Vincotech

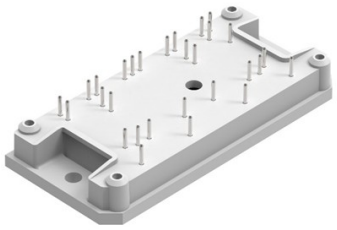
10-FY12S2A080N3-L860L28
datasheet

flowBOOST 1 symmetric dual **1200 V / 80 A**

Features

- Symmetric Boost for 1500Vdc applications
- Latest IGBT technology for high speed frequencies
- Low inductance package
- Integrated NTC
- Cost effective alternative to L869L08
- Same package and pin-out as L869L08

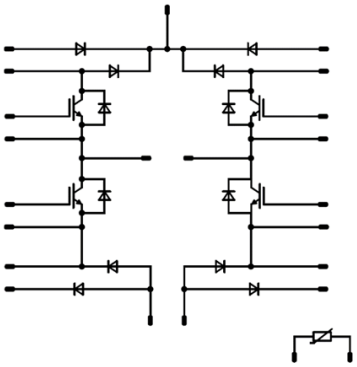
flow 1 12 mm housing



Target applications

- Solar Inverters

Schematic



Types

- 10-FY12S2A080N3-L860L28

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	68	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	320	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	138	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}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	28	A
Repetitive peak forward current	I_{FRM}		92	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	87	W
Maximum junction temperature	T_{jmax}		175	°C
Boost Sw. Protection Diode				
Peak repetitive reverse voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	25	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms T_j = 150 °C	200	A
Surge current capability	I^2t		200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	37	W
Maximum junction temperature	T_{jmax}		150	°C
ByPass Diode				
Peak repetitive reverse voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	38	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms T_j = 150 °C	270	A
Surge current capability	I^2t		370	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	47	W
Maximum junction temperature	T_{jmax}		150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	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
		AC Voltage t_p = 1 min	2500	V
Creepage distance			min. 12,7	mm
Clearance			9,6	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}			0,0008	25	4,5	5,5	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		80	25 125 150		1,89 2,05 2,11	1,95	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			800	µA
Gate-emitter leakage current	I_{GES}		20	0		25			400	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f= 1 Mhz	0	20		25		9824		pF
Output capacitance	C_{oes}							280		
Reverse transfer capacitance	C_{res}							160		
Gate charge	Q_g		15	600	80	25		424		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,69		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	0 / 15	700	45	25 125 150		26 24 24		ns
Rise time	t_r					25 125 150		13 14 14		
Turn-off delay time	$t_{d(off)}$					25 125 150		232 273 283		
Fall time	t_f					25 125 150		22 95 81		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,4 µC Q_{rFWD} = 0,3 µC Q_{rFWD} = 0,3 µC				25 125 150		0,842 0,917 0,944		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,980 1,867 2,173		

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				20	25 125 150		1,43 1,74 1,85	1,6	V
Reverse leakage current	I_R			1200		25 150			400	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,09		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 3376 A/µs di/dt = 3376 A/µs di/dt = 3479 A/µs	0 / 15	700	45	25 125 150		20 20 20		A
Reverse recovery time	t_{rr}					25 125 150		12 12 12		ns
Recovered charge	Q_r					25 125 150		0,362 0,340 0,318		µC
Reverse recovered energy	E_{rec}					25 125 150		0,153 0,138 0,121		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		4988 4928 4745		A/µs
Boost Sw. Protection Diode										
Static										
Forward voltage	V_F				18	25 125		1,12 1,03	1,5	V
Reverse leakage current	I_R			1600		25 150			100 1000	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,87		K/W

Characteristic Values

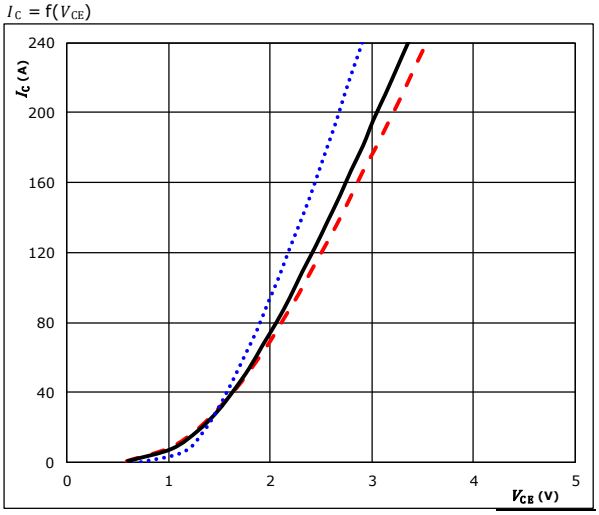
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
ByPass Diode										
Static										
Forward voltage	V_F				28	25 125		1,15 1,10	1,5	V
Reverse leakage current	I_R			1600		25 150			100 1000	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,50		K/W
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

