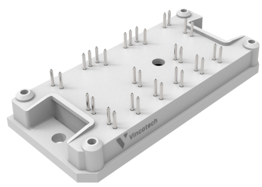
10-FY123BA080N302-LN28L37
datasheet

_flow_3xBOOST 1 — **1200 V / 80 A**

Features

- High Efficiency Triple Booster
- Latest IGBT Technology
- Integrated NTC
- Compact Design
- Low inductance housing

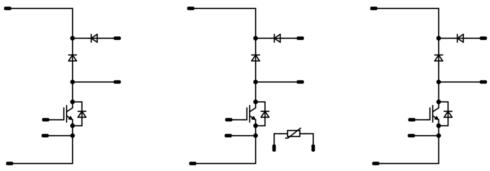
flow 1 12 mm housing



Target applications

- Solar Inverters

Schematic



Types

- 10-FY123BA080N302-LN28L37

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		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
Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	32	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		92	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 8,3 ms	T_j = 150 °C	66	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
Forward average current	I_{FAV}	$T_j = T_{jmax}$	T_s = 80 °C	31	A
Surge (non-repetitive) forward current	I_{FSM}	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

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
ByPass Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward average current	I_{FAV}	$T_j = T_{jmax}$	T_s = 80 °C	38	A
Surge (non-repetitive) forward current	I_{FSM}	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	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				8,12	mm
Comparative Tracking Index	CTI			≥ 200	

*100 % tested in production

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 Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0008	25	4,5	5,5	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		80	25 125 150		1,9 2,06 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		pF
Reverse transfer capacitance	C_{res}							160		pF
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

*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} = 4 Ω R_{goff} = 4 Ω	0/15	700	45	25 125 150		26 24 24,5		ns
Rise time	t_r					25 125 150		12,5 14,5 14		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		232 273 283		ns
Fall time	t_f					25 125 150		21,91 95,27 81,01		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,362 µC Q_{rFWD}=0,34 µC Q_{rFWD}=0,318 µC				25 125 150		0,842 0,917 0,944		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,98 1,87 2,17		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										
Forward voltage	V_F				20	25 125 150		1,43 1,74 1,84	1,6	V
Reverse leakage current	I_R	V_r = 1200 V				25 150		20 160	400	µA
Thermal										
Thermal resistance junction to sink*	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,09		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										
Peak recovery current	I_{RRM}	di/dt=3376 A/µs di/dt=3479 A/µs	0/15	700	45	25 125 150		20,01 20,11 19,96		A
Reverse recovery time	t_{rr}					25 125 150		11,89 11,86 12,37		ns
Recovered charge	Q_r					25 125 150		0,362 0,34 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

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				18	25 125 150		1,12 1,03 1,02	1,5	V
Reverse leakage current	I_R	V_r = 1600 V				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

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

Parameter	Symbol	Conditions					Min	Typ	Max	Unit
ByPass Diode										
Static										
Forward voltage	V_F				28	25 125		1,15 1,1	1,5	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			100 1000	µA
Thermal										
Thermal resistance junction to sink*	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,5		K/W

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

Characteristic Values

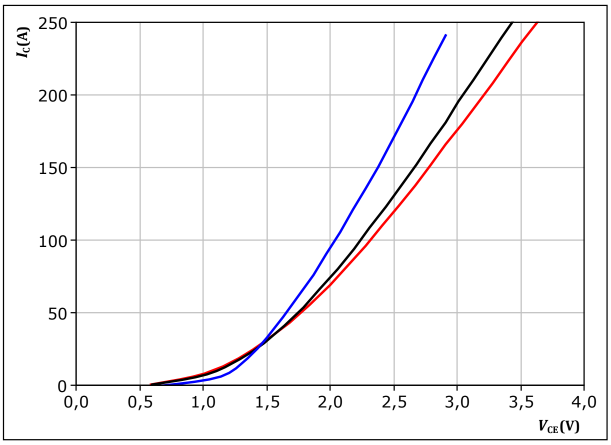
Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation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

Boost Switch Characteristics

figure 1. IGBT

Typical output characteristics

I_C = f(V_{CE})

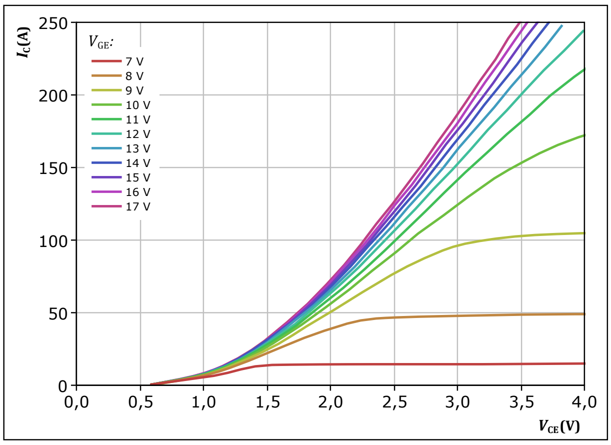


t_p =	250	µs	
V_{GE} =	15	V	T_j: 25 °C / 125 °C / 150 °C

figure 2. IGBT

Typical output characteristics

I_C = f(V_{CE})



