr}					25 125		35 59		ns
Reverse recovery charge	Q_{rr}					25 125		2,18 5,95		µC
Reverse recovered energy	E_{rec}					25 125		0,367 1,043		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		8564 8366		A/µs
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase-change material λ=3,4W/mK						0,66		K/W
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	R_{100}=1486 Ω				100	-12		+12	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$	*Tol. ±3%*				25		3950		K
B-value	$B_{(25/100)}$	*Tol. ±3%*				25		3998		K
Vincotech NTC Reference									B	

INPUT BOOST

Figure 1 BOOST MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



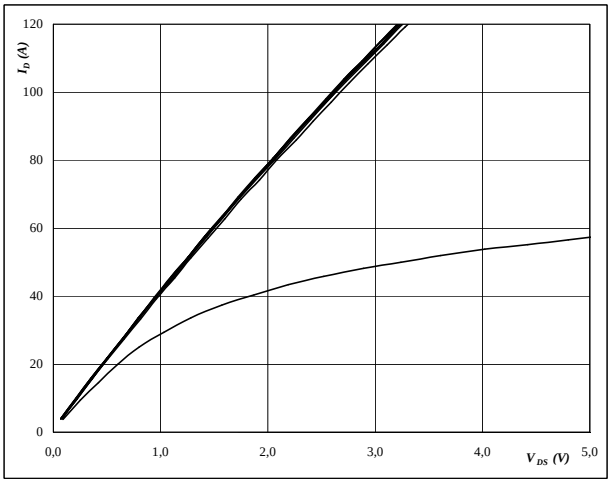
At

t_p = 250 µs
T_j = 25 °C
V_{GS} from 0 V to 20 V in steps of 2 V

Figure 2 BOOST MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



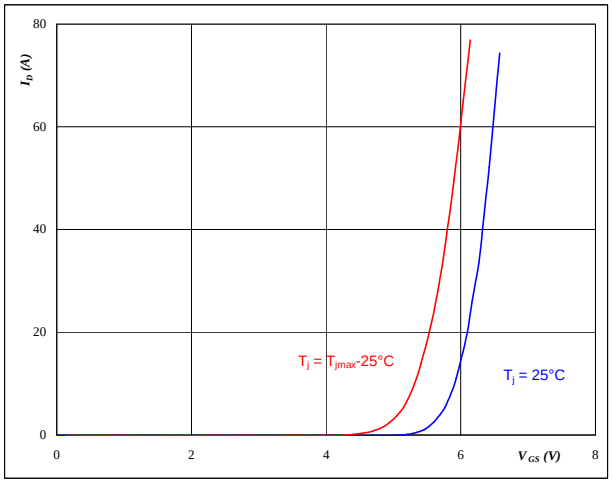
At

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

$I_D = f(V_{GS})$



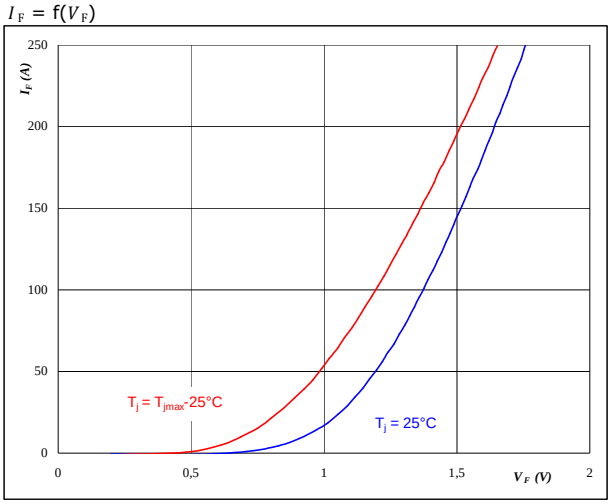
At

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

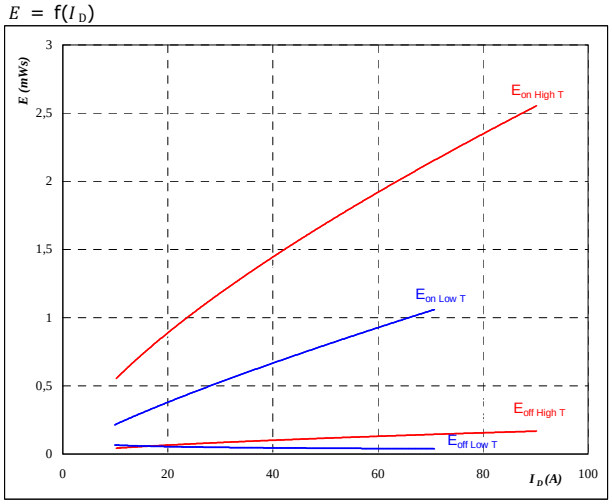
t_p = 250 µs

INPUT BOOST

Figure 5 BOOST MOSFET

Typical switching energy losses as a function of drain current

$E = f(I_D)$



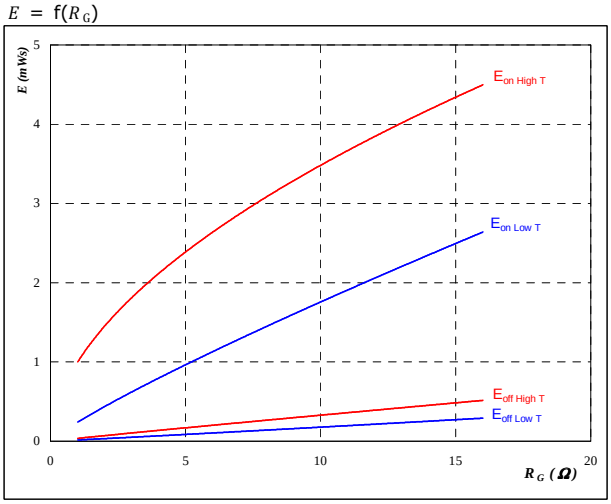
With an inductive load at

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	±10	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 6 BOOST MOSFET

