10-FZ07B2A030SM02-M575L48

datasheet

Vincotech

flow 2xBOOST 0	650 V / 30 A

Features

- High efficient dual booster
- Included capacitor
- Very high switching frequency
- Very compact design

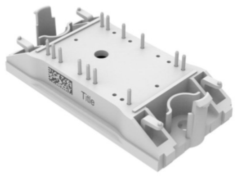
Target applications

- Solar Inverter

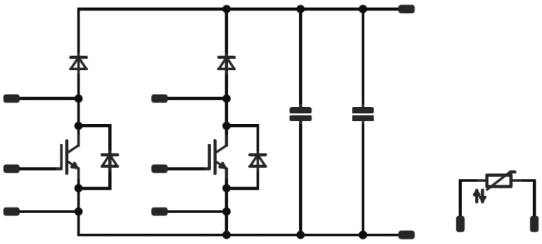
Types

- 10-FZ07B2A030SM02-M575L48

flow 0 12mm housing



Schematic



Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Boost Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current	I_C	T_j=$T_j$max	T_S=80°C	28	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_j$max		90	A
Total power dissipation	P_{tot}	T_j=$T_j$max	T_S=80°C	57	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum Junction Temperature	T_{jmax}			175	°C

Boost Diode

Parameter	Symbol	Conditions		Value	Unit
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	T_j=T_{jmax}	T_h=80°C	29	A
Repetitive peak forward current	I_{FRM}			180	A
Total power dissipation	P_{tot}	T_j=T_{jmax}	T_h=80°C	52	W
Maximum Junction Temperature	T_{jmax}			175	°C

Boost Inverse Diode

Parameter	Symbol	Conditions		Value	Unit
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	T_j=T_{jmax}	T_h=80°C	30	A
Surge (non-repetitive) forward current	I_{FSM}	50Hz Single Half Sine Wave		150	A
Total power dissipation	P_{tot}	T_j=T_{jmax}	T_h=80°C	58	W
Maximum Junction Temperature	T_{jmax}			175	°C

DC Link Capacitor

Parameter	Symbol	Conditions	Value	Unit
Maximum DC voltage	V_{MAX}		1000	V
Operation Temperature	T_{op}		-55…+125	°C

Module Properties

Parameter	Symbol	Conditions		Value	Unit
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation Junction Temperature	T_{jop}			-40…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC voltage	t_p=2s	4000	V
Creepage distance				min 12,7	mm
Clearance				9,22	mm
Comparative Tracking Index	CTI			>200	

Characteristic Values

Boost Switch

Parameter	Symbol	Conditions	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{GE}=V_{CE}			0,0003	25 125	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		30	25 125 150		1,69 1,92	2,22	V
Collector-emitter cut-off current	I_{CES}		0	650		25 125			40	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			120	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1MHz	0	25		25		2100		pF
Reverse transfer capacitance	C_{res}							7,7		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						1,67		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 16 Ω R_{gon} = 16 Ω	15/0	400	30	25 125		22 21		ns
Rise time	t_r					25 125		6 8		
Turn-off delay time	$t_{d(off)}$					25 125		158 175		
Fall time	t_f					25 125		3 5		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,3 µC Q_{rFWD} = 1,1 µC				25 125		0,385 0,512		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,138 0,252		

Boost Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				30	25 125 150		2,46 2,03 -	2,6	V
Reverse leakage current	I_r			665		25 150			10 -	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						1,83		K/W
FWD Switching										
Peak recovery current	I_{RRM}	d*i*/d*t* = 4188 A/µs d*i*/d*t* = 3749 A/µs	15/0	400	30	25 125		28 36		A
Reverse recovery time	t_{rr}					25 125		17 77		ns
Recovered charge	Q_r					25 125		0,336 1,091		µC
Reverse recovered energy	E_{rec}					25 125		0,040 0,251		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		6280 2364		A/µs

Boost Inverse Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				15	25 125 150		2,48 1,73	2,93	V
Reverse leakage current	I_r			650		25 150			10	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						1,65		K/W

DC Link Capacitor

Parameter	Symbol	Conditions					Value			Unit
						T_j[°C]	Min	Typ	Max	
Static										
Capacitance per leg	C							47		nF
Tolerance							-10		+10	%

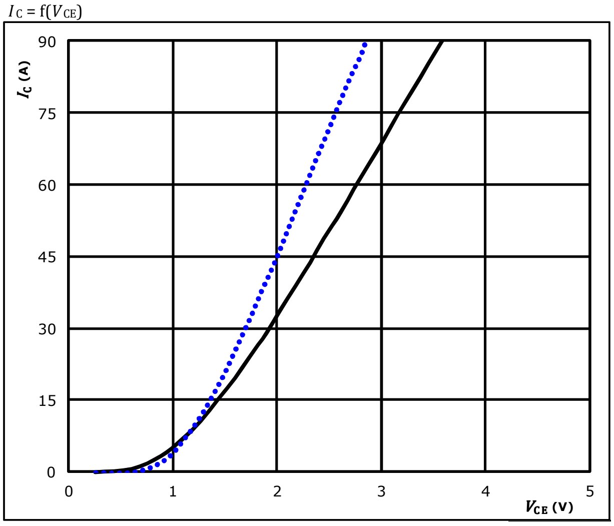
Thermistor

Parameter	Symbol	Conditions					Value			Unit
			V_{GE}[V]	V_{CE}[V]	I_C[A]	T_j[°C]	Min	Typ	Max	
Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	R100=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	