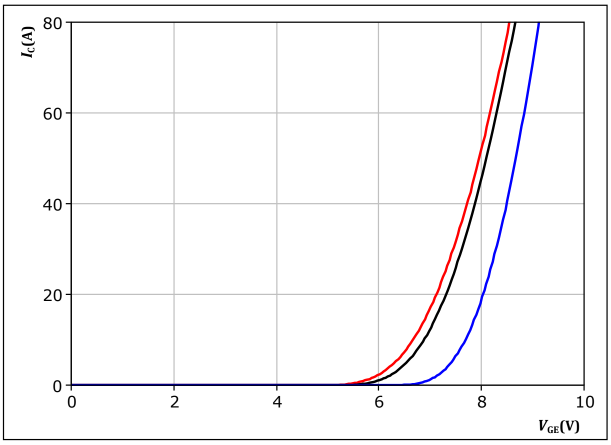
t_p =	250	µs
T_j =	150	°C

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

figure 3. IGBT

Typical transfer characteristics

I_C = f(V_{GE})

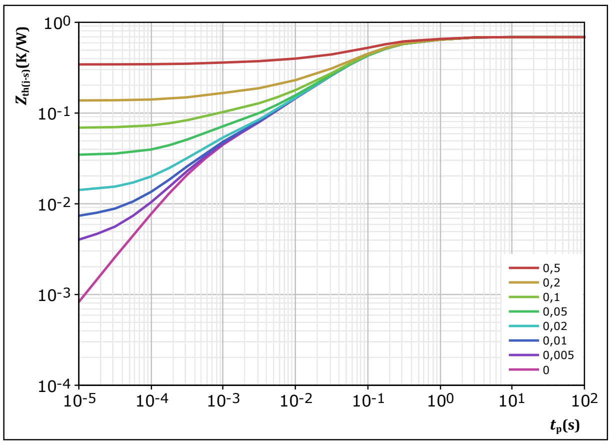


t_p =	250	µs	
V_{CE} =	10	V	T_j: 25 °C / 125 °C / 150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,687	K/W

IGBT thermal model values

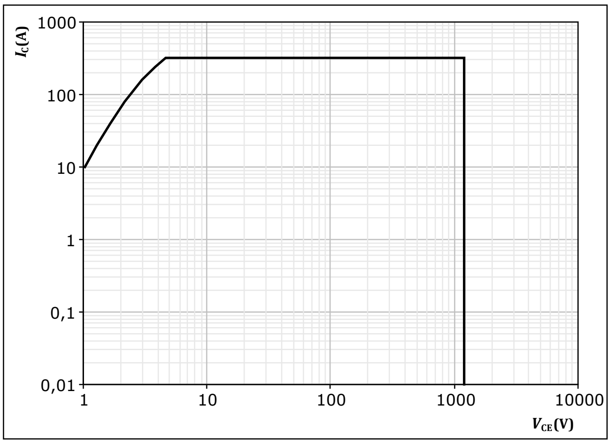
R (K/W)	τ (s)
1,16E-01	1,00E+00
3,47E-01	1,15E-01
1,38E-01	3,11E-02
5,25E-02	5,14E-03
3,27E-02	4,97E-04

Boost Switch Characteristics

figure 5.	IGBT

Safe operating area

I_C = f(V_{CE})



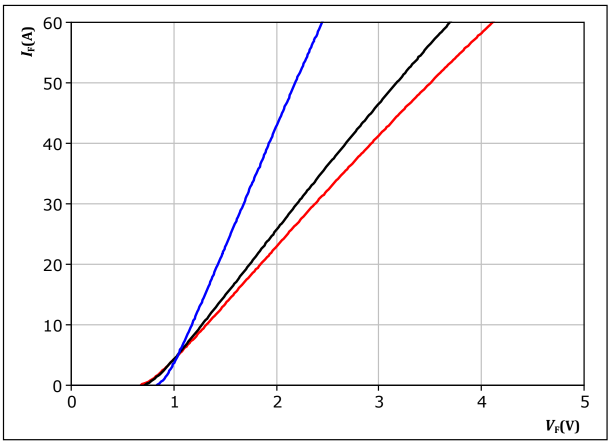
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

I_F = f(V_F)



