Vincotech

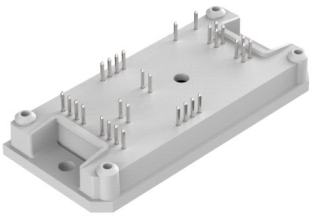
10-FY07NBA100SM-M506L48
datasheet

***flow* BOOST 1 symmetric** **650 V / 100 A**

Features

- High efficient and compact symmetric booster
- High switching frequency and low inductive design
- Low losses with TRENCHSTOP™ H5 IGBT
- Integrated temperature sensor

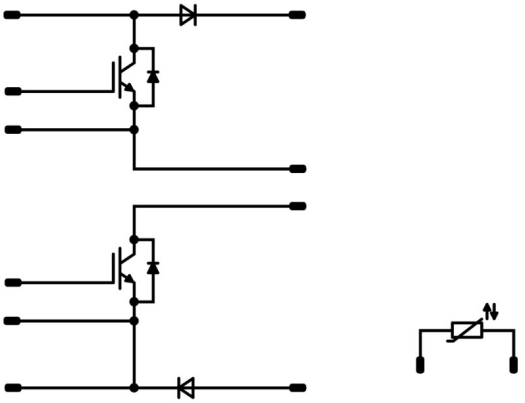
flow 1 12 mm housing



Target applications

- Charging Stations
- Solar Inverters
- UPS

Schematic



Types

- 10-FY07NBA100SM-M506L48

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	62	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	100	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}		600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	101	A
Surge (non-repetitive) forward current	I_{FSM}	60 Hz Single Half Sine Wave T_j = 150 °C	1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	117	W
Maximum Junction Temperature	T_{jmax}		150	°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	21	A
Repetitive peak forward current	I_{FRM}		30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	40	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	6000	V
		AC Voltage t_p = 1 min	2500	V
Creepage distance			min. 12,7	mm
Clearance			8,44	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,001	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CEsat}		15		100	25 125 150		1,77 1,86 1,91	2,1	V
Collector-emitter cut-off current	I_{CES}		0	650		25			100	µA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f= 1 MHz	0	25		25		6560		pF
Output capacitance	C_{oes}							97		
Reverse transfer capacitance	C_{res}							21		
Gate charge	Q_g		15	520	100	25		210		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,95		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	15/0	350	96	25 125 150		32 31 31		ns
Rise time	t_r					25 125 150		20 20 21		
Turn-off delay time	$t_{d(off)}$					25 125 150		129 145 149		
Fall time	t_f					25 125 150		6 11 14		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 1,3 µC Q_{rFWD} = 4,8 µC Q_{rFWD} = 6,1 µC				25 125 150		2,43 4,00 4,50		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,62 1,06 1,17		

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Diode										
Static										
Forward voltage	V_F				120	25 125		1,47 1,29	1,7	V
Reverse leakage current	I_r			600		25 125			200 1000	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,60		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 1952 A/µs di/dt = 889 A/µs di/dt = 965 A/µs	15/0	350	96	25 125 150		39 75 87		A
Reverse recovery time	t_{rr}					25 125 150		51 99 110		ns
Recovered charge	Q_r					25 125 150		1,34 4,77 6,08		µC
Reverse recovered energy	E_{rec}					25 125 150		0,146 0,519 0,703		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		2631 3586 4556		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						2,36		K/W

Characteristic Values

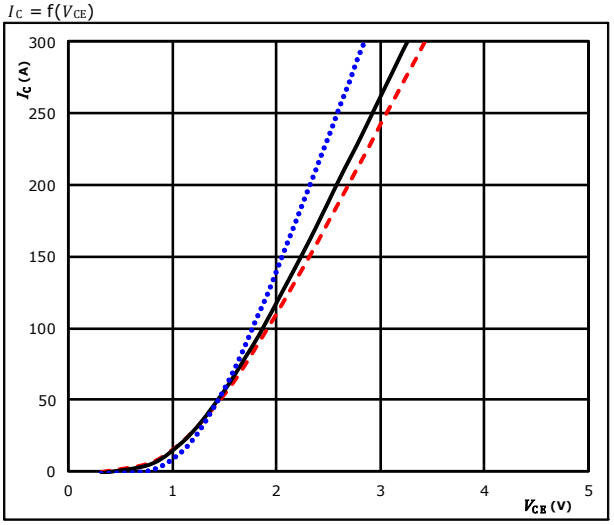
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %				25		3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %				25		4000		K
Vincotech NTC Reference									I	

