10-FY07NBA150FY-M506L68

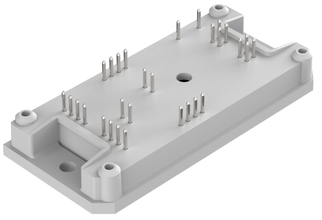
datasheet

***flow*BOOST 1 symmetric** | **650 V / 150 A**

Features

- Highly efficient and compact symmetric booster
- High switching frequency and low inductive design
- High speed IGBT and diode
- Integrated temperature sensor

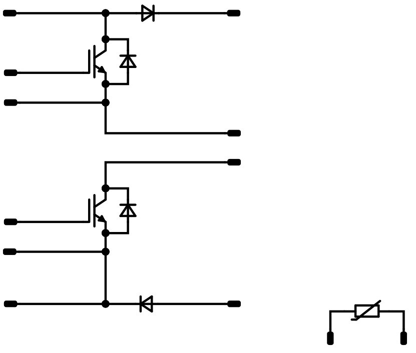
flow 1 12 mm housing



Target applications

- Solar Inverters
- UPS

Schematic



Types

- 10-FY07NBA150FY-M506L68

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Boost Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	114	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	152	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	102	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	127	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	33	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		60	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	53	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
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
Isolation voltage	V_{isol}	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	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	Unit
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,15	25	2,6	4,6	6,4	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 150		1,41 1,44	1,9	V
Collector-emitter cut-off current	I_{CES}		0	650		25			500	µA
Gate-emitter leakage current	I_{GES}		20	0		25			800	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	30		25		9712		pF
Output capacitance	C_{oes}							130		pF
Reverse transfer capacitance	C_{res}							32		pF
Gate charge	Q_g		15	400	150	25		276		nC
Thermal										
Thermal resistance junction to sink*	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,63		K/W

*Only valid with pre-applied Vincotech thermal interface material.

Parameter	Symbol	Conditions	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	0/15	400	150	25 125 150		24 22,08 23,36		ns
Rise time	t_r					25 125 150		31,68 34,88 35,84		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		128,96 147,2 151,68		ns
Fall time	t_f					25 125 150		14,76 15,37 17,66		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=3,08 µC Q_{rFWD}=6,84 µC Q_{rFWD}=8,1 µC				25 125 150		3,42 4,7 5,08		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		2,44 3,2 3,39		mWs

Characteristic Values

Parameter	Symbol	Conditions					Values			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

Parameter	Symbol	Conditions	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F				150	25 125 150		1,53 1,49 1,47	1,92	V
Reverse leakage current	I_R	V_r = 650 V				25			7,6	µA

Thermal

Parameter	Symbol	Conditions	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Thermal resistance junction to sink*	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,75		K/W

*Only valid with pre-applied Vincotech thermal interface material.

Dynamic

Parameter	Symbol	Conditions	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Peak recovery current	I_{RRM}	d*i*/d*t*=3165 A/µs d*i*/d*t*=3211 A/µs d*i*/d*t*=3091 A/µs	0/15	400	150	25 125 150		63,27 95,88 102,34		A
Reverse recovery time	t_{rr}					25 125 150		68,24 100,02 111,47		ns
Recovered charge	Q_r					25 125 150		3,08 6,84 8,1		µC
Reverse recovered energy	E_{rec}					25 125 150		0,728 1,57 1,96		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		6762 4994 4054		A/µs

Characteristic Values

Parameter	Symbol	Conditions					Values			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 Sw. Protection Diode										
Static										
Forward voltage	V_F				30	25 150	1,23	1,64 1,56	1,87	V
Reverse leakage current	I_R	V_r = 650 V				25			0,36	µA
Thermal										
Thermal resistance junction to sink*	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,8		K/W

*Only valid with pre-applied Vincotech thermal interface material.

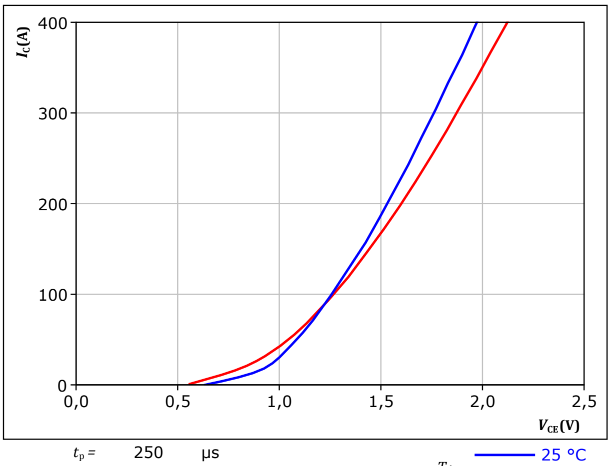
Parameter	Symbol	Conditions					Min	Typ	Max	Unit
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1486 Ω				100	-12		14	%
Power dissipation	P							200		mW
Power dissipation constant	d					25		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3 %						3950		K
B-value	$B_{(25/100)}$	Tol. ±3 %						3998		K
Vincotech Thermistor Reference									B	