$I_C = f(V_{CE})$

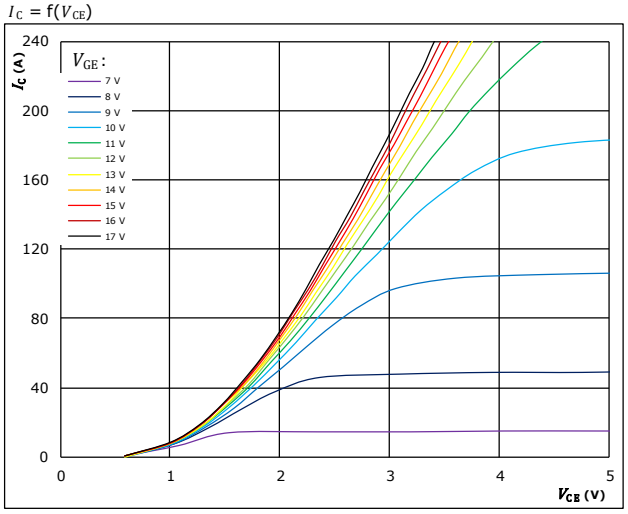


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

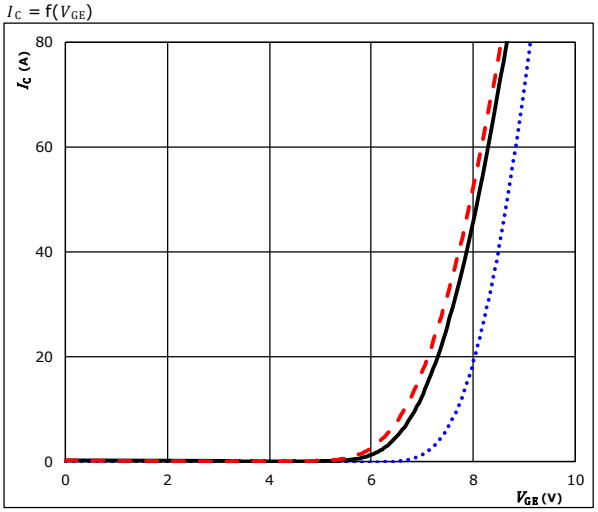


t_p =	250	µs
T_j =	125	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

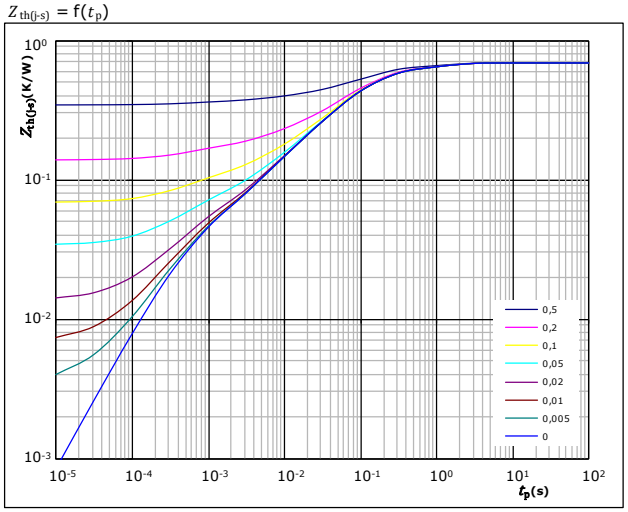


t_p =	100	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,69	K/W

IGBT thermal model values

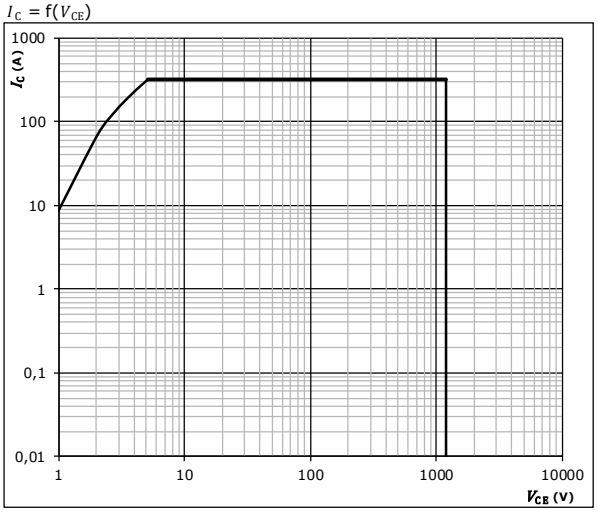
R (K/W)	τ (s)
1,16E-01	1,00E+00
3,47E-01	1,15E-01
1,38E-01	3,11E-02
5,25E-02	5,14E-03
3,27E-02	4,97E-04

Boost Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



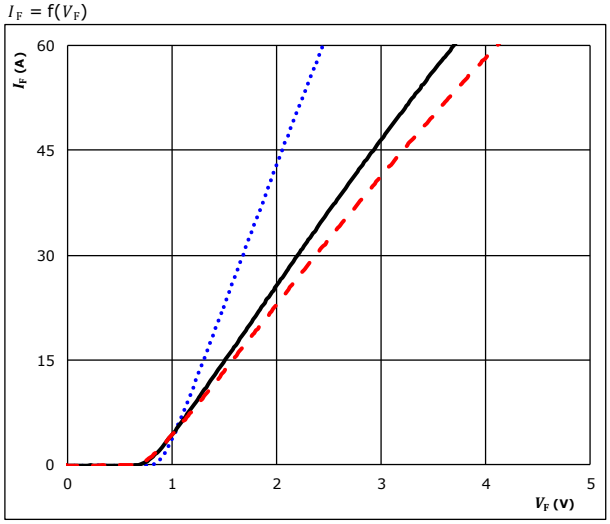
D =	single pulse	
T_s =	80	°C
V_{GE} =	0	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



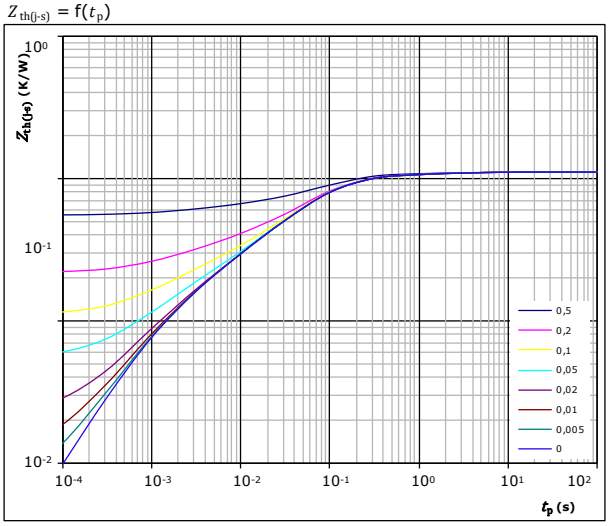
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,09 K/W