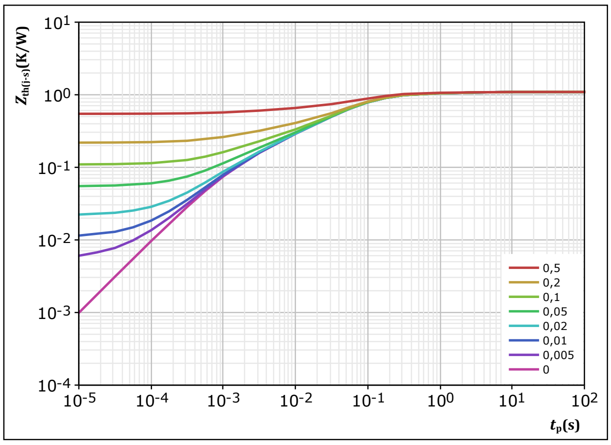
t_p = 250 µs

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

$R_{th(j-s)}$ = 1,093 K/W

IGBT thermal model values

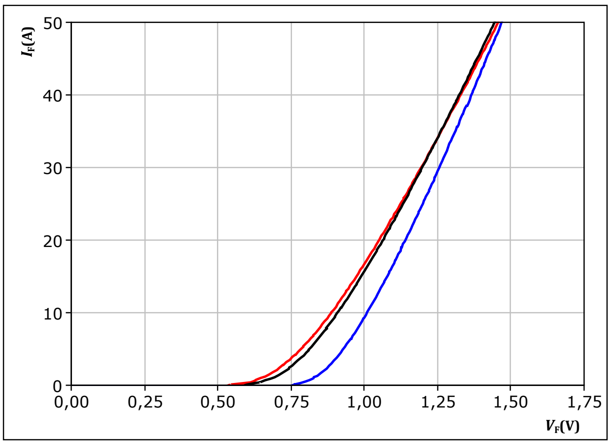
R (K/W)	τ (s)
4,73E-02	2,96E+00
1,05E-01	4,20E-01
5,77E-01	8,31E-02
1,79E-01	2,65E-02
1,16E-01	5,49E-03
6,86E-02	1,07E-03

Boost Sw. Protection Diode Characteristics

figure 8. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



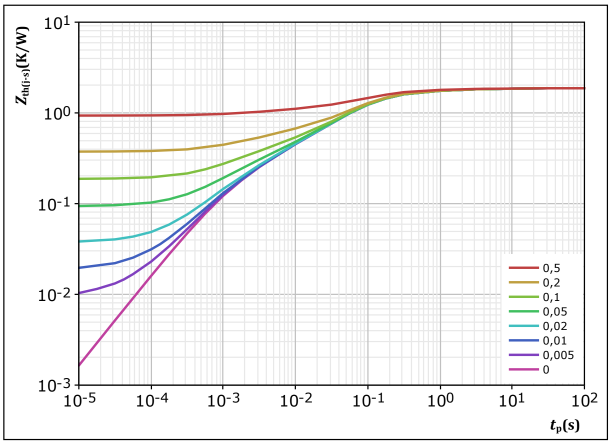
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 9. **Rectifier**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,869 K/W

IGBT thermal model values

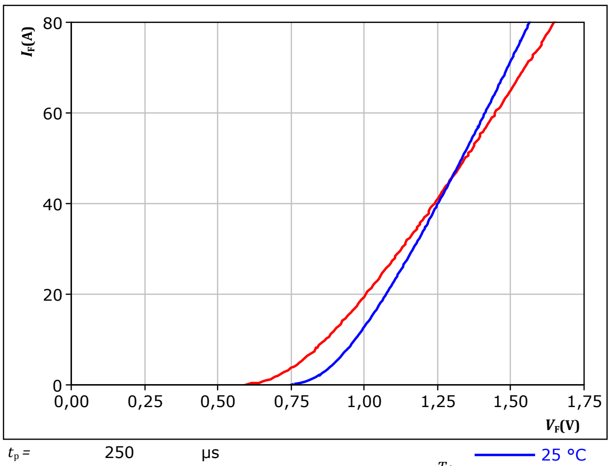
R (K/W)	τ (s)
5,65E-02	8,90E+00
1,70E-01	1,08E+00
6,15E-01	1,58E-01
6,94E-01	5,21E-02
2,16E-01	6,16E-03
1,19E-01	1,06E-03

ByPass Diode Characteristics

figure 10. **Rectifier**

Typical forward characteristics

I_F = f(V_F)



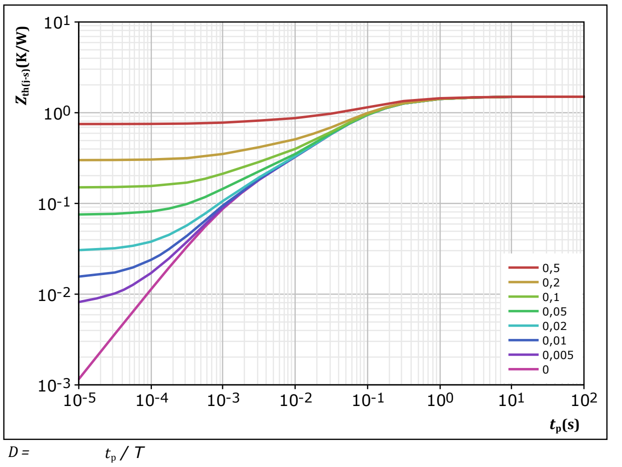
t_p = 250 μs

T_j: 25 °C, 125 °C

figure 11. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 1,5 K/W

IGBT thermal model values

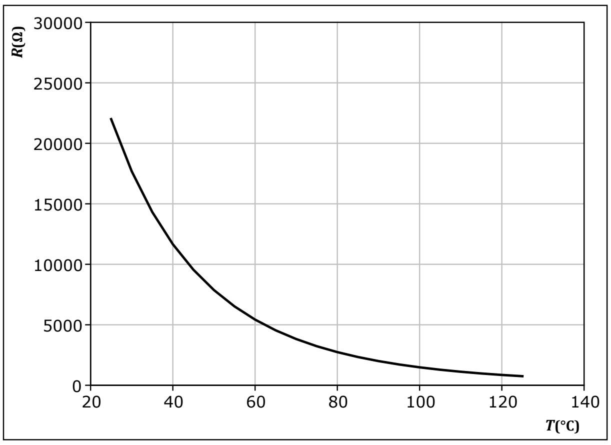
R (K/W)	τ (s)
9,44E-02	2,48E+00
3,47E-01	3,51E-01
7,44E-01	7,63E-02
2,04E-01	1,21E-02
1,11E-01	1,25E-03

