Vincotech

10-PG123BA080SH21-LN68L18T
datasheet

_flow_BOOST 1 triple **1200 V / 80 A**

Topology features

- Bypass Diode
- Kelvin Emitter for improved switching performance
- Temperature sensor
- Triple Booster

Component features

- Easy paralleling
- High speed switching
- Low switching losses

Housing features

- Base isolation: Al_2O_3
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

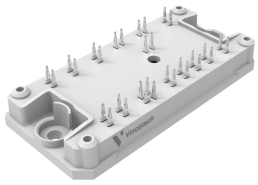
Target applications

- Solar Inverters

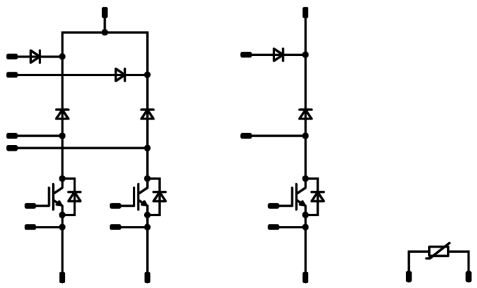
Types

- 10-PG123BA080SH21-LN68L18T

flow 1 12 mm housing



Schematic



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 (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	78	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		240	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	192	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 800 V	T_j = 150 °C	10	µs
Maximum junction temperature	T_{jmax}			175	°C
Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	47	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	286	A
Surge current capability	I^2t			408	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	96	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	47	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	61	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 current (DC current)	I_F	T_j = T_{jmax}	T_s = 80 °C	94	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	600	A
Surge current capability	I^2t			1800	A^2s
Total power dissipation	P_{tot}	T_j = T_{jmax}	T_s = 80 °C	113	W
Maximum junction temperature	T_{jmax}			150	°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
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	2500	V
Creepage distance				>12,7	mm
Clearance				11,53	mm
Comparative Tracking Index	CTI			≥ 600	

*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}			0,003	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		80	25 125 150	1,78	1,99 2,33 2,41	2,42(1)	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			10	µA
Gate-emitter leakage current	I_{GES}		20	0		25			240	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		4660		pF
Output capacitance	C_{oes}							300		pF
Reverse transfer capacitance	C_{res}							260		pF
Gate charge	Q_g	V_{CC} = 960 V	15		80	25		370		nC
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,5		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	0/15	700	80	25 125 150		27,8 27,26 27,08		ns
Rise time	t_r					25 125 150		17,04 18,29 18,94		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		253,26 312,64 326,81		ns
Fall time	t_f					25 125 150		35,66 73,64 87,85		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,236 µC Q_{rFWD}=0,234 µC Q_{rFWD}=0,228 µC				25 125 150		1,58 1,97 2,09		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		3,68 5,82 6,43		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				40	25 125 150		1,44 1,71 1,81	1,6(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25 150		0,4 28	160	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,99		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=5717 A/µs di/dt=5016 A/µs di/dt=5857 A/µs	0/15	700	80	25 125 150		31,88 30,27 29,42		A
Reverse recovery time	t_{rr}					25 125 150		12,64 13,06 13,16		ns
Recovered charge	Q_r					25 125 150		0,236 0,234 0,228		µC
Reverse recovered energy	E_{rec}					25 125 150		0,078 0,075 0,072		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		5872,58 5171,9 4213,78		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				28	25 125		1,15 1,1	1,5(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			100 1000	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,15		K/W
ByPass Diode										
Static										
Forward voltage	V_F				50	25 125 150		1,07 1 0,983	1,5(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			100 2	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,62		K/W

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		5		kΩ
Deviation of R100	$\Delta_{R/R}$	R_{100} = 499 Ω				100	3,2		3,3	%
Power dissipation	P					25		130		mW
Power dissipation constant	d					25		1,3		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %						3380		K
Vincotech Thermistor Reference									V	

(1) Value at chip level

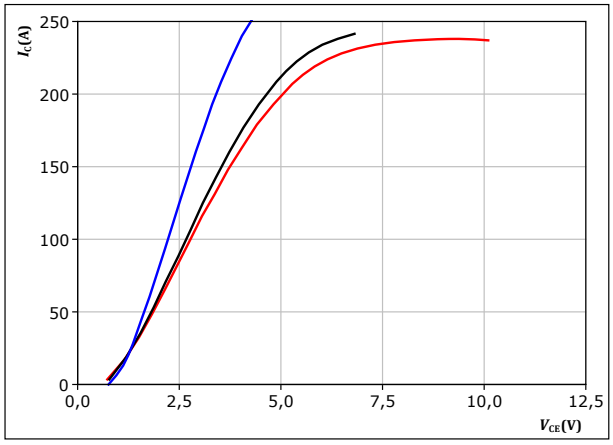
(2) Only valid with pre-applied Vincotech thermal interface material.

