Vincotech

10-FZ07NBA030SM01-P914L53
datasheet

flow BOOST 0 symmetric — **650 V / 30 A**

Features

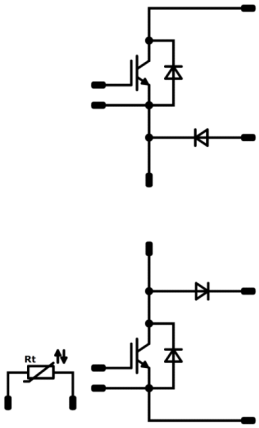
- Buck-Boost for battery management
- High speed
- High efficiency
- Compact
- Thermistor

flow 0 12mm housing

Target applications

- UPS

Schematic



Types

- 10-FZ07NBA030SM01-P914L53

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	$T_j = T_{jmax}$ T_s = 80 °C	28	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	90	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	57	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum Junction Temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	32	A
Repetitive peak forward current	I_{FRM}		180	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	61	W
Maximum Junction Temperature	T_{jmax}		175	°C
Boost Sw. Protection Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	20	A
Repetitive peak forward current	I_{FRM}		30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	36	W
Maximum Junction Temperature	T_{jmax}		175	°C
Module Properties				
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{jop}		-40…(T_{jmax} - 25)	°C
Isolation Properties				
Isolation voltage	V_{isol}	DC Test Voltage t_p = 2 s	4000	V
Creepage distance			min. 12,7	mm
Clearance			9,53	mm
Comparative Tracking Index	CTI		> 200	

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V]	I_C [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0003	25	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		30	25 125		1,69 1,92	2,22	V
Collector-emitter cut-off current	I_{CES}		0	650		25			40	µA
Gate-emitter leakage current	I_{GES}		20	0		25			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		
Gate charge	Q_g		15	520	30	25		70		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/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		

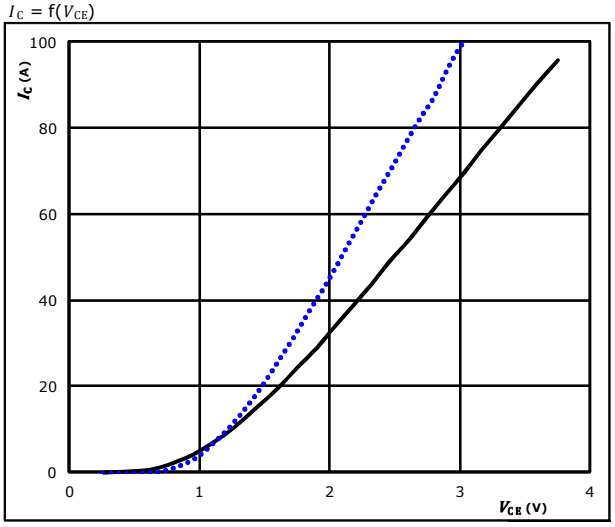
Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V]	I_C [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Boost Diode										
Static										
Forward voltage	V_F				30	25 125		2,46 2,03	2,6	V
Reverse leakage current	I_r			665		25			10	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,55		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt = 4188 A/µs di/dt = 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 Sw. Protection Diode										
Static										
Forward voltage	V_F				15	25 125		1,79 1,67	1,87	V
Reverse leakage current	I_r			650		25			0,18	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						2,65		K/W
Thermistor										
Rated resistance	R					25		4,7		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 426 Ω				100	-12		+11	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$					25		3500		K
B-value	$B_{(25/100)}$					25		3560		K
Vincotech NTC Reference									G	

