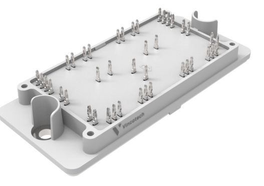
30-PT10B2A200S706-PA79L98Y
datasheet

***flow*BOOST 2 dual** **950 V / 200 A**

Features

- Dual Booster
- High Performance Flying Capacitor Topology
- Optimized for 1500 V applications
- Latest Si Technology
- Integrated flying snubber capacitor
- Integrated NTC
- Low Inductance Design

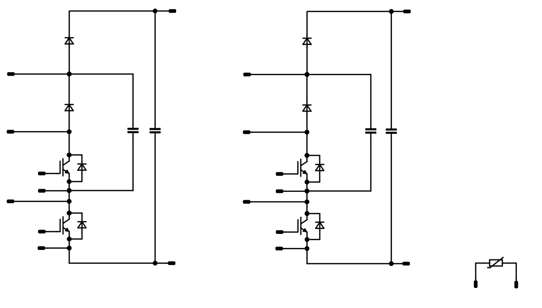
flow 2 12 mm housing



Target applications

- Energy Storage Systems
- Solar Inverters

Schematic



Types

- 30-PT10B2A200S706-PA79L98Y

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Boost Switch					
Collector-emitter voltage	V_{CES}			950	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	139	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		400	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	261	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			950	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	110	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		400	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	198	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	52	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	96	W
Maximum junction temperature	T_{jmax}			175	°C
Flying Capacitor					
Maximum DC voltage	V_{MAX}			1000	V
Operation Temperature	T_{op}			-55 ... 125	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Capacitor (DC)					
Maximum DC voltage	V_{MAX}			1500	V
Operation Temperature	T_{op}			-55 ... 125	°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
Creepage distance				>12,7	mm
Clearance				>12,7	mm
Comparative Tracking Index	CTI			≥ 600	

*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	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00334	25	4,35	5,1	5,85	V
Collector-emitter saturation voltage	V_{CEsat}		15		200	25 125 150		1,83 2,06 2,11	2,35(1)	V
Collector-emitter cut-off current	I_{CES}		0	950		25			4	μA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							0,75		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		13000		pF
Output capacitance	C_{oes}							278		pF
Reverse transfer capacitance	C_{res}							40		pF
Gate charge	Q_g		15		0	25		460		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,36		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	±15	600	170	25 125 150		259,85 258,71 258,39		ns
Rise time	t_r					25 125 150		25,63 28,06 29,12		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		182,5 208,82 216,26		ns
Fall time	t_f					25 125 150		21,26 42,49 47,76		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=4,18 μC Q_{rFWD}=9,83 μC Q_{rFWD}=11,69 μC				25 125 150		10,16 11,99 12,42		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		4,1 6,62 7,38		mWs

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 Diode										
Static										
Forward voltage	V_F				200	25 125 150	2,1	2,64 2,44 2,36	2,8(1)	V
Reverse leakage current	I_R	V_r = 950 V				25			8	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,48		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=6201 A/µs d*i*/d*t*=5610 A/µs d*i*/d*t*=5882 A/µs	±15	600	170	25 125 150		103,93 145,58 159,43		A
Reverse recovery time	t_{rr}					25 125 150		125,49 183,62 197,84		ns
Recovered charge	Q_r					25 125 150		4,18 9,83 11,69		µC
Reverse recovered energy	E_{rec}					25 125 150		0,936 2,71 3,37		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		6221,25 4201,78 4090,98		A/µs

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 Sw. Protection Diode										
Static										
Forward voltage	V_F				50	25 125 150		1,66 1,78 1,79	2,1[1]	V
Reverse leakage current	I_R	V_r = 1200 V				25			40	μA
Thermal										
Thermal resistance junction to sink [2]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,99		K/W
Flying Capacitor										
Static										
Capacitance	C	DC bias voltage = 0 V				25		100		nF
Tolerance							-10		10	%
Dissipation factor		f = 1 kHz				25		2,5		%
Capacitor (DC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		33		nF
Tolerance							-10		10	%
Dissipation factor		f = 1 kHz				25		2,5		%