Thermistor Characteristics

figure 12. **Thermistor**

Typical NTC characteristic as function of temperature

R_T = f(T)

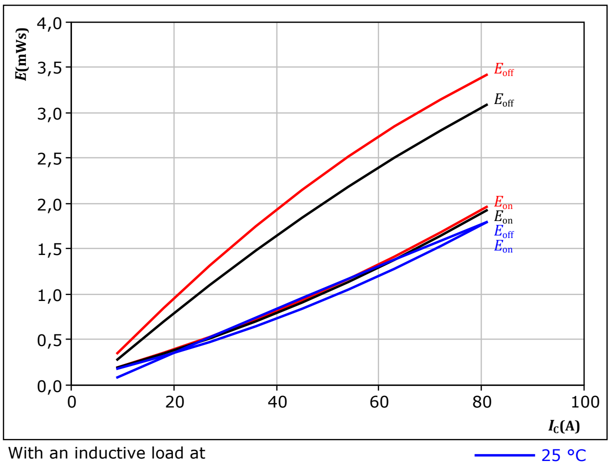


Boost Switching Characteristics

figure 13. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



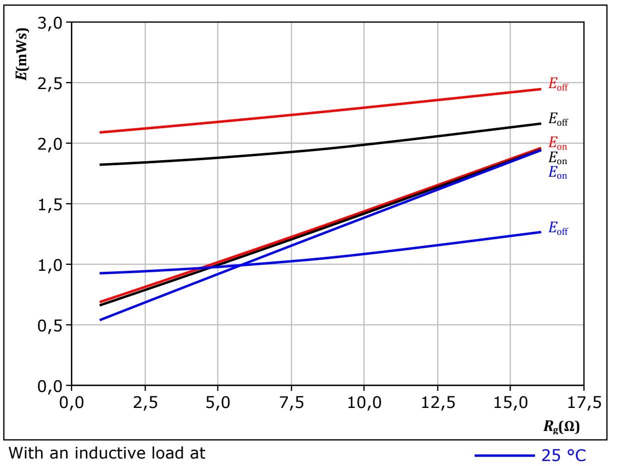
With an inductive load at

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 14. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



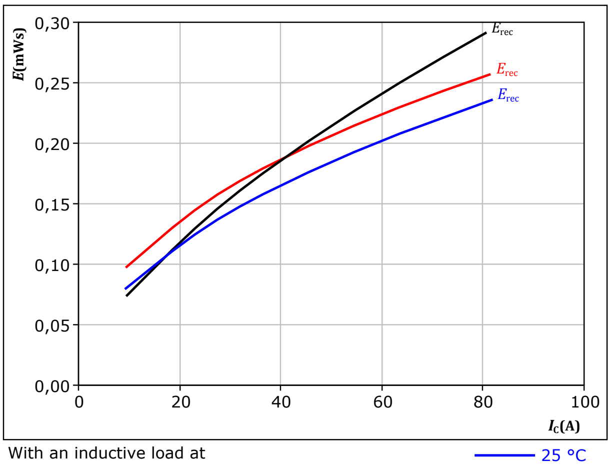
With an inductive load at

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

figure 15. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



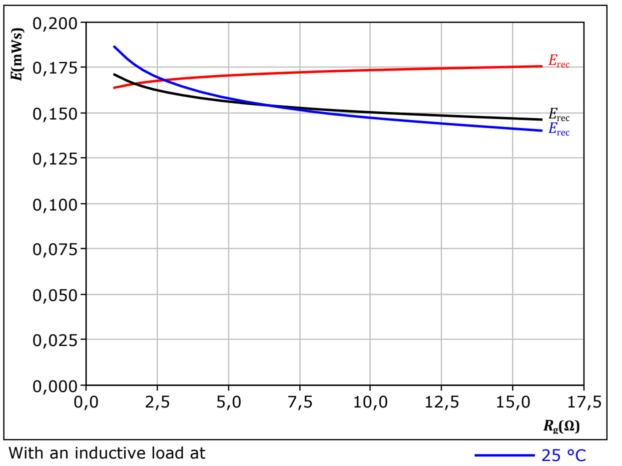
With an inductive load at

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

figure 16. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

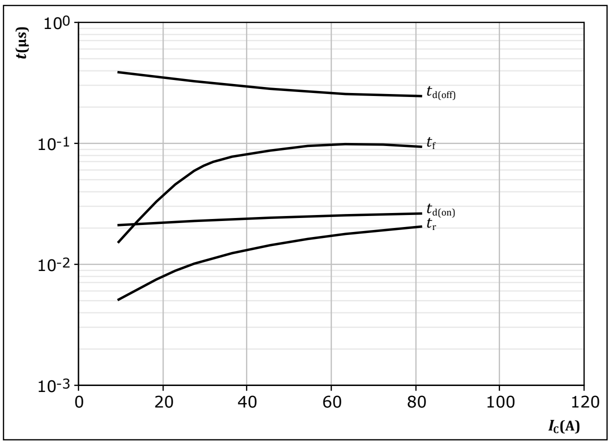
V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	45	A		150 °C