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

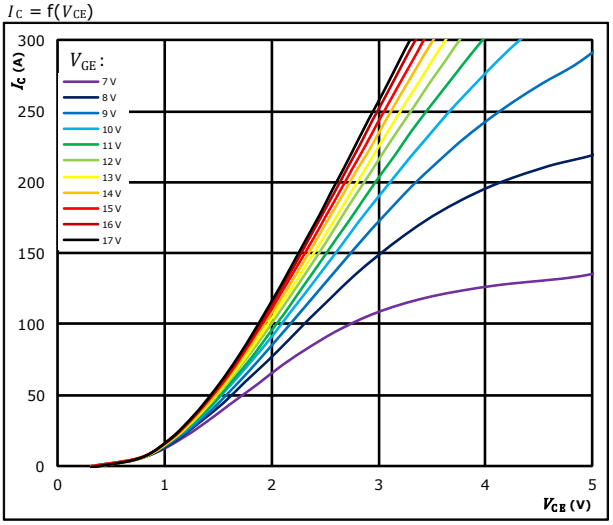


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

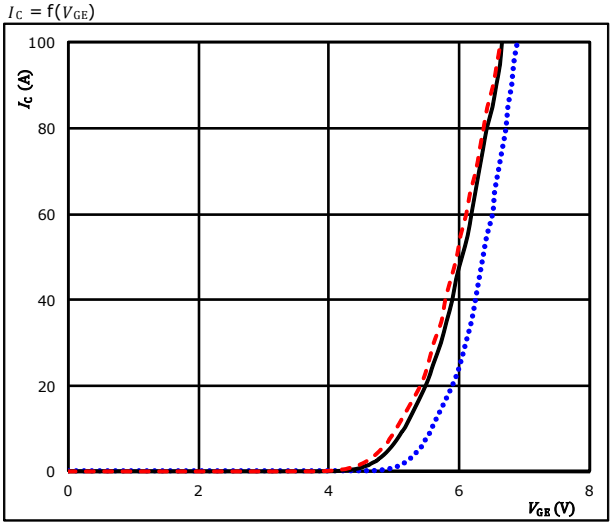


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

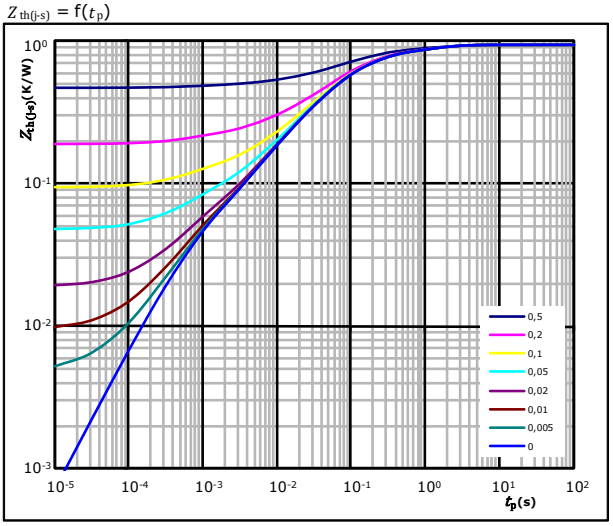


t_p =	100	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,95	K/W

IGBT thermal model values

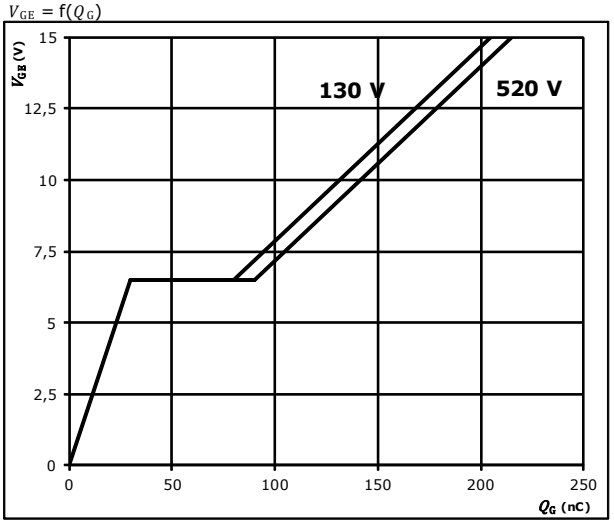
R (K/W)	τ (s)
1,57E-01	1,21E+00
3,43E-01	1,58E-01
3,28E-01	4,39E-02
9,05E-02	7,74E-03
3,40E-02	6,69E-04