Boost Switch Characteristics

Typical output characteristics **IGBT**

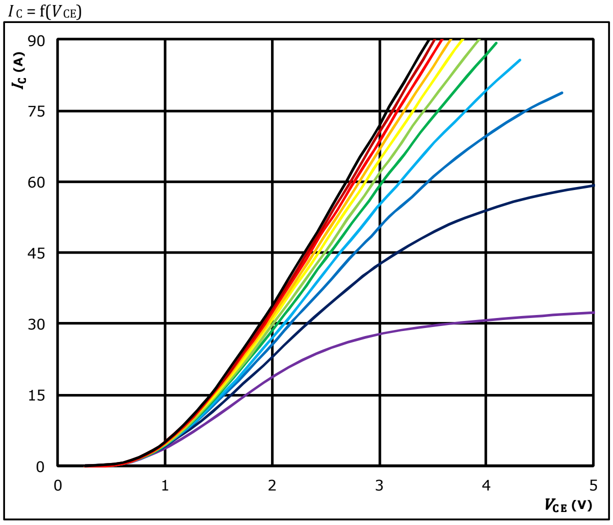
$I_C = f(V_{CE})$



t_p =	250	μs	25 °C	············
V_{GE}=	15	V	125 °C	———
			150 °C	– – –

Typical output characteristics **IGBT**

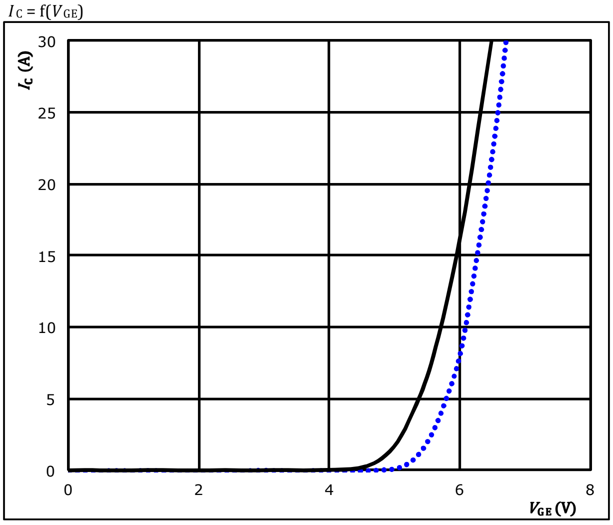
$I_C = f(V_{CE})$



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

Typical transfer characteristics **IGBT**

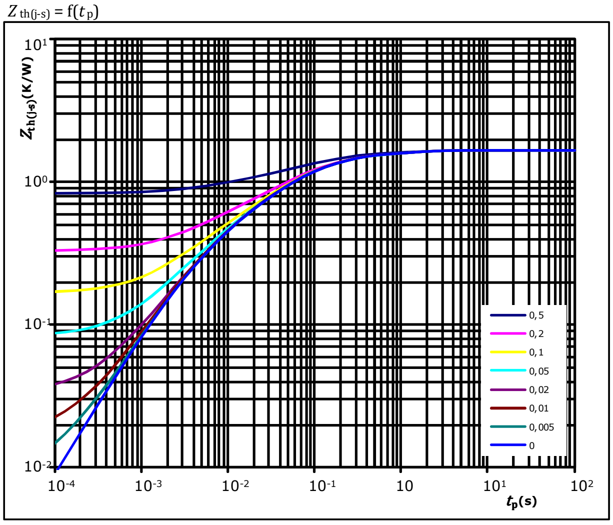
$I_C = f(V_{GE})$



t_p =	100	μs	25 °C	············
V_{CE} =	10	V	125 °C	———
			150 °C	– – –

Transient Thermal Impedance as function of Pulse duration **IGBT**

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



D = t_p / T
$R_{th(j-s)}$ = 1,67 K/W

IGBT thermal model values

R_{th} (K/W)	τ (s)
1,80E-01	1,06E+00
3,72E-01	1,72E-01
6,39E-01	5,52E-02
3,20E-01	1,27E-02
1,54E-01	3,03E-03

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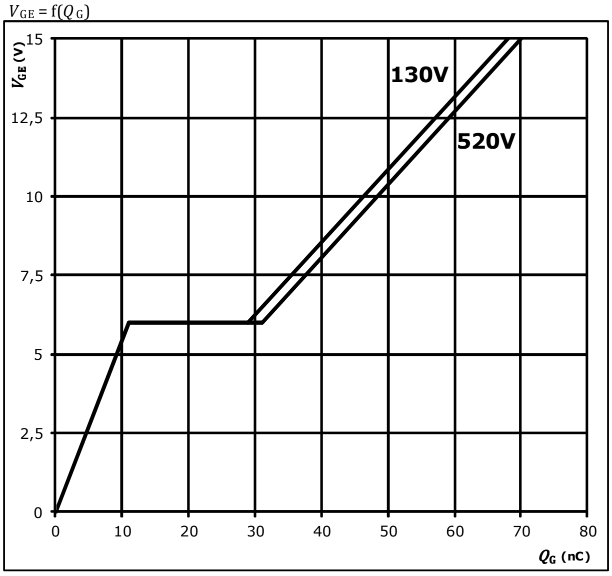
Boost Switch Characteristics