FWD thermal model values

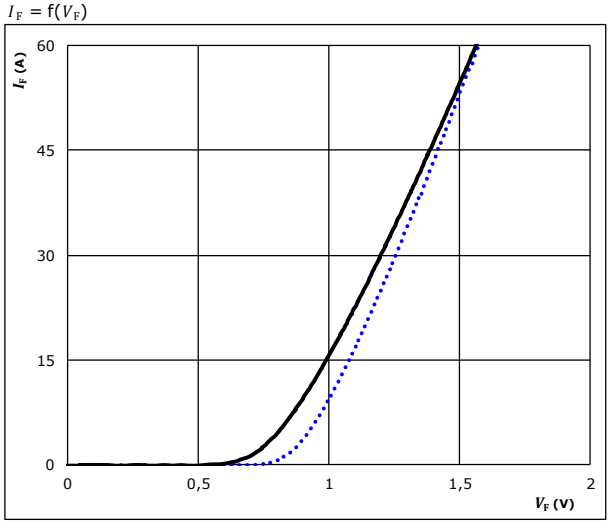
R (K/W)	τ (s)
4,73E-02	2,07E+00
1,05E-01	2,95E-01
5,77E-01	5,82E-02
1,79E-01	1,86E-02
1,16E-01	3,85E-03
6,86E-02	7,48E-04

Boost Sw. Protection Diode Characteristics

figure 1. **Rectifier Diode**

Typical forward characteristics

$I_F = f(V_F)$



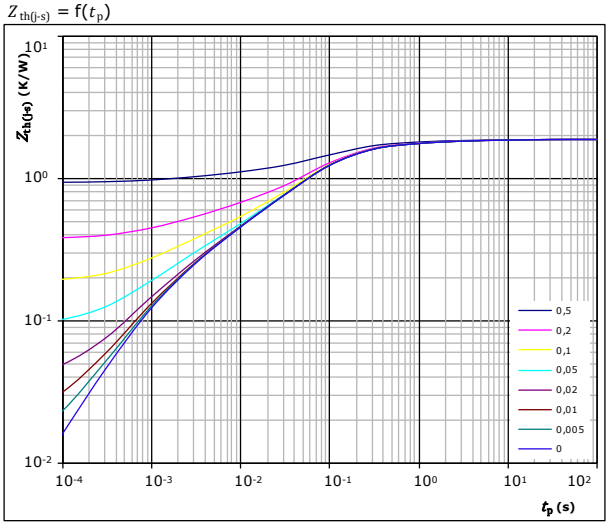
t_p = 250 µs

T_j: 25 °C
125 °C
150 °C

figure 2. **Rectifier Diode**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,87 K/W

Diode thermal model values

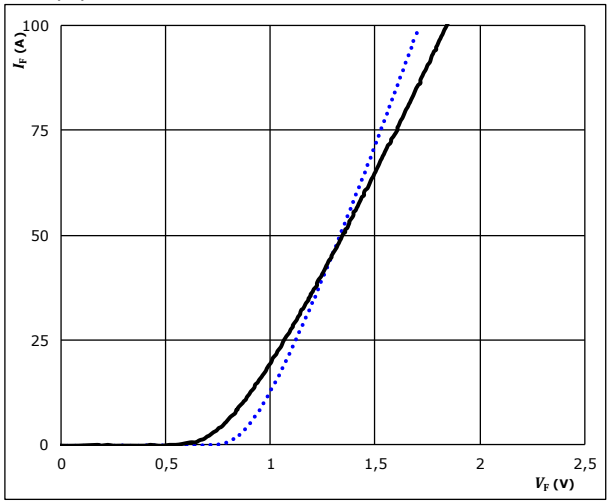
R (K/W)	τ (s)
5,65E-02	8,90E+00
1,70E-01	1,08E+00
6,15E-01	1,58E-01
6,94E-01	5,21E-02
2,16E-01	6,16E-03
1,19E-01	1,06E-03

