Vincotech

10-FZ063BA040MF-M575L08-PM
10-FZ06B2A040MF01-M575L28-PM

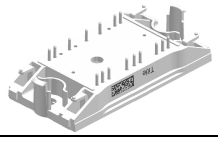
datasheet

flow 2xBOOST 0 / flow 3xBOOST 0 — **600 V / 41 mΩ**

Features

- High efficiency dual or triple booster
- Low Inductance Layout
- Ultra fast switching frequency

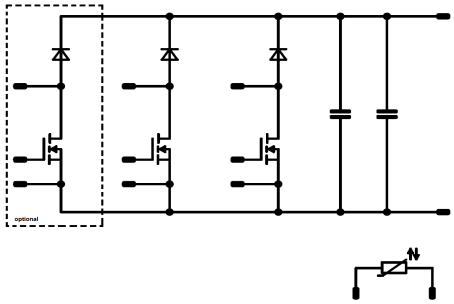
flow 0 12mm housing



Target Applications

- solar inverter

Schematic



Types

- 10-FZ063BA040MF-M575L08 (triple booster)
- 10-FZ06B2A040MF01-M575L28 (dual booster)

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost Swich (T1*, T2, T3)				
Drain to source breakdown voltage	V_{DS}		600	V
DC drain current	I_D	T_j=$T_j$max, T_h=80°C	32	A
Pulsed drain current	I_{Dpulse}	t_p limited by $T_j$max	272	A
MOSFET dv/dt ruggedness	dv/dt	VDS=0...480V	50	V/ns
Power dissipation	P_{tot}	T_j=$T_j$max, T_h=80°C	97	W
Gate-source peak voltage	V_{GS}		±20	V
Reverse diode dv/dt	dv/dt		15	V/ns
Maximum Junction Temperature	T_{jmax}		150	°C

*not assembled in 10-FZ06B2A040MF01-M575L28

Boost Diode (D1*, D2, D3)				
Peak Repetitive Reverse Voltage	V_{RRM}		600	V
DC forward current	I_F	T_j=$T_j$max, T_h=80°C	29	A
Repetitive peak forward current	I_{FSM}	60Hz Single Half-Sine Wave	300	A
Power dissipation	P_{tot}	T_j=$T_j$max, T_h=80°C	42	W
Maximum Junction Temperature	T_{jmax}		150	°C

*not assembled in 10-FZ06B2A040MF01-M575L28

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
DC Link Capacitance (C1, C2)				
Max.DC voltage	V_{MAX}	T_c=25°C	630	V
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{op}		-40…+(Tjmax - 25)	°C
Insulation Properties				
Insulation voltage	V_{is}	t=2s DC voltage	4000	V
Creepage distance			min 12,7	mm
Clearance			9,22	mm
Comparative tracking index	CTI		>200	

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_F [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 Swich (T1*, T2, T3)										
Static drain to source ON resistance	$r_{DS(on)}$	VCE=VGE			44,4	Tj=25°C Tj=125°C		41 85	51,8	mΩ
Gate threshold voltage	$V_{(GS)th}$		10		0,00296	Tj=25°C Tj=125°C	2,4	3	3,6	V
Gate to Source Leakage Current	I_{GSS}		0	600		Tj=25°C Tj=125°C			100	nA
Zero Gate Voltage Drain Current	I_{DSS}		20	0		Tj=25°C Tj=125°C			5000	nA
Turn On Delay Time	$t_{d(on)}$	Rgoff=8 Ω Rgon=8 Ω	0/10	480	44,4	Tj=25°C Tj=125°C		35 33		ns
Rise Time	t_r					Tj=25°C Tj=125°C		9 10		
Turn off delay time	$t_{d(off)}$					Tj=25°C Tj=125°C		275 300		
Fall time	t_f					Tj=25°C Tj=125°C		4 5		
Turn-on energy loss	E_{on}					Tj=25°C Tj=125°C		0,18 0,34		mWs
Turn-off energy loss	E_{off}					Tj=25°C Tj=125°C		0,07 0,08		
Total gate charge	Q_{GE}		0/10	480	44,4	Tj=25°C Tj=125°C		290		nC
Gate to source charge	Q_{GS}					Tj=25°C Tj=125°C		36		
Gate to drain charge	Q_{GD}					Tj=25°C Tj=125°C		150		
Input capacitance	C_{iss}	f=1MHz	0	25		Tj=25°C		6530		pF
Output capacitance	C_{oss}							360		
Thermal resistance chip to heatsink	$R_{th(j-s)}$	Thermal grease thickness≤50um λ = 1 W/mK						0,72		K/W
Boost Diode (D1*, D2, D3)										
Forward voltage	V_F				30	Tj=25°C Tj=125°C		2,11 1,59	2,8	V
Reverse leakage current	I_{rm}		0/10	300	30	Tj=25°C Tj=125°C			100	µA
Peak recovery current	I_{RRM}	Rgon=8 Ω	0/10	300	30	Tj=25°C Tj=125°C		17,57 29,54		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		14 32		ns
Reverse recovery charge	Q_{rr}					Tj=25°C Tj=125°C		0,15 0,56		µC
Reverse recovered energy	E_{rec}					Tj=25°C Tj=125°C		0,02 0,07		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					Tj=25°C Tj=125°C		5321 1723		A/µs
Thermal resistance chip to heatsink	$R_{th(j-s)}$	Thermal grease thickness≤50um λ = 1 W/mK						1,67		K/W
*not assembled in 10-FZ06B2A040MF01-M575L28										
DC Link Capacitance (C1, C2)										
C value	C							47		nF
Thermistor										
Rated resistance	R					T=25°C		22		Ω
Deviation of R100	$\Delta_{R/R}$	R100=1486 Ω				T=25°C	-12		12	%
Power dissipation	P					T=25°C		200		mW
Power dissipation constant						T=25°C		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				T=25°C		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				T=25°C		3998		K
Vincotech NTC Reference									B	

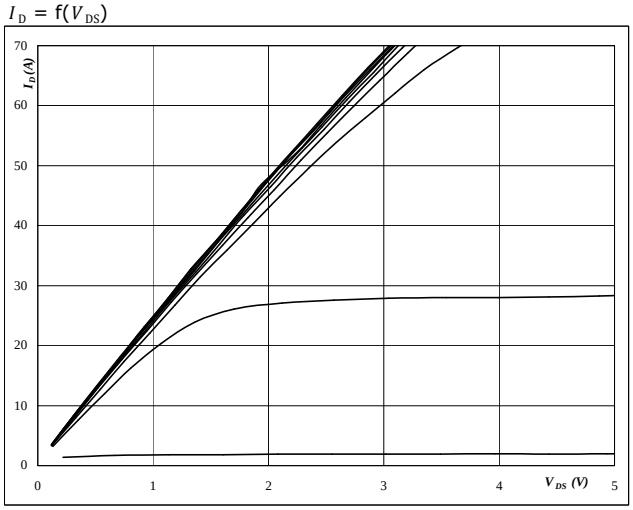
Boost Swich (T1*, T2, T3) / Boost Diode (D1*, D2, D3)

*not assembled in 10-FZ06B2A040MF01-M575L28

Figure 1 Boost Swich (T1*, T2, T3)