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



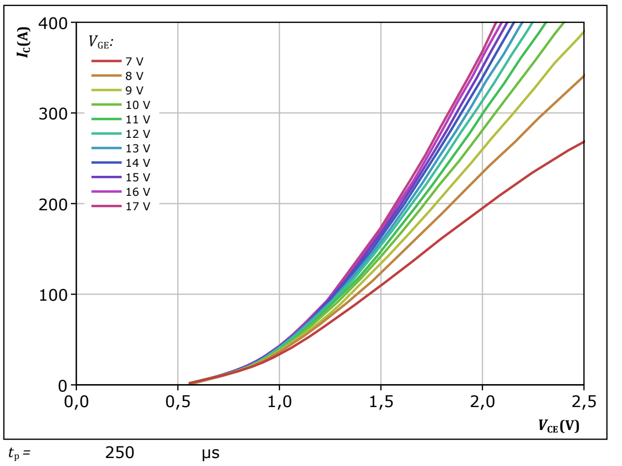
t_p =	250	µs
V_{GE} =	15	V

T_j: 25 °C, 150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



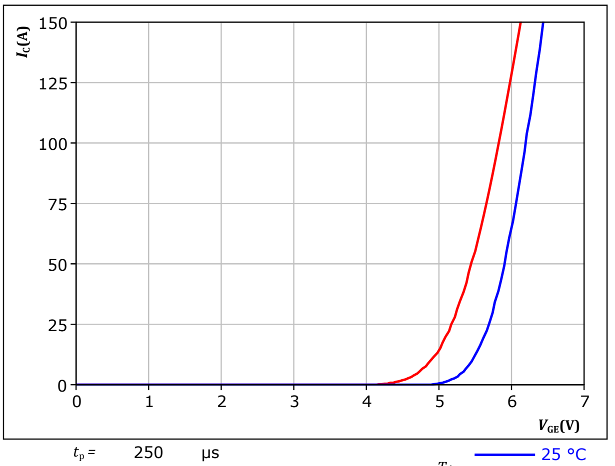
t_p =	250	µs
T_j =	150	°C

V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})



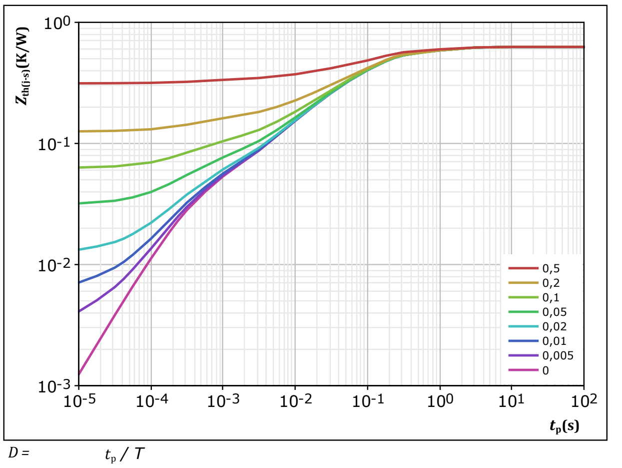
t_p =	250	µs
V_{CE} =	10	V

T_j: 25 °C, 150 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,627	K/W

IGBT thermal model values

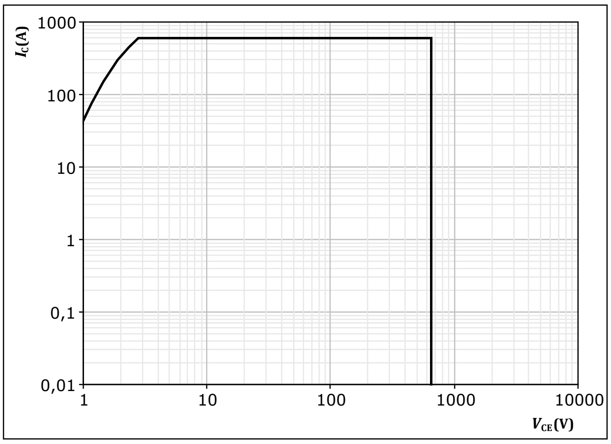
R (K/W)	τ (s)
9,03E-02	1,24E+00
3,31E-01	1,16E-01
1,29E-01	1,93E-02
3,94E-02	4,12E-03
3,80E-02	3,56E-04