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



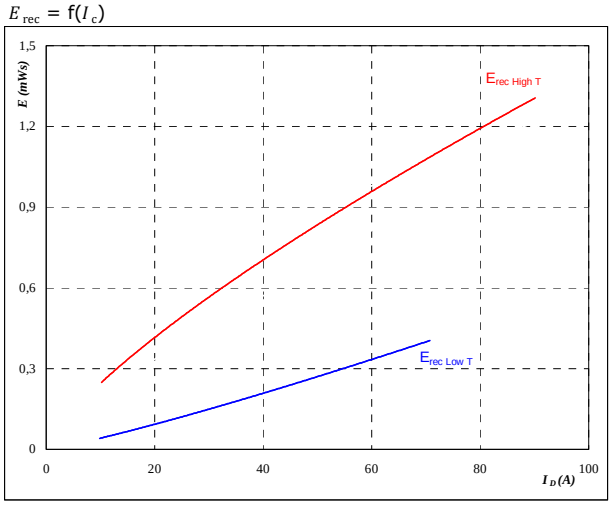
With an inductive load at

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	±10	V
I_D =	70	A

Figure 7 BOOST FWD

Typical reverse recovery energy loss as a function of drain current

$E_{rec} = f(I_c)$



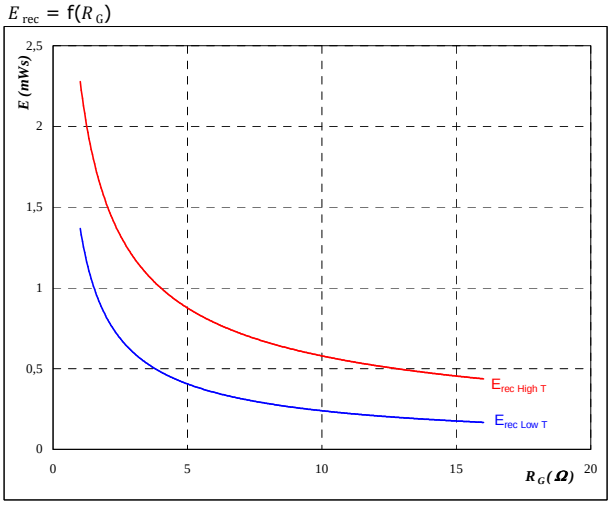
With an inductive load at

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	±10	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

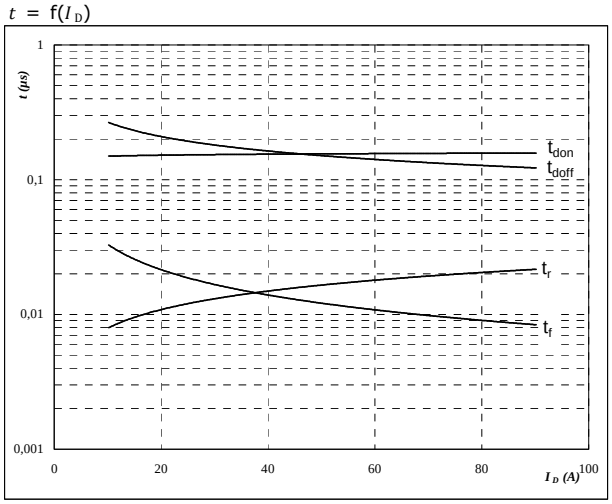
T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	±10	V
I_D =	70	A

INPUT BOOST

Figure 9 BOOST MOSFET

Typical switching times as a function of drain current

$t = f(I_D)$



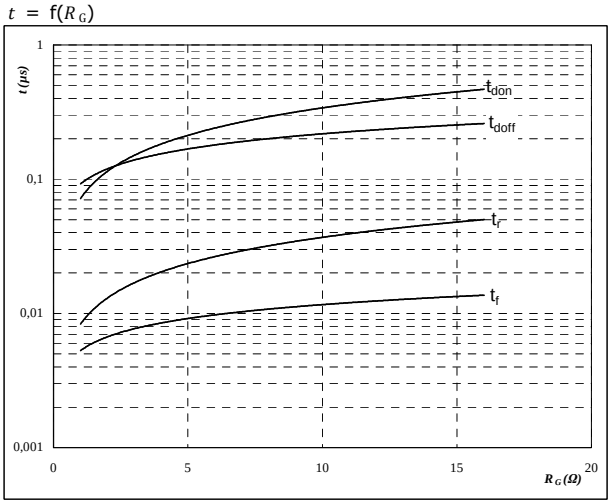
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	±10	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 10 BOOST MOSFET

Typical switching times as a function of gate resistor

$t = f(R_G)$



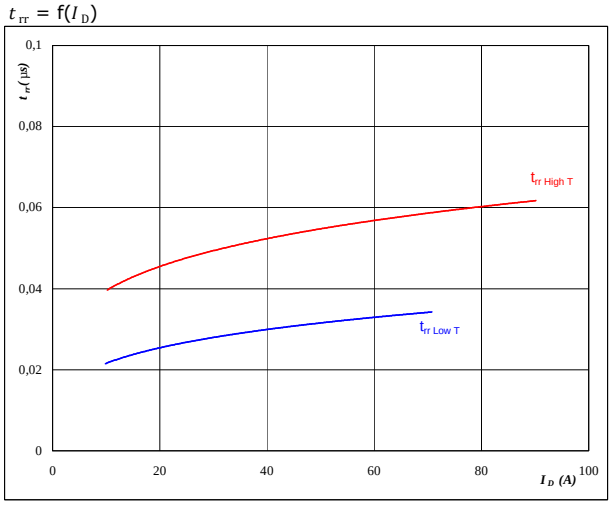
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	±10	V
I_D =	70	A