Boost Switching Characteristics

figure 17. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



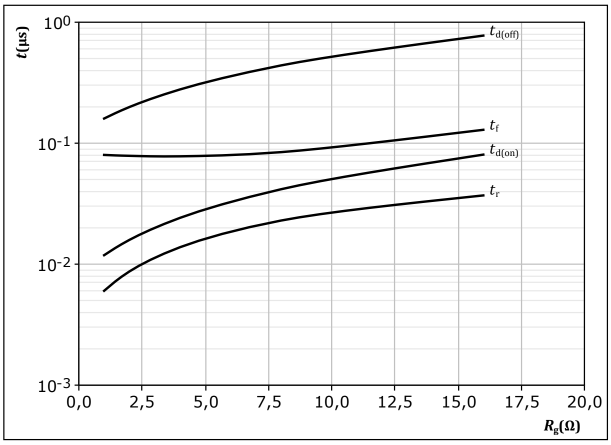
With an inductive load at

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

figure 18. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



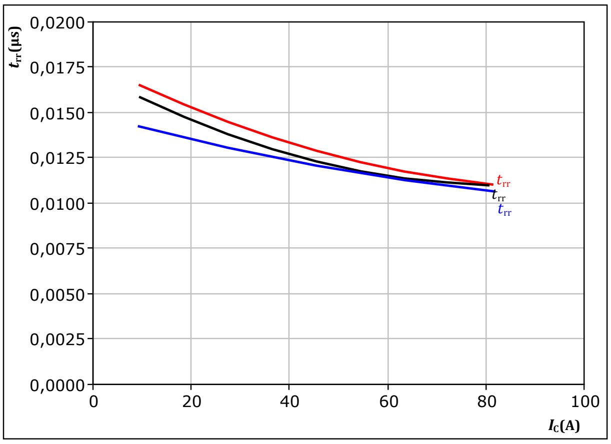
With an inductive load at

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

figure 19. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

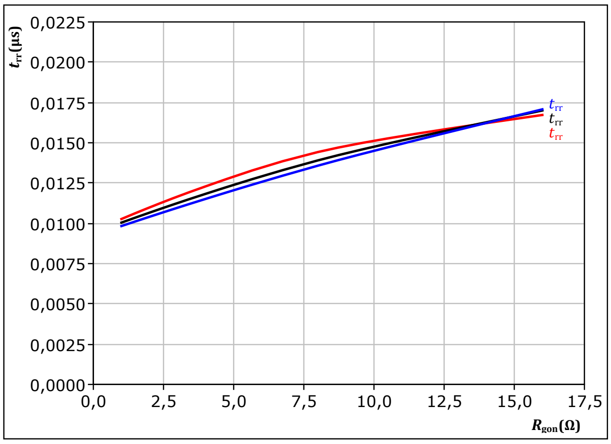
V_{CE} =	700	V
V_{GE} =	0/15	V
R_{gon} =	4	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 20. 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
V_{GE} =	0/15	V
I_C =	45	A

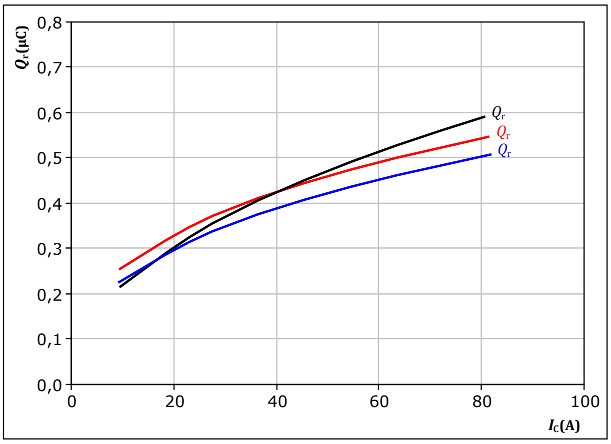
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 21. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



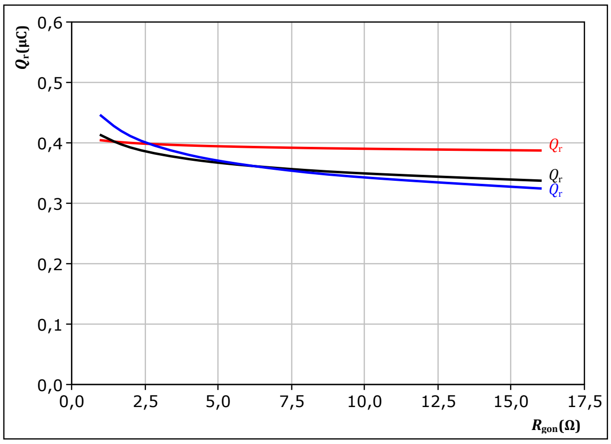
With an inductive load at

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

figure 22. **FWD**

Typical recovered charge as a function of turn on gate resistor

Q_r = f(R_{gon})