Boost Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

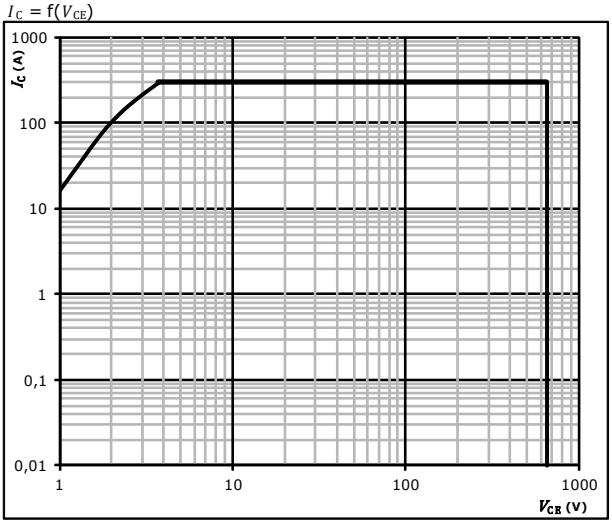


I_C= 100 A

figure 6. **IGBT**

Safe operating area

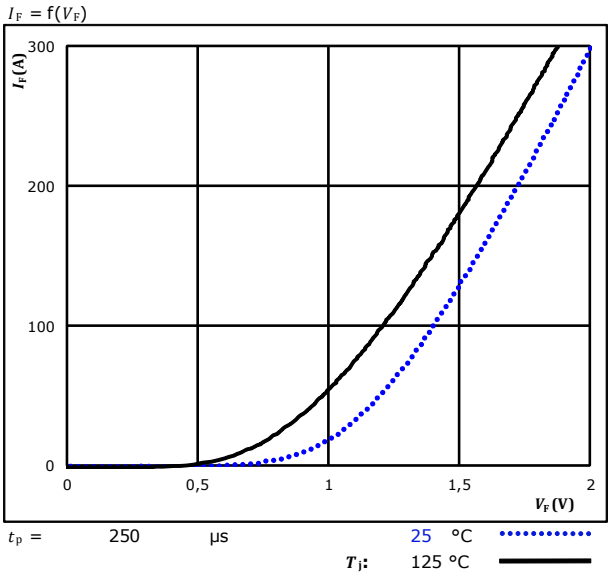
$I_C = f(V_{CE})$



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

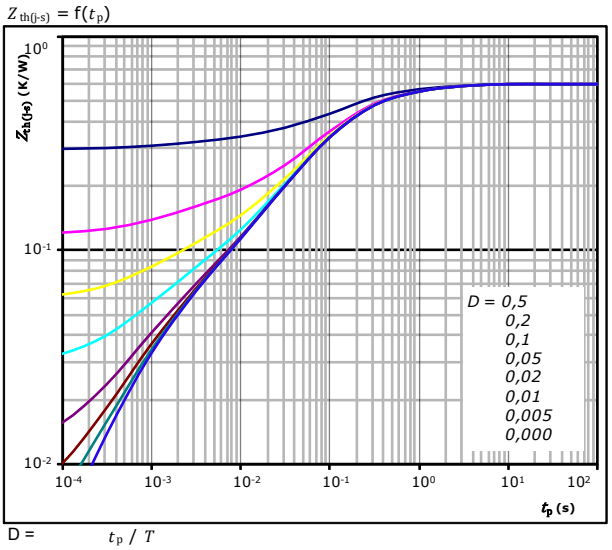
Boost Diode Characteristics

figure 1. **FWD**
Typical forward characteristics



t_p = 250 µs
25 °C
T_j: 125 °C

figure 2. **FWD**
Transient thermal impedance as a function of pulse width



D = t_p / T
$R_{th(j-s)}$ = 0,60 K/W

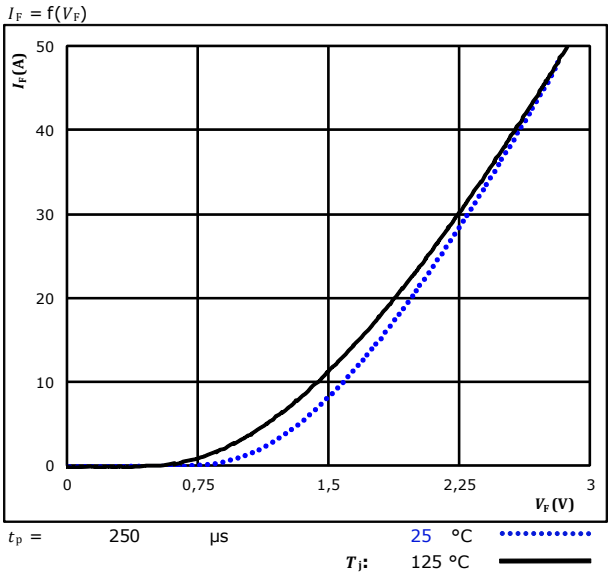
FWD thermal model values

R (K/W)	τ (s)
7,22E-02	1,72E+00
1,60E-01	2,95E-01
2,60E-01	8,21E-02
5,87E-02	1,22E-02
3,26E-02	1,76E-03
1,19E-02	4,78E-04

Boost Sw. Protection Diode Characteristics

figure 1. **FWD**

Typical forward characteristics



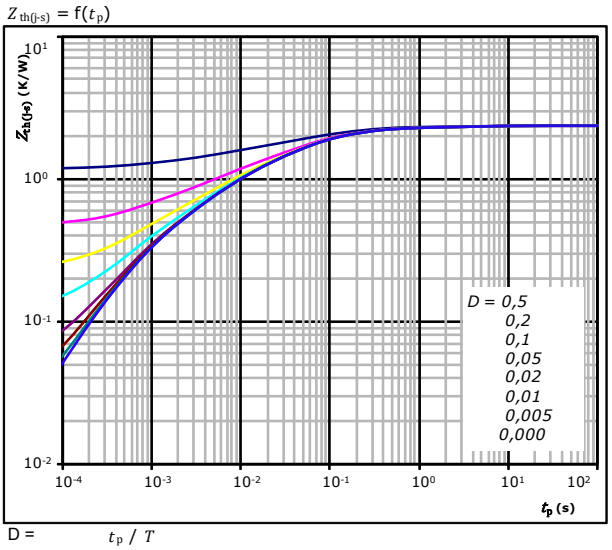
t_p = 250 µs

25 °C

T_j: 125 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width



D = t_p / T

$R_{th(j-s)}$ = 2,36 K/W

FWD thermal model values

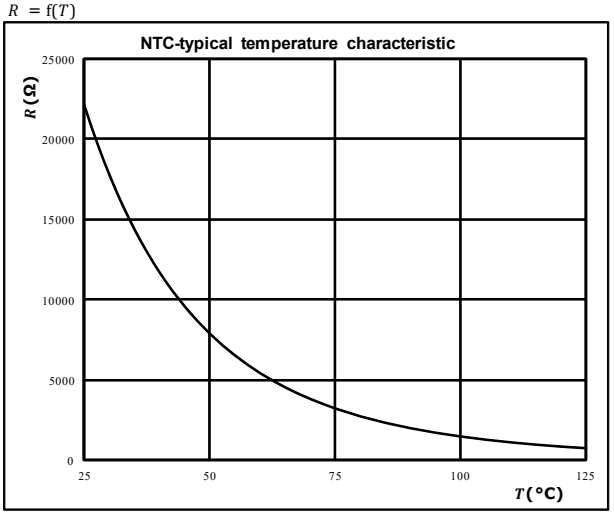
R (K/W)	τ (s)
9,10E-02	3,90E+00
2,66E-01	3,08E-01
8,25E-01	6,57E-02
5,40E-01	1,54E-02
4,23E-01	3,41E-03
2,13E-01	5,87E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

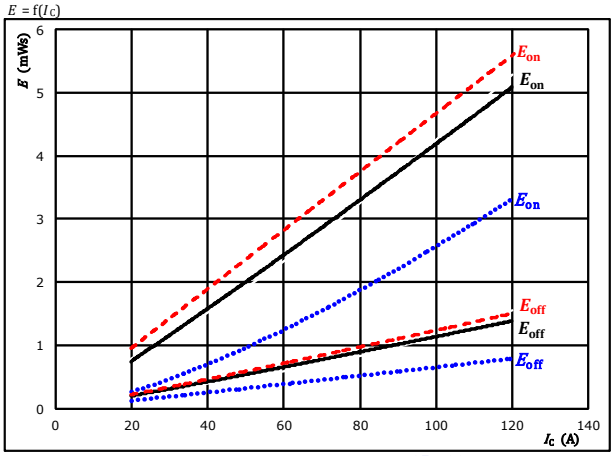


Boost Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



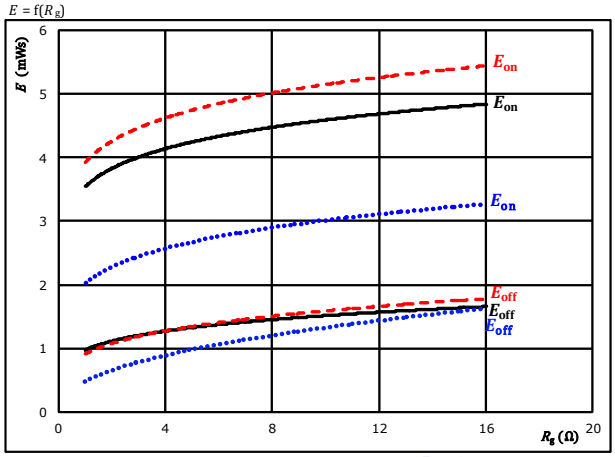
With an inductive load at

V_{CE} =	350	V	T_J:	25 °C	·····
V_{GE} =	15/0	V		125 °C	———
R_{gon} =	4	Ω		150 °C	– – –
R_{goff} =	4	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