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

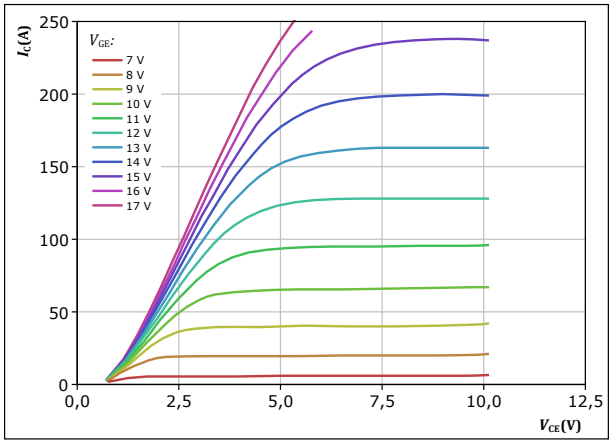


t_p =	250	µs		
V_{GE} =	15	V	T_j:	25 °C
				125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



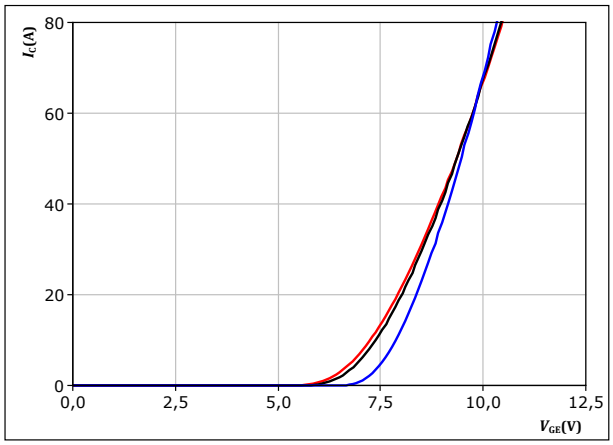
t_p =	250	µs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

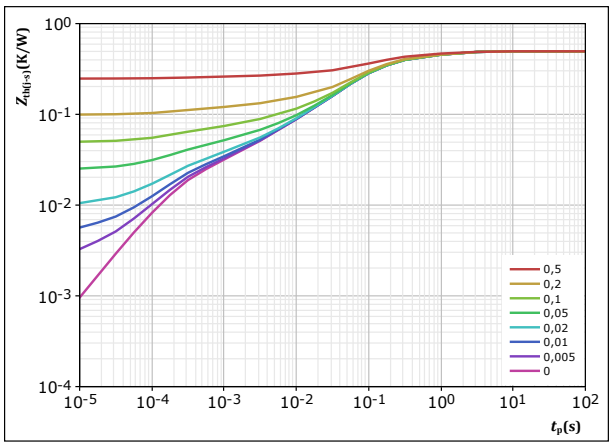


t_p =	250	µs		
V_{CE} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,495	K/W

IGBT thermal model values

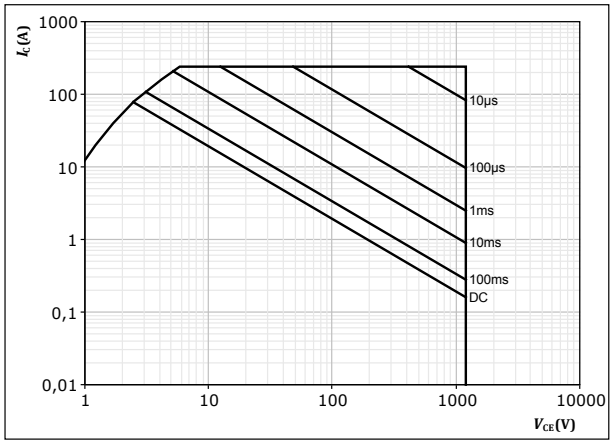
R (K/W)	τ (s)
8,27E-02	1,36E+00
1,80E-01	1,79E-01
1,82E-01	5,73E-02
3,03E-02	3,66E-03
2,06E-02	2,43E-04

Boost Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



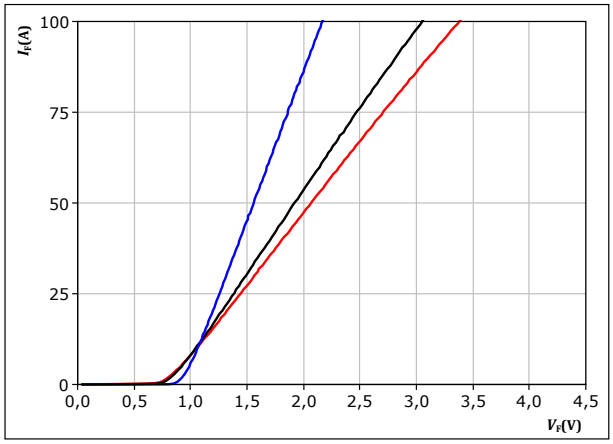
D = single pulse
T_s = 80 °C
V_{GE} = 15 V
T_j = T_{jmax}

Boost Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



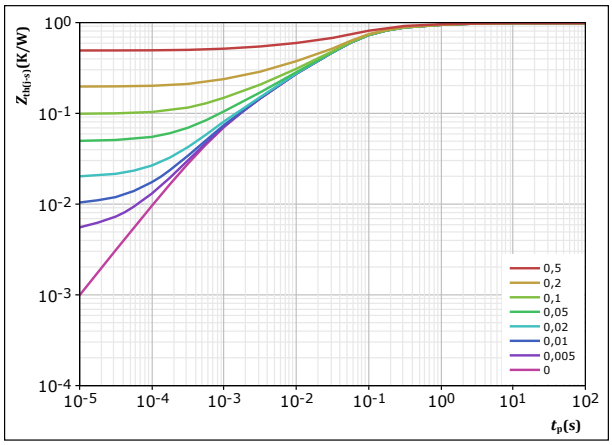
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,986 K/W