Typical output characteristics

$I_D = f(V_{DS})$



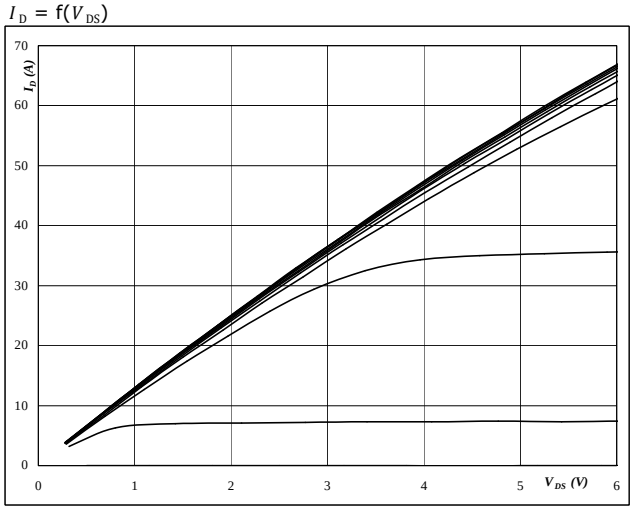
At

t_p = 250 µs
T_j = 25 °C
V_{GS} from 3 V to 13 V in steps of 1 V

Figure 2 Boost Swich (T1*, T2, T3)

Typical output characteristics

$I_D = f(V_{DS})$



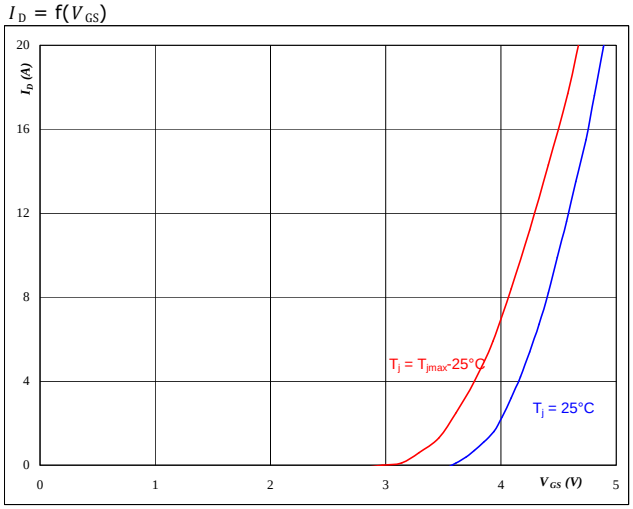
At

t_p = 250 µs
T_j = 125 °C
V_{GS} from 3 V to 13 V in steps of 1 V

Figure 3 Boost Swich (T1*, T2, T3)

Typical transfer characteristics

$I_D = f(V_{GS})$



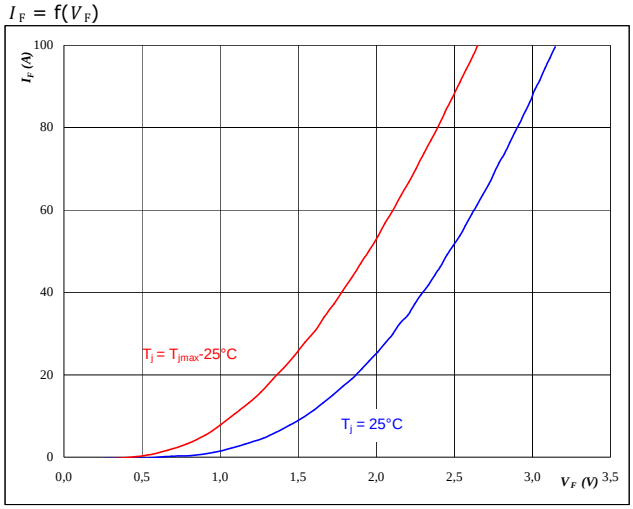
At

t_p = 250 µs
V_{DS} = 10 V

Figure 4 Boost Diode (D1*, D2, D3)

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

t_p = 250 µs

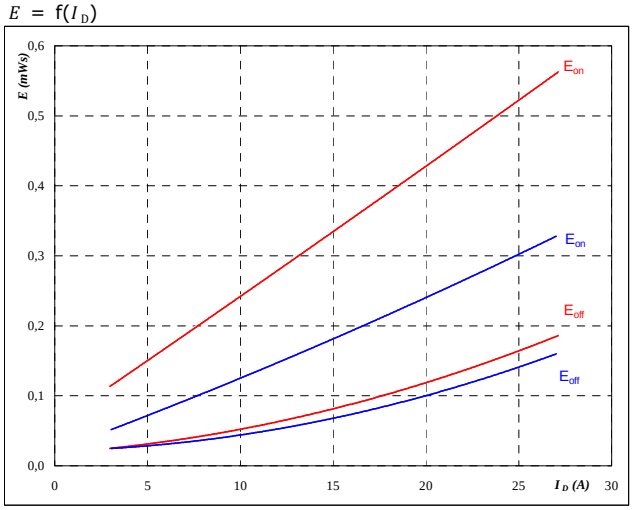
Boost Swich (T1*, T2, T3) / Boost Diode (D1*, D2, D3)

*not assembled in 10-FZ06B2A040MF01-M575L28

Figure 5 Boost Swich (T1*, T2, T3)

Typical switching energy losses as a function of drain current

$E = f(I_D)$



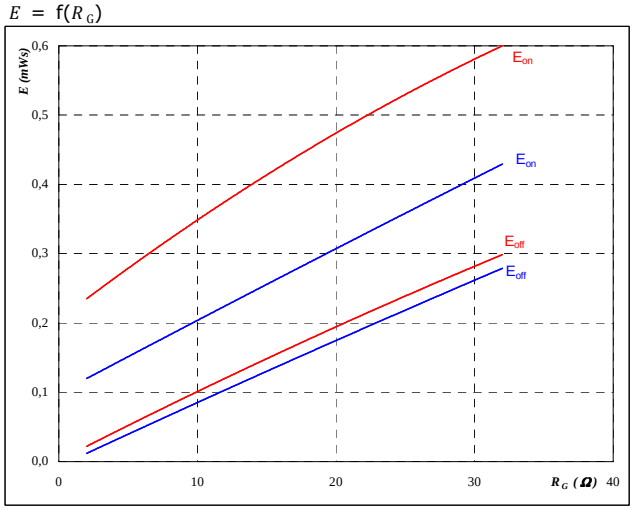
With an inductive load at

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	±15	V
R_{gon} =	8,01	Ω
R_{goff} =	8	Ω

Figure 6 Boost Swich (T1*, T2, T3)

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



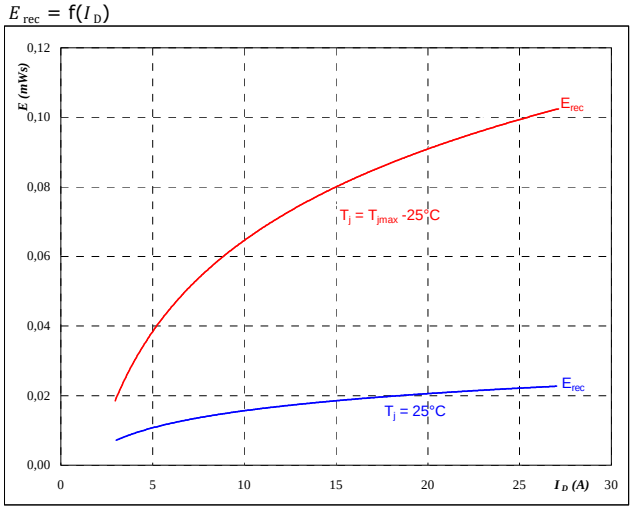
With an inductive load at

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	±15	V
I_D =	15	A

Figure 7 Boost Swich (T1*, T2, T3)