Figure 11 BOOST FWD

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



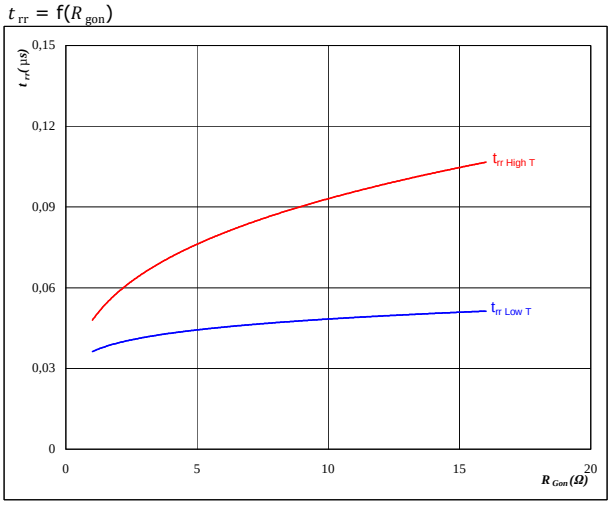
At

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	±10	V
R_{gon} =	4	Ω

Figure 12 BOOST FWD

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

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



At

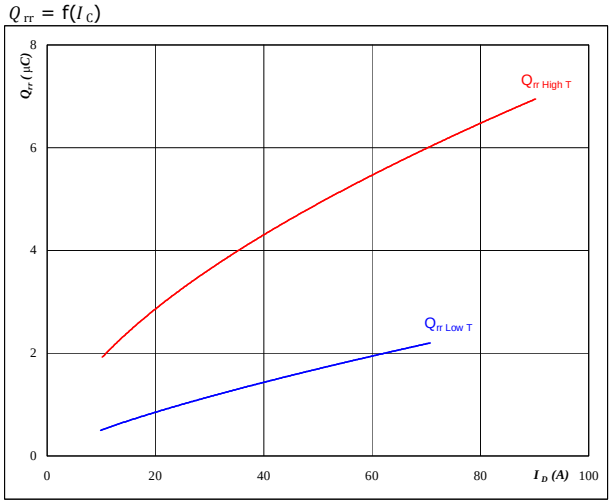
T_j =	25/125	°C
V_R =	400	V
I_F =	70	A
V_{GS} =	±10	V