FWD thermal model values

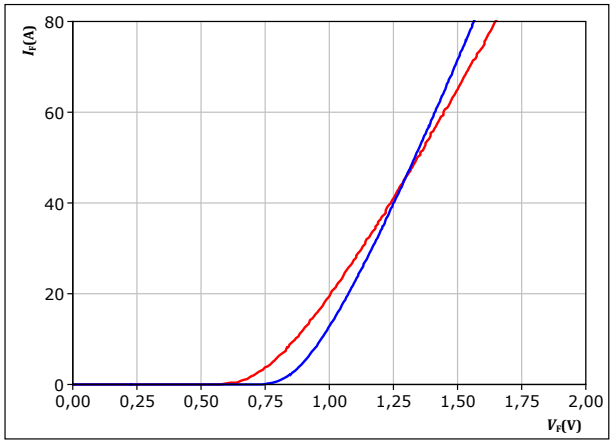
R (K/W)	τ (s)
8,13E-02	1,41E+00
1,88E-01	1,88E-01
5,18E-01	5,07E-02
1,44E-01	6,19E-03
5,47E-02	8,41E-04

Boost Sw. Protection Diode Characteristics

figure 8. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



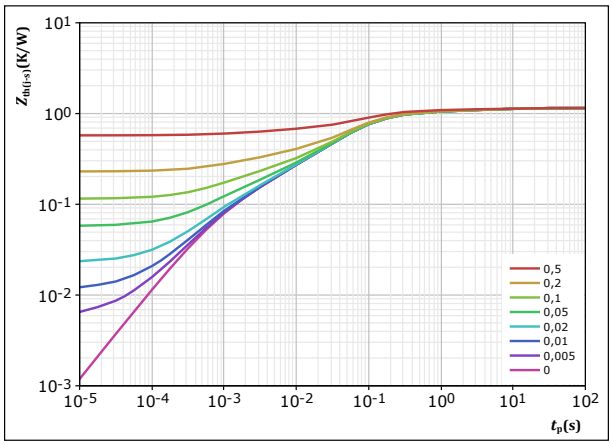
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 9. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,149 K/W

Rectifier thermal model values

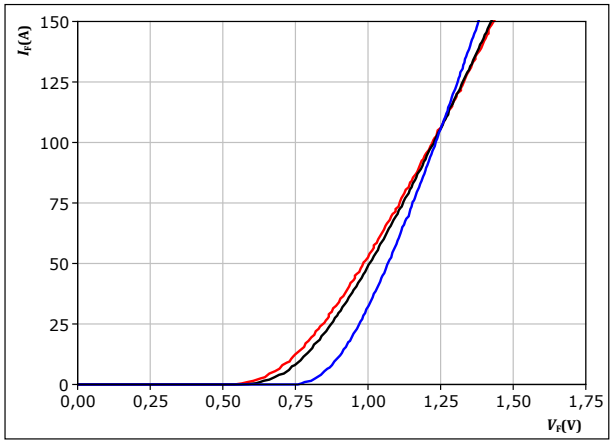
R (K/W)	τ (s)
8,29E-02	7,59E+00
1,02E-01	6,72E-01
4,20E-01	1,19E-01
3,78E-01	4,22E-02
1,08E-01	4,04E-03
5,78E-02	7,21E-04

ByPass Diode Characteristics

figure 10. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



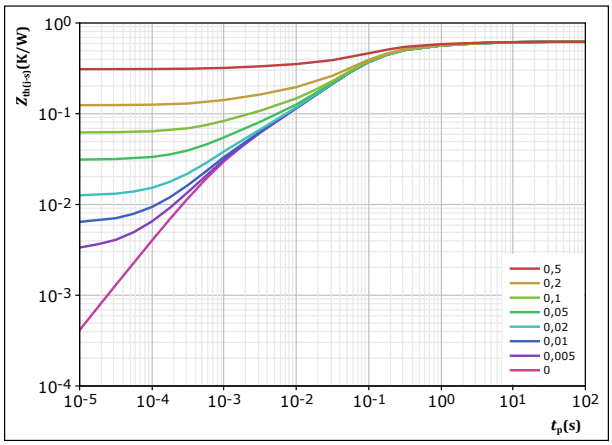
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 11. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,62 K/W

Rectifier thermal model values

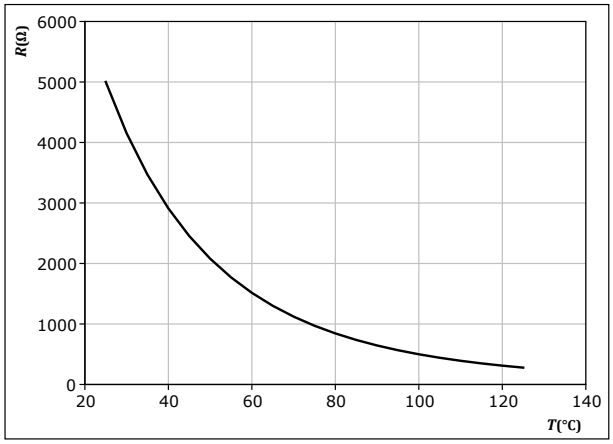
R (K/W)	τ (s)
3,05E-02	6,33E+00
7,00E-02	1,17E+00
1,92E-01	1,79E-01
2,54E-01	5,78E-02
4,42E-02	6,88E-03
2,73E-02	1,10E-03
2,83E-03	5,91E-04