Typical reverse recovery energy loss as a function of drain current

$E_{rec} = f(I_D)$



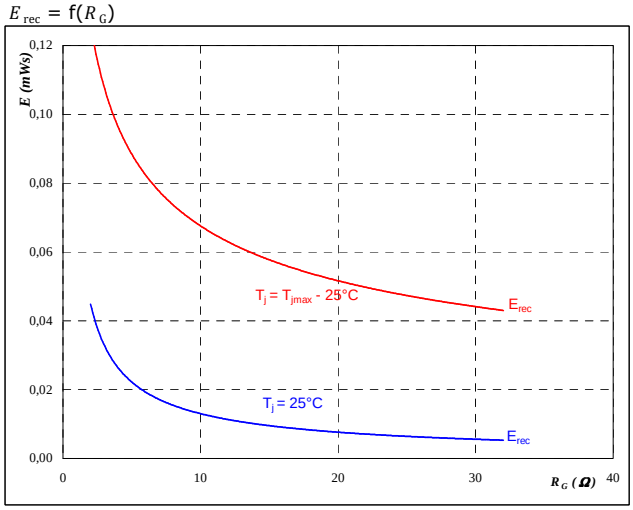
With an inductive load at

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	±15	V
R_{gon} =	8,01	Ω
R_{goff} =	8	Ω

Figure 8 Boost Swich (T1*, T2, T3)

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} =	±15	V
I_D =	15	A

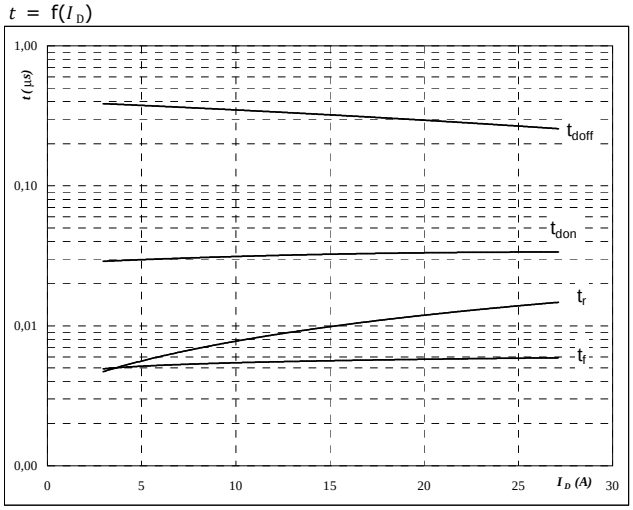
Boost Swich (T1*, T2, T3) / Boost Diode (D1*, D2, D3)

*not assembled in 10-FZ06B2A040MF01-M575L28

Figure 9 Boost Swich (T1*, T2, T3)

Typical switching times as a as a function of drain current

$t = f(I_D)$



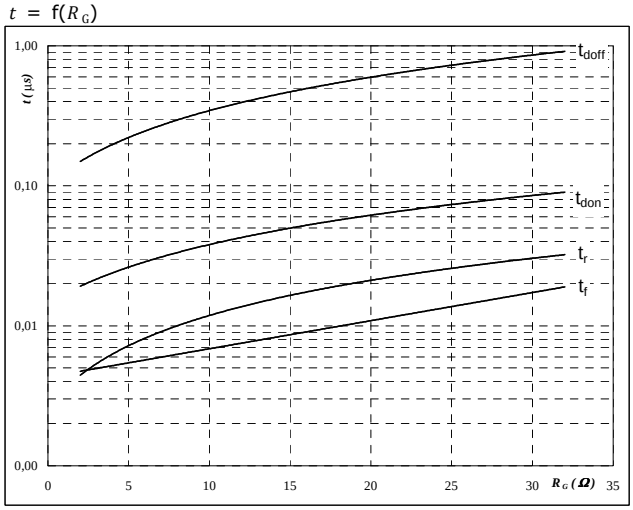
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	±15	V
R_{gon} =	8,01	Ω
R_{goff} =	8	Ω

Figure 10 Boost Swich (T1*, T2, T3)

Typical switching times as a function of gate resistor

$t = f(R_G)$



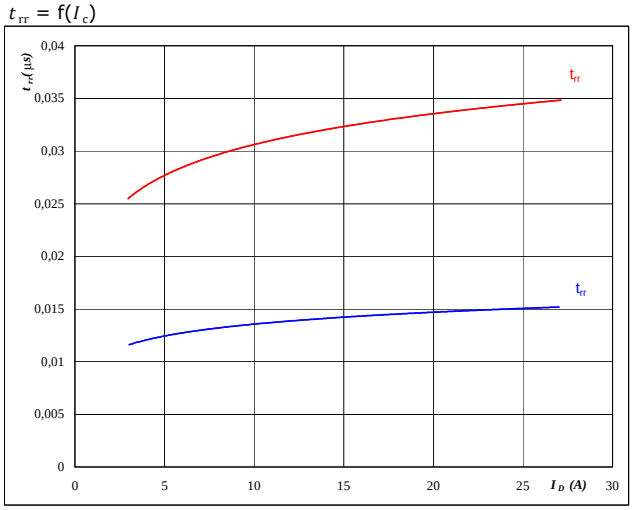
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	±15	V
I_C =	15	A

Figure 11 Boost Diode (D1*, D2, D3)

Typical reverse recovery time as a as a function of drain current

$t_{rr} = f(I_c)$



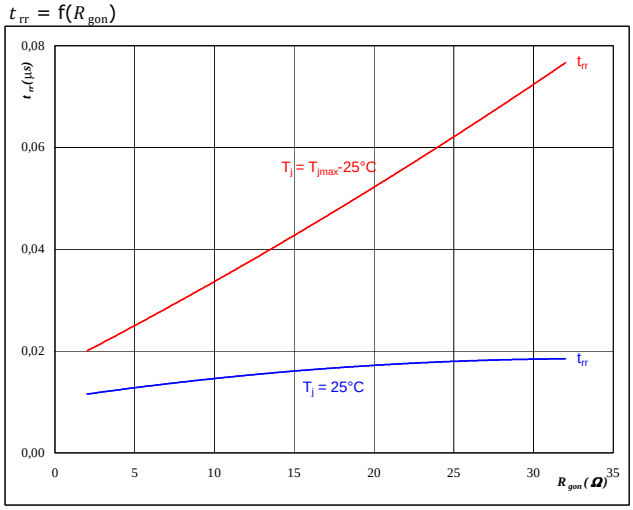
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	8,01	Ω

Figure 12 Boost Diode (D1*, D2, D3)

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 =	15	A
V_{GS} =	±15	V

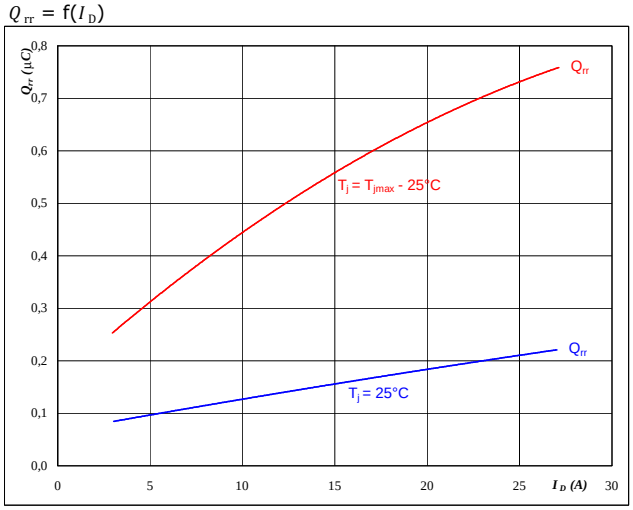
Boost Swich (T1*, T2, T3) / Boost Diode (D1*, D2, D3)