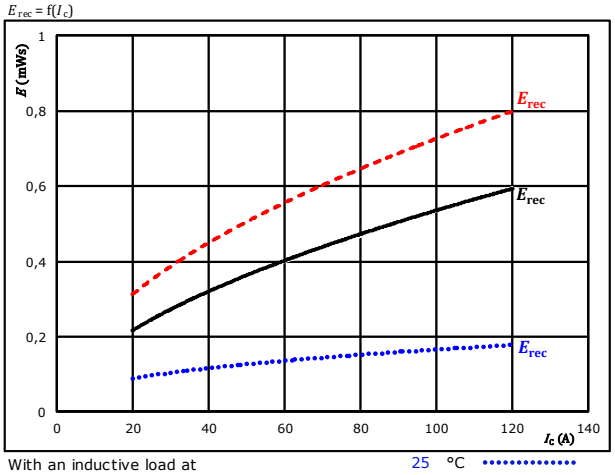
With an inductive load at

V_{CE} =	350	V	T_J:	25 °C	·····
V_{GE} =	15/0	V		125 °C	———
I_C =	96	A		150 °C	– – –

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



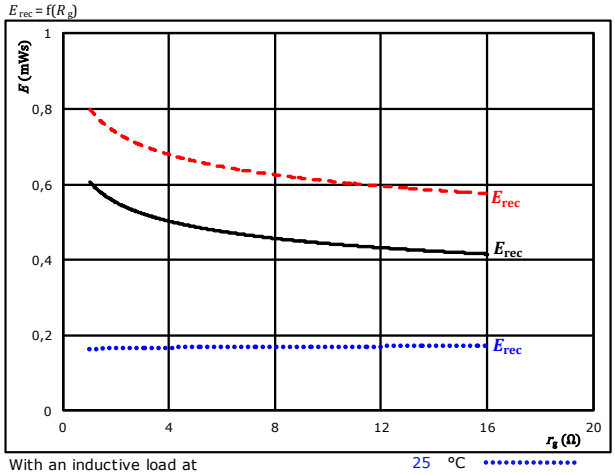
With an inductive load at

V_{CE} =	350	V	T_J:	25 °C	·····
V_{GE} =	15/0	V		125 °C	———
R_{gon} =	4	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

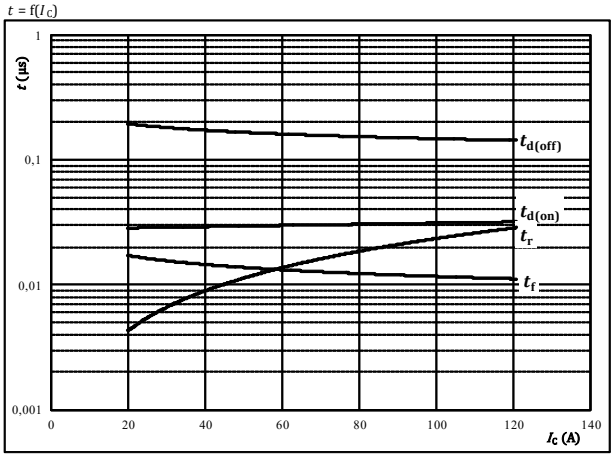
V_{CE} =	350	V	T_J:	25 °C	·····
V_{GE} =	15/0	V		125 °C	———
I_C =	96	A		150 °C	– – –

Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



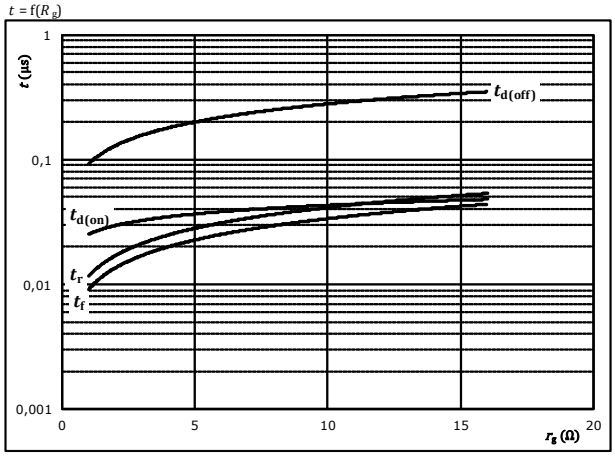
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	15/0	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



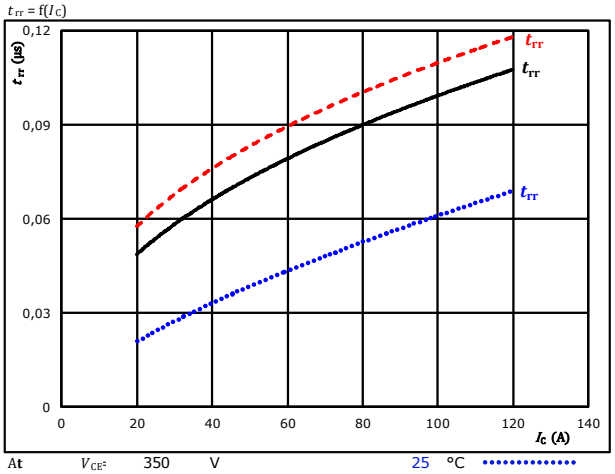
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	15/0	V
I_C =	96	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