Gate voltage vs Gate charge **IGBT**

$V_{GE} = f(Q_G)$



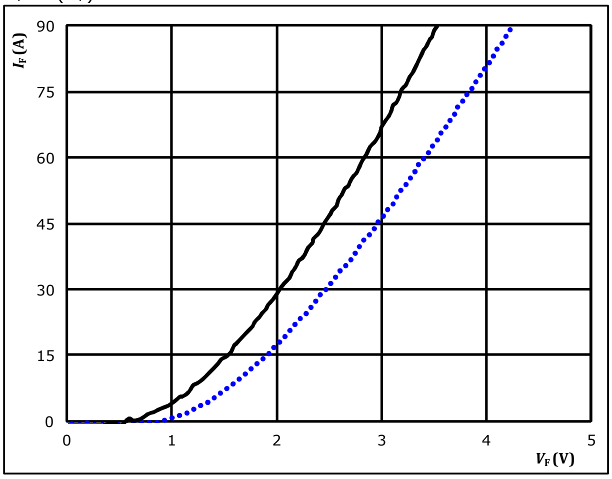
At

I_C= 30 A

Boost Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

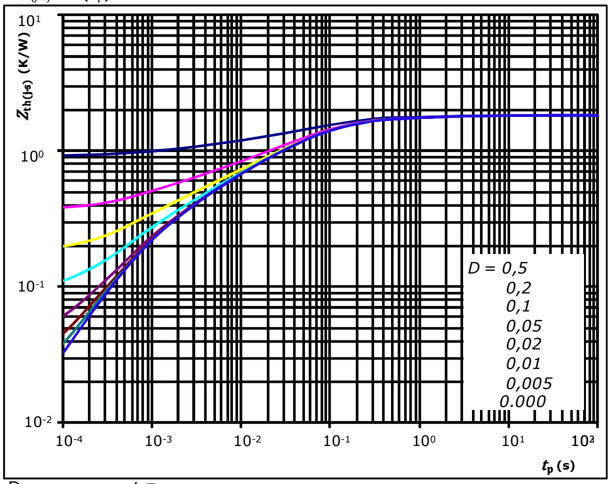


t_p = 250 μs

T_j: **25 °C**, **125 °C**, **150 °C**

Transient thermal impedance as a function of pulse width **FWD**

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 1,83 K/W

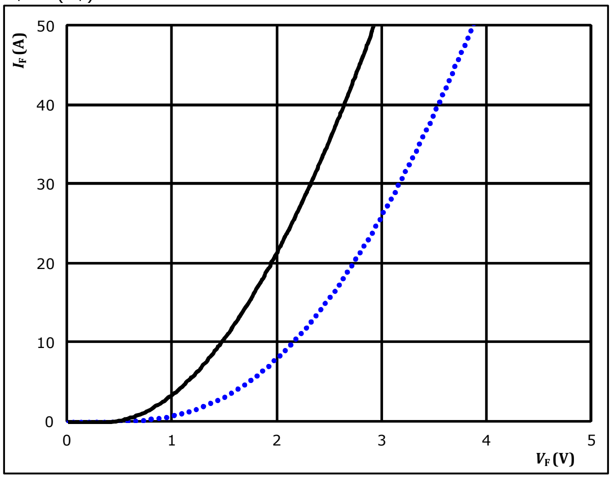
FWD thermal model values

R (K/W)	τ (s)
6,05E-02	3,63E+00
1,50E-01	6,48E-01
8,27E-01	7,70E-02
4,06E-01	1,51E-02
2,16E-01	3,45E-03
1,73E-01	7,36E-04

Boost Inverse Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

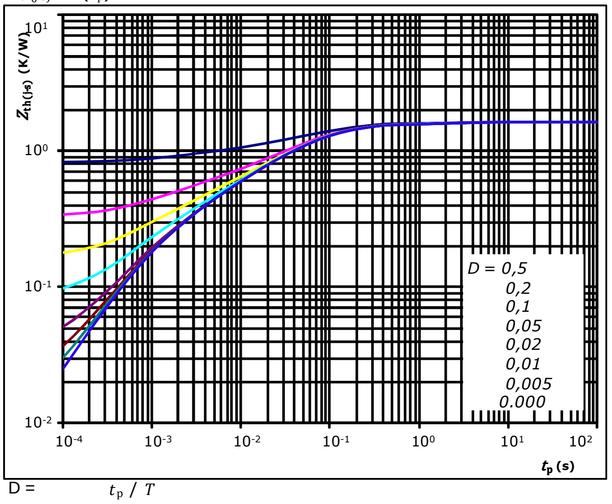


t_p = 250 μs

T_j: 25 °C; 125 °C; 150 °C

Transient thermal impedance as a function of pulse width **FWD**

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



D = t_p / T

$R_{th(j-s)}$ = 1,65 K/W

FWD thermal model values

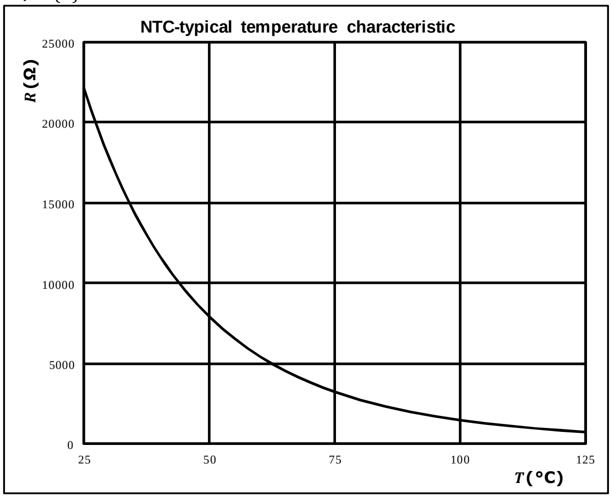
R (K/W)	τ (s)
5,16E-02	4,05E+00
1,04E-01	5,69E-01
7,15E-01	7,94E-02
4,04E-01	1,99E-02
2,10E-01	4,66E-03
1,69E-01	9,24E-04

Thermistor Characteristics

Thermistor typical temperature characteristic

Typical NTC characteristic as a function of temperature

$R_T = f(T)$



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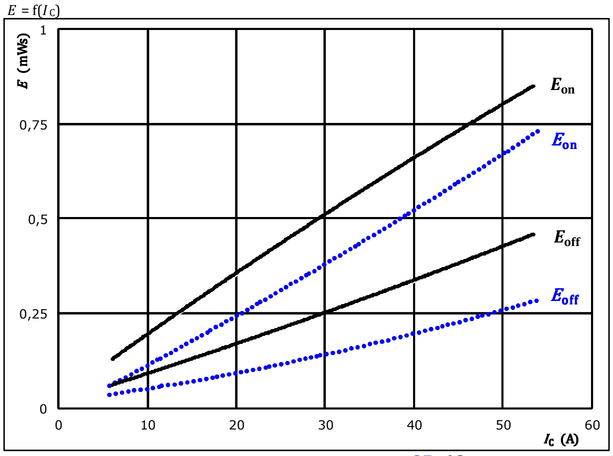
Boost Switching Characteristics

Figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



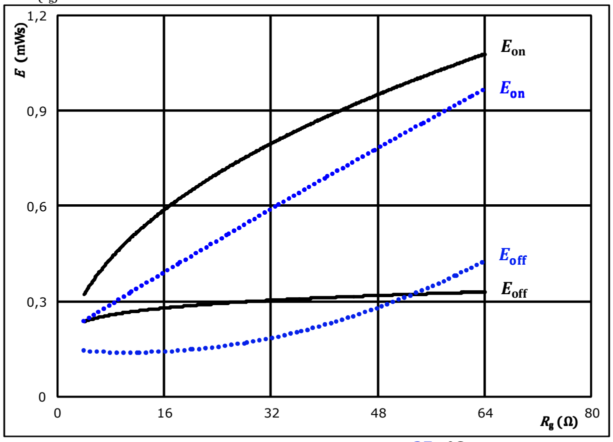
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C	··········
V_{GE} =	15/0	V		125 °C	——
R_{gon} =	16	Ω		150 °C	– – –
R_{goff} =	16	Ω			

Figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



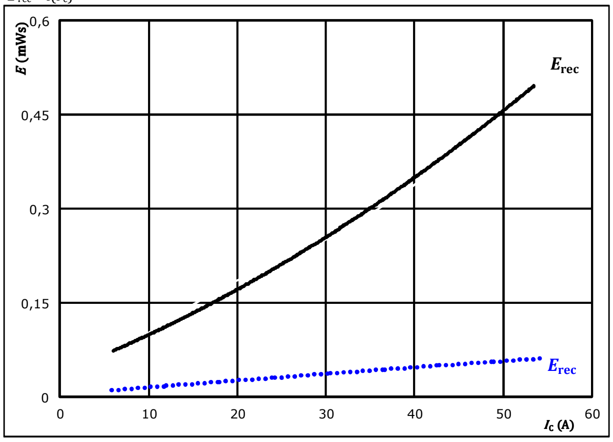
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C	··········
V_{GE} =	15/0	V		125 °C	——
I_C =	30	A		150 °C	– – –

Figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



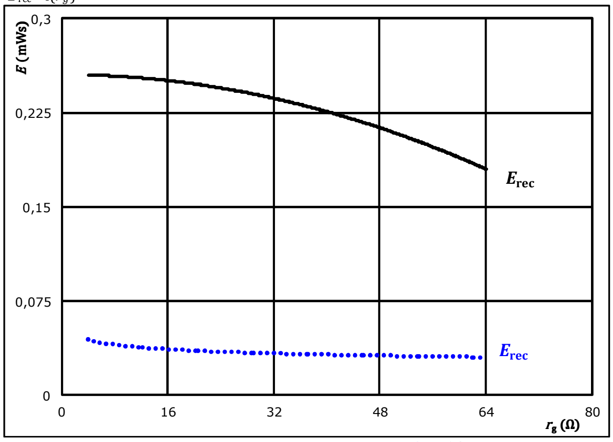
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C	··········
V_{GE} =	15/0	V		125 °C	——
R_{gon} =	16	Ω		150 °C	– – –

Figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(r_g)$



With an inductive load at

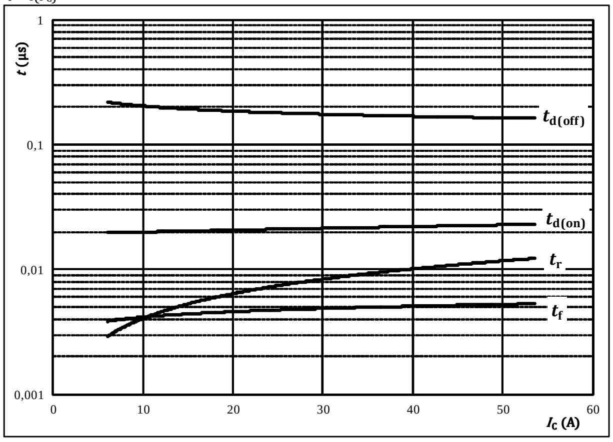
V_{CE} =	400	V	T_j:	25 °C	··········
V_{GE} =	15/0	V		125 °C	——
I_C =	30	A		150 °C	– – –

Boost Switching Characteristics

Figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



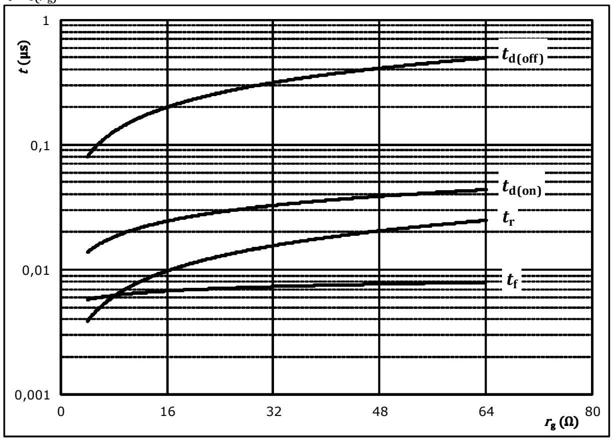
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
V_{GE} =	15/0	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

Figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(r_g)$



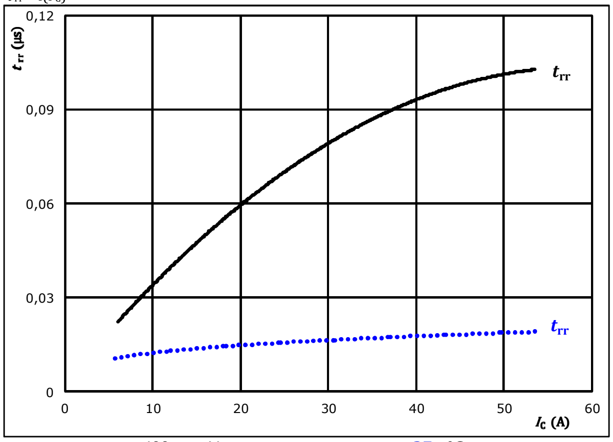
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
V_{GE} =	15/0	V
I_C =	30	A

Figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

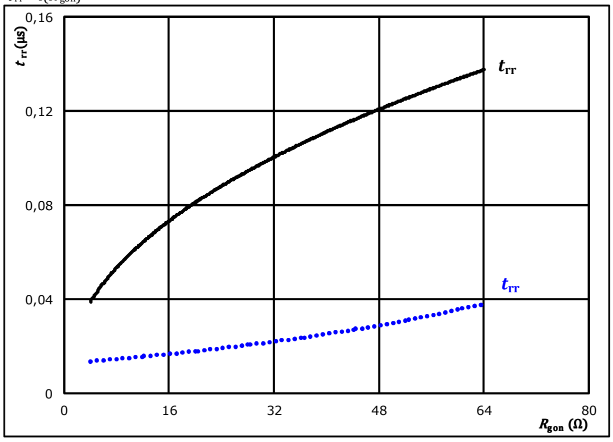


At V_{CE}=	400	V		25 °C	·············
V_{GE} =	15/0	V	T_j:	125 °C	———
R_{gon} =	16	Ω		150 °C	– – – –

Figure 8. **FWD**

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

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



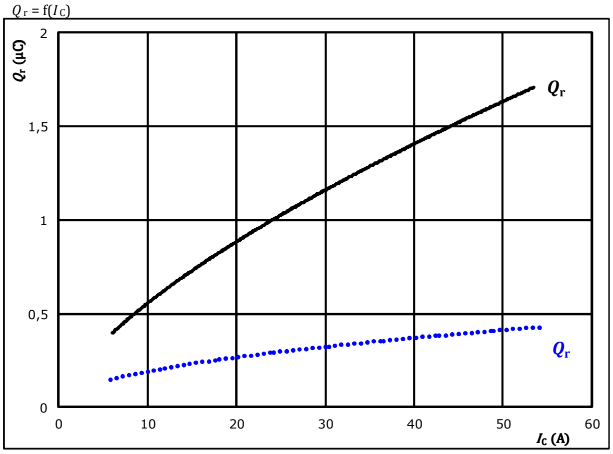
At V_{CE} =	400	V		25 °C	·············
V_{GE} =	15/0	V	T_j:	125 °C	———
I_C =	30	A		150 °C	– – – –

Boost Switching Characteristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

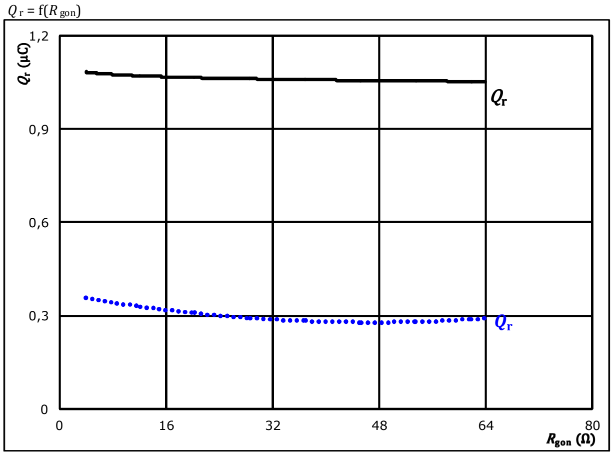


At	V_{CE} =	400	V		25 °C	············
	V_{GE} =	15/0	V	T_j:	125 °C	———
	R_{gon} =	16	Ω		150 °C	– – – –

Figure 10. **FWD**

Typical recoved charge as a function of IGBT turn on gate resistor

$Q_r = f(R_{gon})$

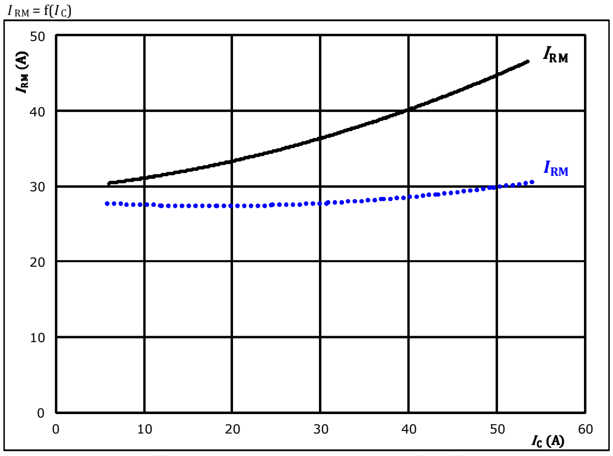


At	V_{CE}=	400	V		25 °C	············
	V_{GE} =	15/0	V	T_j:	125 °C	———
	I_C=	30	A		150 °C	– – – –

Figure 11. **FWD**

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$

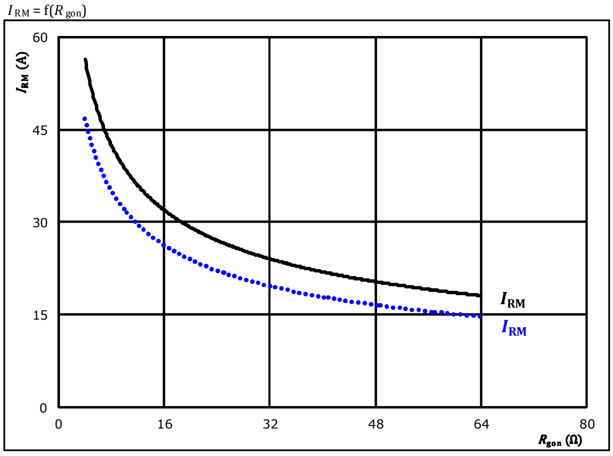


At	V_{CE}:	400	V		25 °C	············
	V_{GE} =	15/0	V	T_j:	125 °C	———
	R_{gon} =	16	Ω		150 °C	– – – –