*not assembled in 10-FZ06B2A040MF01-M575L28

Figure 13 Boost Diode (D1*, D2, D3)

Typical reverse recovery charge as a as a function of drain current

$Q_{rr} = f(I_D)$



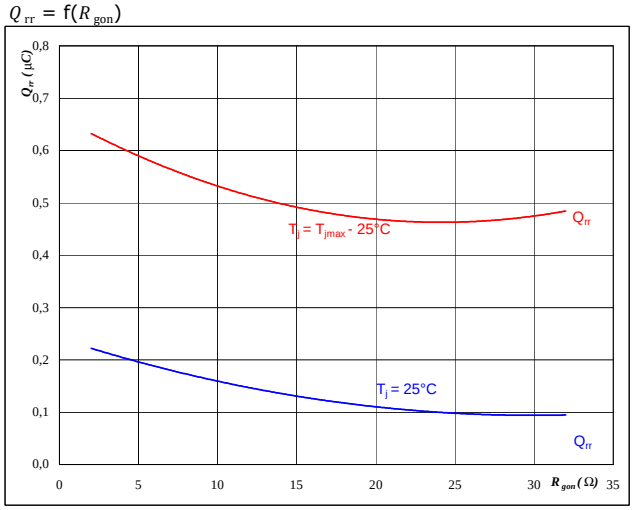
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	8,01	Ω

Figure 14 Boost Diode (D1*, D2, D3)

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

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



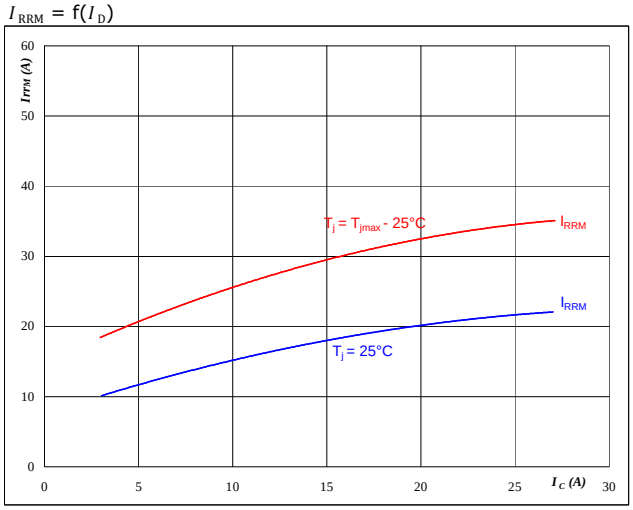
At

T_j =	25/125	°C
V_R =	400	V
I_F =	15	A
V_{GS} =	±15	V

Figure 15 Boost Diode (D1*, D2, D3)

Typical reverse recovery current as a function of drain current

$I_{RRM} = f(I_D)$



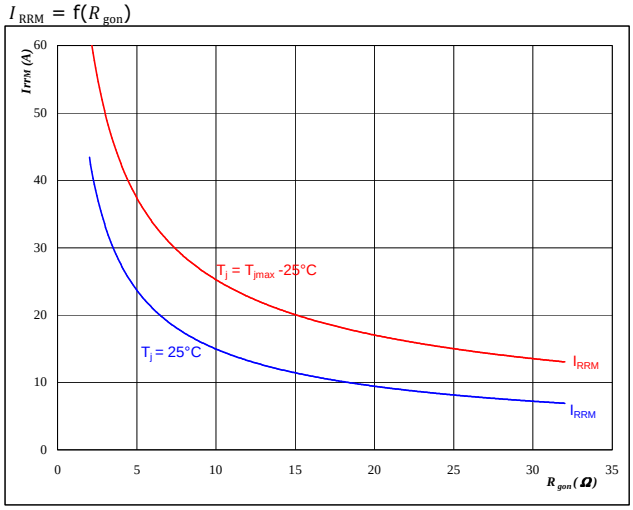
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
R (K/W)	8,01	Ω

Figure 16 Boost Diode (D1*, D2, D3)

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 =	15	A
R (K/W)	±15	V

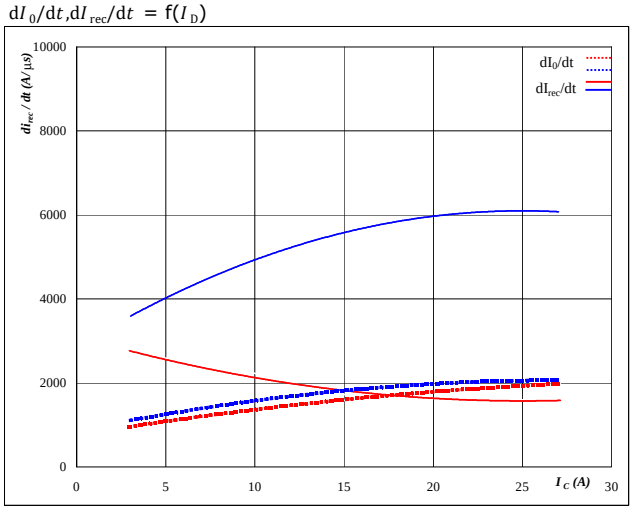
Boost Swich (T1*, T2, T3) / Boost Diode (D1*, D2, D3)

*not assembled in 10-FZ06B2A040MF01-M575L28

Figure 17 Boost Diode (D1*, D2, D3)

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

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



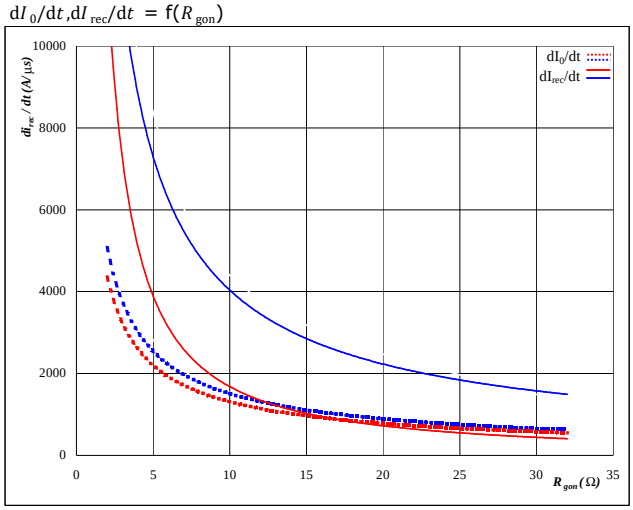
At

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	±15	V
R_{gon} =	8	Ω

Figure 18 Boost Diode (D1*, D2, D3)