Boost Switch Charateristics

Typical output characteristics **IGBT**

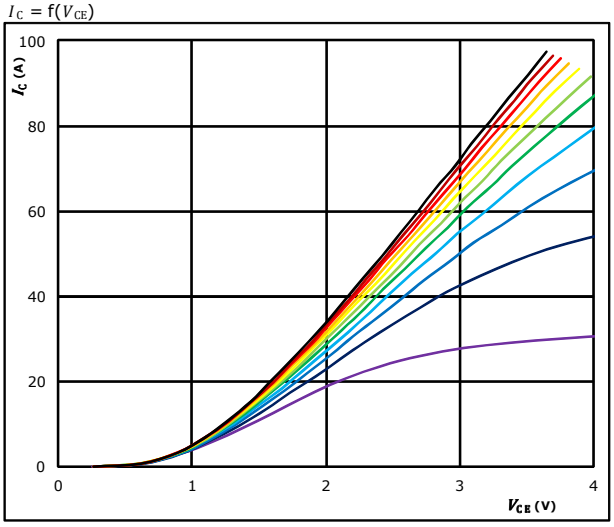
$I_C = f(V_{CE})$



t_p =	250	µs		**25 °C**
V_{GE} =	15	V	T_j:	**125 °C**

Typical output characteristics **IGBT**

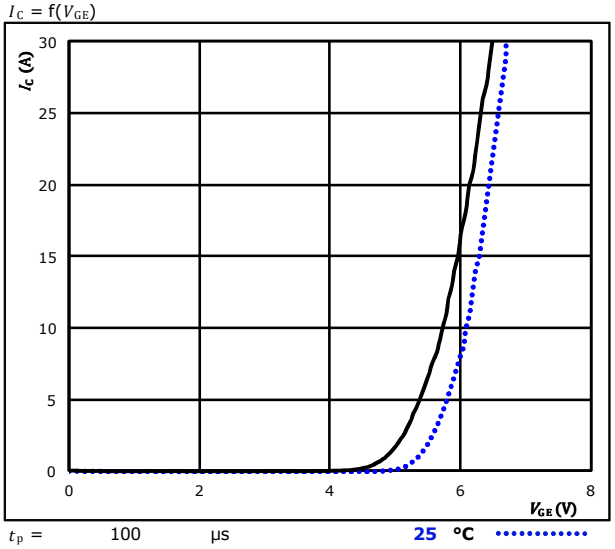
$I_C = f(V_{CE})$



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**

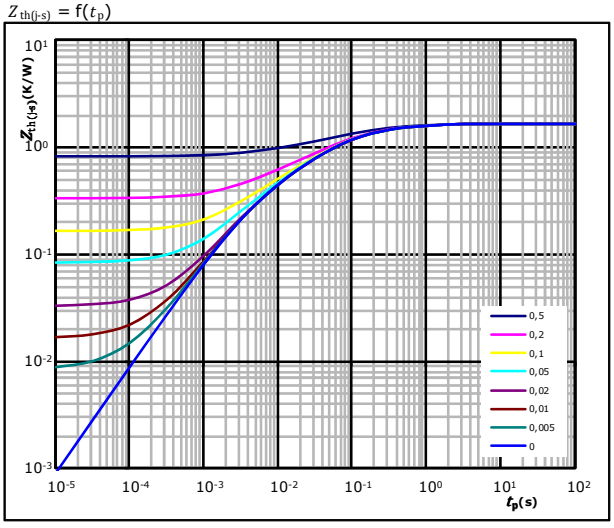
$I_C = f(V_{GE})$



t_p =	100	µs		**25 °C**
V_{CE} =	10	V	T_j:	**125 °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