ByPass Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



t_p = 250 µs

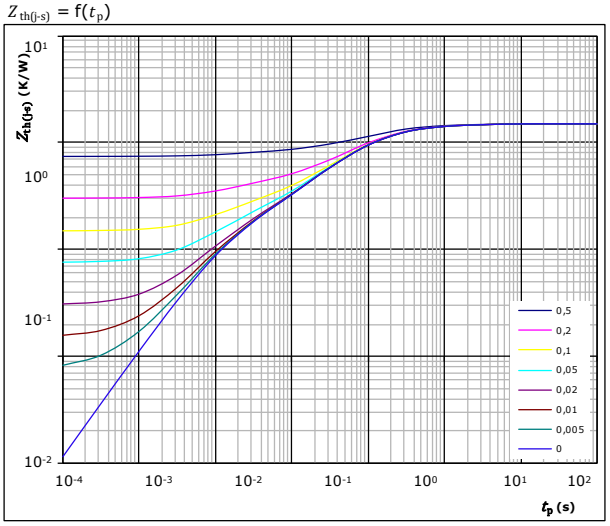
T_j: 25 °C

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

$R_{th(j-s)}$ = 1,50 K/W

FWD thermal model values

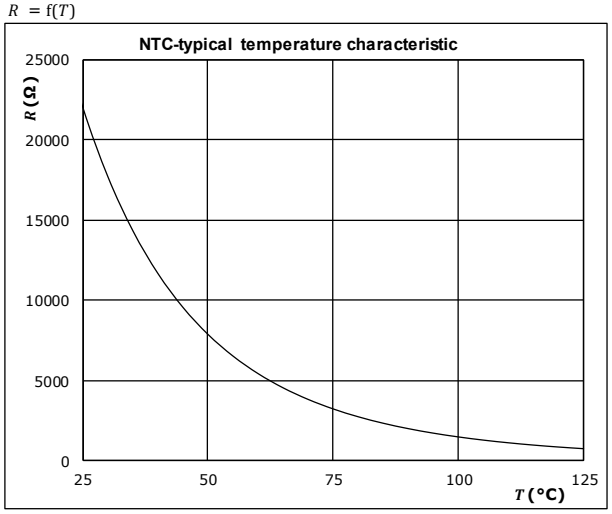
R (K/W)	τ (s)
9,44E-02	2,48E+00
3,47E-01	3,51E-01
7,44E-01	7,63E-02
2,04E-01	1,21E-02
1,11E-01	1,25E-03

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

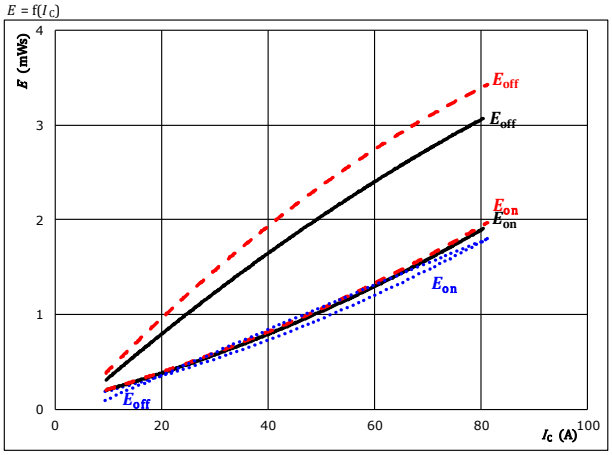


Boost Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



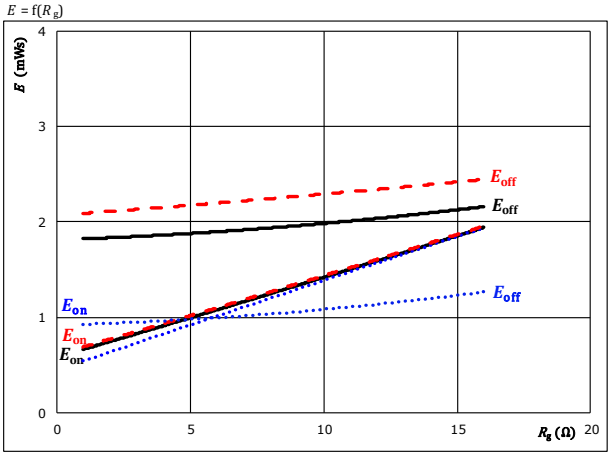
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0 / 15	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

$E = f(R_g)$



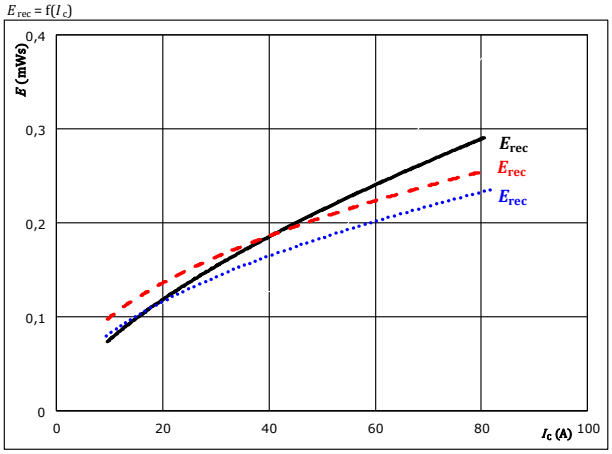
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
I_C =	45	A		150 °C

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



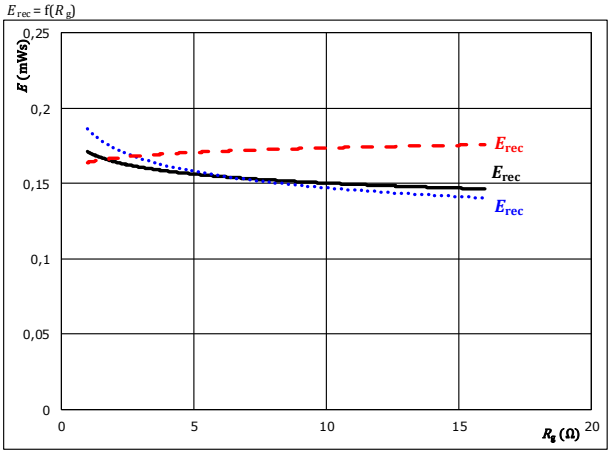
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0 / 15	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

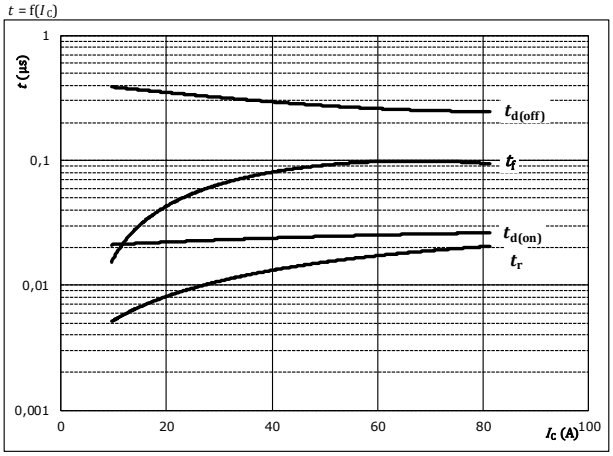
V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
I_C =	45	A		150 °C