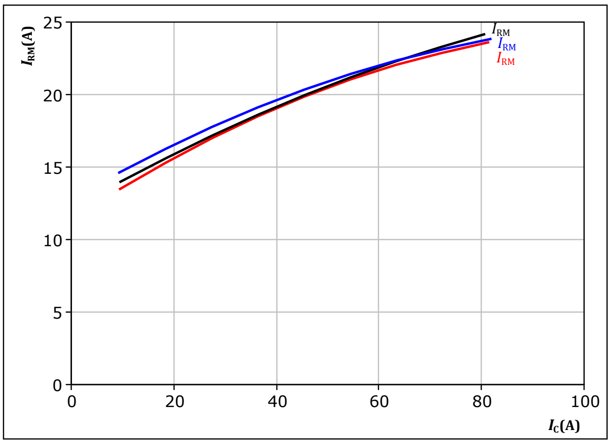
With an inductive load at

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

figure 23. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



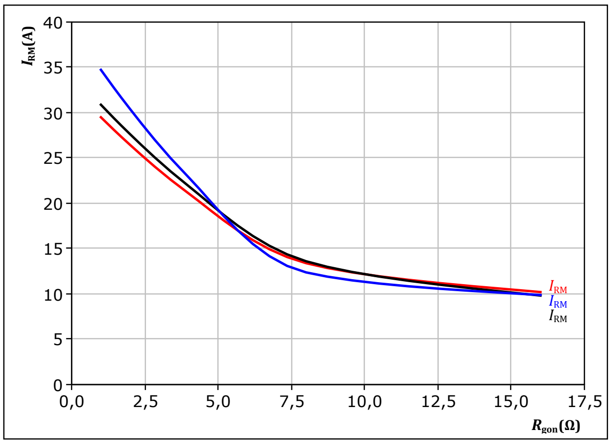
With an inductive load at

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

figure 24. **FWD**

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

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



With an inductive load at

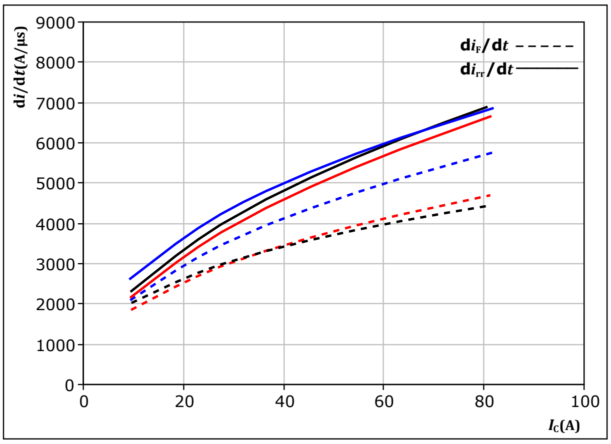
V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	45	A		150 °C

Boost Switching Characteristics

figure 25. **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

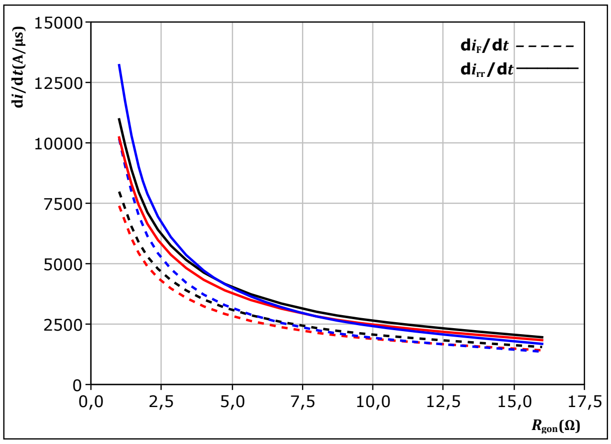
V_{CE} =	700	V	
V_{GE} =	0/15	V	
R_{gon} =	4	Ω	

T_j: 25 °C, 125 °C, 150 °C

figure 26. **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

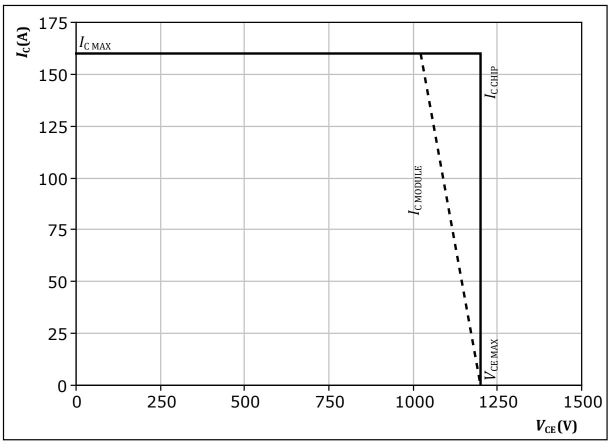
V_{CE} =	700	V
V_{GE} =	0/15	V
I_C =	45	A