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	

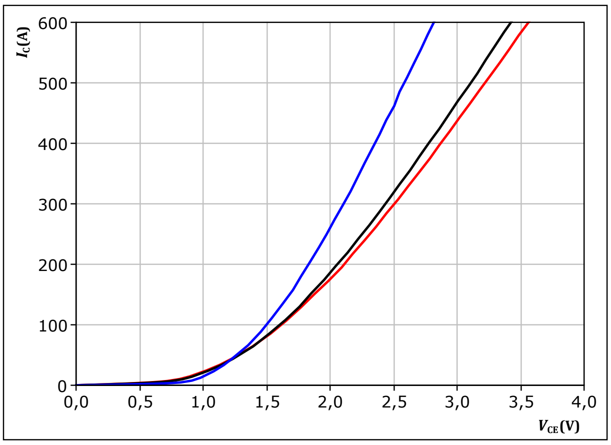
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

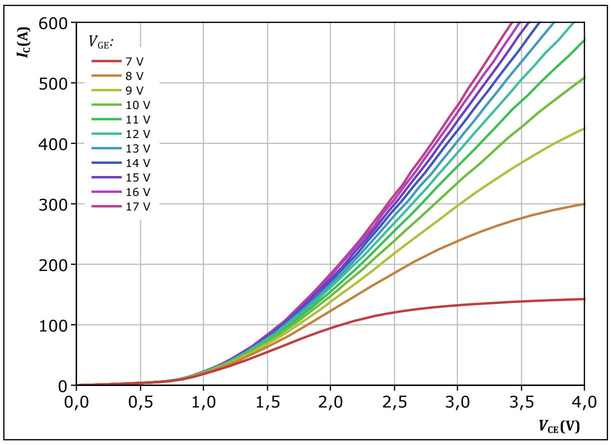


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



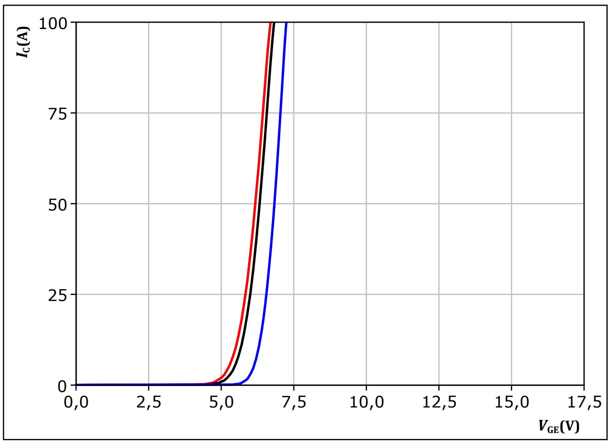
t_p =	250	µs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

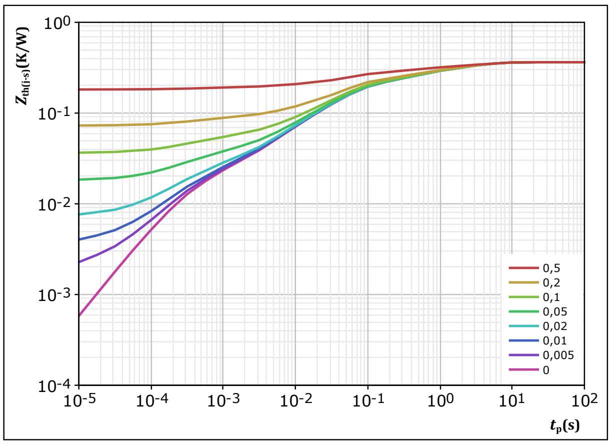


t_p =	250	µs		25 °C
V_{CE} =	8	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,363	K/W