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

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



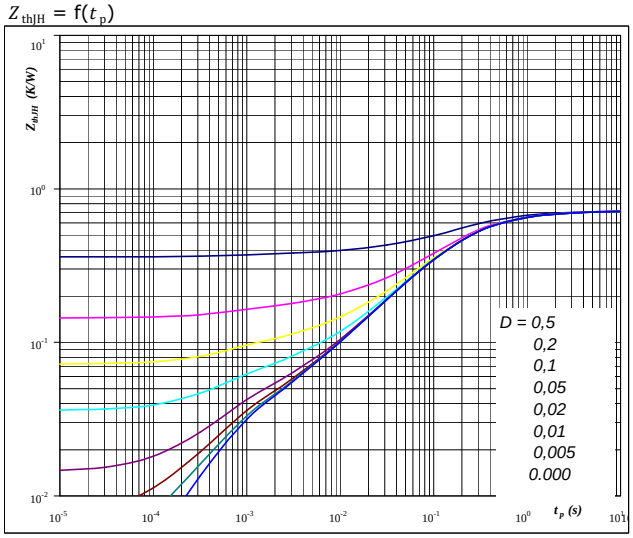
At

T_j =	25/125	°C
V_R =	400	V
I_F =	15	A
V_{GS} =	±15	V

Figure 19 Boost Swich (T1*, T2, T3)

MOSFET transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	0,72	K/W

IGBT thermal model values

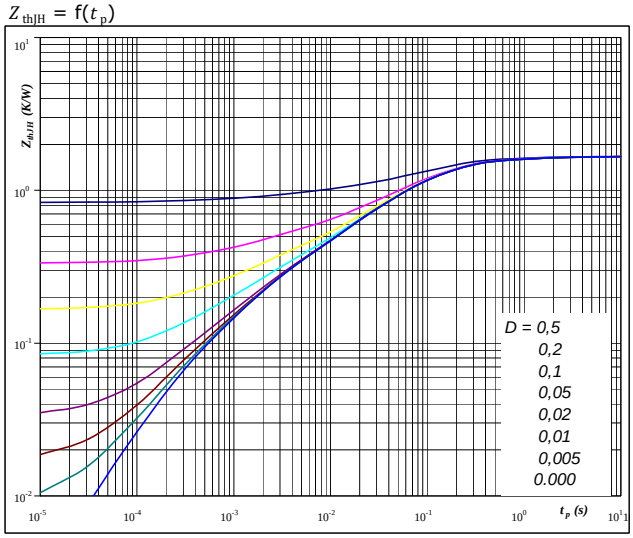
Thermal grease

R (K/W)	Tau (s)
0,02	8,77E+00
0,11	1,31E+00
0,35	2,19E-01
0,16	6,50E-02
0,05	1,06E-02
0,03	7,41E-04

Figure 20 Boost Diode (D1*, D2, D3)

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	1,67	K/W

FWD thermal model values

Thermal grease

R (K/W)	Tau (s)
0,06	3,60E+00
0,24	4,21E-01
0,84	8,48E-02
0,32	1,50E-02
0,17	1,83E-03
0,05	2,72E-04

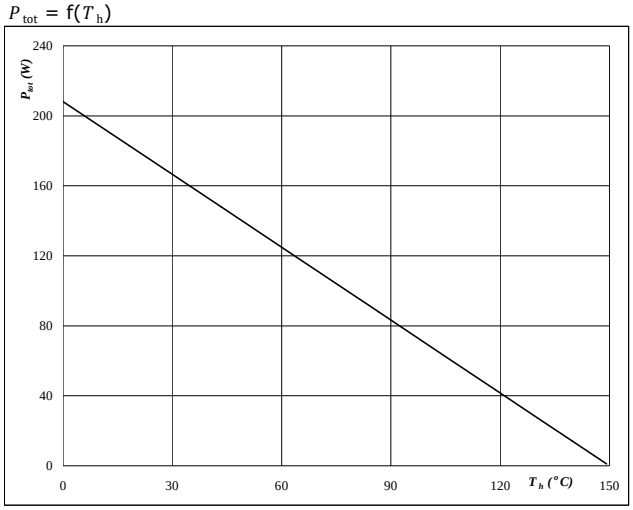
Boost Swich (T1*, T2, T3) / Boost Diode (D1*, D2, D3)

*not assembled in 10-FZ06B2A040MF01-M575L28

Figure 21 Boost Swich (T1*, T2, T3)

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



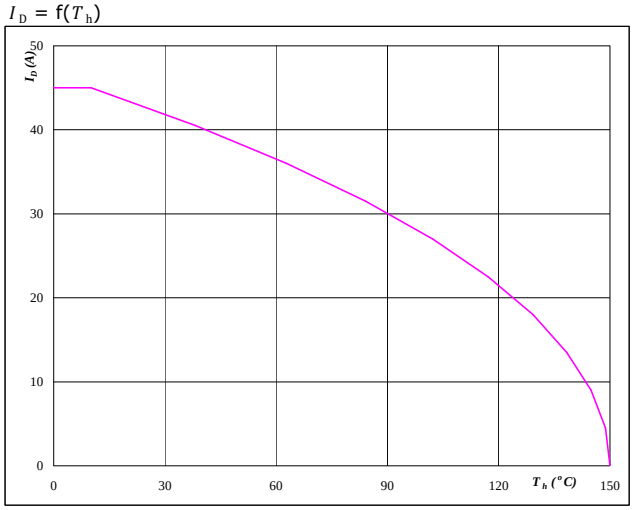
At

T_j = 150 ºC

Figure 22 Boost Swich (T1*, T2, T3)

Collector/Drain current as a function of heatsink temperature

$I_D = f(T_h)$



At

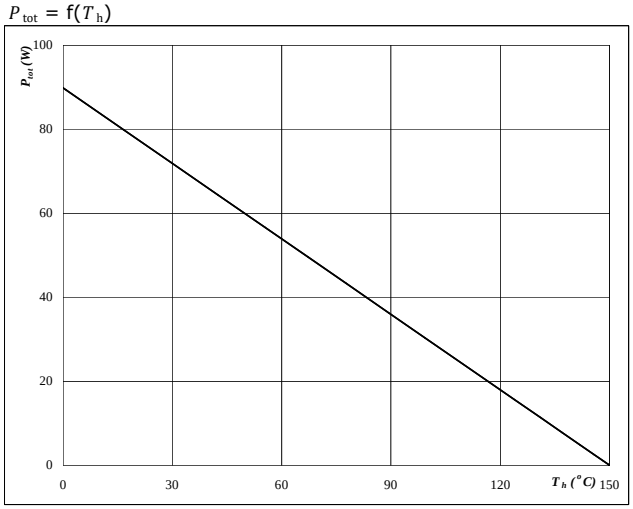
T_j = 150 ºC

V_{GS} = 10 V

Figure 23 Boost Diode (D1*, D2, D3)

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



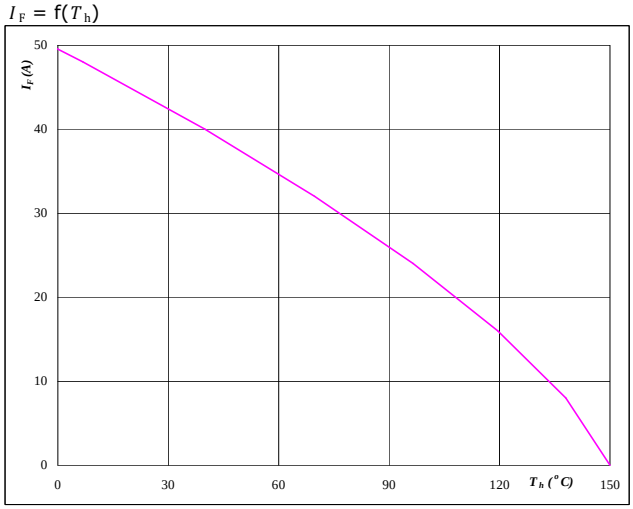
At

T_j = 150 ºC

Figure 24 Boost Diode (D1*, D2, D3)