Thermistor Characteristics

figure 12. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

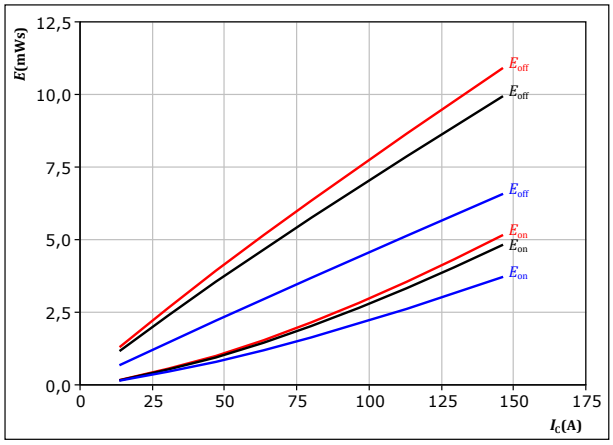


Boost Switching Characteristics

figure 13. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



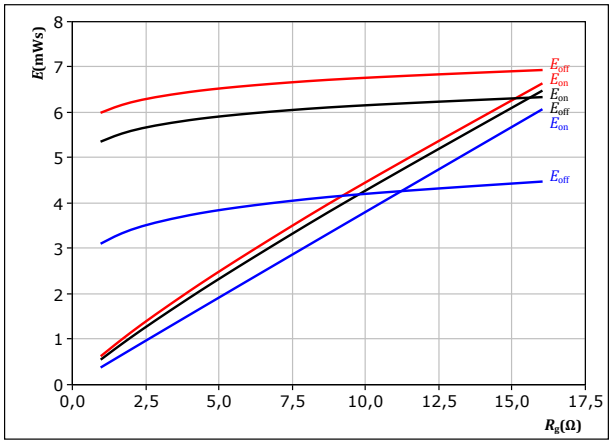
With an inductive load at

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 IGBT turn on gate resistor

$E = f(R_g)$



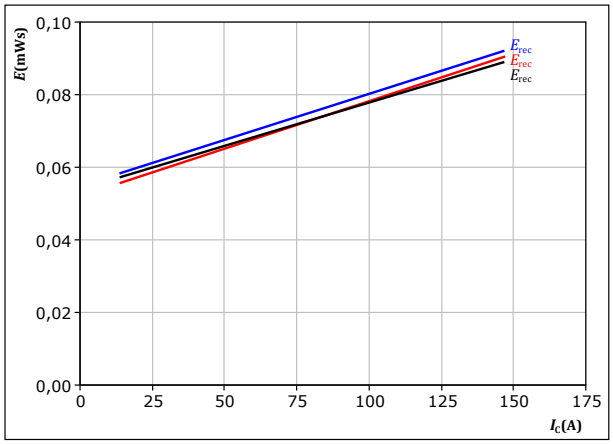
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	80	A		150 °C

figure 15. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



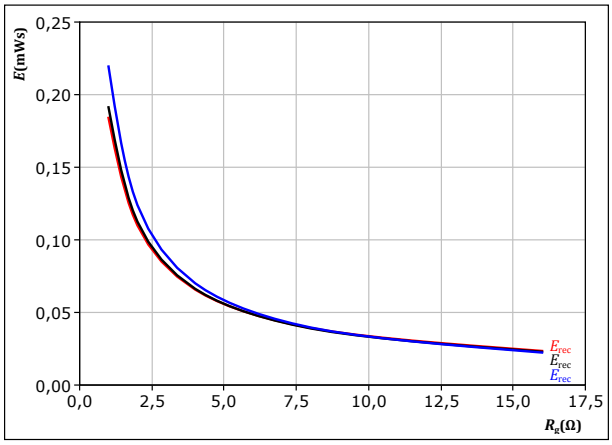
With an inductive load at

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 IGBT turn on gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

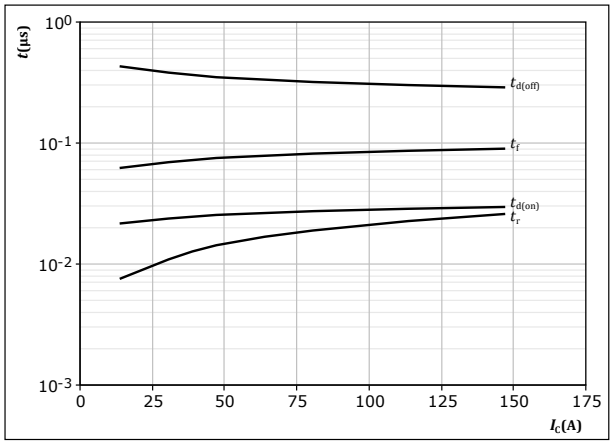
V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	80	A		150 °C