Figure 12. **FWD**

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

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



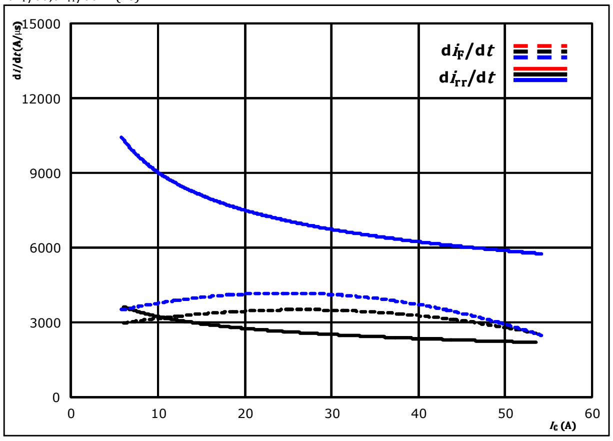
At	V_{CE} =	400	V		25 °C	············
	V_{GE} =	15/0	V	T_j:	125 °C	———
	I_C =	30	A		150 °C	– – – –

Boost Switching Characteristics

Figure 13. **FWD**

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

$di_F/dt, di_{rr}/dt = f(I_C)$

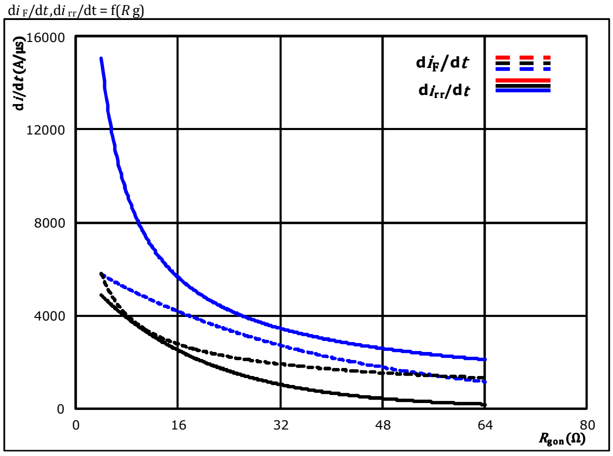


At					
V_{CE} =	400	V		25	°C
V_{GE} =	15/0	V	T_j:	125	°C
R_{gon} =	16	Ω		150	°C

Figure 14. **FWD**

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

$di_F/dt, di_{rr}/dt = f(R_g)$

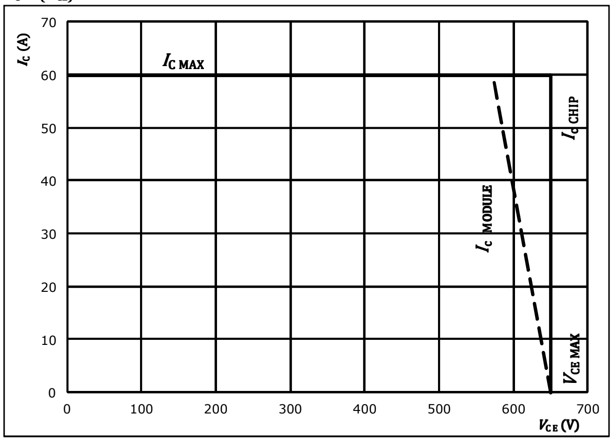


At		
V_{CE} =	400	V
V_{GE} =	15/0	V
I_C=	30	A

Figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



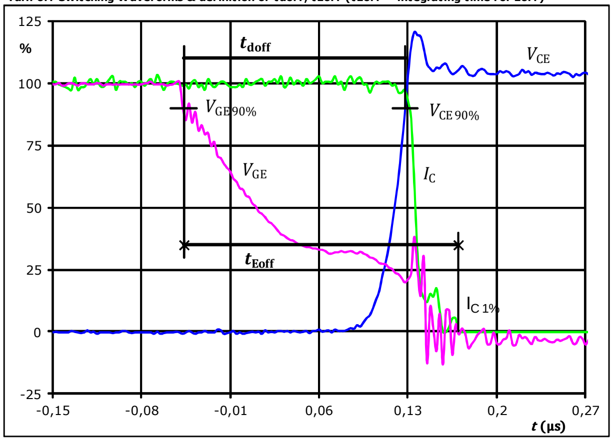
At		
T_j =	175	°C
R_{gon} =	16	Ω
R_{goff} =	16	Ω

Boost Switching Definitions

General conditions		
T_j	=	125 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

Figure 1. IGBT

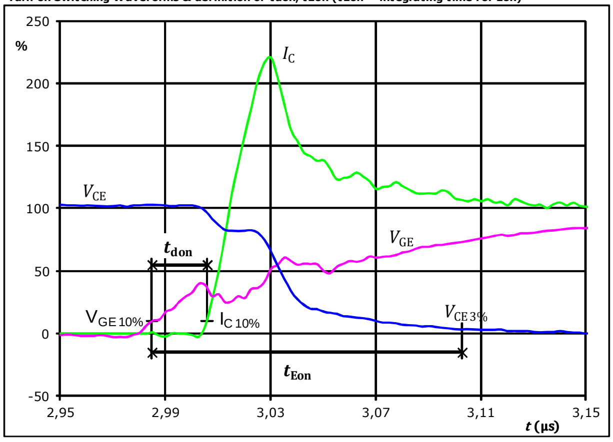
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	30	A
t_{doff} =	0,175	µs
t_{Eoff} =	0,216	µs

Figure 2. IGBT

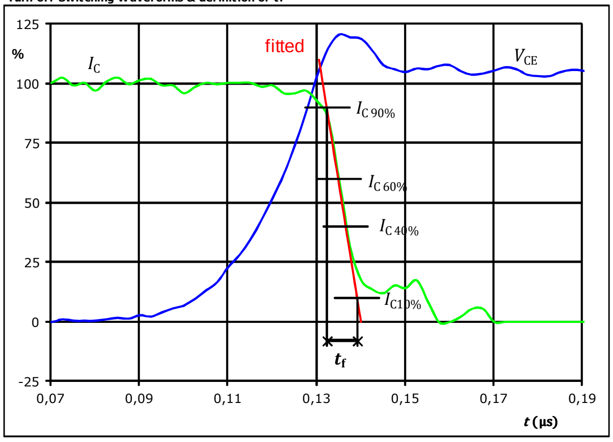
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	30	A
t_{don} =	0,021	µs
t_{Eon} =	0,118	µs