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

T_j = 150 ºC

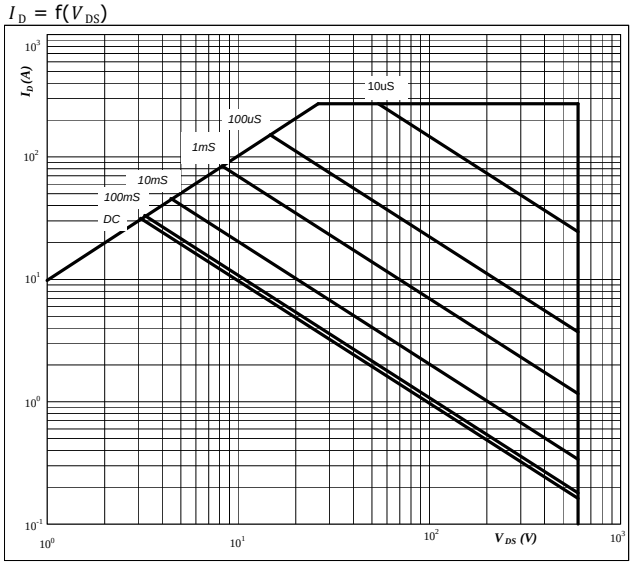
Boost Swich (T1*, T2, T3) / Boost Diode (D1*, D2, D3)

*not assembled in 10-FZ06B2A040MF01-M575L28

Figure 25 Boost Swich (T1*, T2, T3)

Safe operating area as a function of drain-source voltage

$I_D = f(V_{DS})$



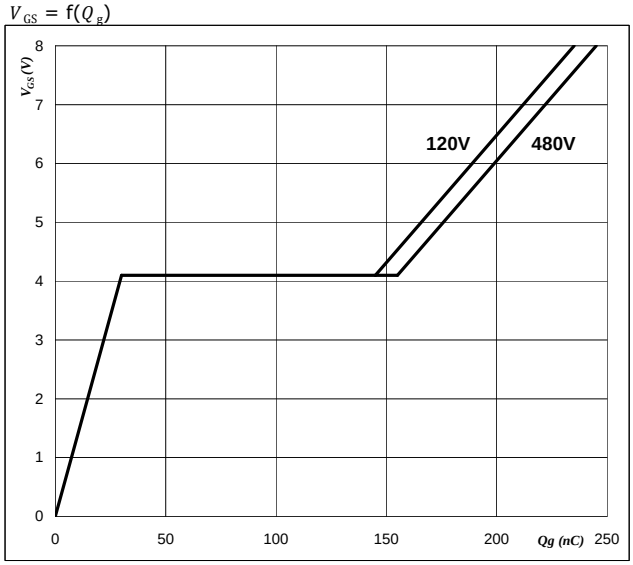
At

D =	single pulse	
T_h =	80	ºC
V_{GS} =	±15	V
T_j =	T_{jmax}	ºC

Figure 26 Boost Swich (T1*, T2, T3)

Gate voltage vs Gate charge

$V_{GS} = f(Q_g)$



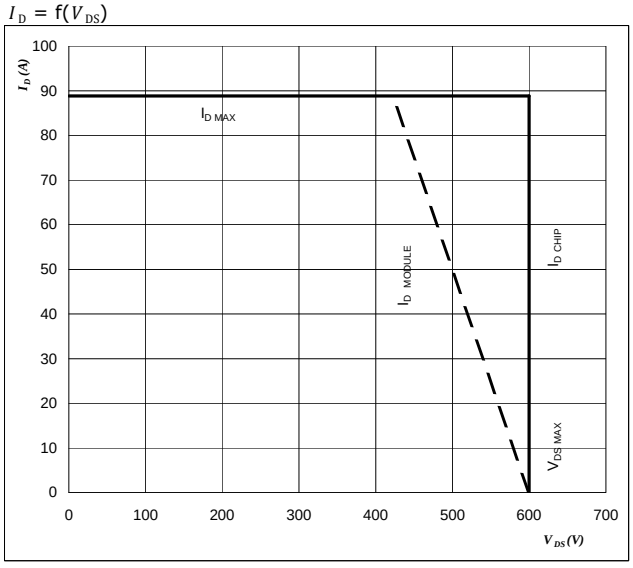
At

I_D =	50	A

Figure 27 Boost Swich (T1*, T2, T3)

Reverse bias safe operating area

$I_D = f(V_{DS})$



At

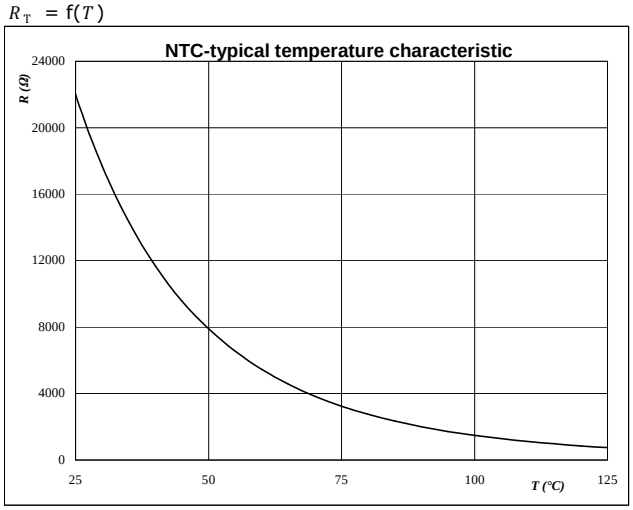
T_j =	150	°C
R_{gon} =	8	Ω
R_{goff} =	8	Ω