Boost Switch Characteristics

figure 5.	IGBT

Safe operating area

$I_C = f(V_{CE})$



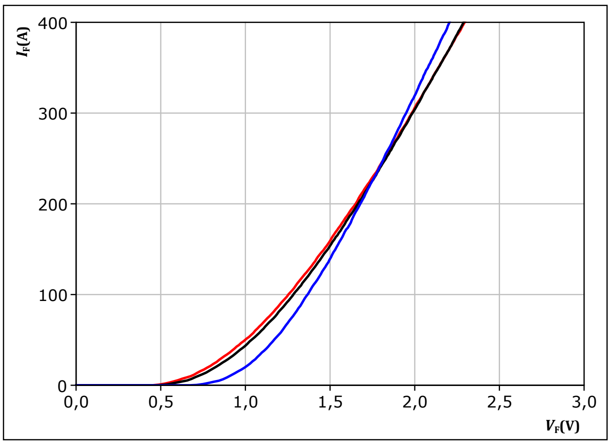
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



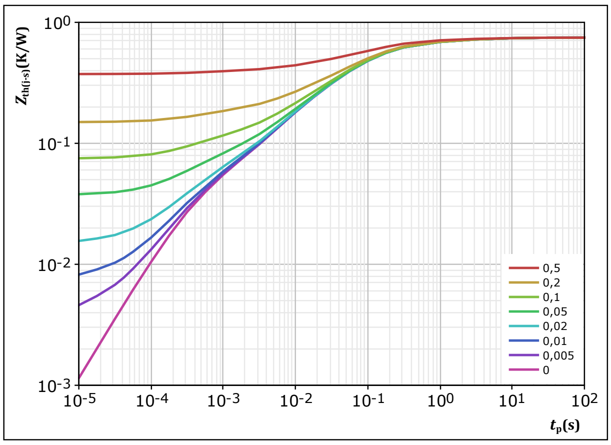
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 7. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,748 K/W

IGBT thermal model values

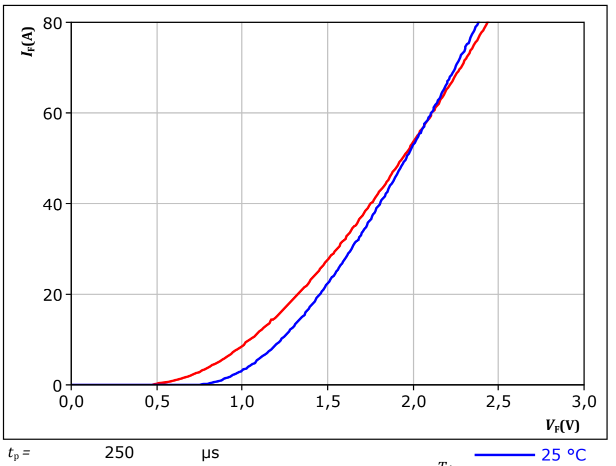
R (K/W)	τ (s)
2,88E-02	7,46E+00
7,02E-02	1,27E+00
1,95E-01	2,04E-01
2,65E-01	6,33E-02
1,21E-01	1,27E-02
3,39E-02	3,05E-03
3,36E-02	3,74E-04

Boost Sw. Protection Diode Characteristics

figure 8. **FWD**

Typical forward characteristics

I_F = f(V_F)



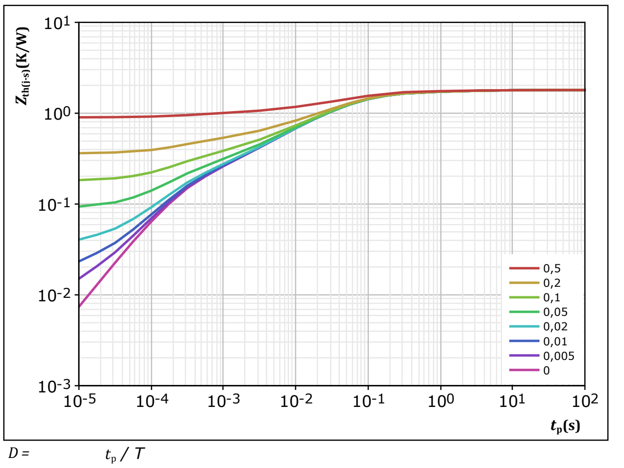
t_p = 250 µs

T_j: 25 °C, 150 °C

figure 9. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,799 K/W

IGBT thermal model values

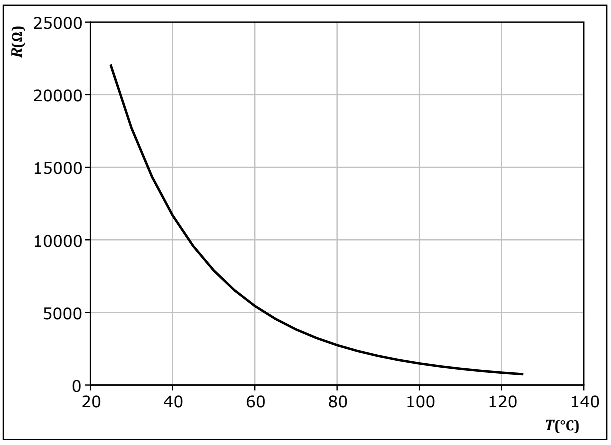
R (K/W)	τ (s)
5,88E-02	5,09E+00
1,26E-01	6,40E-01
5,91E-01	8,94E-02
5,13E-01	2,64E-02
2,57E-01	6,46E-03
1,01E-01	1,53E-03
1,52E-01	2,46E-04