Figure 3. IGBT

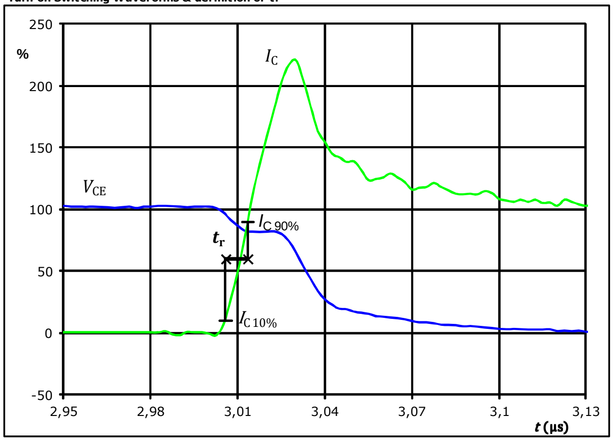
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	30	A
t_f =	0,005	µs

Figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

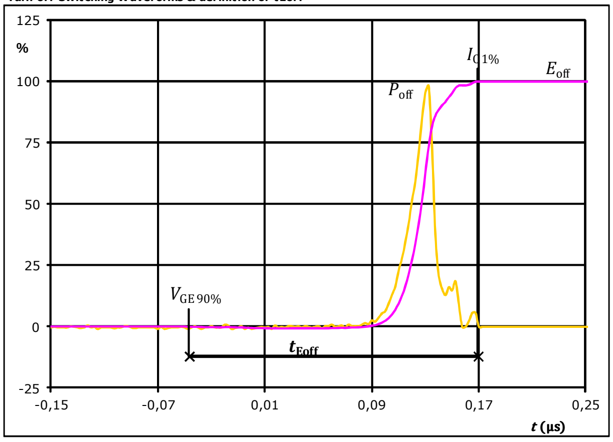


$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	30	A
t_r =	0,008	µs

Boost Switching Definitions

Figure 5. **IGBT**

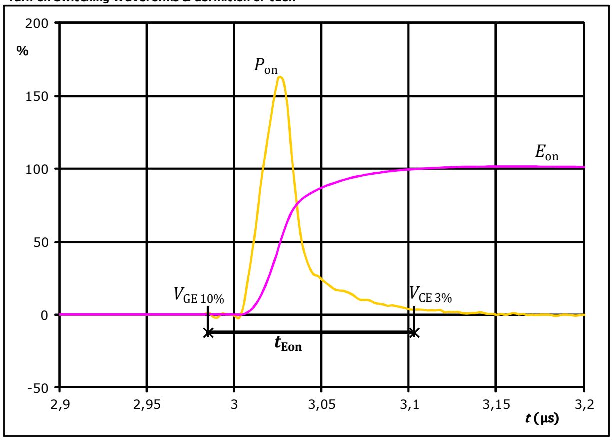
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	11,95	kW
E_{off} (100%) =	0,25	mJ
t_{Eoff} =	0,216	µs

Figure 6. **IGBT**

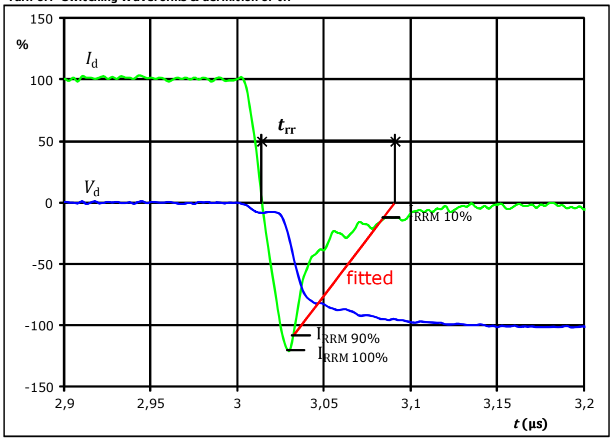
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	11,95	kW
E_{on} (100%) =	0,51	mJ
t_{Eon} =	0,118	µs

Figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

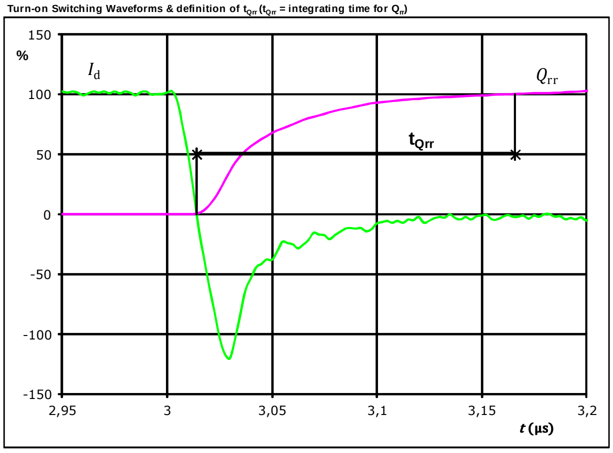


V_d (100%) =	400	V
I_d (100%) =	30	A
I_{RRM} (100%) =	-36	A
t_{rr} =	0,077	µs

Boost Switching Definitions

Figure 8. **FWD**

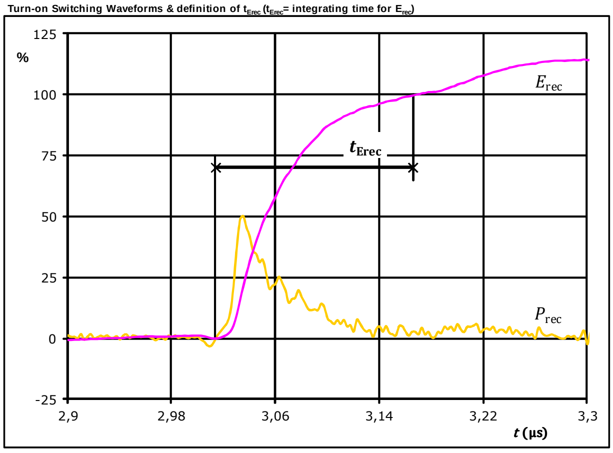
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	30	A
Q_{rr} (100%) =	1,09	µC
t_{Qrr} =	0,152	µs