Boost Switching Characteristics

figure 17. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



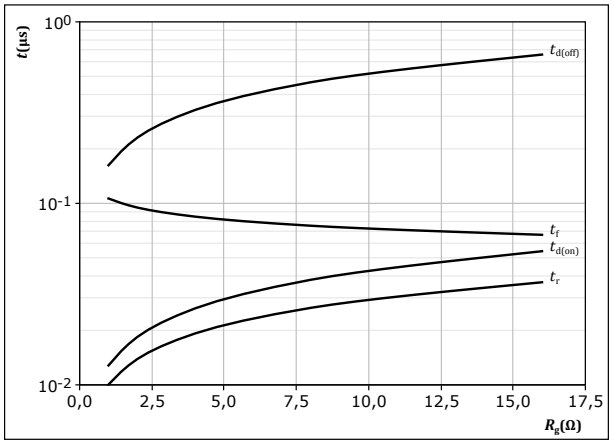
With an inductive load at

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 IGBT turn on gate resistor

t = f(R_g)



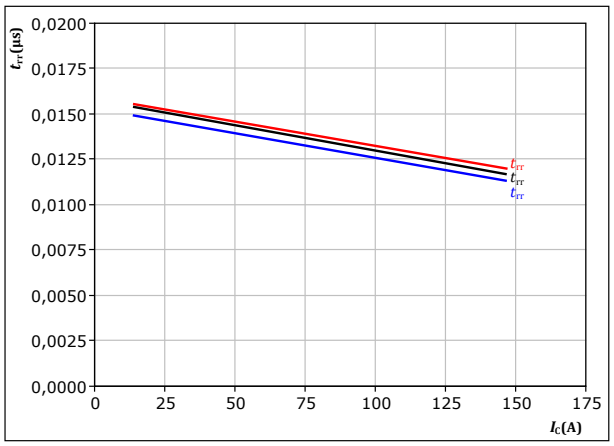
With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	0/15	V
I_C =	80	A

figure 19. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

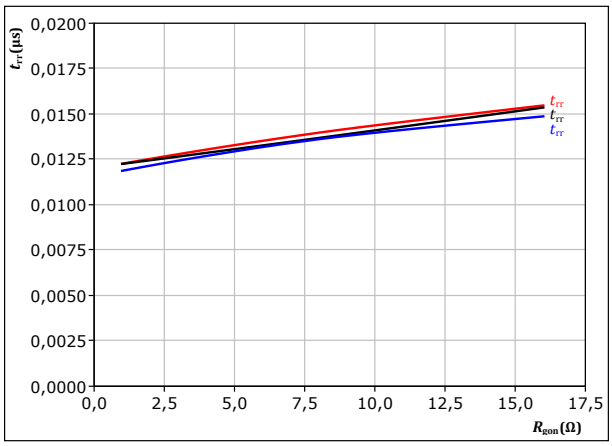
V_{CE} =	700	V
V_{GE} =	0/15	V
R_{gon} =	4	Ω

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 =	80	A

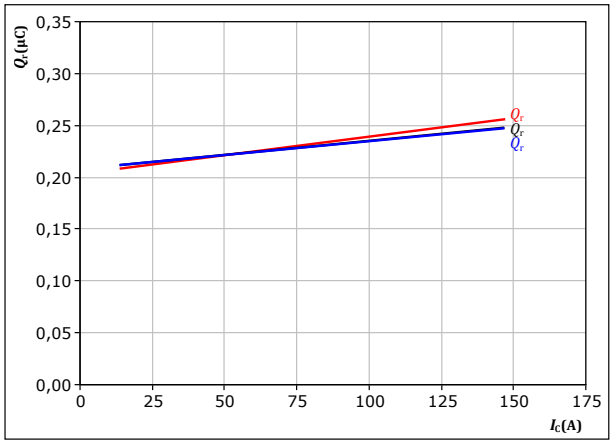
T_j: 25 °C, 125 °C, 150 °C

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

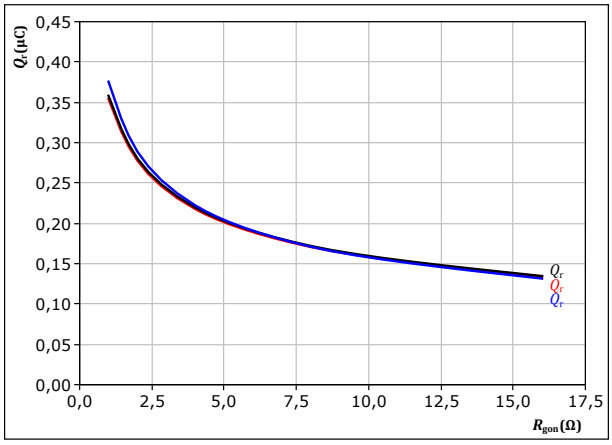
V_{CE} =	700	V
V_{GE} =	0/15	V
R_{gon} =	4	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 22. **FWD**