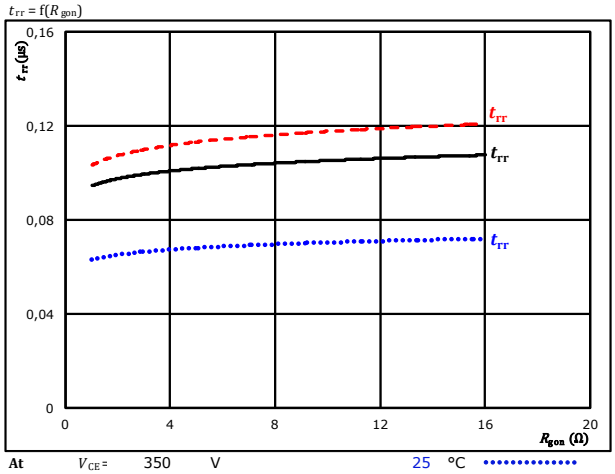


At	V_{CE} =	350	V	T_j:	25 °C
	V_{GE} =	15/0	V		125 °C
	R_{gon} =	4	Ω		150 °C

figure 8. FWD

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

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



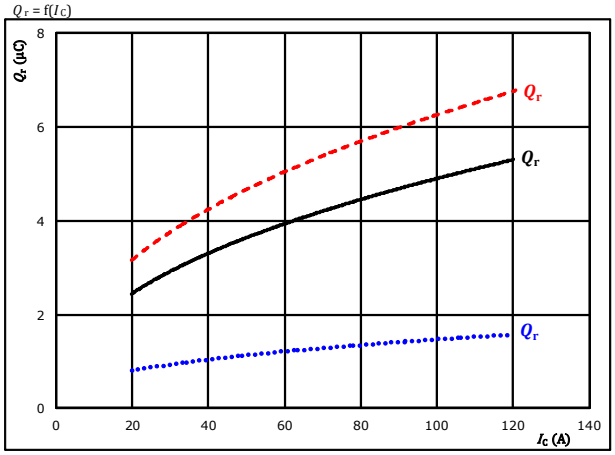
At	V_{CE} =	350	V	T_j:	25 °C
	V_{GE} =	15/0	V		125 °C
	I_C =	96	A		150 °C

Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

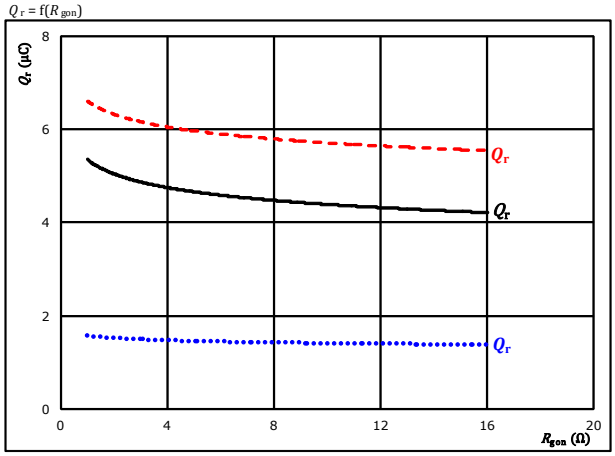


At						
	V_{CE} =	350	V		25 °C	
	V_{GE} =	15/0	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 10. FWD

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

$Q_r = f(R_{gon})$

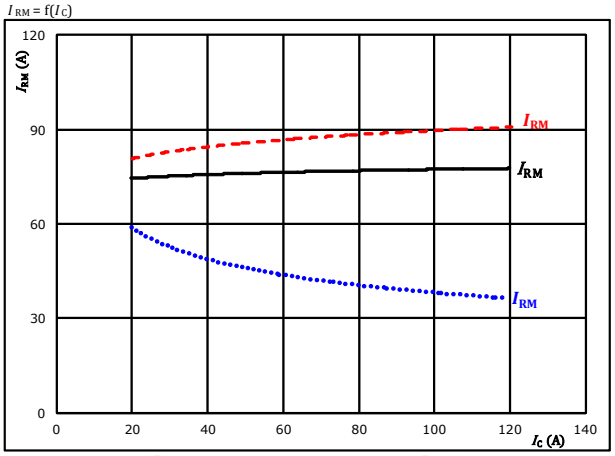


At						
	V_{CE}=	350	V		25 °C	
	V_{GE} =	15/0	V	T_j:	125 °C	
	I_C=	96	A		150 °C	

figure 11. FWD

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

$I_{RM} = f(I_C)$

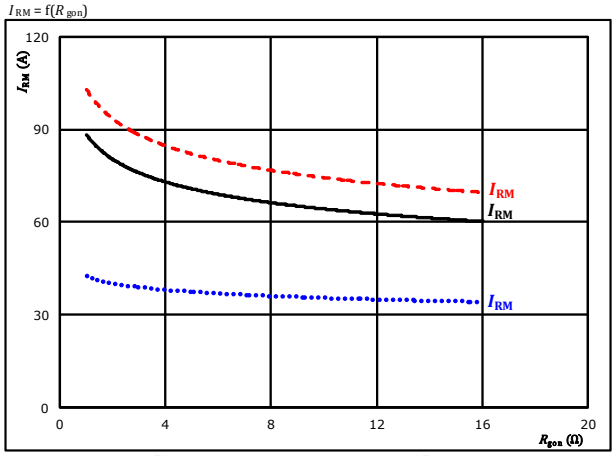


At						
	V_{CE}:	350	V		25 °C	
	V_{GE} =	15/0	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 12. FWD

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

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



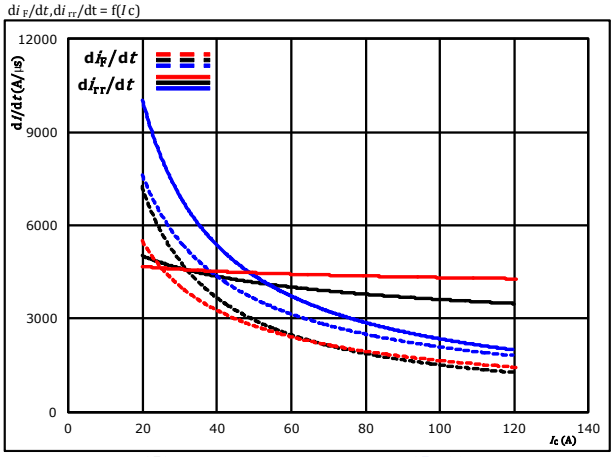
At						
	V_{CE} =	350	V		25 °C	
	V_{GE} =	15/0	V	T_j:	125 °C	
	I_C =	96	A		150 °C	