Figure 9. **FWD**

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



P_{rec} (100%) =	11,95	kW
E_{rec} (100%) =	0,25	mJ
t_{Erec} =	0,152	µs

Ordering Code & Marking

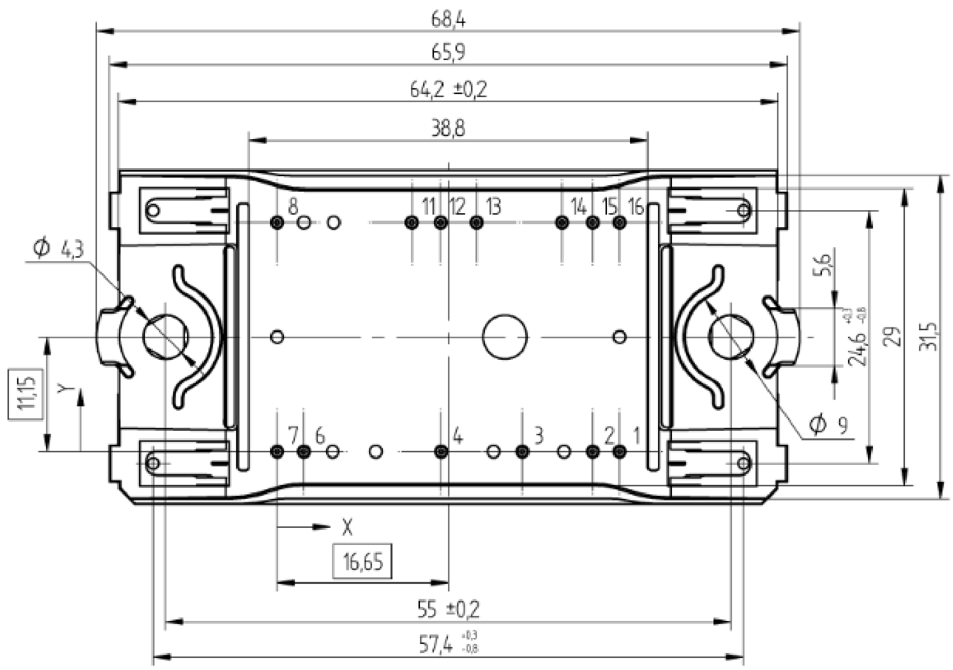
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-FZ07B2A030SM02-M575L48	M575L48	M575L48

Text	Name		Date code	UL & Vinco	Lot	Serial
	NN-NNNNNNNNNNNNNN-NNNNNNNN		WWYY	UL Vinco	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

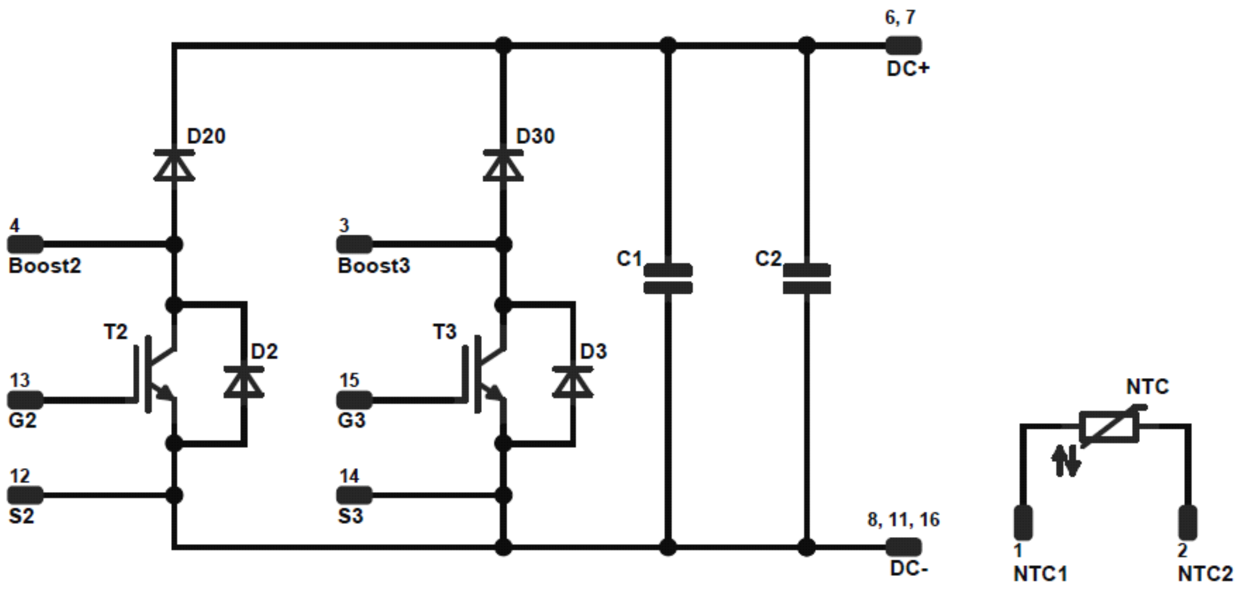
Outline

Pin table [mm]

Pin	X	Y	Function
1	33,3	0	NTC1
2	30,7	0	NTC2
3	23,85	0	Boost3
4	15,95	0	Boost2
6	2,6	0	DC+
7	0	0	DC+
8	0	22,3	DC-
11	13,1	22,3	DC-
12	15,9	22,3	S2
13	19,4	22,3	G2
14	27,7	22,3	S3
15	30,7	22,3	G3
16	33,3	22,3	DC-



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T2,T3	IGBT	650V	30A	Boost Switch	IGC10T65U8Q
D20,D30	FWD	650V	30A	Boost Diode	PCFF30S65W
D2,D3	FWD	650V	15A	Boost Inverse Diode	PCFF15S65W
C1,C2	Capacitor	1000V		DC Link Capacitor	
NTC	NTC			Thermistor	

Vincotech

Packaging instruction					
Standard packaging quantity (SPQ)	135	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-FZ07B2A030SM02-M575L48-D2-14	24 Jul. 2015	New topology name	1