Boost Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



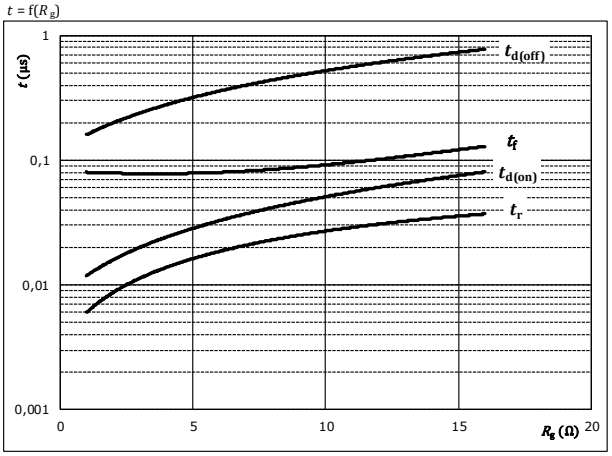
With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	0 / 15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



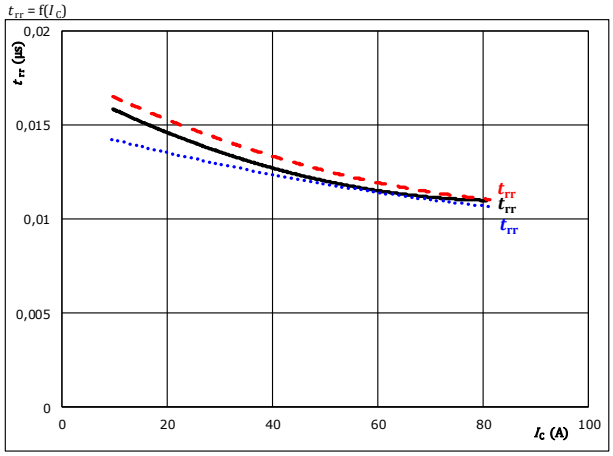
With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	0 / 15	V
I_C =	45	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



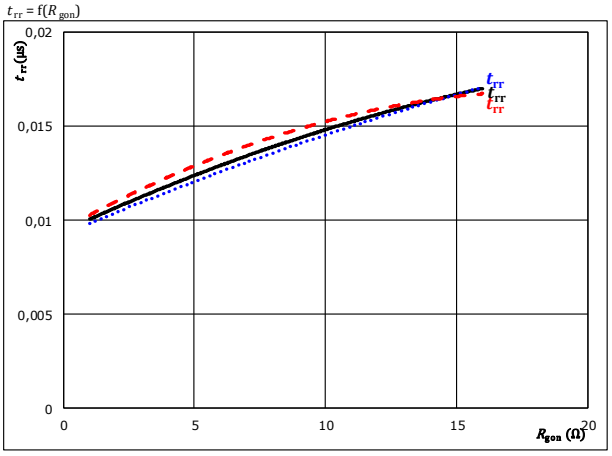
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0 / 15	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

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



With an inductive load at

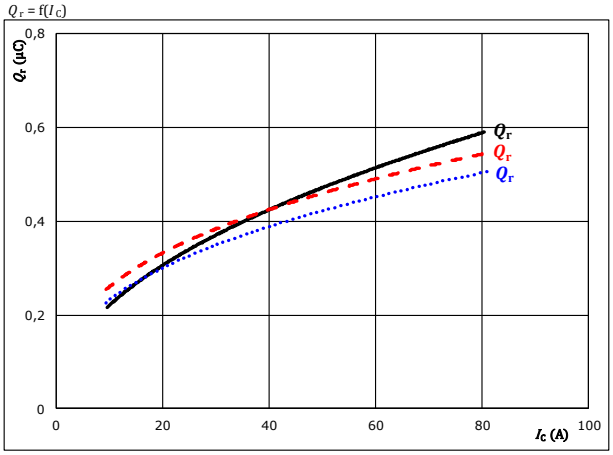
V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
I_C =	45	A		150 °C

Boost Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$



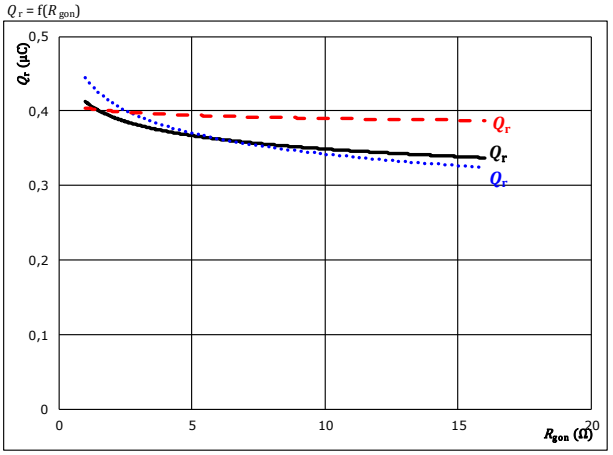
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C	·····
V_{GE} =	0 / 15	V		125 °C	———
R_{gon} =	4	Ω		150 °C	– – –