INPUT BOOST

Figure 13 BOOST FWD

Typical reverse recovery charge as a function of drain current

$Q_{rr} = f(I_C)$



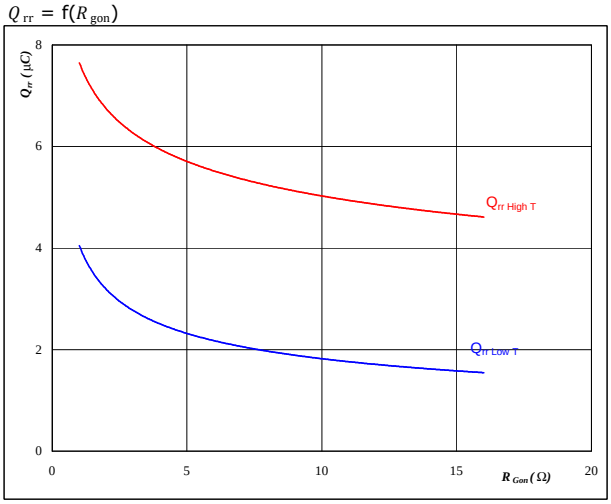
At

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	±10	V
R_{gon} =	4	Ω

Figure 14 BOOST FWD

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

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



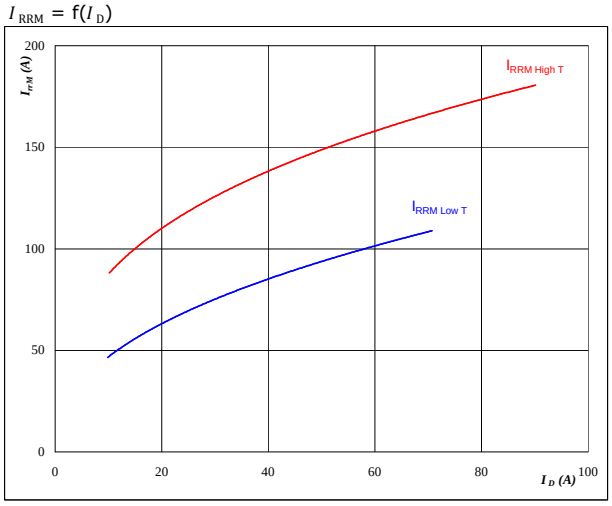
At

T_j =	25/125	°C
V_R =	400	V
I_F =	70	A
V_{GS} =	±10	V

Figure 15 BOOST FWD

Typical reverse recovery current as a function of drain current

$I_{RRM} = f(I_D)$



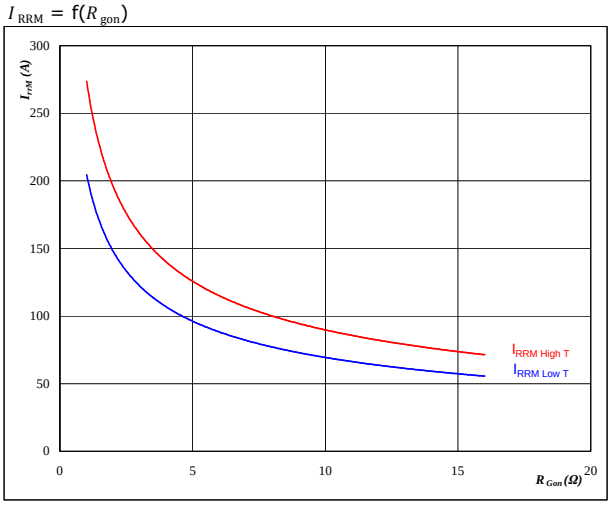
At

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	±10	V
R_{gon} =	4	Ω

Figure 16 BOOST FWD

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

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



At

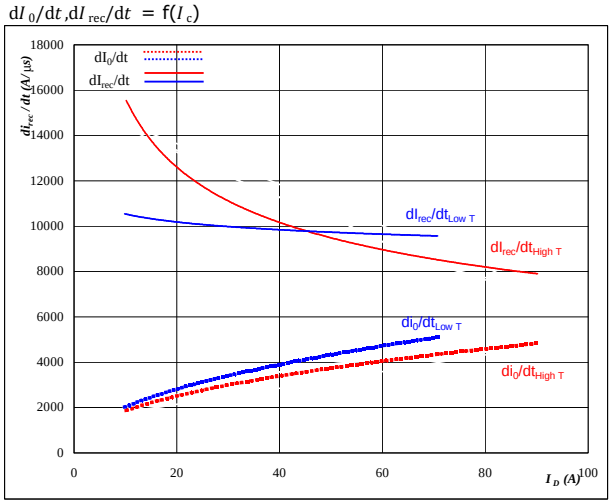
T_j =	25/125	°C
V_R =	400	V
I_F =	70	A
V_{GS} =	±10	V

INPUT BOOST

Figure 17 BOOST FWD

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

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



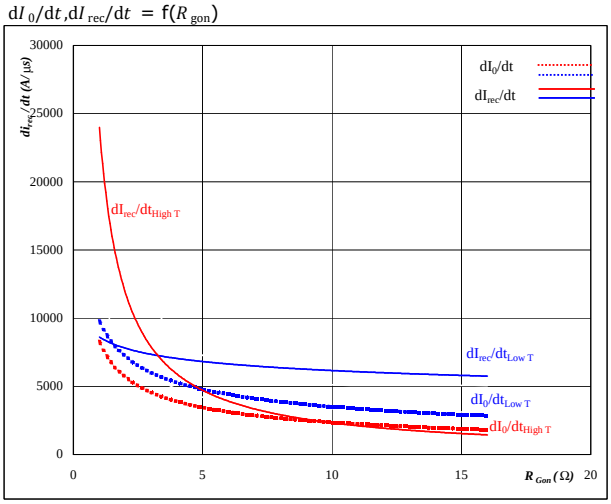
At

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	±10	V
R_{gon} =	4	Ω

Figure 18 BOOST FWD

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

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



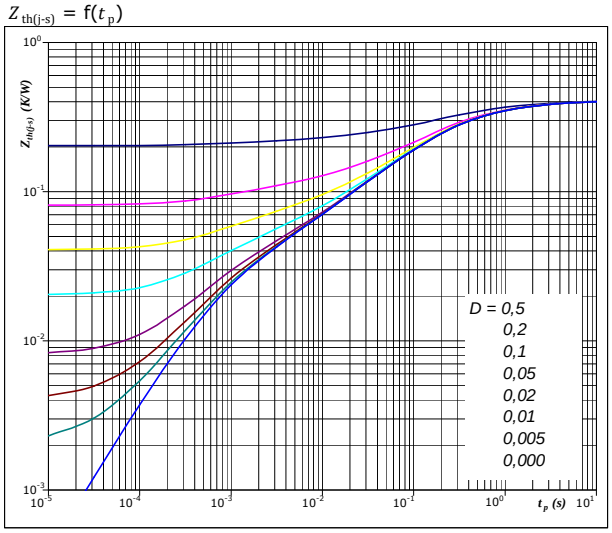
At

T_j =	25/125	°C
V_R =	400	V
I_F =	70	A
V_{GS} =	±10	V

Figure 19 BOOST MOSFET

MOSFET transient thermal impedance as a function of pulse width

$Z_{th(j-s)} = f(t_p)$



At

D =	t_p / T	
$R_{th(j-s)}$ =	0,41	K/W

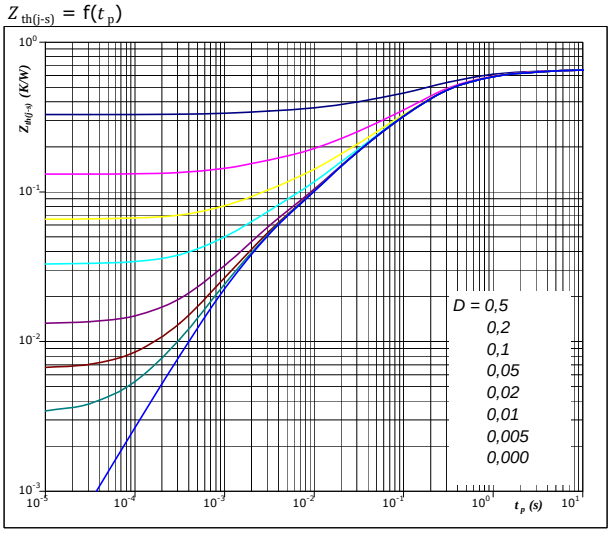
MOSFET thermal model values

R (K/W)	Tau (s)
3,22E-02	5,52E+00
7,42E-02	1,05E+00
1,52E-01	2,31E-01
7,06E-02	7,51E-02
4,18E-02	1,64E-02
1,94E-02	2,60E-03