Thermistor

Figure 1 Thermistor

Typical NTC characteristic as a function of temperature

$R_T = f(T)$



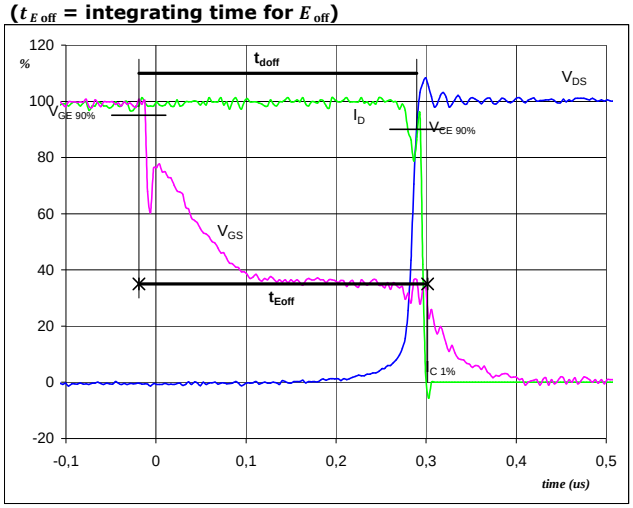
Switching Definitions Boost

General conditions

T_j	=	125 °C
R_{gon}	=	11 Ω
R_{goff}	=	6,3 Ω

Figure 1 Boost Swich

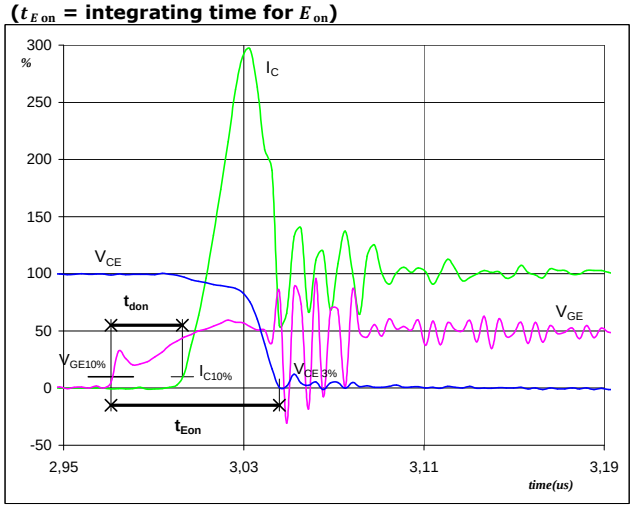
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	10	V
V_C (100%) =	410	V
I_C (100%) =	15	A
t_{doff} =	0,30	µs
$t_{E\,off}$ =	0,32	µs

Figure 2 Boost Swich

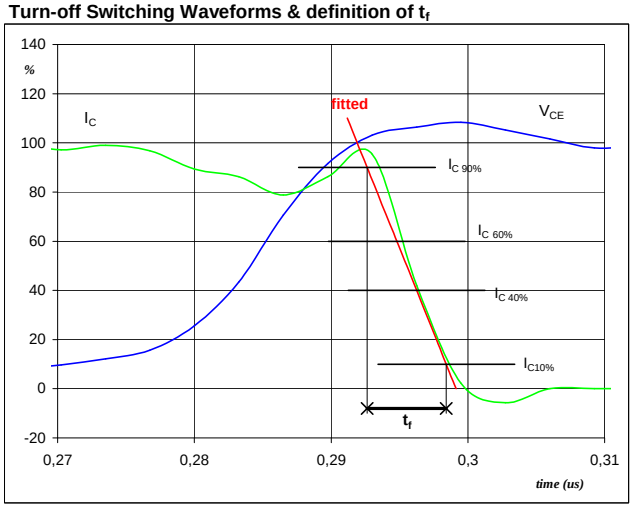
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	10	V
V_C (100%) =	410	V
I_C (100%) =	15	A
t_{don} =	0,03	µs
$t_{E\,on}$ =	0,07	µs

Figure 3 Boost Swich

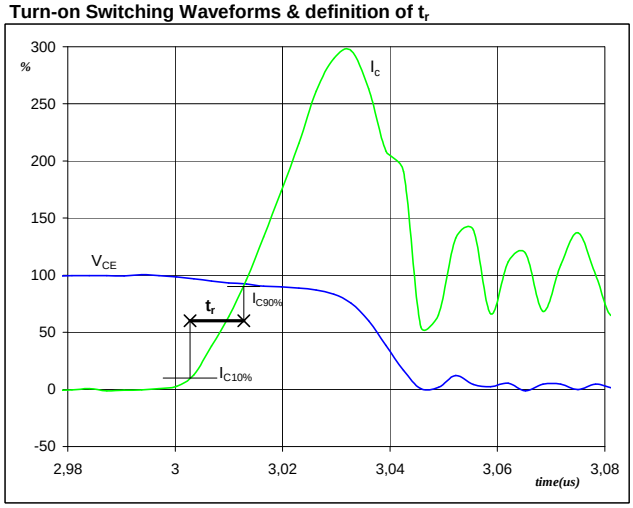
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	410	V
I_C (100%) =	15	A
t_f =	0,00	µs

Figure 4 Boost Swich

Turn-on Switching Waveforms & definition of t_r

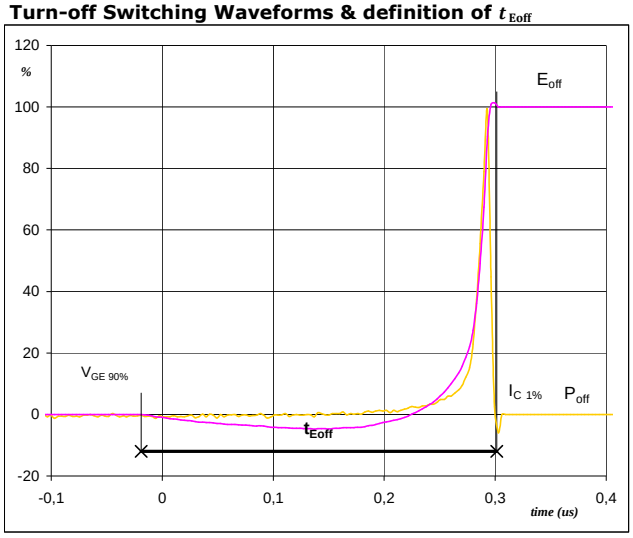


V_C (100%) =	410	V
I_C (100%) =	15	A
t_r =	0,01	µs

Switching Definitions Boost

Figure 5 Boost Swich

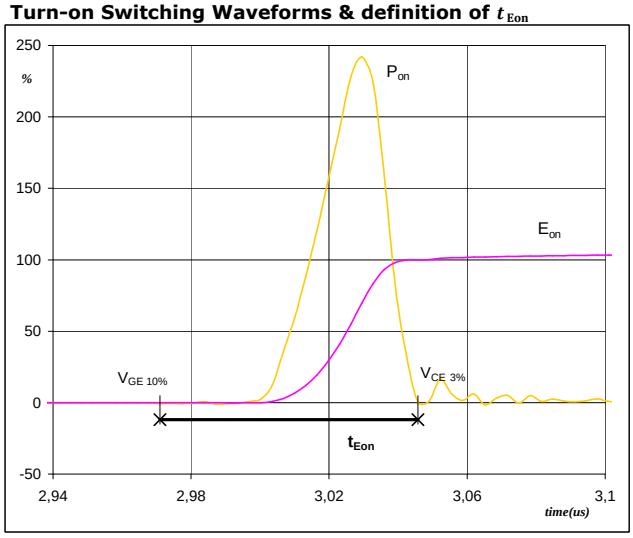
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	6,17	kW
E_{off} (100%) =	0,08	mJ
$t_{E\,off}$ =	0,32	µs

Figure 6 Boost Swich

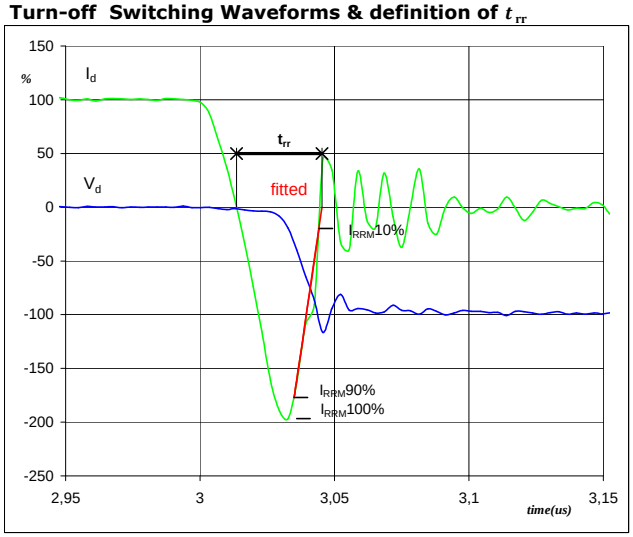
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	6,17	kW
E_{on} (100%) =	0,34	mJ
$t_{E\,on}$ =	0,07	µs