figure 10. **FWD**

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

$Q_r = f(R_{gon})$



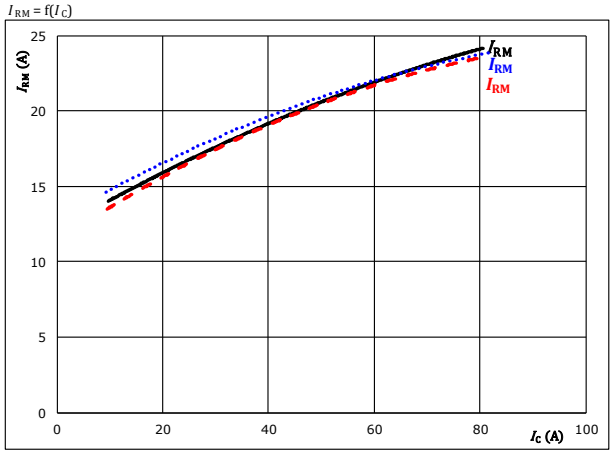
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C	·····
V_{GE} =	0 / 15	V		125 °C	———
I_C =	45	A		150 °C	– – –

figure 11. **FWD**

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

$I_{RM} = f(I_C)$



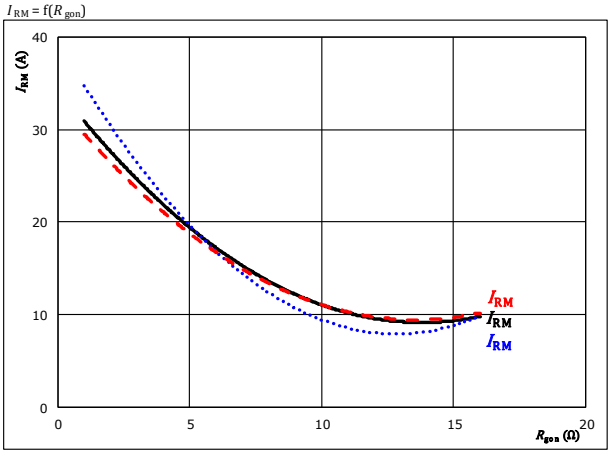
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C	·····
V_{GE} =	0 / 15	V		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

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



With an inductive load at

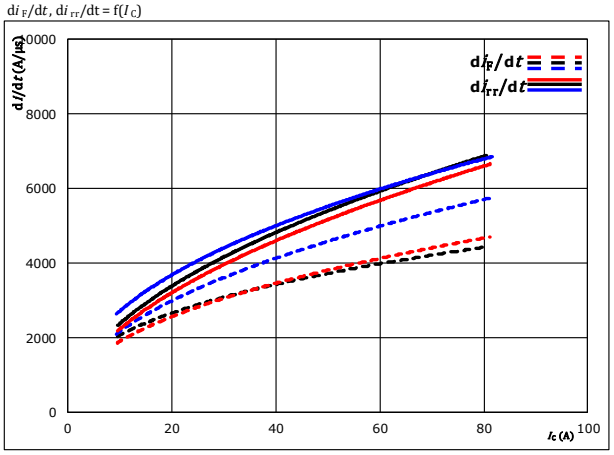
V_{CE} =	700	V	T_j:	25 °C	·····
V_{GE} =	0 / 15	V		125 °C	———
I_C =	45	A		150 °C	– – –

Boost Switching Characteristics

figure 13. **FWD**

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

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



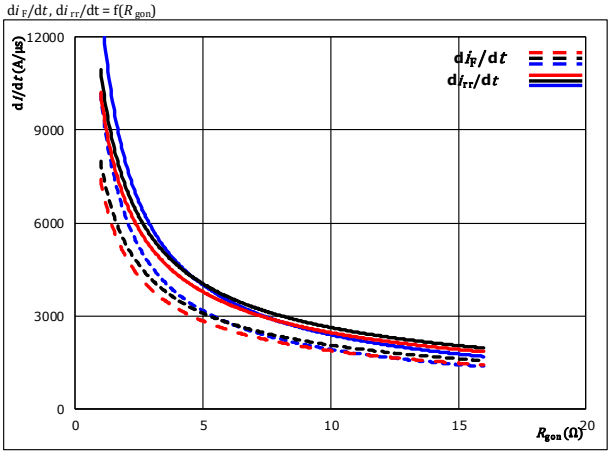
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0 / 15	V		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

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



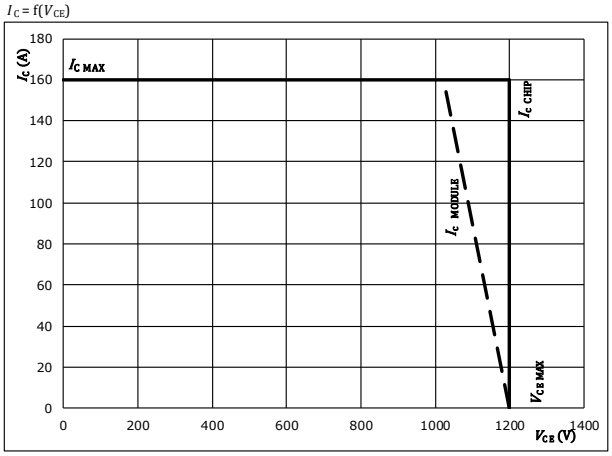
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
I_C =	45	A		150 °C

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	150	°C
R_{gon} =	4	Ω
R_{goff} =	4	Ω