Figure 20 BOOST FWD

FWD transient thermal impedance as a function of pulse width

$Z_{th(j-s)} = f(t_p)$



At

D =	t_p / T	
$R_{th(j-s)}$ =	0,66	K/W

FWD thermal model values

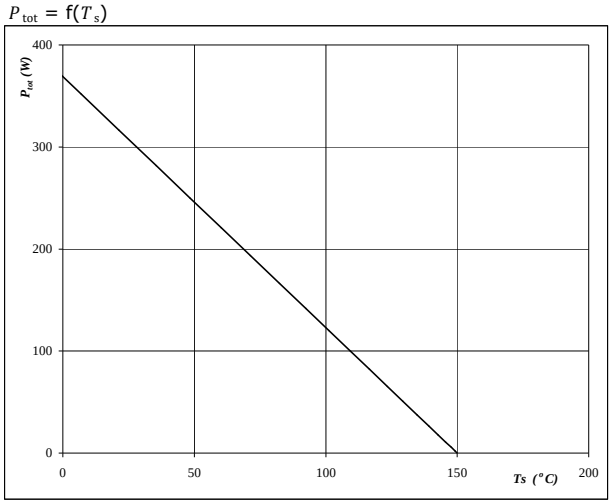
R (K/W)	Tau (s)
3,46E-02	5,31E+00
1,02E-01	9,80E-01
3,07E-01	2,08E-01
1,10E-01	6,00E-02
6,93E-02	1,40E-02
3,32E-02	1,76E-03