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

$Q_r = f(R_{gon})$



With an inductive load at

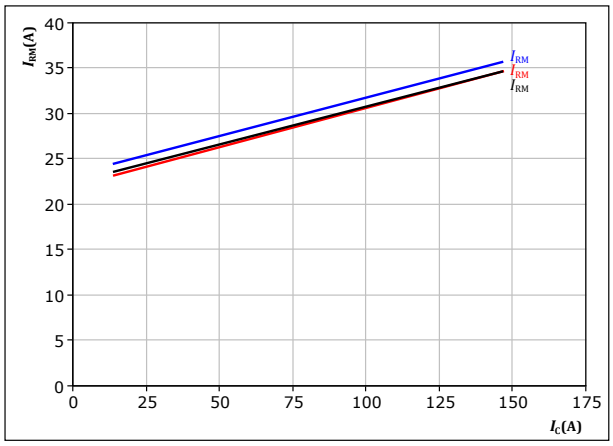
V_{CE} =	700	V
V_{GE} =	0/15	V
I_C =	80	A

T_j: 25 °C, 125 °C, 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

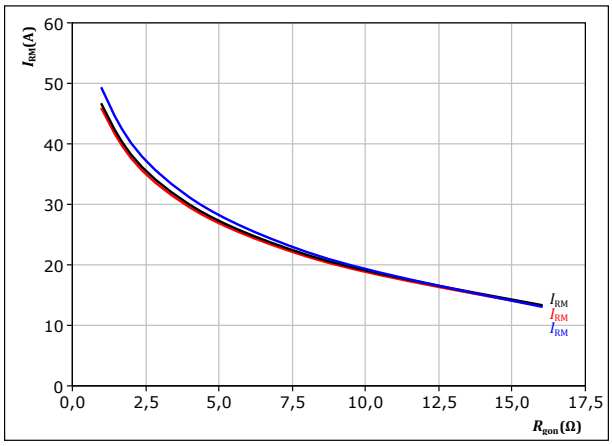
V_{CE} =	700	V
V_{GE} =	0/15	V
R_{gon} =	4	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 24. **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
V_{GE} =	0/15	V
I_C =	80	A

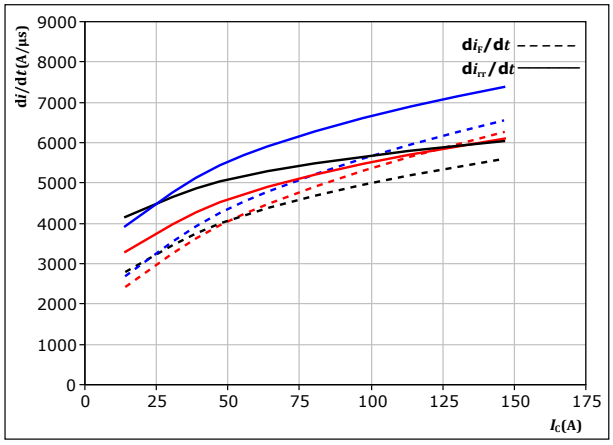
T_j: 25 °C, 125 °C, 150 °C

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)



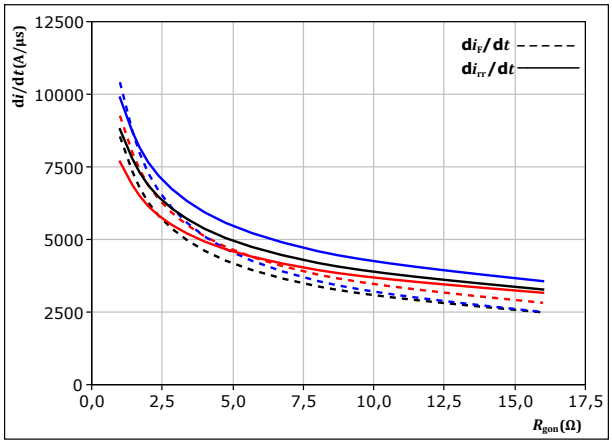
With an inductive load at

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



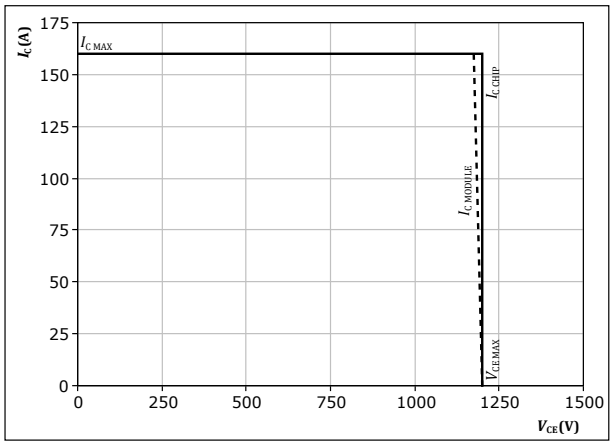
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	80	A		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})