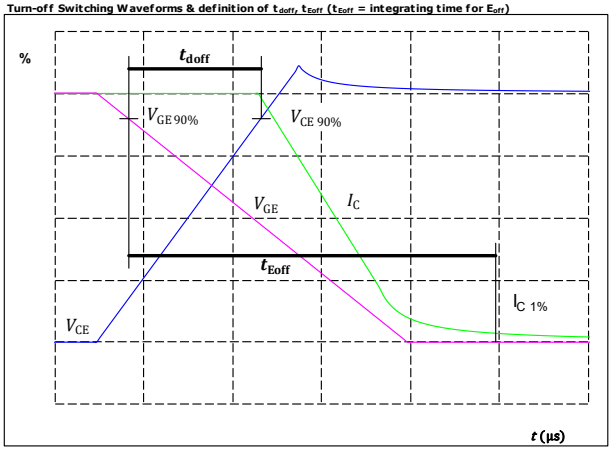
Boost Switching Definitions

General conditions

T_j	=	150 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

figure 1. IGBT

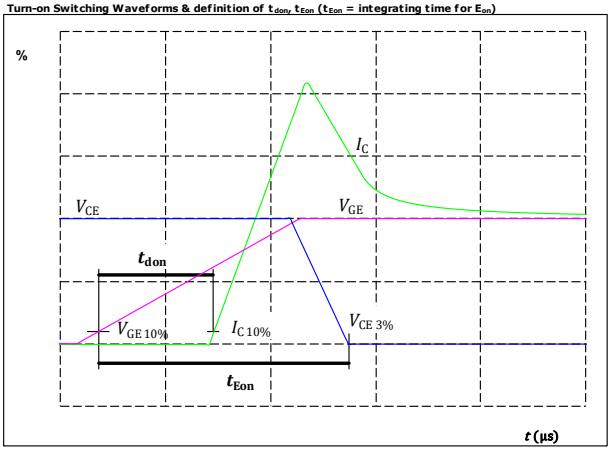
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	45	A
t_{doff} =	283	ns

figure 2. IGBT

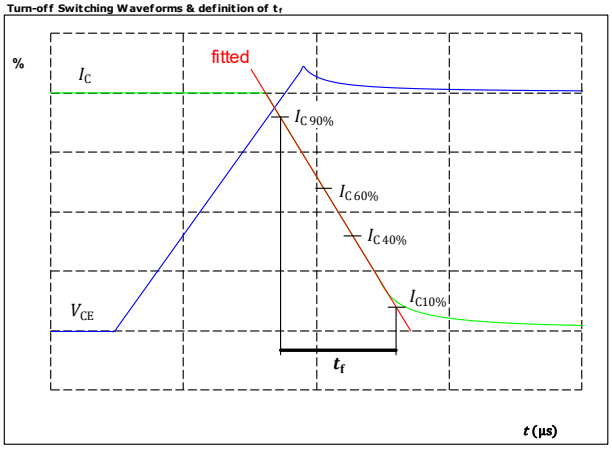
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	45	A
t_{don} =	24	ns

figure 3. IGBT

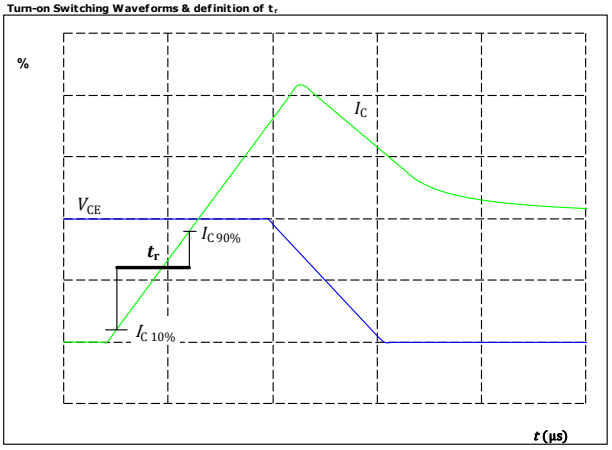
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	45	A
t_f =	81	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

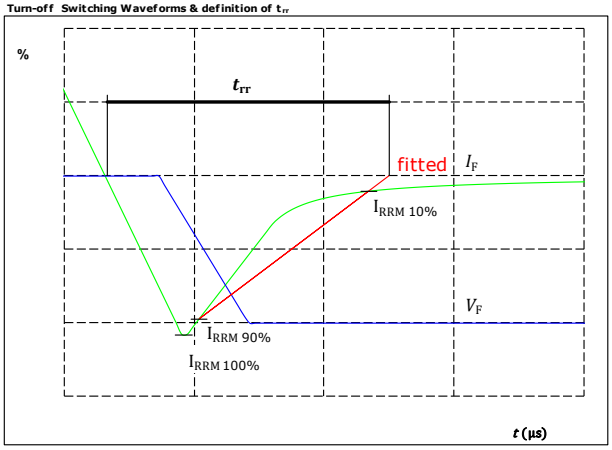


$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	45	A
t_r =	14	ns

Boost Switching Characteristics

figure 5. **FWD**

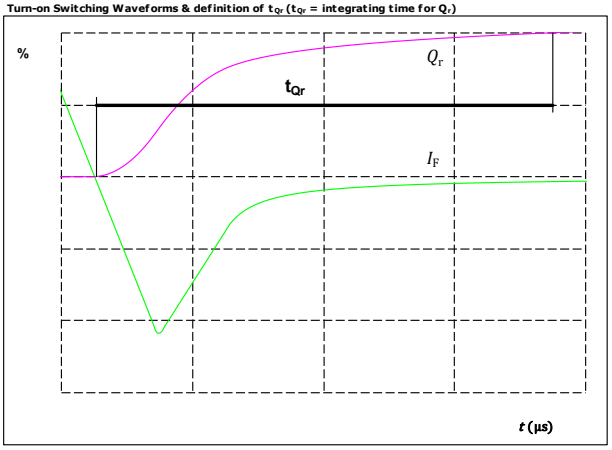
Turn-off Switching Waveforms & definition of t_{rr}