Thermistor Characteristics

figure 10.	Thermistor

Typical NTC characteristic as function of temperature

$R_T = f(T)$

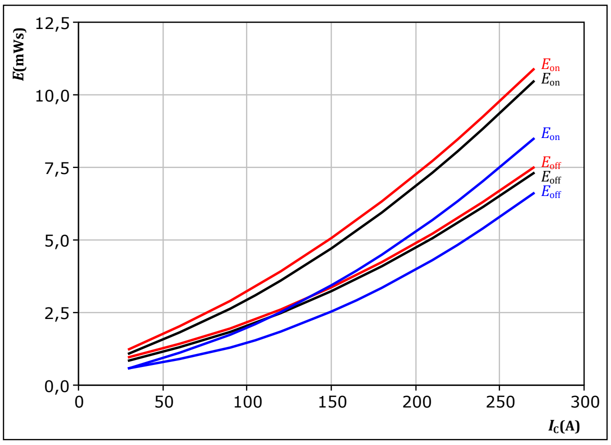


Boost Switching Characteristics

figure 11. **IGBT**

Typical switching energy losses as a function of collector current

E = f(I_C)



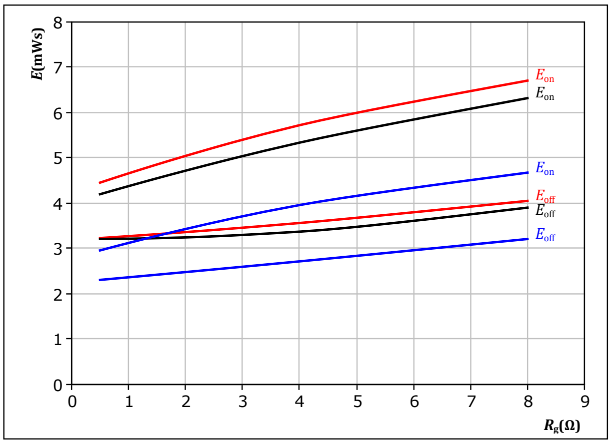
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
R_{gon} =	2	Ω		150 °C
R_{goff} =	2	Ω		

figure 12. **IGBT**

Typical switching energy losses as a function of gate resistor

E = f(R_g)



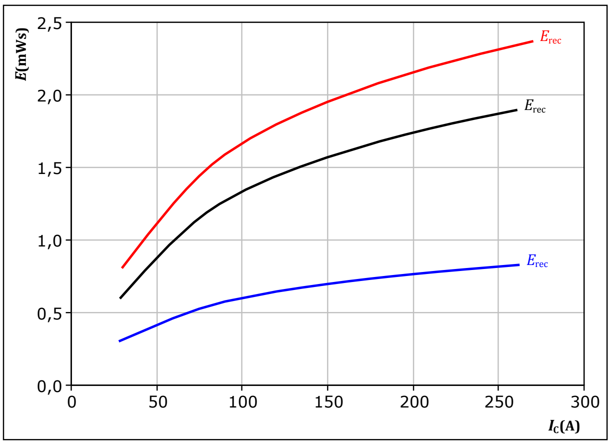
With an inductive load at

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

figure 13. **FWD**

Typical reverse recovered energy loss as a function of collector current

E_{rec} = f(I_C)



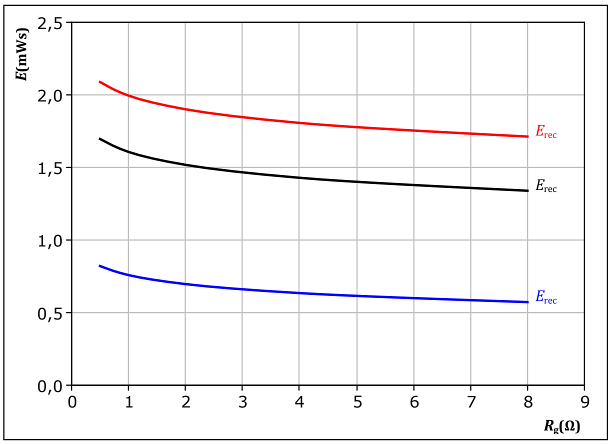
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 14. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

E_{rec} = f(R_g)



With an inductive load at

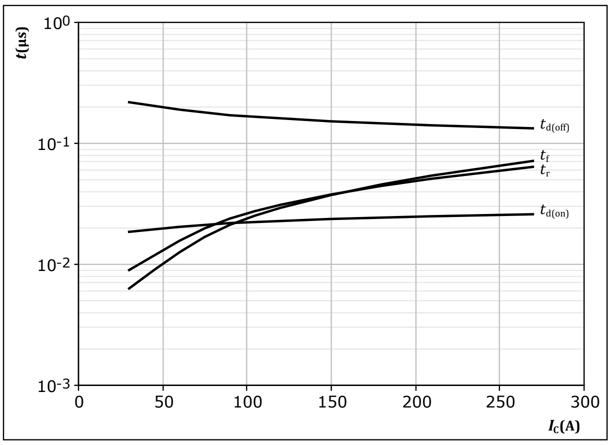
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	150	A		150 °C