INPUT BOOST

Figure 21 BOOST MOSFET

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



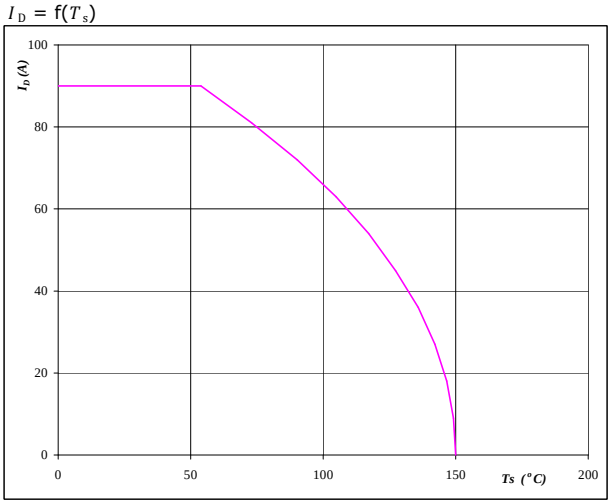
At

T_j = 150 ºC

Figure 22 BOOST MOSFET

Drain current as a function of heatsink temperature

$I_D = f(T_s)$



At

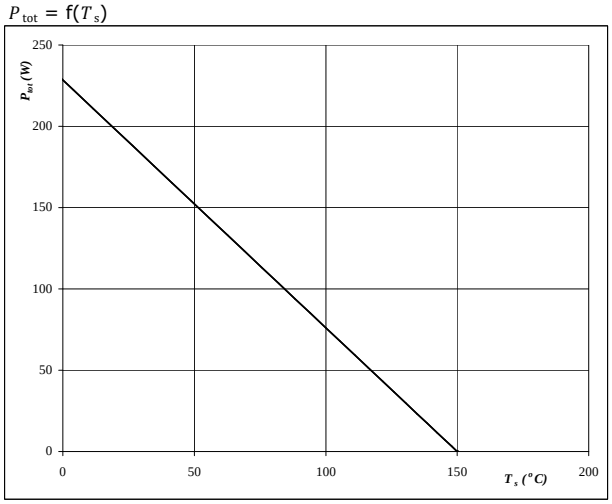
T_j = 150 ºC

V_{GS} = 10 V

Figure 23 BOOST FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



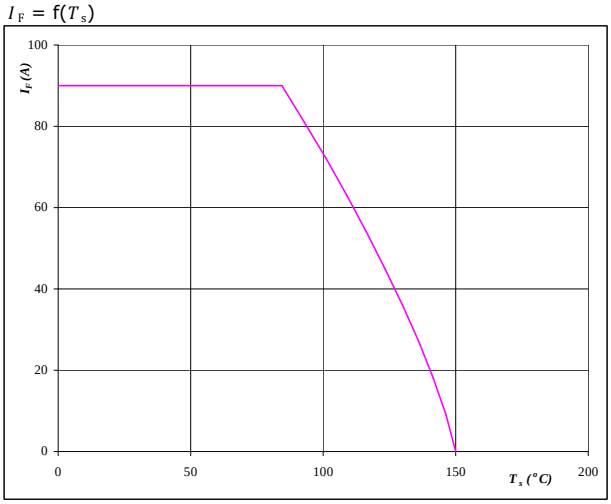
At

T_j = 150 ºC

Figure 24 BOOST FWD

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

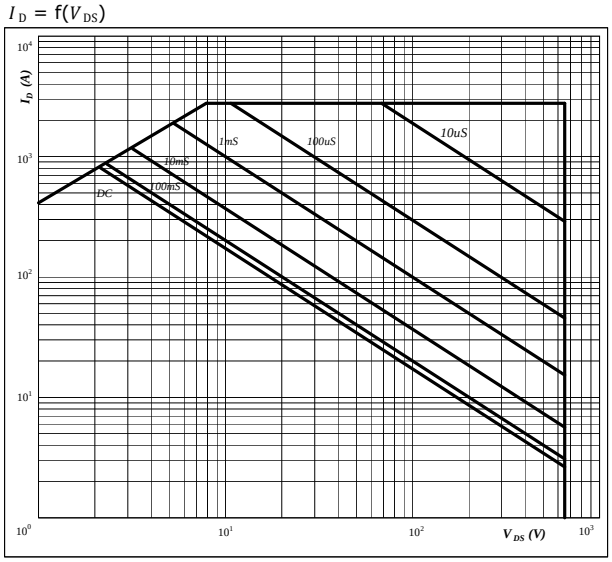
T_j = 150 ºC

INPUT BOOST

Figure 25 BOOST MOSFET

Safe operating area as a function of drain-source voltage

$I_D = f(V_{DS})$



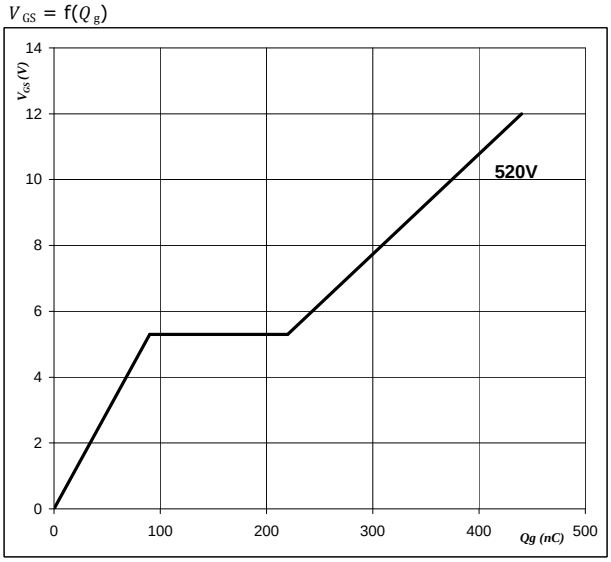
At

D =	single pulse	
T_h =	80	ºC
V_{GS} =	±10	V
T_j =	T_{jmax}	ºC

Figure 26 BOOST MOSFET

Gate voltage vs Gate charge

$V_{GS} = f(Q_g)$



At

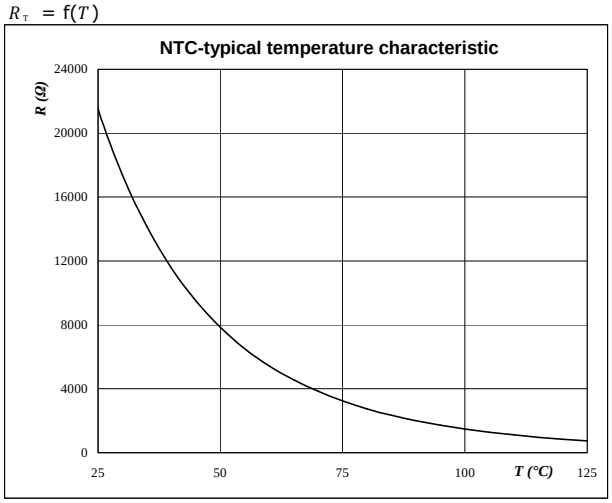
I_D =	69	A

Thermistor

Figure 1 Thermistor

Typical NTC characteristic as a function of temperature

$R_T = f(T)$



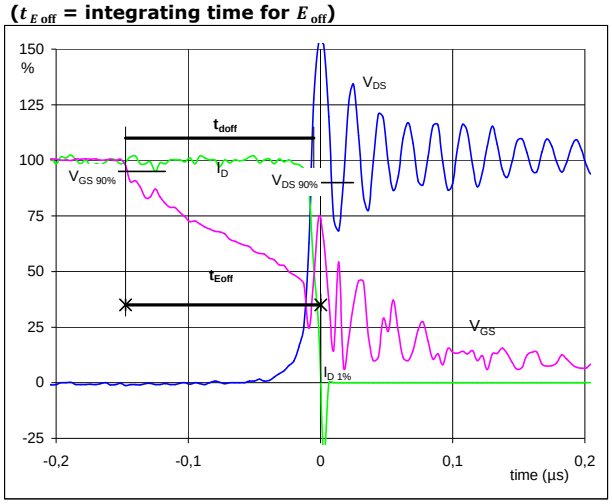
Switching Definitions Input Boost

General conditions

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

Figure 1 Boost MOSFET

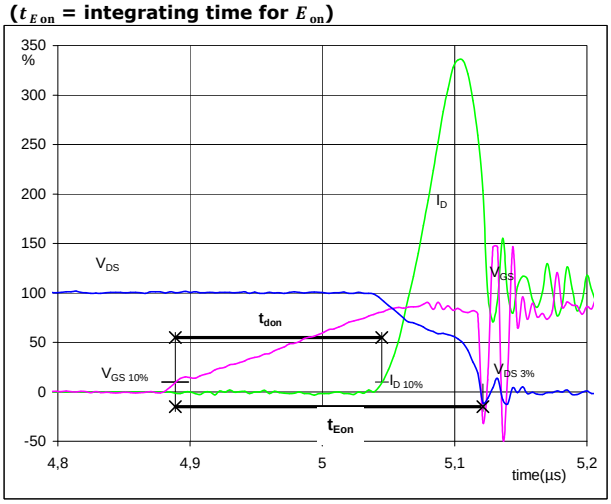
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GS} (0%) =	-10	V
V_{GS} (100%) =	10	V
V_D (100%) =	400	V
I_D (100%) =	70	A
t_{doff} =	0,14	µs
$t_{E\,off}$ =	0,15	µs

Figure 2 Boost MOSFET

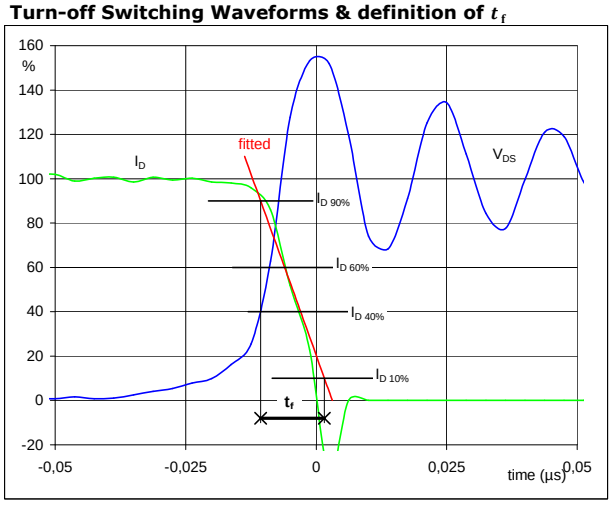
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GS} (0%) =	-10	V
V_{GS} (100%) =	10	V
V_D (100%) =	400	V
I_D (100%) =	70	A
t_{don} =	0,16	µs
$t_{E\,on}$ =	0,23	µs