Boost Switching Characteristics

figure 13. **FWD**

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

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

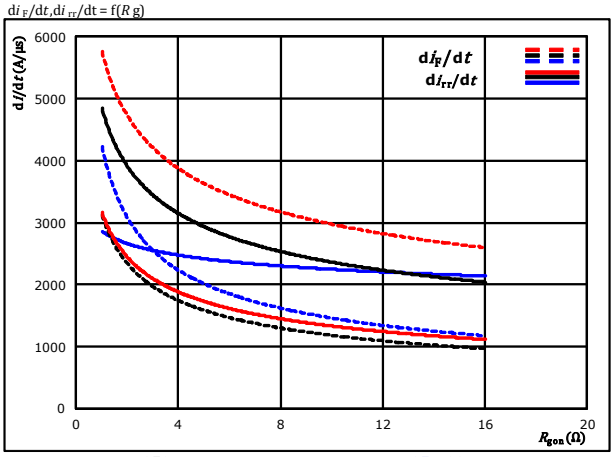


At					
V_{CE} =	350	V		25 °C	
V_{GE} =	15/0	V	T_j:	125 °C	
R_{gon} =	4	Ω		150 °C	

figure 14. **FWD**

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

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

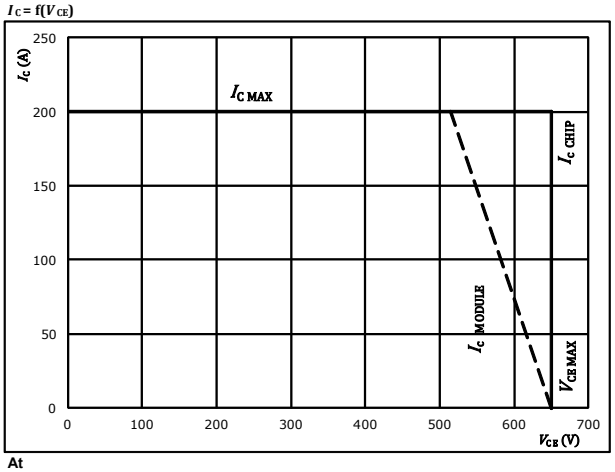


At					
V_{CE} =	350	V		25 °C	
V_{GE} =	15/0	V	T_j:	125 °C	
I_C =	96	A		150 °C	

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	175	°C
R_{gon} =	4	Ω
R_{goff} =	4	Ω

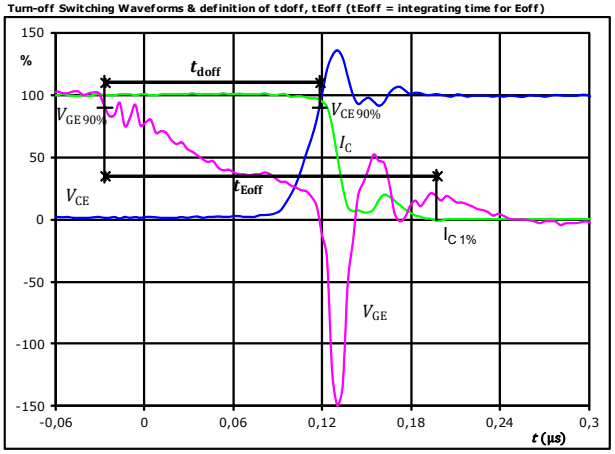
Boost Switching Definitions

General conditions

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

figure 1. IGBT

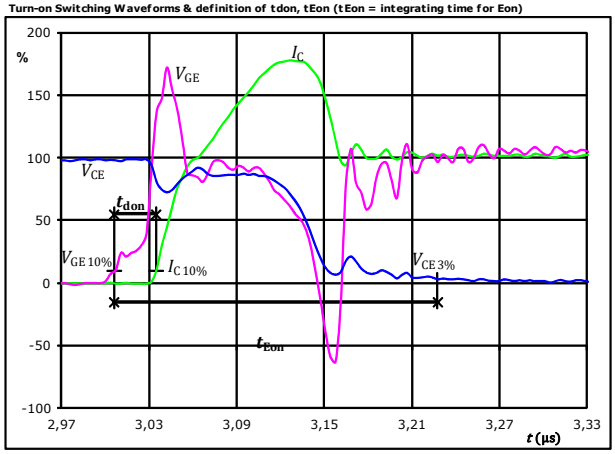
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	95	A
t_{doff} =	0,145	µs
t_{Eoff} =	0,224	µs

figure 2. IGBT

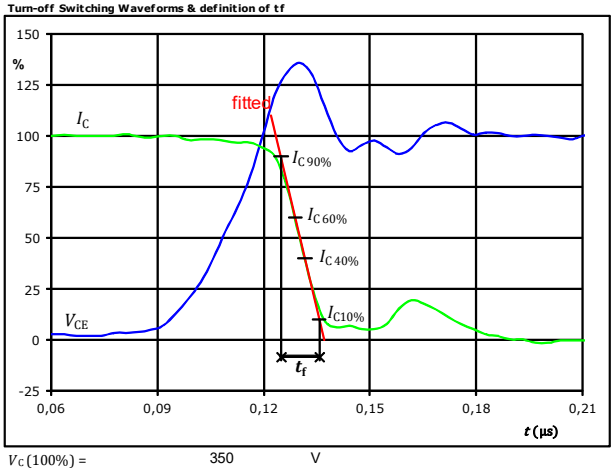
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	95	A
t_{don} =	0,031	µs
t_{Eon} =	0,222	µs

figure 3. IGBT

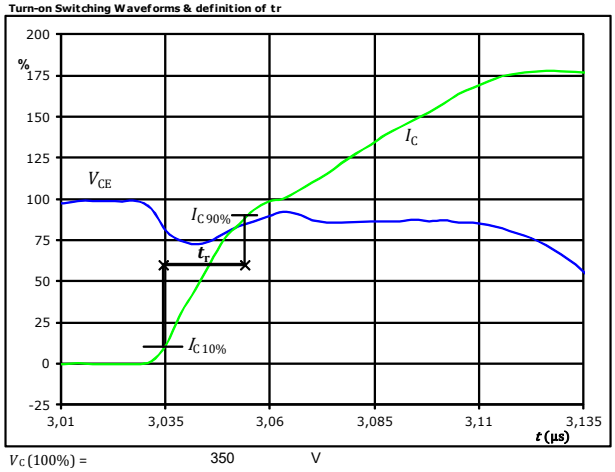
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	95	A
t_f =	0,011	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