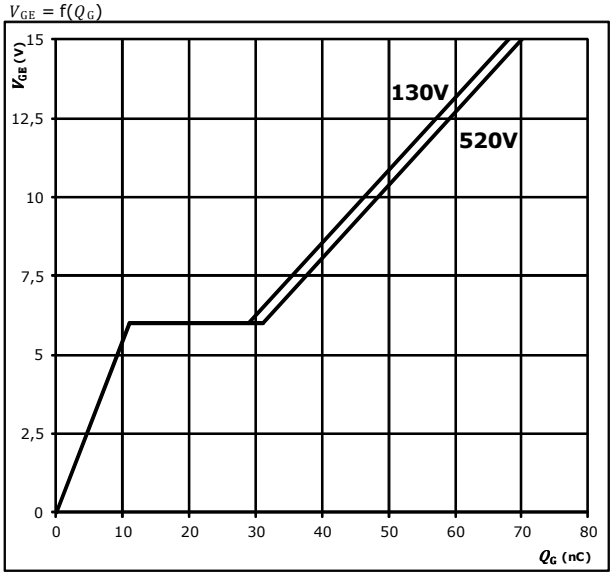
IGBT thermal model values

R (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

Boost Switch Charateristics

Gate voltage vs Gate charge **IGBT**

$V_{GE} = f(Q_G)$

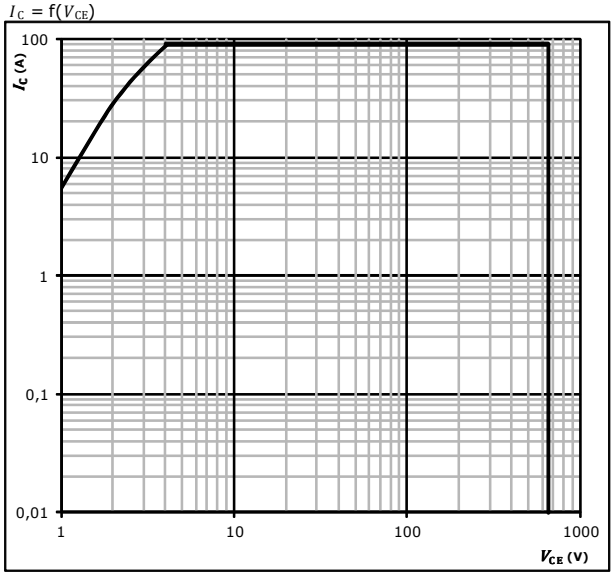


At

I_C= 30 A

Safe operating area **IGBT**

$I_C = f(V_{CE})$

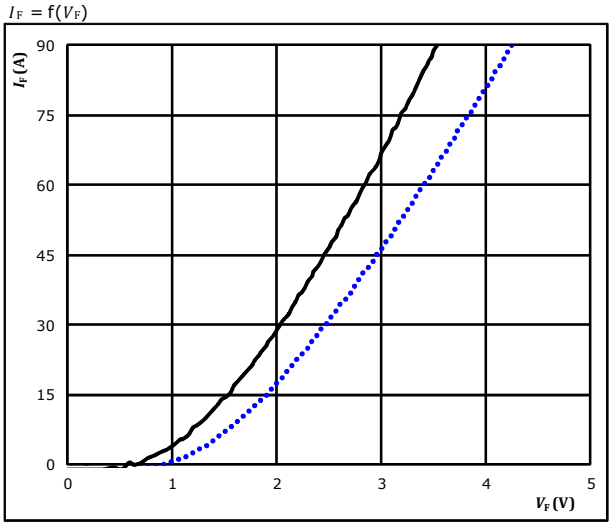


At

D =	single pulse	
T_s =	80	°C
V_{GE} =	±15	V
T_j =	T_{jmax}	°C

Boost Diode Charateristics

Typical forward characteristics **FWD**

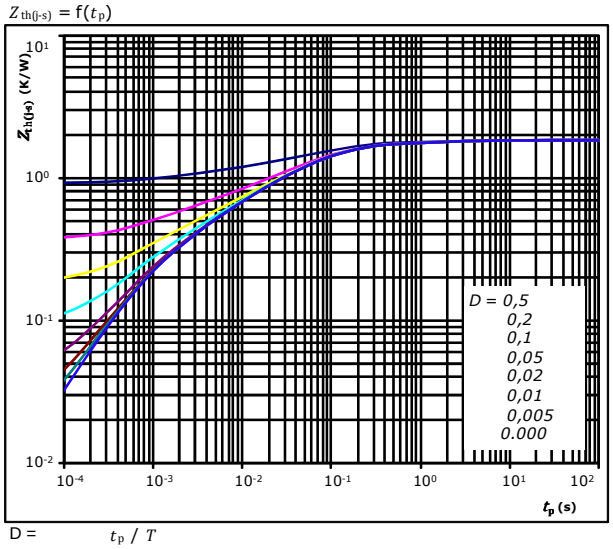


t_p = 250 µs

T_j: 25 °C

T_j: 125 °C

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



D = t_p / T

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

FWD thermal model values

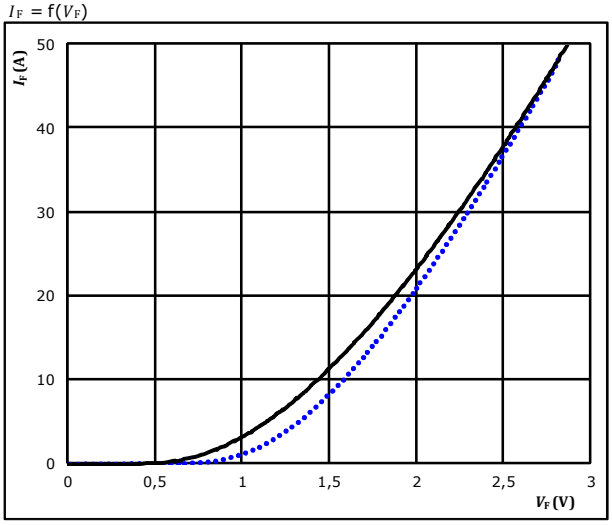
R (K/W)	τ (s)
6,0500E-02	3,6260E+00
1,5000E-01	6,4840E-01
8,2690E-01	7,6990E-02
4,0610E-01	1,5140E-02
2,1570E-01	3,4520E-03
1,7340E-01	7,3630E-04

Boost Sw. Protection Diode Charateristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



t_p = 250 µs

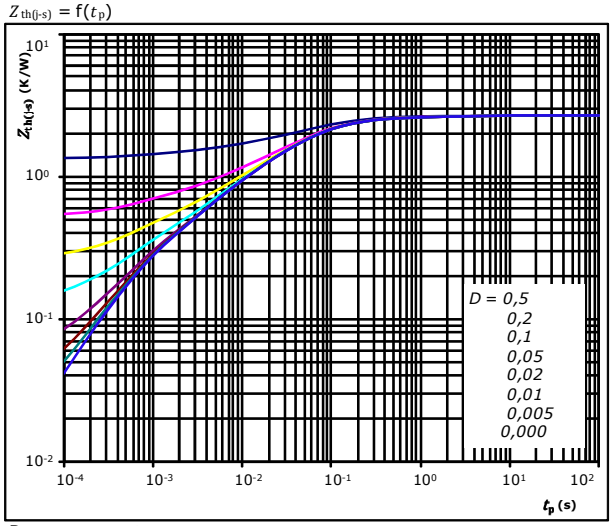
T_j: 25 °C

T_j: 125 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 2,65 K/W

FWD thermal model values

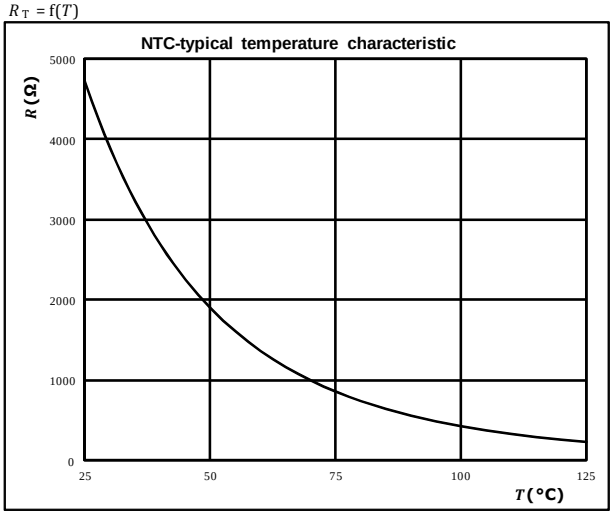
R (K/W)	τ (s)
9,91E-02	3,14E+00
2,93E-01	2,74E-01
1,19E+00	6,07E-02
5,73E-01	1,63E-02
3,07E-01	4,11E-03
1,95E-01	6,37E-04

Thermistor Charateristics

Thermistor typical temperature characteristic

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$

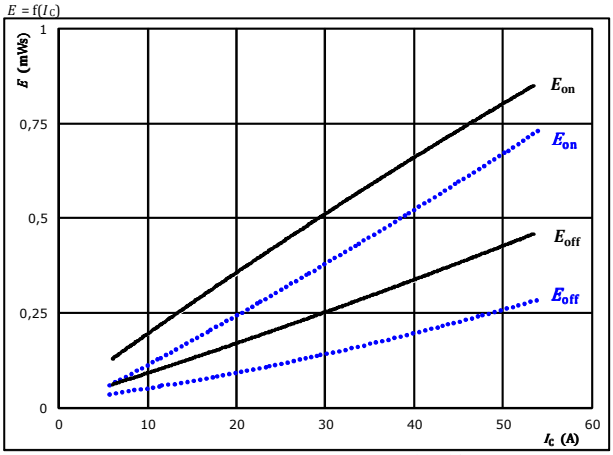


Boost Switching Charateristics

Figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



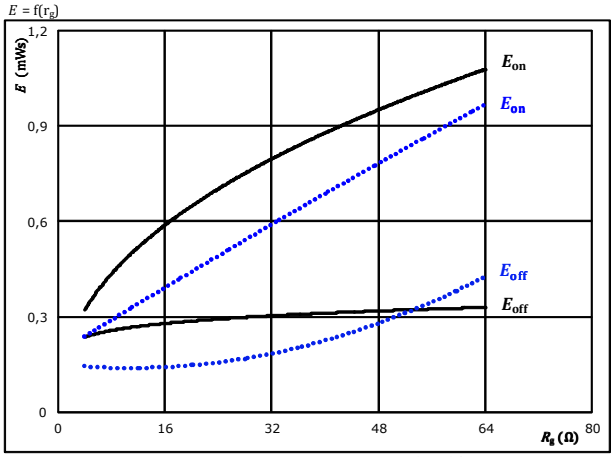
With an inductive load at — T_j: 25 °C, 125 °C