Figure 3 Boost MOSFET

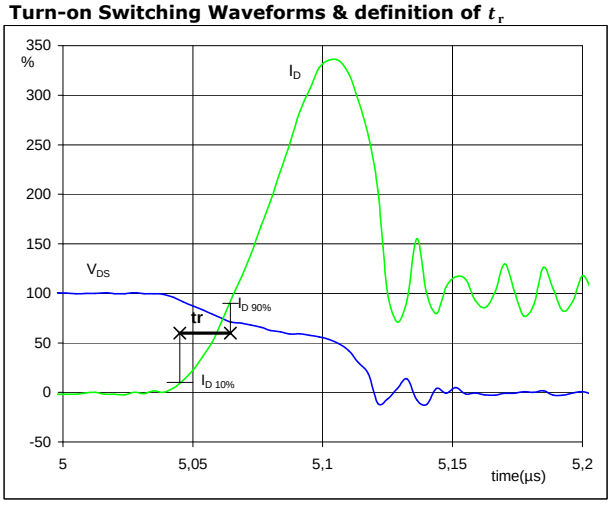
Turn-off Switching Waveforms & definition of t_f



V_D (100%) =	400	V
I_D (100%) =	70	A
t_f =	0,02	µs

Figure 4 Boost MOSFET

Turn-on Switching Waveforms & definition of t_r

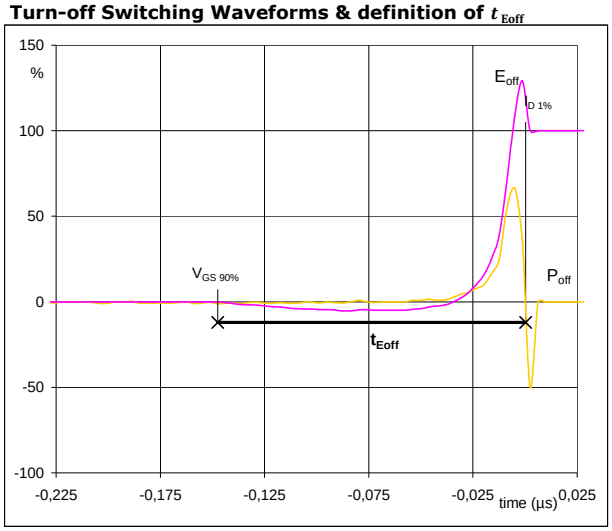


V_D (100%) =	400	V
I_D (100%) =	70	A
t_r =	0,02	µs

Switching Definitions BUCK MOSFET

Figure 5 Boost MOSFET

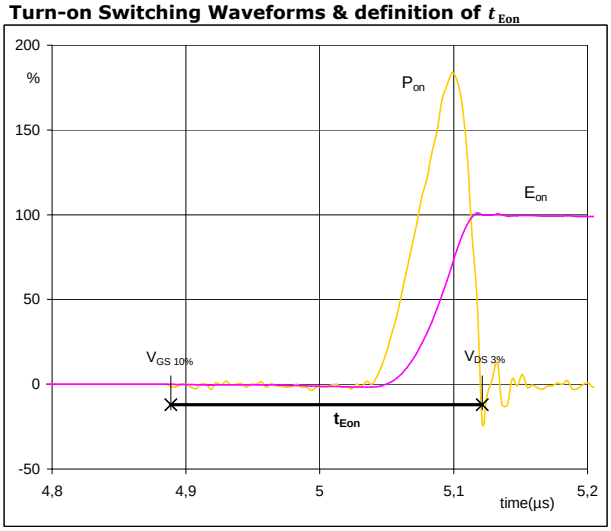
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	27,95	kW
E_{off} (100%) =	0,15	mJ
$t_{E\,off}$ =	0,15	µs

Figure 6 Boost MOSFET

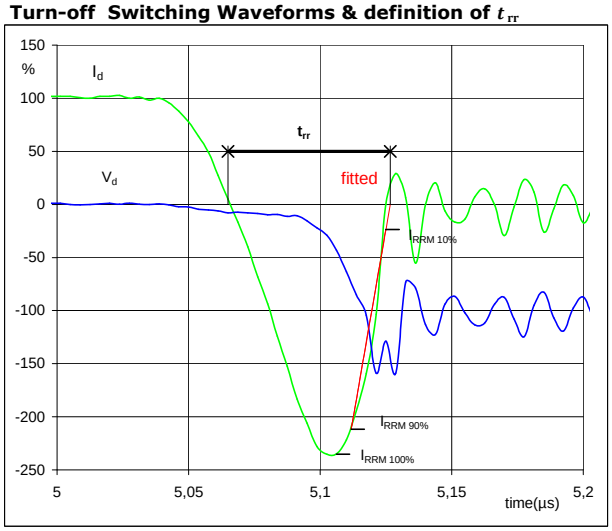
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	27,95	kW
E_{on} (100%) =	2,15	mJ
$t_{E\,on}$ =	0,23	µs