Figure 7 Boost Diode

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

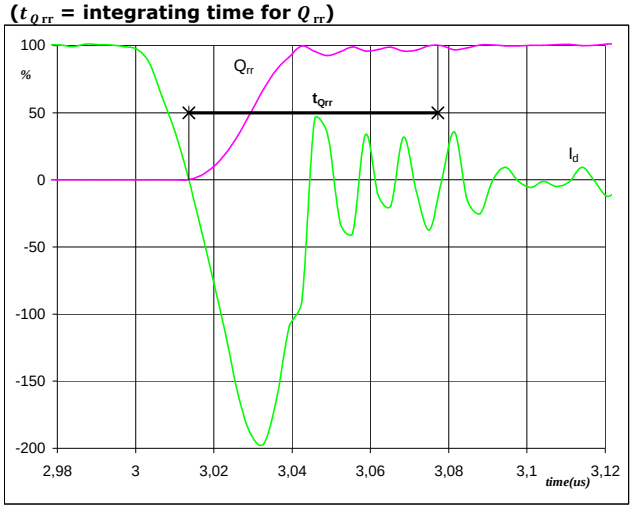


V_d (100%) =	410	V
I_d (100%) =	15	A
I_{RRM} (100%) =	-30	A
t_{rr} =	0,03	µs

Switching Definitions Boost

Figure 8 Boost Diode

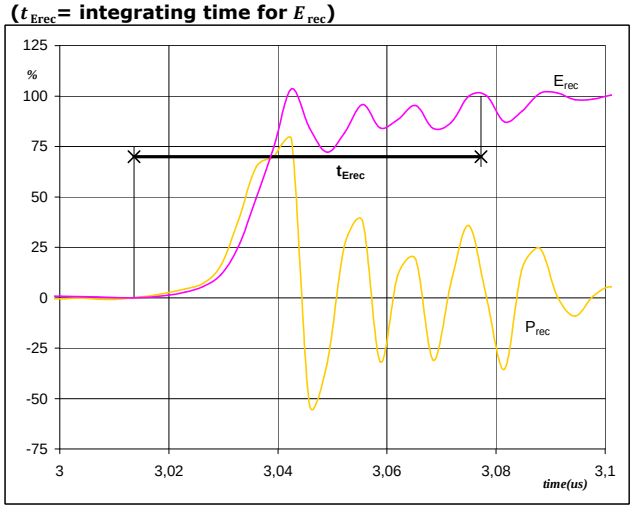
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	15	A
Q_{rr} (100%) =	0,56	µC
$t_{Q\,rr}$ =	0,06	µs

Figure 9 Boost Diode

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



P_{rec} (100%) =	6,17	kW
E_{rec} (100%) =	0,08	mJ
$t_{E\,rec}$ =	0,06	µs

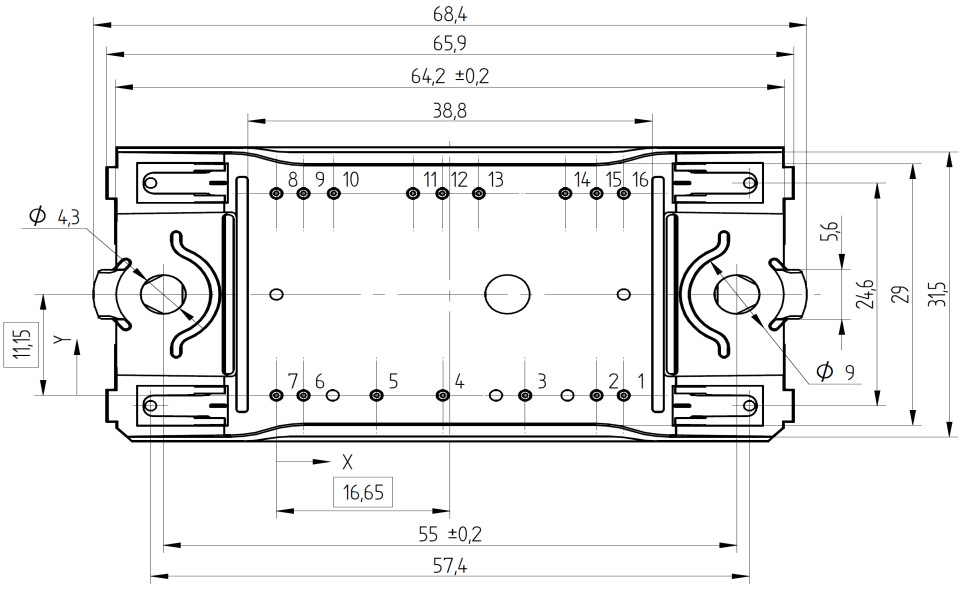
Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

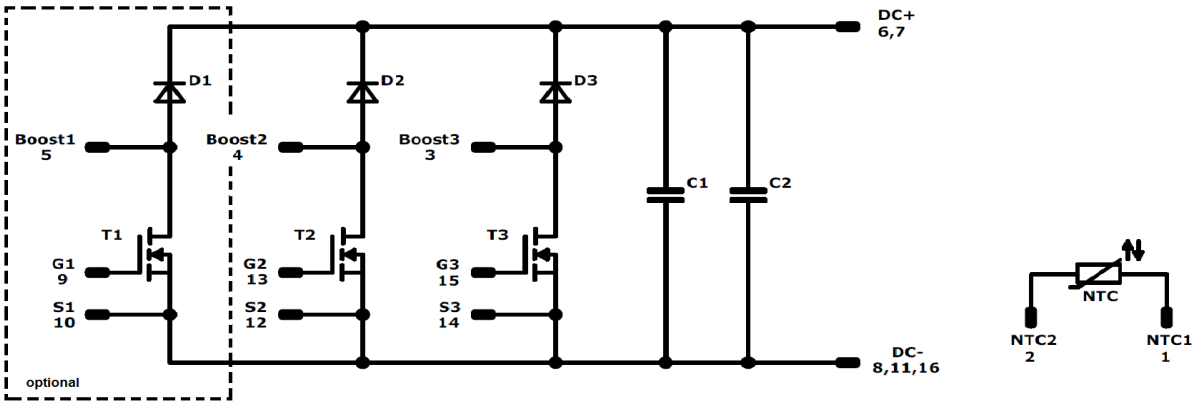
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing (triple booster)	10-FZ063BA040MF-M575L08	M575L08	M575L08
without thermal paste 12mm housing (dual booster)	10-FZ06B2A040MF01-M575L28	M575L28	M575L28

Outline

Pin table		
Pin	X	Y
1	33,3	0
2	30,7	0
3	23,85	0
4	15,95	0
5	9,6	0
6	2,6	0
7	0	0
8	0	22,3
9	2,6	22,3
10	5,5	22,3
11	13,1	22,3
12	15,9	22,3
13	19,4	22,3
14	27,7	22,3
15	30,7	22,3
16	33,3	22,3



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1*,T2,T3	MOSFET	600V	41mΩ	Boost Switch	
D1*,D2,D3	FWD	600V	30A	Boost Diode	
C1,C2	Capacitor	630V		DC Link Capacitance	
NTC	NTC			Thermistor	

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As used herein: ● 10-FZ063BA040MF-M575L08 (triple booster)

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.

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.