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

Figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



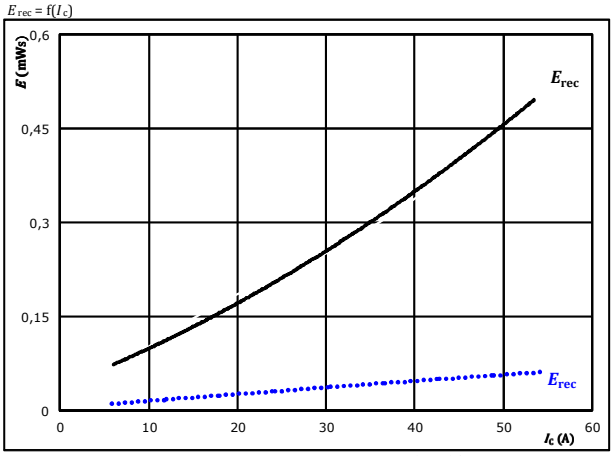
With an inductive load at — T_j: 25 °C, 125 °C

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

Figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



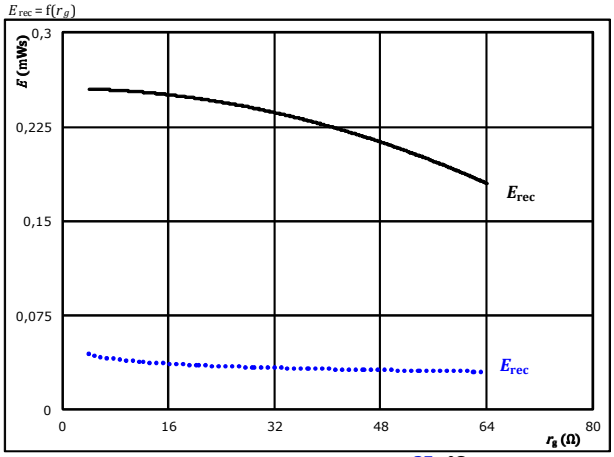
With an inductive load at — T_j: 25 °C, 125 °C

V_{CE} =	400	V
V_{GE} =	15/0	V
R_{gon} =	16	Ω

Figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(r_g)$



With an inductive load at — T_j: 25 °C, 125 °C

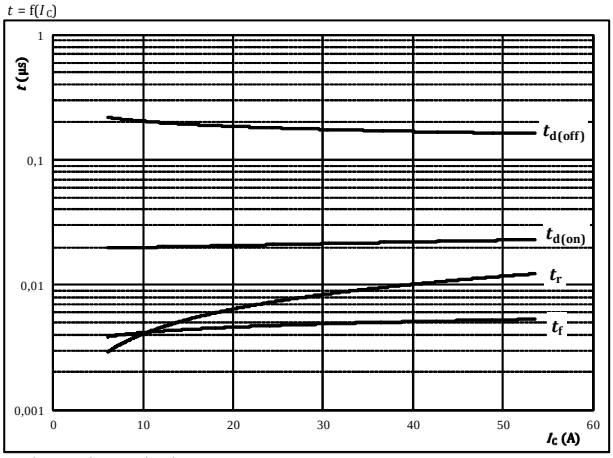
V_{CE} =	400	V
V_{GE} =	15/0	V
I_C =	30	A