Boost Switching Characteristics

figure 15. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



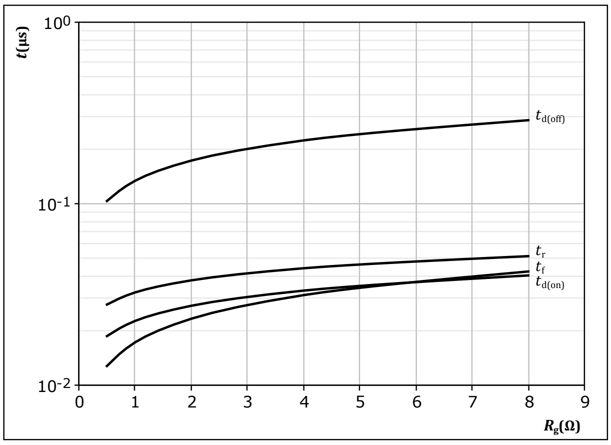
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 16. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



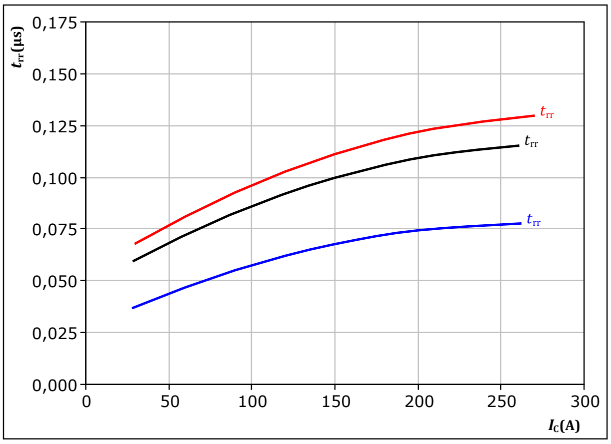
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	0/15	V
I_C =	150	A

figure 17. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

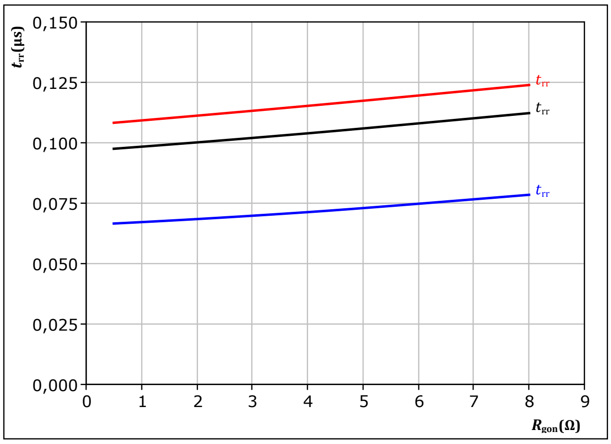
V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 18. **FWD**

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

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



With an inductive load at

V_{CE} =	400	V
V_{GE} =	0/15	V
I_C =	150	A

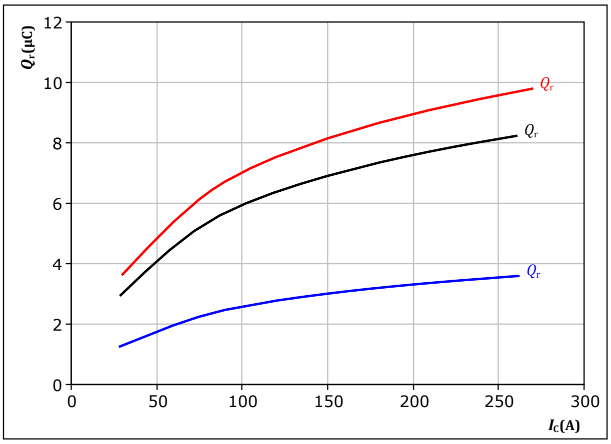
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 19. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



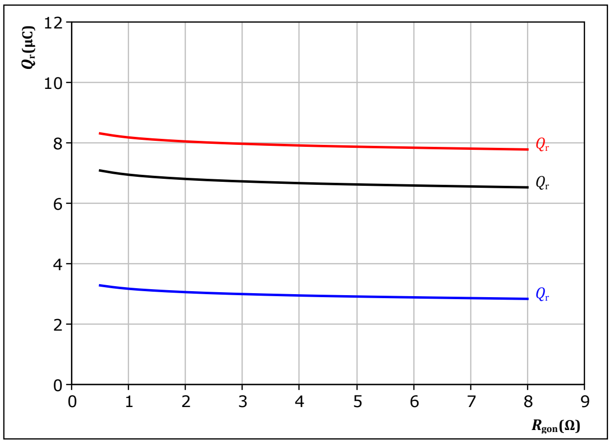
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	0/15	V	
R_{gon} =	2	Ω	

figure 20. **FWD**

Typical recovered charge as a function of turn on gate resistor

Q_r = f(R_{gon})