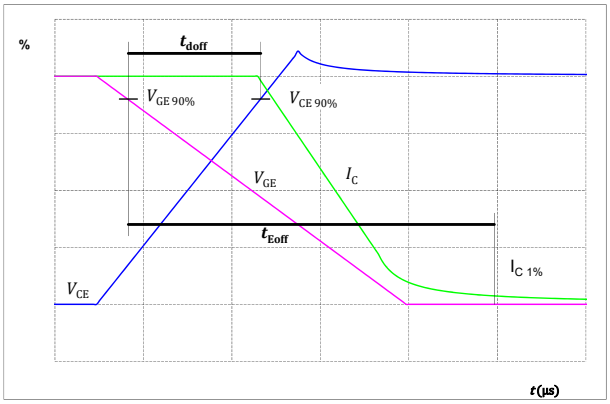


figure 29. **IGBT**

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

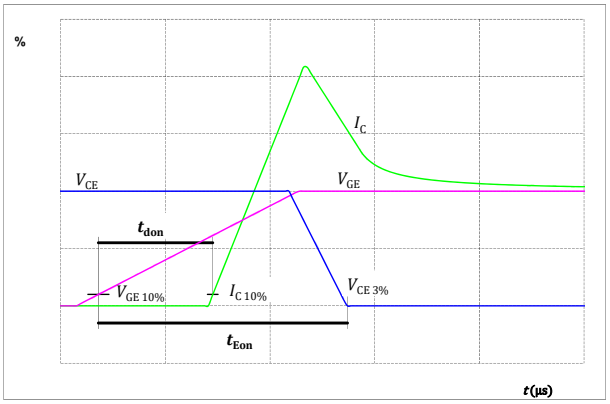


figure 30. **IGBT**

Turn-off Switching Waveforms & definition of t_f

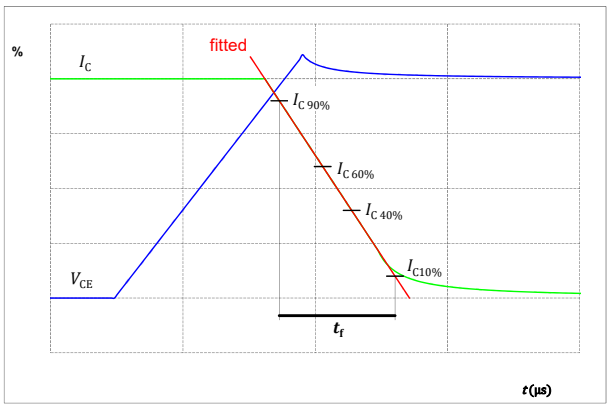
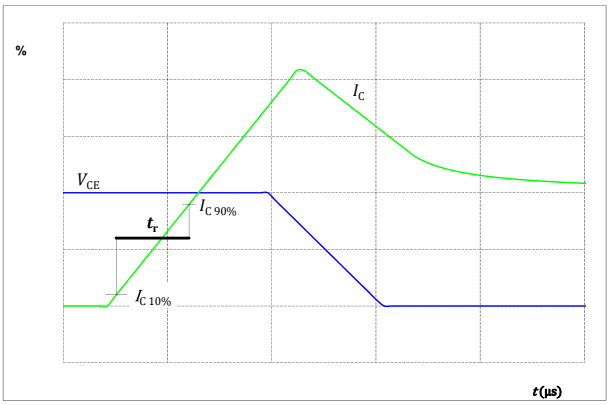


figure 31. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Boost Switching Definitions

figure 32. **FWD**

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

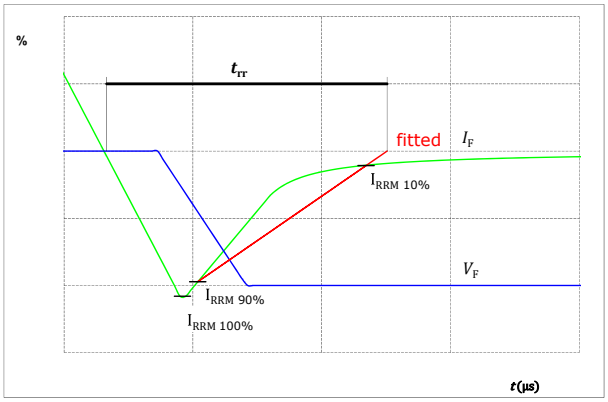
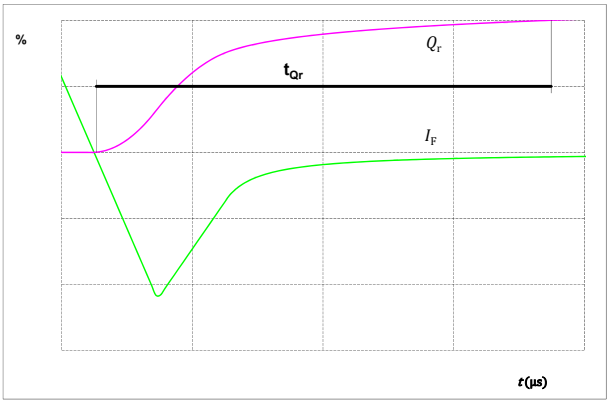


figure 33. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	10-PG123BA080SH21-LN68L18T
With thermal paste (5,2 W/mK, PTM6000HV)	10-PG123BA080SH21-LN68L18T-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-PG123BA080SH21-LN68L18T-/3/