Boost Switching Charateristics

Figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



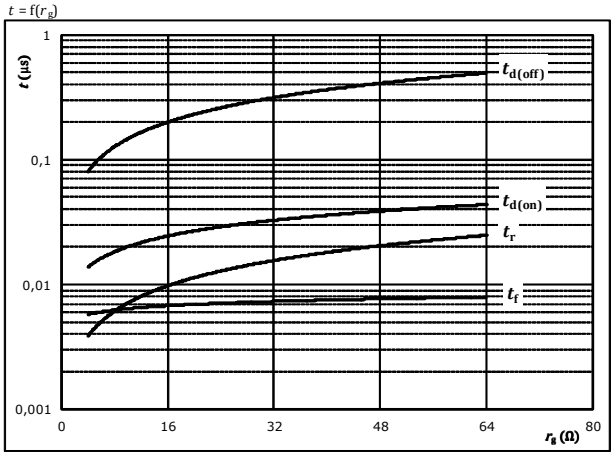
With an inductive load at

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

$t = f(r_g)$



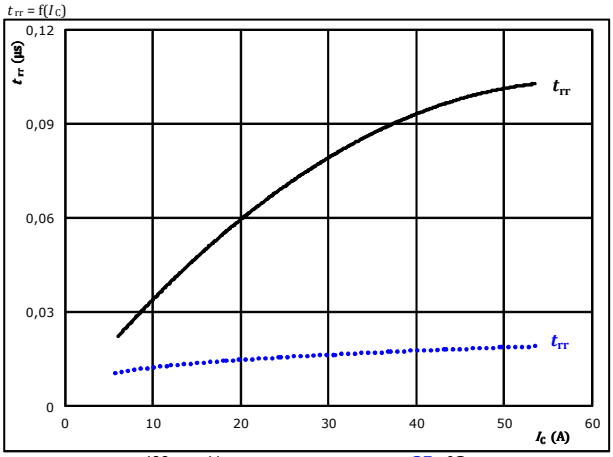
With an inductive load at

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

$t_{rr} = f(I_C)$

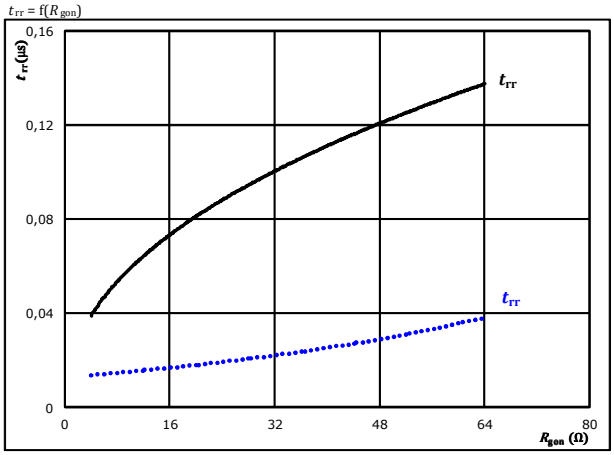


At	V_{CE} =	400	V	T_j:	25 °C
	V_{GE} =	15/0	V		125 °C
	R_{gon} =	16	Ω		

Figure 8. **FWD**

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

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



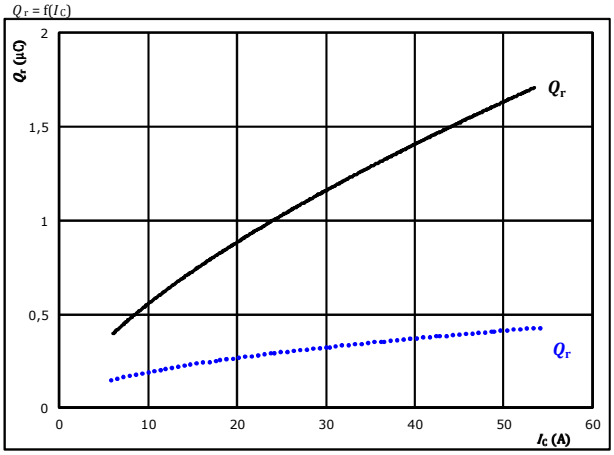
At	V_{CE} =	400	V	T_j:	25 °C
	V_{GE} =	15/0	V		125 °C
	I_C =	30	A		