Figure 8 Input Boost FWD

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

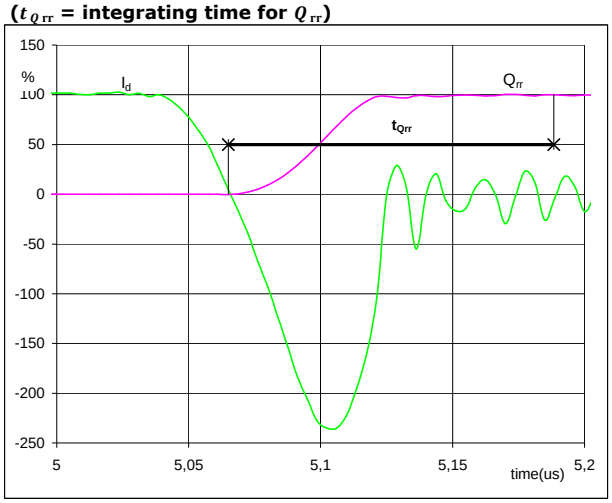


V_d (100%) =	400	V
I_d (100%) =	70	A
I_{RRM} (100%) =	-167	A
t_{rr} =	0,06	µs

Switching Definitions BUCK MOSFET

Figure 9 Input Boost FWD

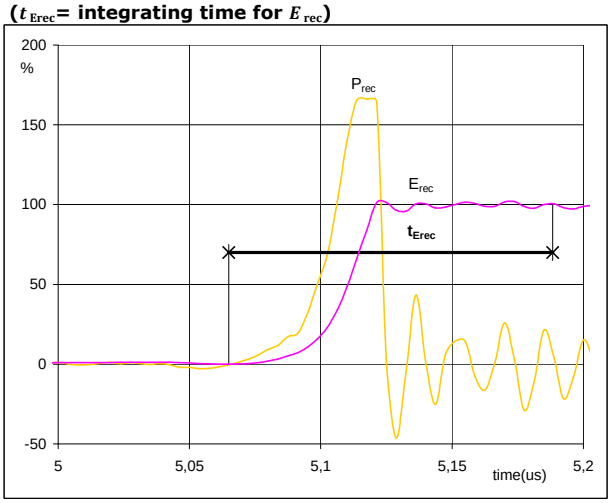
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	70	A
Q_{rr} (100%) =	5,95	µC
$t_{Q\,rr}$ =	0,12	µs

Figure 10 Input Boost FWD

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



P_{rec} (100%) =	27,95	kW
E_{rec} (100%) =	1,04	mJ
$t_{E\,rec}$ =	0,12	µs

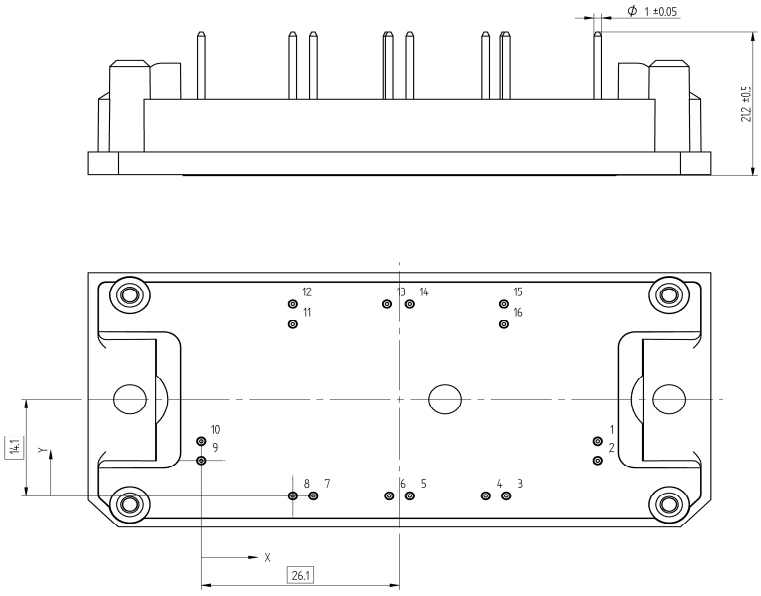
Ordering Code and Marking - Outline - Pinout - Identification

Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 17mm housing	10-F106BIB020FK-M285L	M285L	M285L

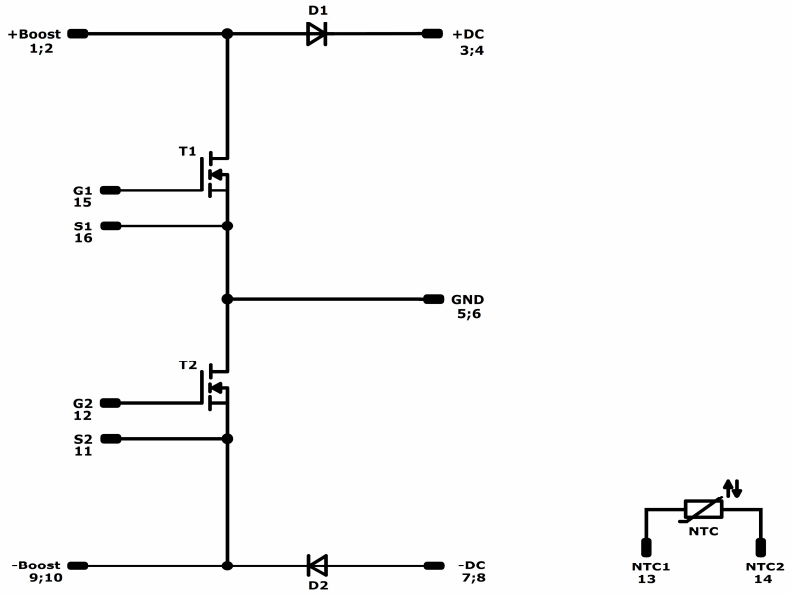
Outline

Pin table			
Pin	X	Y	Function
1	52,2	7,9	+BOOST
2	52,2	5,2	+BOOST
3	40,15	0	+DC
4	37,45	0	+DC
5	27,45	0	GND
6	24,75	0	GND
7	14,75	0	-DC
8	12,05	0	-DC
9	0	5,2	-BOOST
10	0	7,9	-BOOST
11	12,05	28,2	S2
12	12,05	25,2	G2
13	24,45	28,2	NTC1
14	27,45	28,2	NTC2
15	39,85	28,2	G1
16	39,85	25,2	S1



Tolerance of pinpositions ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2	MOSFET	650 V	19 mΩ	Input Boost Switch	
D1,D2	FWD	600 V	120 A	Input Boost Diode	
NTC	NTC			Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ)	**100**	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 1 packages see vincotech.com website.

Package data
Package data for *flow* 1 packages see vincotech.com website.