$V_F(100\%)$ =	700	V
$I_F(100\%)$ =	45	A
$I_{RRM}(100\%)$ =	20	A
t_{rr} =	12	ns

figure 6. **FWD**

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



$I_F(100\%)$ =	45	A
$Q_r(100\%)$ =	0,32	µC

Vincotech

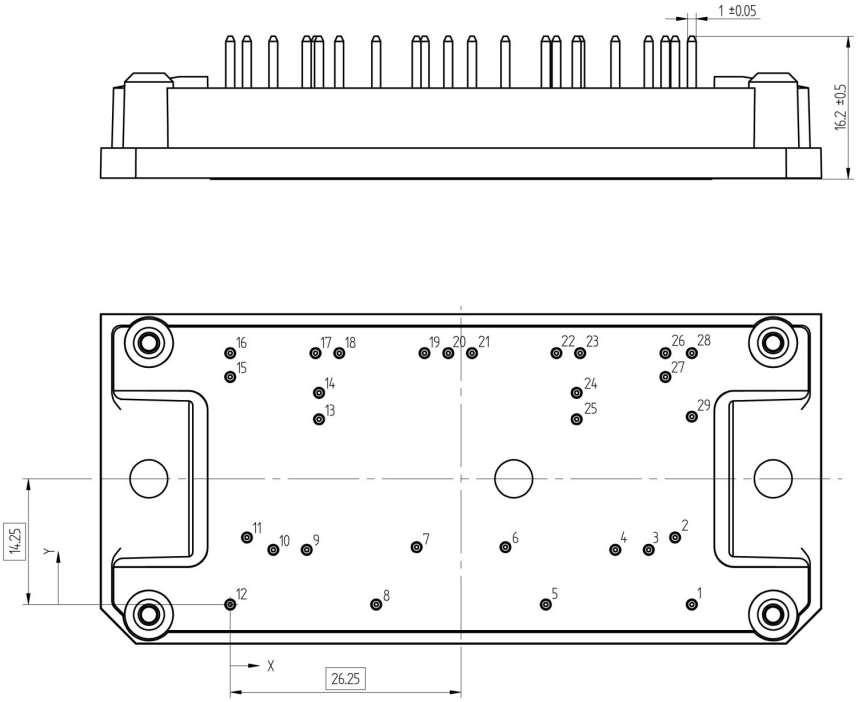
Ordering Code & Marking

Version	Ordering Code
without thermal paste 12 mm housing with Solder Pins	10-FY12S2A080N3-L860L28
with thermal paste 12 mm housing with Solder Pins	10-FY12S2A080N3-L860L28-/3/

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

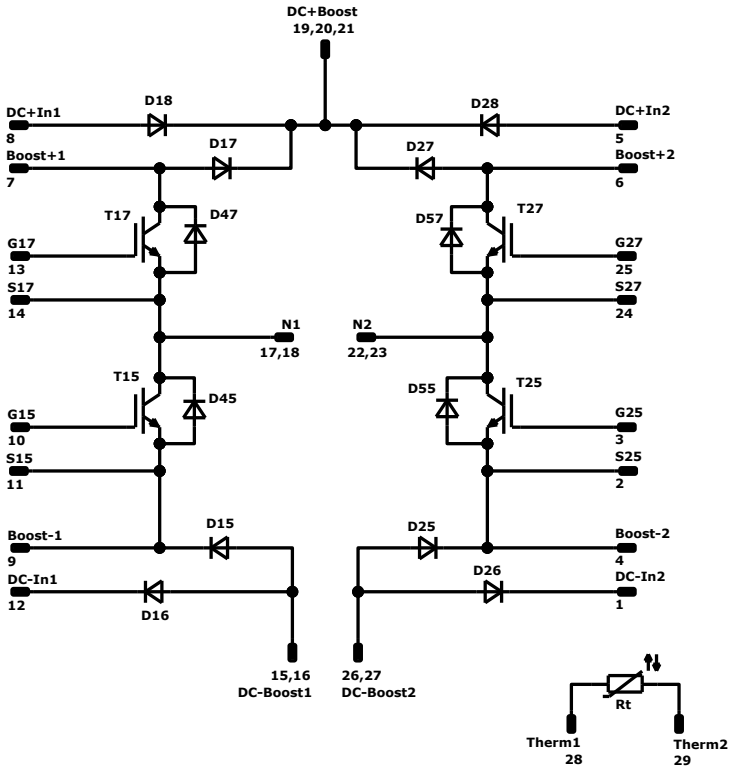
Outline

Pin table			
Pin	X	Y	Function
1	52,5	0	DC-In2
2	50,6	7,6	S25
3	47,6	6,2	G25
4	43,8	6,2	Boost-2
5	35,9	0	DC+In2
6	31,3	6,5	Boost+2
7	21,2	6,5	Boost+1
8	16,6	0	DC+In1
9	8,7	6,2	Boost-1
10	4,9	6,2	G15
11	1,9	7,6	S15
12	0	0	DC-In1
13	10,1	21	G17
14	10,1	24	S17
15	0	25,8	DC-Boost1
16	0	28,5	DC-Boost1
17	9,7	28,5	N1
18	12,4	28,5	N1
19	22,1	28,5	DC+Boost
20	24,8	28,5	DC+Boost
21	27,5	28,5	DC+Boost
22	37,1	28,5	N2
23	39,8	28,5	N2
24	39,4	24	S27
25	39,4	21	G27
26	49,5	28,5	DC-Boost2
27	49,5	25,8	DC-Boost2
28	52,5	28,5	Therm1
29	52,5	21,3	Therm2



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
T15, T17, T25, T27	IGBT	1200 V	80 A	Boost Switch	
D15, D17, D25, D27	FWD	1200 V	20 A	Boost Diode	
D45, D47, D55, D57	FWD	1600 V	18 A	Boost Sw. Protection Diode	
D16, D18, D26, D28	FWD	1600 V	28 A	ByPass 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-FY12S2A080N3-L860L28-D1-14	27 Aug. 2019		

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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.