Boost Switching Charateristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

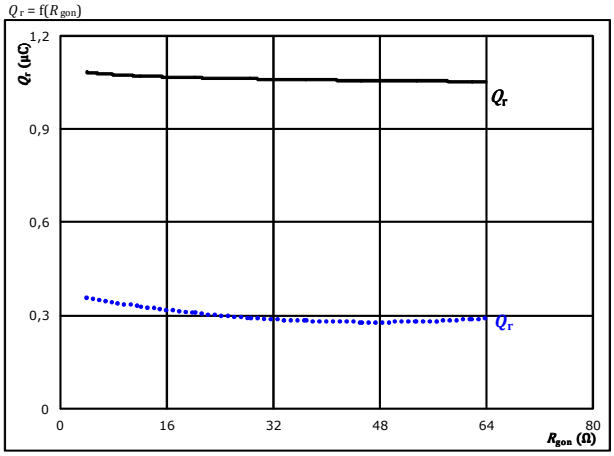


At					
	V_{CE} =	400	V		25 °C
	V_{GE} =	15/0	V	T_j:	125 °C
	R_{gon} =	16	Ω		

Figure 10. **FWD**

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

$Q_r = f(R_{gon})$

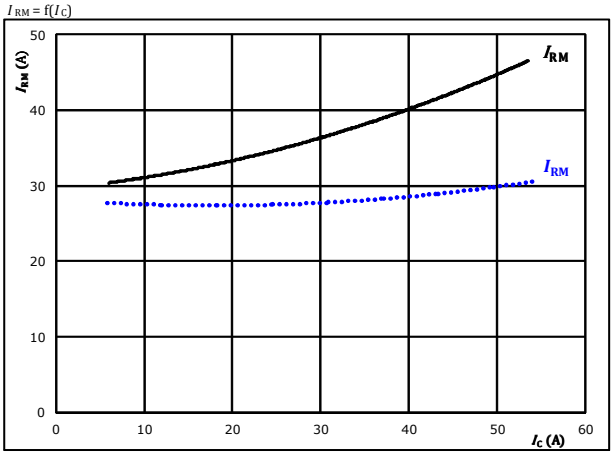


At					
	V_{CE}=	400	V		25 °C
	V_{GE} =	15/0	V	T_j:	125 °C
	I_C=	30	A		

Figure 11. **FWD**

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

$I_{RM} = f(I_C)$

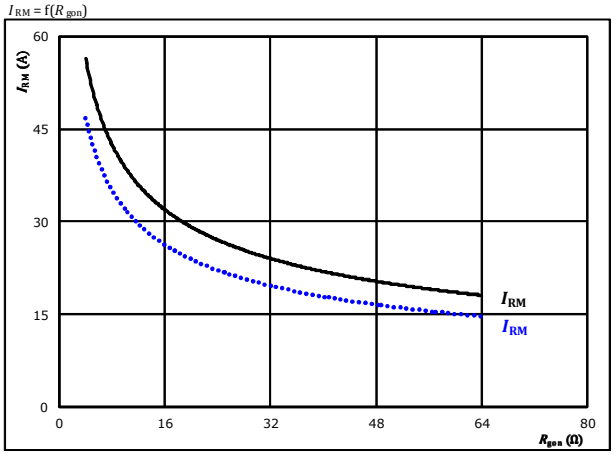


At					
	V_{CE}:	400	V		25 °C
	V_{GE} =	15/0	V	T_j:	125 °C
	R_{gon} =	16	Ω		

Figure 12. **FWD**

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

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



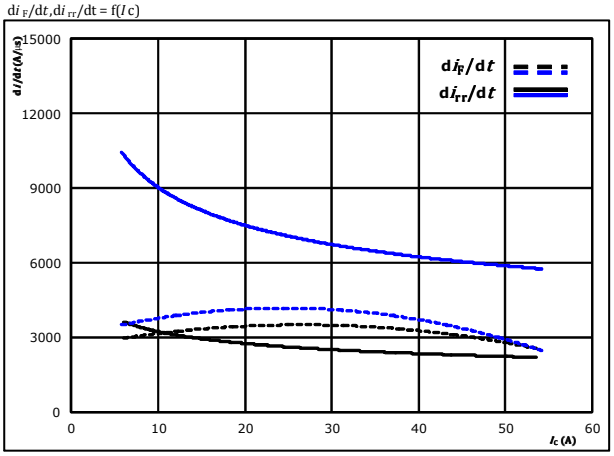
At					
	V_{CE} =	400	V		25 °C
	V_{GE} =	15/0	V	T_j:	125 °C
	I_C =	30	A		

Boost Switching Charateristics

Figure 13. FWD

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

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

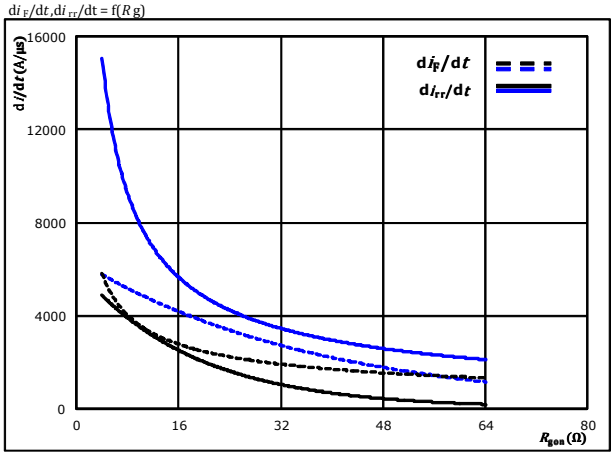


At	V_{CE} =	400	V	25 °C	.....
	V_{GE} =	15/0	V	T_j: 125 °C	———
	R_{gon} =	16	Ω		

Figure 14. FWD

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

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

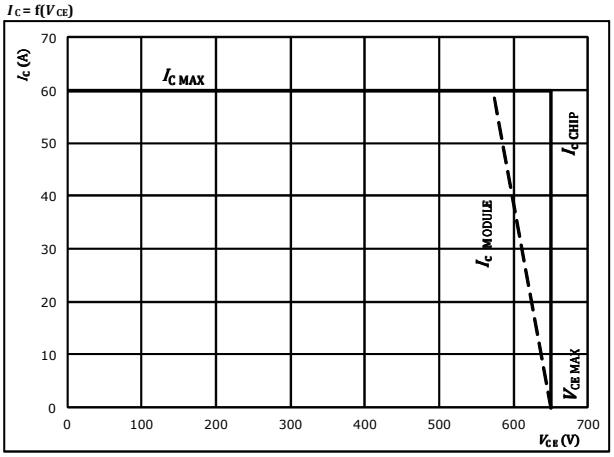


At	V_{CE} =	400	V	25 °C	.....
	V_{GE} =	15/0	V	T_j: 125 °C	———
	I_C =	30	A		

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

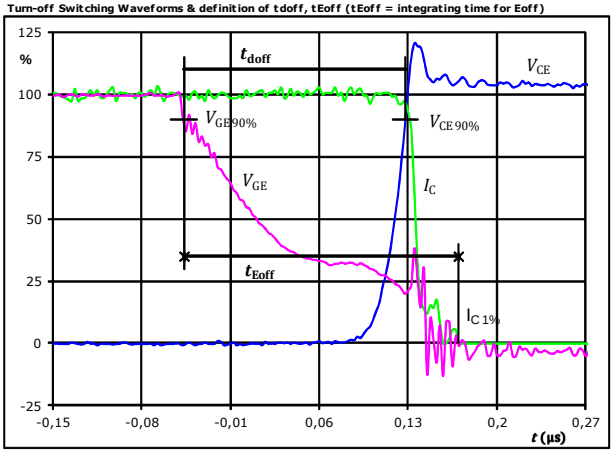
Boost Switching Definitions

General conditions

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

Figure 1. IGBT

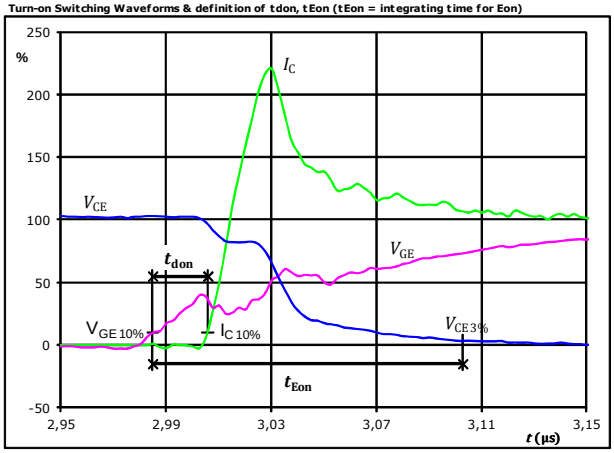
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	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