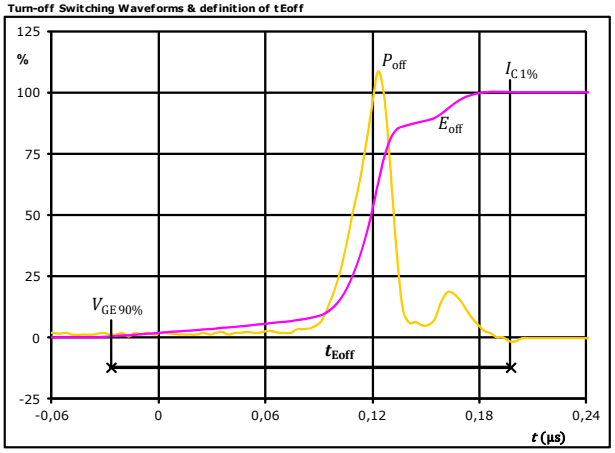


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	95	A
t_r =	0,020	µs

Boost Switching Characteristics

figure 5. **IGBT**

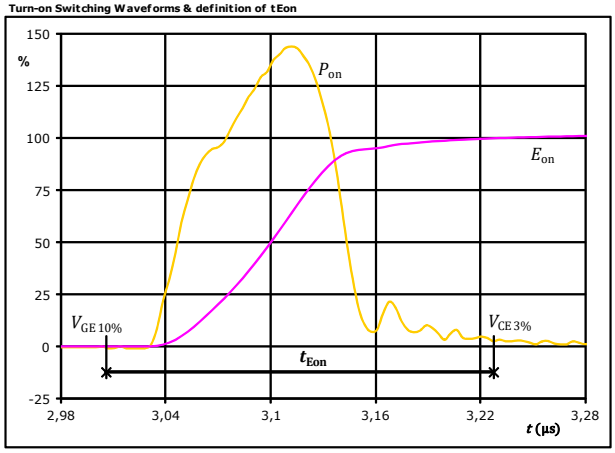
Turn-off Switching Waveforms & definition of tEoff



$P_{off}(100\%)$ =	33,21	kW
$E_{off}(100\%)$ =	1,06	mJ
t_{Eoff} =	0,22	µs

figure 6. **IGBT**

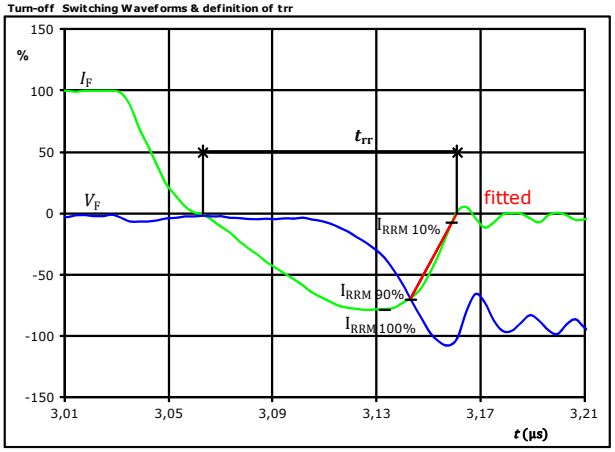
Turn-on Switching Waveforms & definition of tEon



$P_{on}(100\%)$ =	33,21	kW
$E_{on}(100\%)$ =	4,00	mJ
t_{Eon} =	0,22	µs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

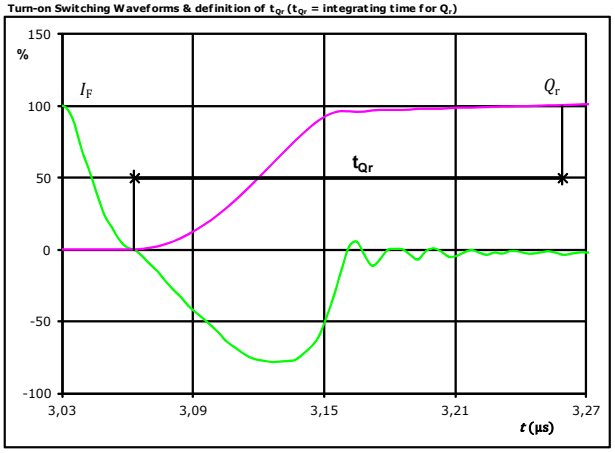


$V_F(100\%)$ =	350	V
$I_F(100\%)$ =	95	A
$I_{RRM}(100\%)$ =	-75	A
t_{rr} =	0,099	µs

Boost Switching Characteristics

figure 8. **FWD**

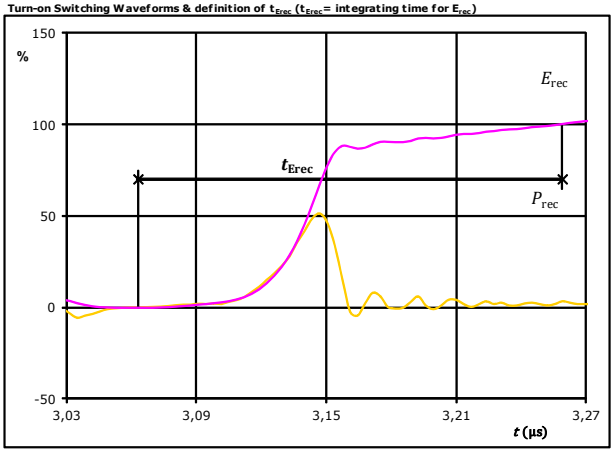
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	95	A
Q_r (100%) =	4,77	µC
t_{Qr} =	0,20	µs

figure 9. **FWD**

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



P_{rec} (100%) =	33,21	kW
E_{rec} (100%) =	0,52	mJ
t_{Erec} =	0,20	µs

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Ordering Code & Marking

Version	Ordering Code
without thermal paste 12 mm housing with solder pins	10-FY07NBA100SM-M506L48
with thermal paste 12 mm housing with solder pins	10-FY07NBA100SM-M506L48-/3/