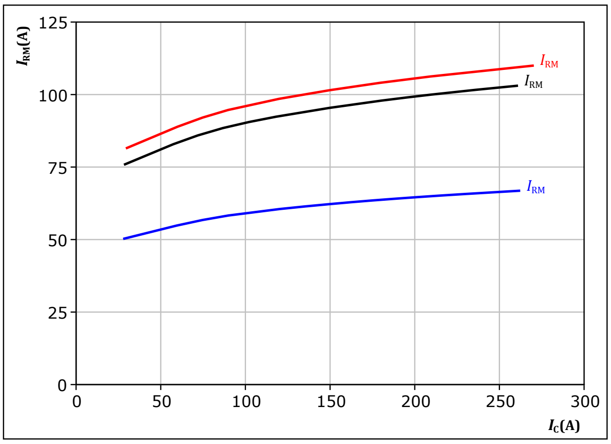
With an inductive load at

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

figure 21. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



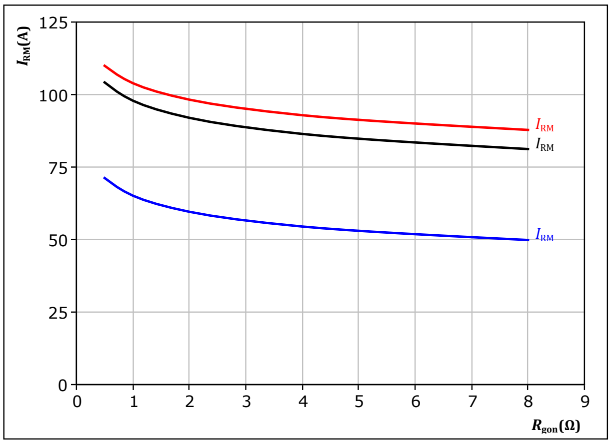
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	0/15	V	
R_{gon} =	2	Ω	

figure 22. **FWD**

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

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



With an inductive load at

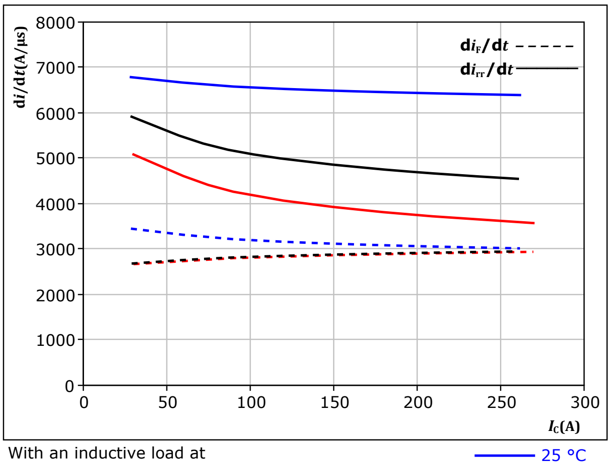
V_{CE} =	400	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	0/15	V	
I_C =	150	A	

Boost Switching Characteristics

figure 23. **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)



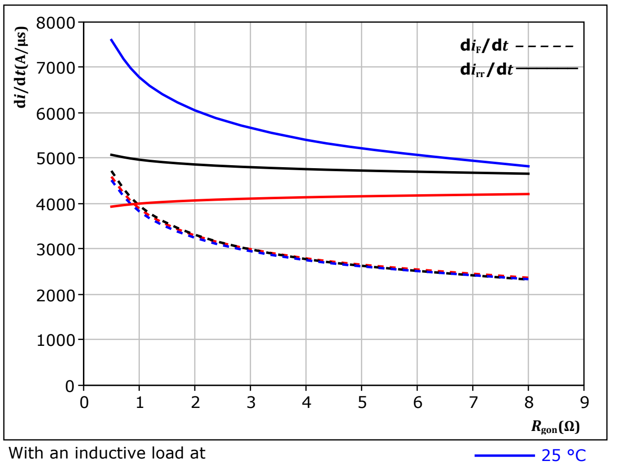
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 24. **FWD**

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

di_F/dt, di_{rr}/dt = f(R_{gon})