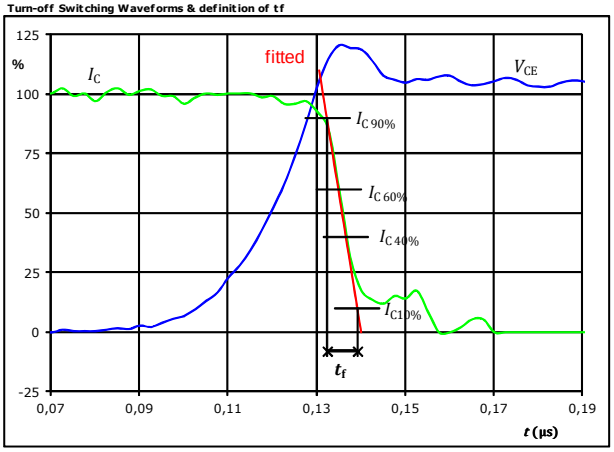
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	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

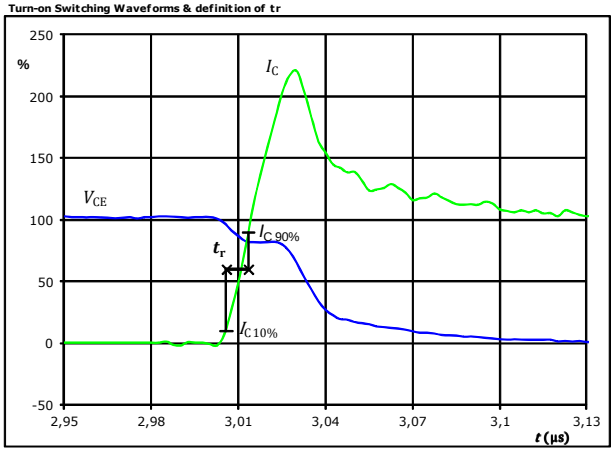
Turn-off Switching Waveforms & definition of tf



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

Figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

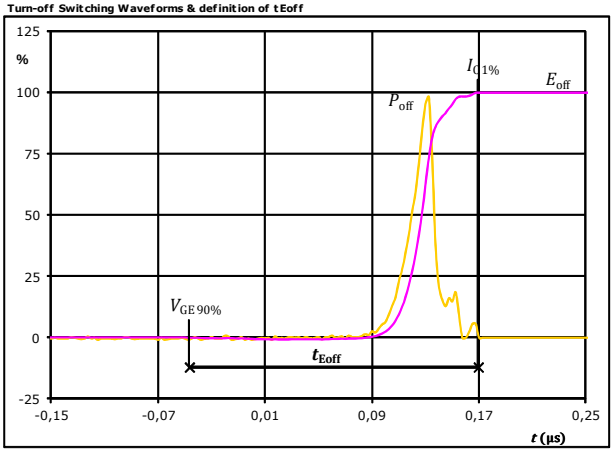


$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	30	A
t_r =	0,008	µs

Boost Switching Definitions

Figure 5. **IGBT**

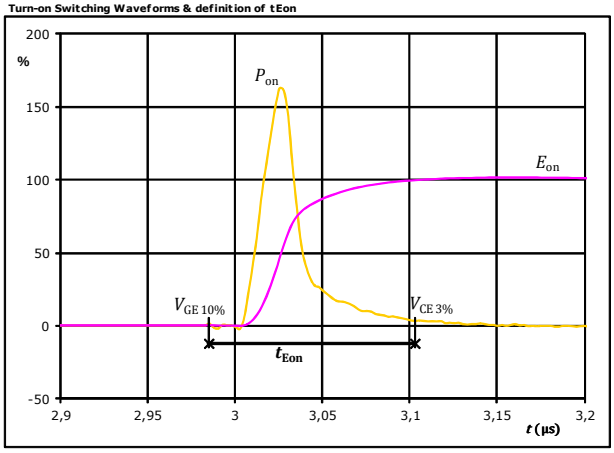
Turn-off Switching Waveforms & definition of tEoff



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

Figure 6. **IGBT**

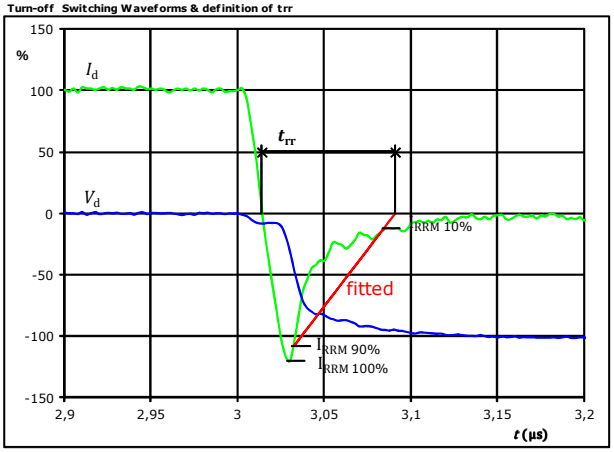
Turn-on Switching Waveforms & definition of tEon



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

Figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

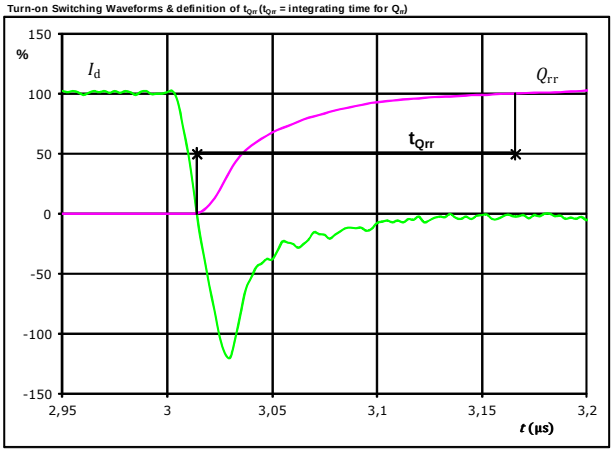


$V_d(100\%)$ =	400	V
$I_d(100\%)$ =	30	A
$I_{RRM}(100\%)$ =	-36	A
t_{rr} =	0,077	µs