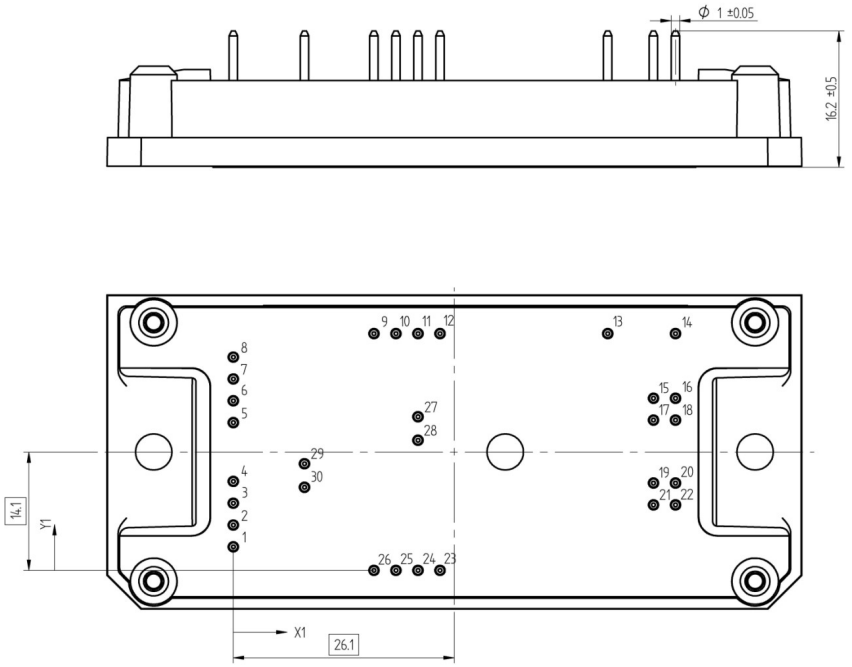
NN-NNNNNNNNNNNNN
TTTTTTVV WWYY UL
VIN LLLLL SSSS

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

Outline

Pin table

Pin	X	Y	Function
1	0	2,8	GND+
2	0	5,4	GND+
3	0	8	GND+
4	0	10,6	GND+
5	0	17,6	GND-
6	0	20,2	GND-
7	0	22,8	GND-
8	0	25,4	GND-
9	16,6	28,2	DC-
10	19,2	28,2	DC-
11	21,8	28,2	DC-
12	24,4	28,2	DC-
13	44,2	28,2	NTC1
14	52,2	28,2	NTC2
15	49,6	20,5	B-
16	52,2	20,5	B-
17	49,6	17,9	B-
18	52,2	17,9	B-
19	49,6	10,4	B+
20	52,2	10,4	B+
21	49,6	7,8	B+
22	52,2	7,8	B+
23	24,4	0	DC+
24	21,8	0	DC+
25	19,2	0	DC+
26	16,6	0	DC+
27	21,8	18,3	E2
28	21,8	15,5	G2
29	8,4	12,7	G1
30	8,4	9,9	E1



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

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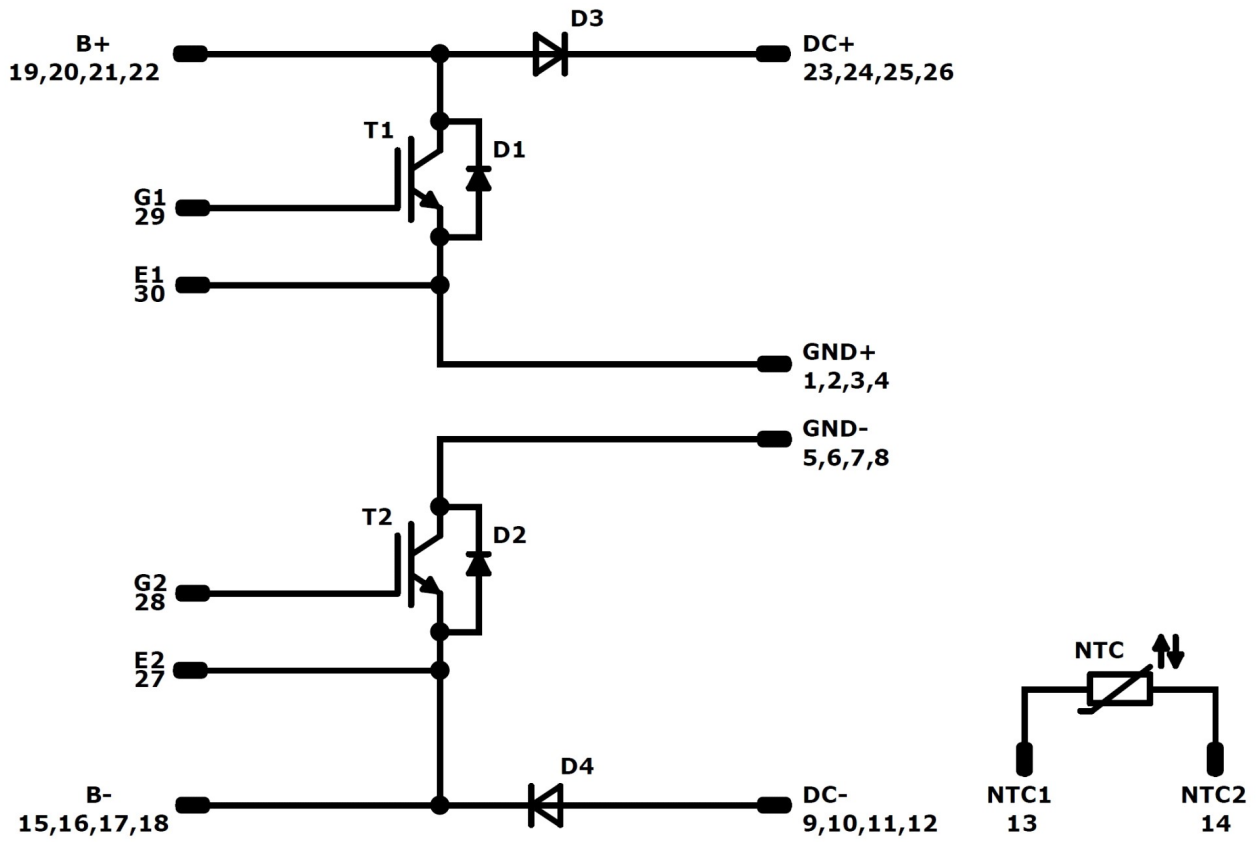
Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1 , T2	IGBT	650 V	100 A	Boost Switch	
D4 , D3	FWD	600 V	120 A	Boost Diode	
D2 , D1	FWD	650 V	15 A	Boost Sw. Protection 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.

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-FY07NBA100SM-M506L48-D1-14	11 Jul. 2017		

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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.