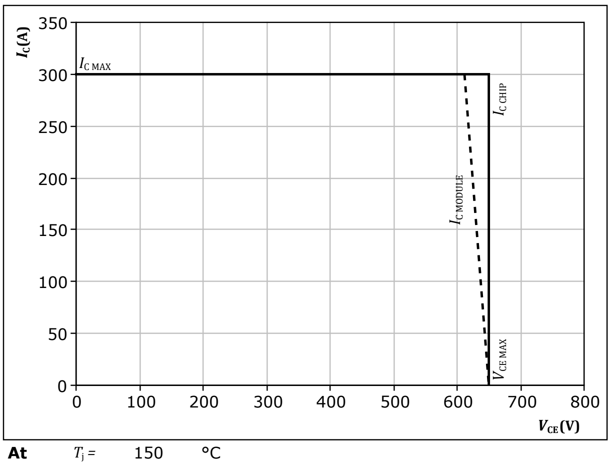
With an inductive load at

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

figure 25. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

Boost Switching Definitions

figure 26. **IGBT**

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

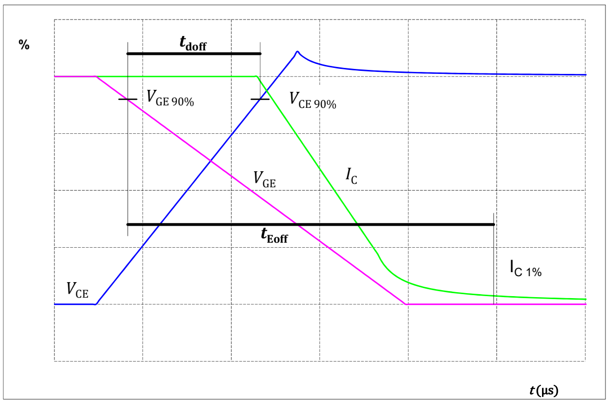


figure 27. **IGBT**

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

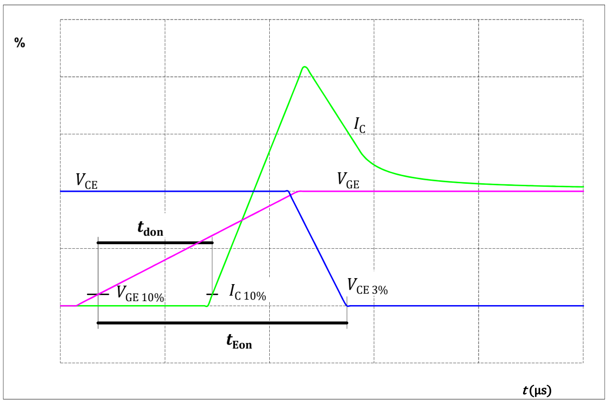


figure 28. **IGBT**

Turn-off Switching Waveforms & definition of t_f

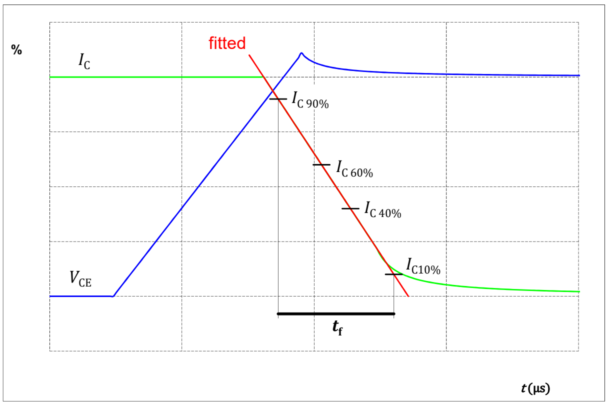
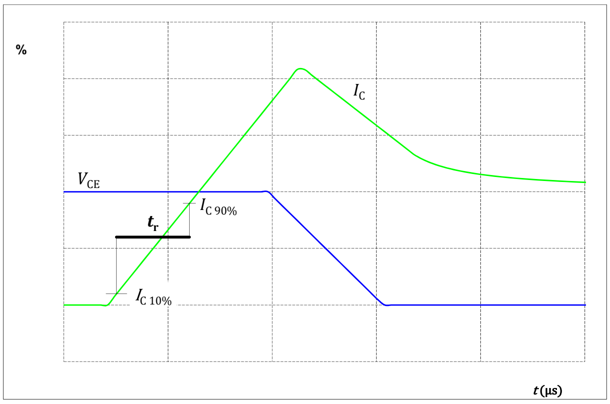


figure 29. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Boost Switching Definitions