Boost Switching Definitions

Figure 8. **FWD**

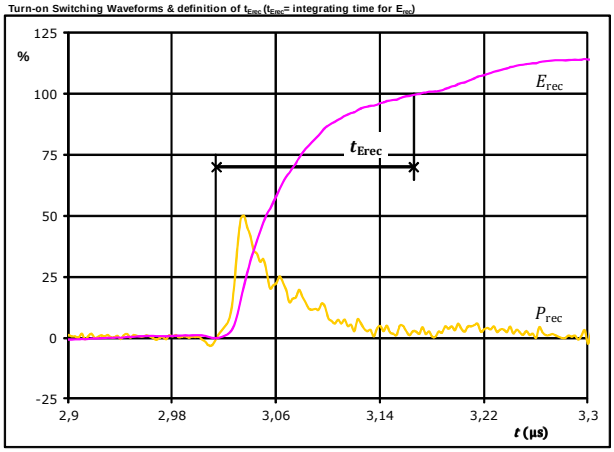
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



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

Vincotech

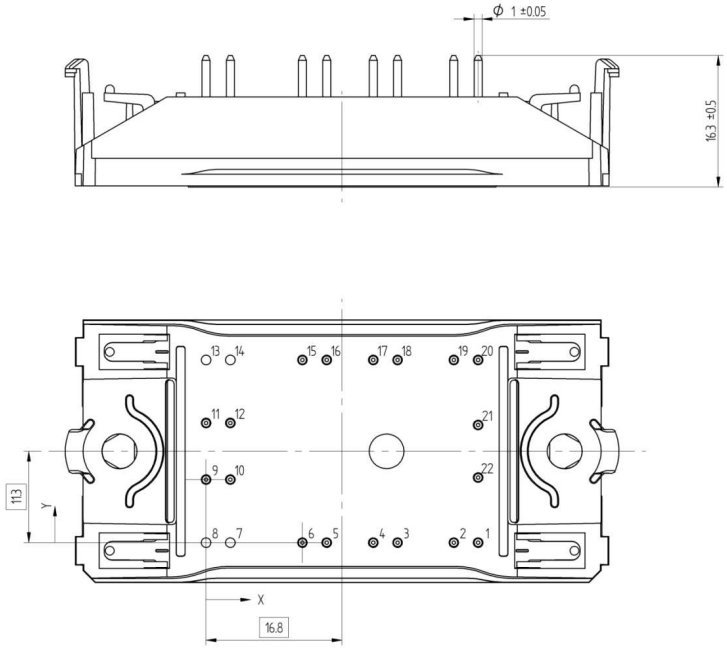
Ordering Code & Marking

Version	Ordering Code
without thermal paste 12mm housing	10-FZ07NBA030SM01-P914L53

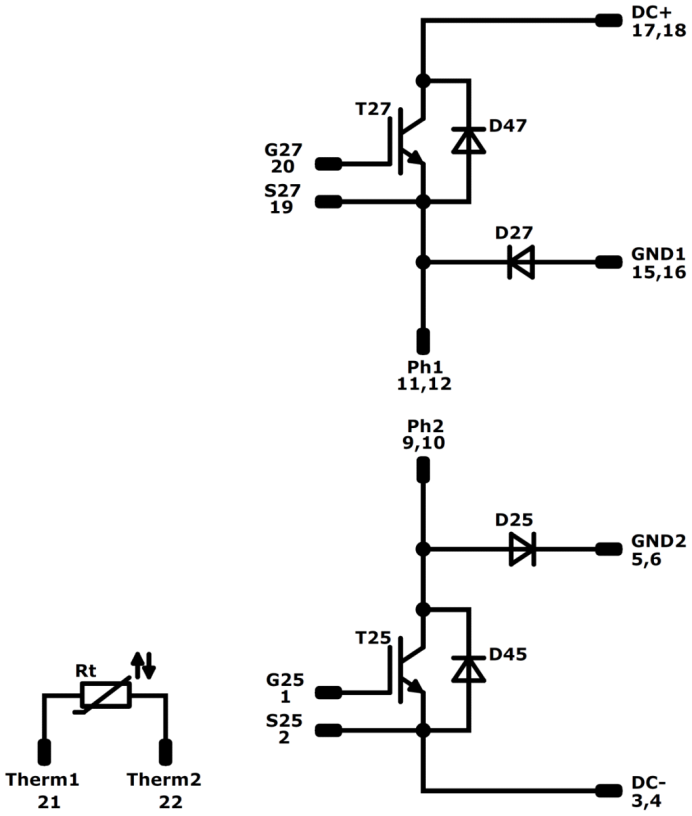
		Name		Date code	UL & VIN	Lot	Serial
Text		NN-NNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
		Type&Ver	**Lot number**	**Serial**	**Date code**		
Datamatrix		TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	33,6	0	G25
2	30,6	0	S25
3	23,65	0	DC-
4	20,65	0	DC-
5	14,9	0	GND2
6	11,9	0	GND2
7	Not assembled		
8	Not assembled		
9	0	7,8	Ph2
10	3	7,8	Ph2
11	0	14,8	Ph1
12	3	14,8	Ph1
13	Not assembled		
14	Not assembled		
15	11,9	22,6	GND1
16	14,9	22,6	GND1
17	20,65	22,6	DC+
18	23,65	22,6	DC+
19	30,6	22,6	S27
20	33,6	22,6	G27
21	33,6	14,55	Therm1
22	33,6	8,05	Therm2



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T25, T27	IGBT	650 V	30 A	Boost Switch	
D25, D27	FWD	650 V	30 A	Boost Diode	
D45, D47	FWD	650 V	15 A	Boost Sw. Protection Diode	
Rt	NTC			Thermistor	

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

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

Package data
Package data for *flow* 0 packages see vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-FZ07NBA030SM01-P914L53-D1-14	02 May. 2016		