T_j: 25 °C, 125 °C, 150 °C

figure 27. **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

figure 28. **IGBT**

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

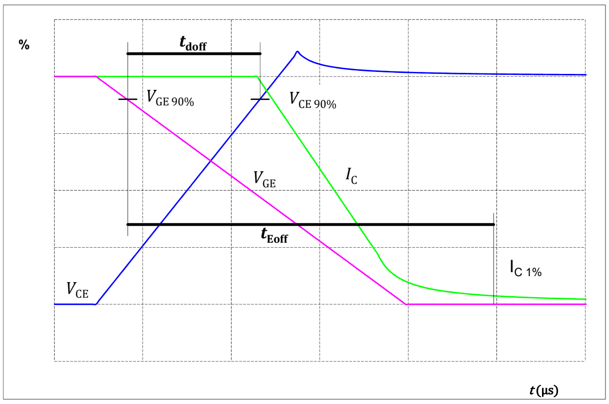


figure 29. **IGBT**

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

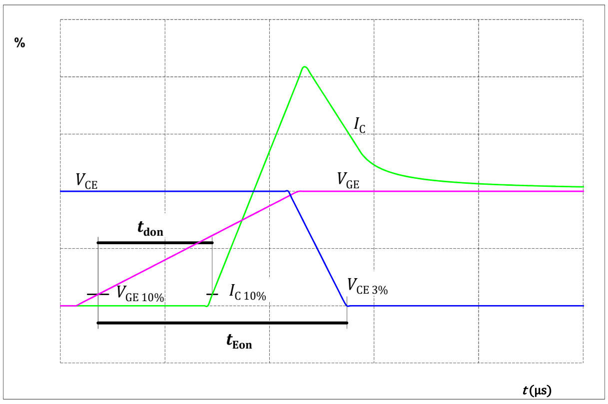


figure 30. **IGBT**

Turn-off Switching Waveforms & definition of t_f

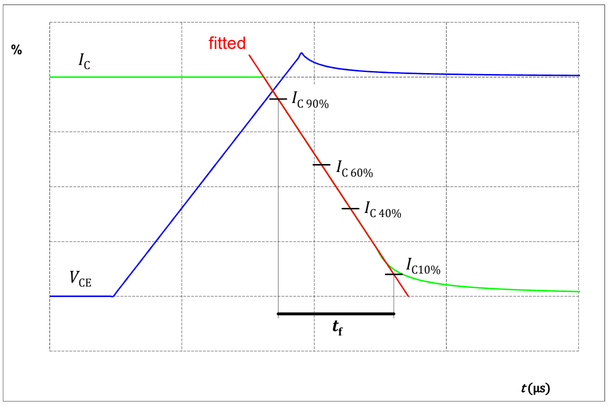
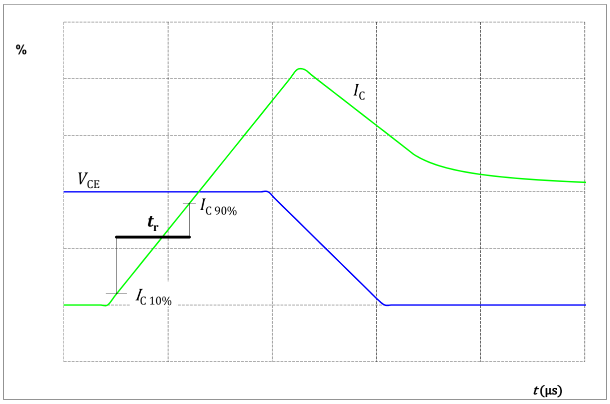


figure 31. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Boost Switching Definitions

figure 32. **FWD**

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

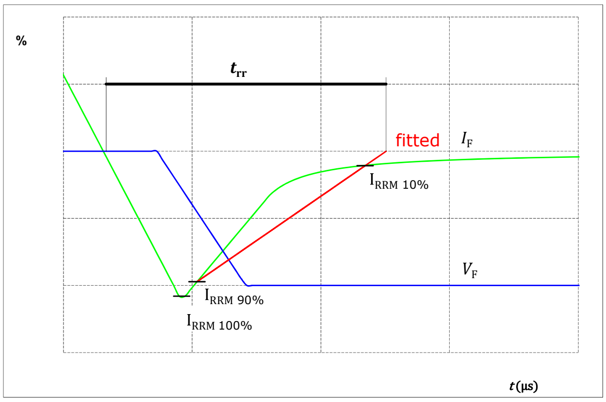
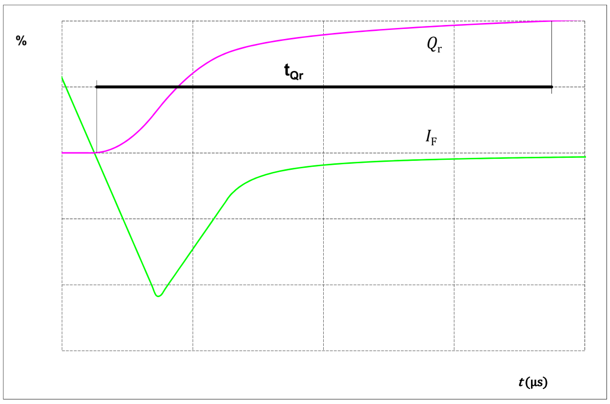