figure 30.	FWD

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

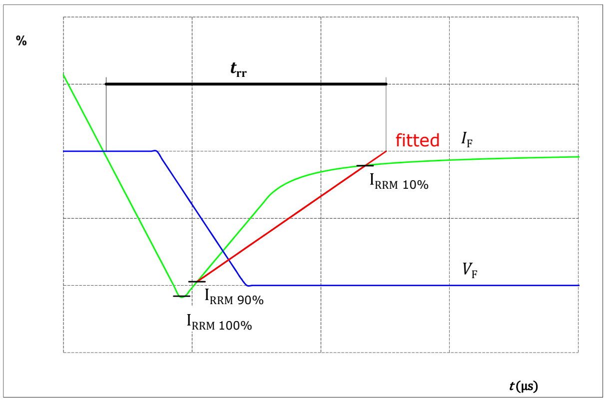
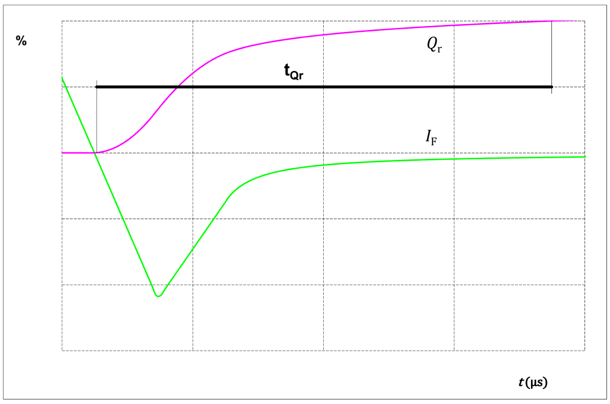


figure 31.	FWD

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



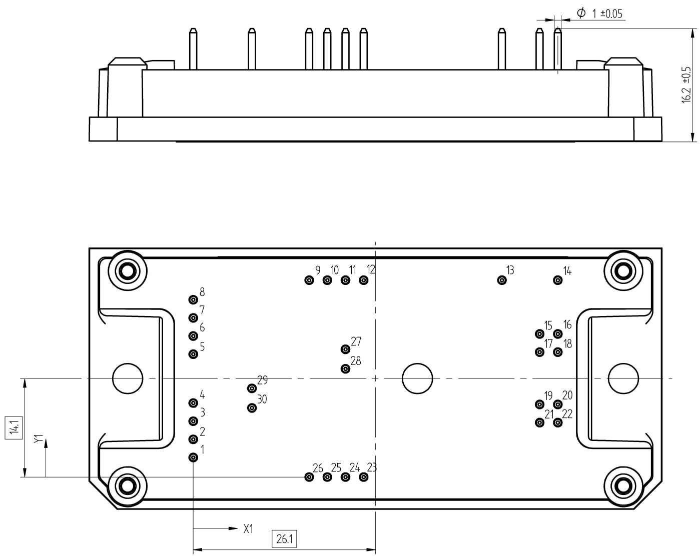
Ordering Code	
Version	**Ordering Code**
Without thermal paste	10-FY07NBA150FY-M506L68
With thermal paste	10-FY07NBA150FY-M506L68-/3/

Marking

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

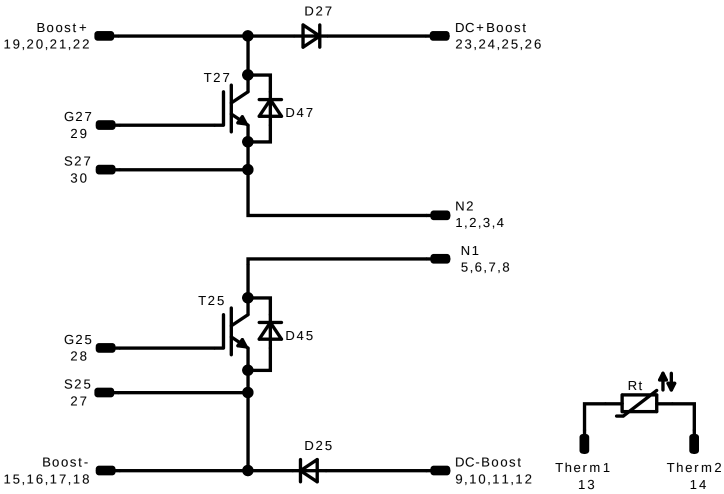
Outline

Pin table [mm]			
Pin	X	Y	Function
1	0	2,8	N2
2	0	5,4	N2
3	0	8	N2
4	0	10,6	N2
5	0	17,6	N1
6	0	20,2	N1
7	0	22,8	N1
8	0	25,4	N1
9	16,6	28,2	DC-Boost
10	19,2	28,2	DC-Boost
11	21,8	28,2	DC-Boost
12	24,4	28,2	DC-Boost
13	44,2	28,2	Therm1
14	52,2	28,2	Therm2
15	49,6	20,5	Boost-
16	52,2	20,5	Boost-
17	49,6	17,9	Boost-
18	52,2	17,9	Boost-
19	49,6	10,4	Boost+
20	52,2	10,4	Boost+
21	49,6	7,8	Boost+
22	52,2	7,8	Boost+
23	24,4	0	DC+Boost
24	21,8	0	DC+Boost
25	19,2	0	DC+Boost
26	16,6	0	DC+Boost
27	21,8	18,3	S25
28	21,8	15,5	G25
29	8,4	12,7	G27
30	8,4	9,9	S27



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
T25, T27	IGBT	650 V	150 A	Boost Switch	
D25, D27	FWD	650 V	150 A	Boost Diode	
D45, D47	FWD	650 V	30 A	Boost Sw. Protection Diode	
Rt	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-FY07NBA150FY-M506L68-D1-14	22 Apr. 2020		