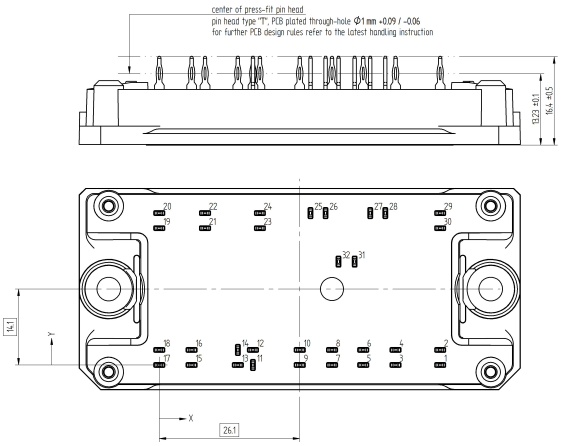
Marking

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

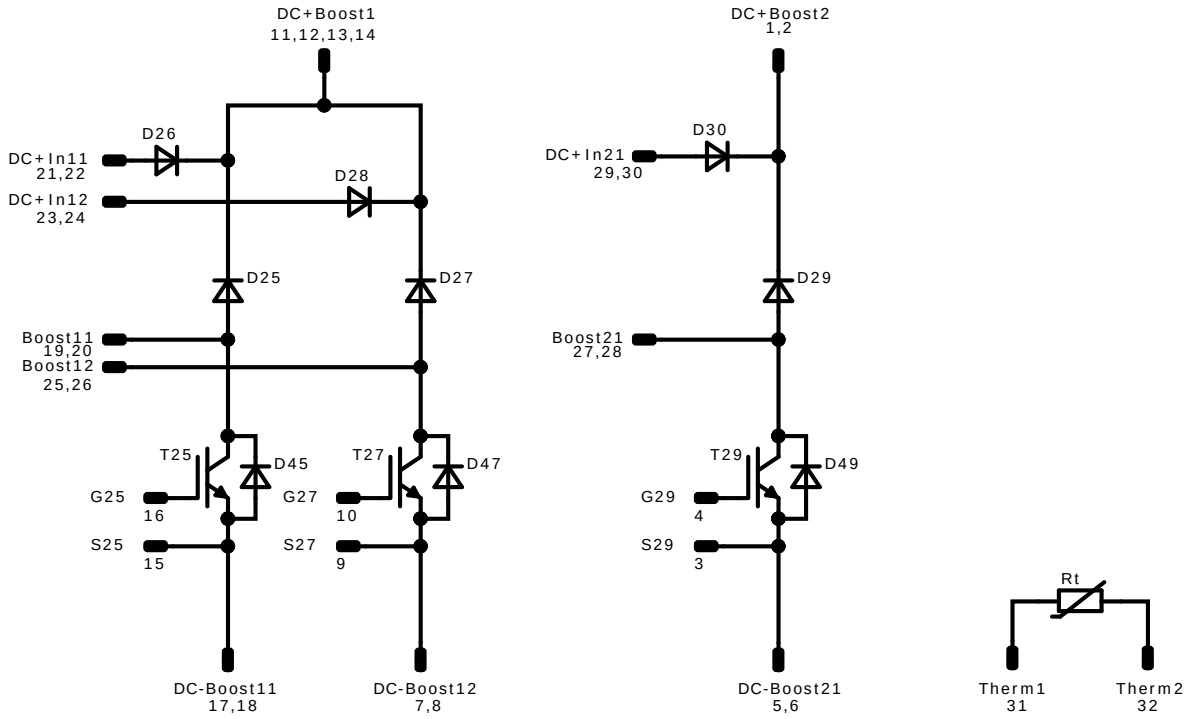
Outline

Pin table [mm]

Pin	X	Y	Function
1	52,2	0	DC+Boost2
2	52,2	2,8	DC+Boost2
3	43,9	0	S29
4	43,9	2,8	G29
5	37,9	0	DC-Boost21
6	37,9	2,8	DC-Boost21
7	32,1	0	DC-Boost12
8	32,1	2,8	DC-Boost12
9	26,1	0	S27
10	26,1	2,8	G27
11	17,4	0	DC+Boost1
12	17,4	2,8	DC+Boost1
13	14,6	0	DC+Boost1
14	14,6	2,8	DC+Boost1
15	6	0	S25
16	6	2,8	G25
17	0	0	DC-Boost11
18	0	2,8	DC-Boost11
19	0	25,4	Boost11
20	0	28,2	Boost11
21	8,5	25,4	DC+In11
22	8,5	28,2	DC+In11
23	18,7	25,4	DC+In12
24	18,7	28,2	DC+In12
25	28,1	28,2	Boost12
26	30,9	28,2	Boost12
27	39,2	28,2	Boost21
28	42	28,2	Boost21
29	52,2	28,2	DC+In21
30	52,2	25,4	DC+In21
31	36,3	19,2	Therm1
32	33,3	19,2	Therm2



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T25, T27, T29	IGBT	1200 V	80 A	Boost Switch	
D25, D27, D29	FWD	1200 V	40 A	Boost Diode	
D45, D47, D49	Rectifier	1600 V	28 A	Boost Sw. Protection Diode	
D26, D28, D30	Rectifier	1600 V	50 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.

Vincotech thermistor reference
See Vincotech thermistor reference table at 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-PG123BA080SH21-LN68L18T-D2-14	31 Mar. 2023	Change Boost Diode	

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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.