figure 33. **FWD**

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



Ordering Code

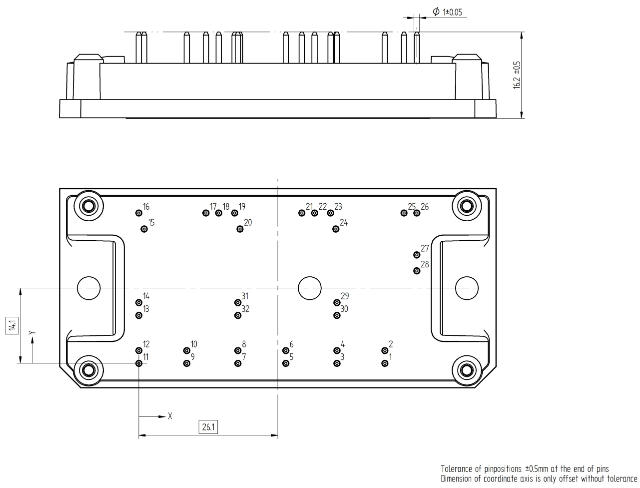
Version	Ordering Code
Without thermal paste	10-FY123BA080N302-LN28L37
With thermal paste	10-FY123BA080N302-LN28L37-/3/

Marking

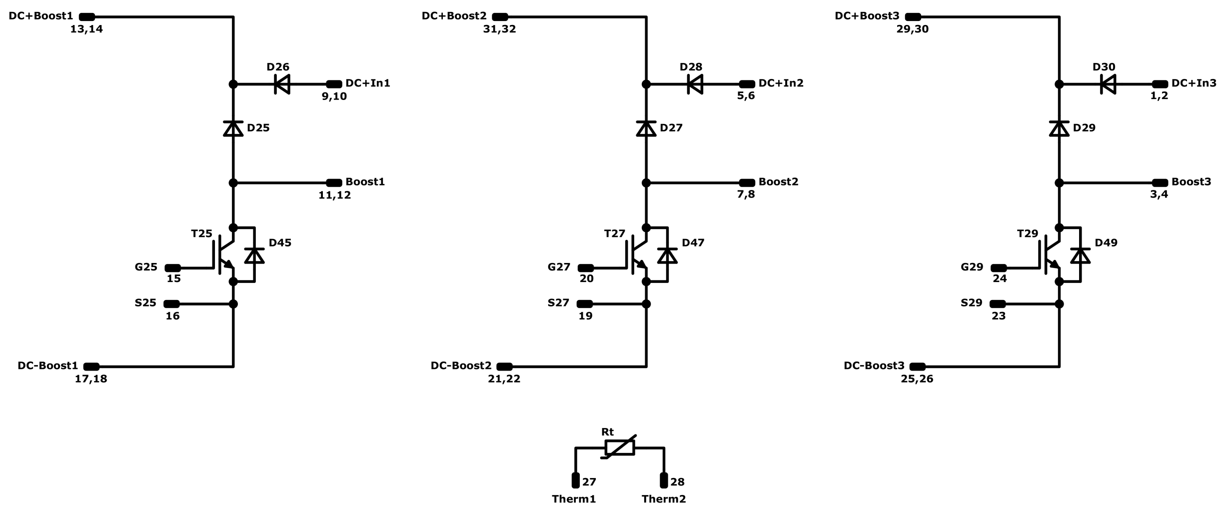
	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	46,2	0	DC+In3
2	46,2	2,4	DC+In3
3	37,2	0	Boost3
4	37,2	2,4	Boost3
5	27,6	0	DC+In2
6	27,6	2,4	DC+In2
7	18,6	0	Boost2
8	18,6	2,4	Boost2
9	9	0	DC+In1
10	9	2,4	DC+In1
11	0	0	Boost1
12	0	2,4	Boost1
13	0	9	DC+Boost1
14	0	11,4	DC+Boost1
15	1	25,2	G25
16	0	28,2	S25
17	12,6	28,2	DC-Boost1
18	15	28,2	DC-Boost1
19	18	28,2	S27
20	19	25,2	G27
21	30,6	28,2	DC-Boost2
22	33	28,2	DC-Boost2
23	36	28,2	S29
24	37	25,2	G29
25	49,8	28,2	DC-Boost3
26	52,2	28,2	DC-Boost3
27	52,2	20,35	Therm1
28	52,2	17,35	Therm2
29	37,2	11,4	DC+Boost3
30	37,2	9	DC+Boost3
31	18,6	11,4	DC+Boost2
32	18,6	9	DC+Boost2



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T25, T27, T29	IGBT	1200 V	80 A	Boost Switch	
D25, D27, D29	FWD	1200 V	20 A	Boost Diode	
D45, D47, D49	Rectifier	1600 V	18 A	Boost Sw. Protection Diode	
D26, D28, D30	Rectifier	1600 V	28 A	ByPass Diode	
Rt	Thermistor			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-FY123BA080N302-LN28L37-D1-14	5 Dec. 2019	Initial Release	