IGBT thermal model values

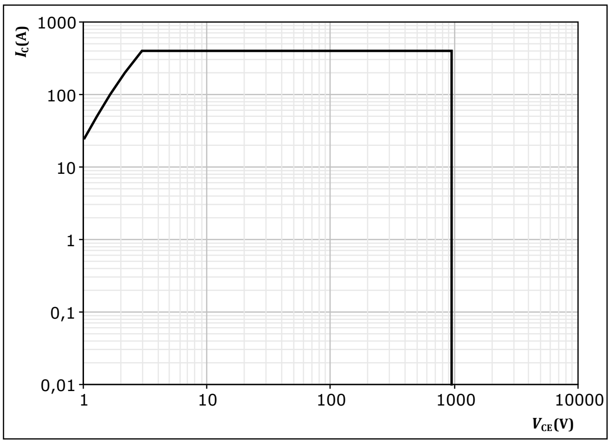
R (K/W)	τ (s)
9,25E-02	2,69E+00
8,12E-02	4,10E-01
1,47E-01	4,37E-02
2,64E-02	5,33E-03
1,62E-02	3,22E-04

Boost Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})



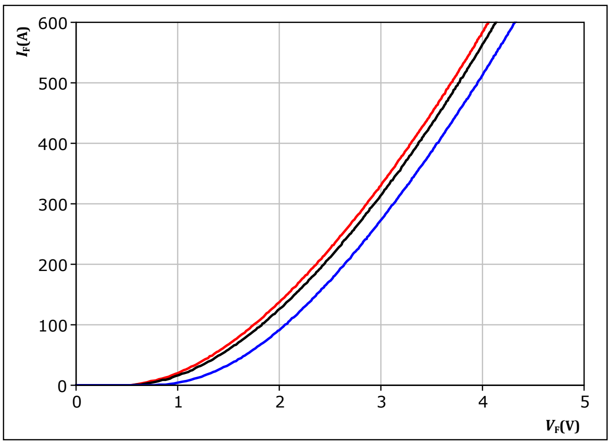
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

I_F = f(V_F)



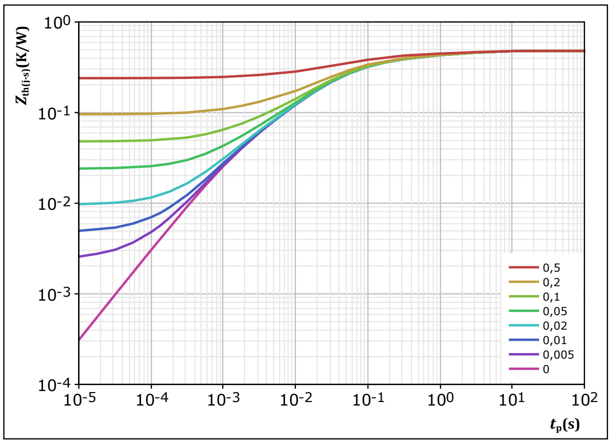
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,479 K/W

FWD thermal model values

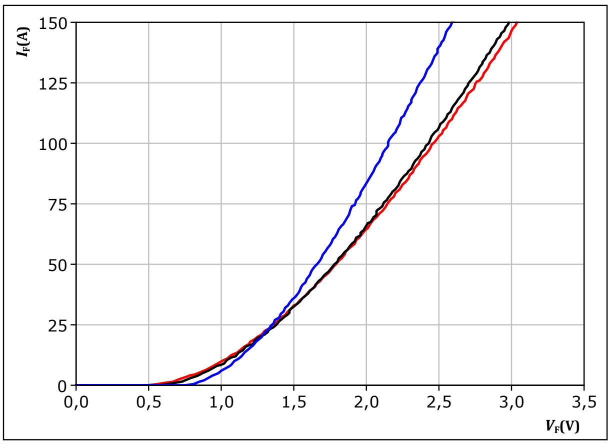
R (K/W)	τ (s)
5,14E-02	3,38E+00
7,77E-02	5,08E-01
2,04E-01	6,60E-02
1,19E-01	1,31E-02
2,76E-02	1,47E-03

Boost Sw. Protection Diode Characteristics

figure 8. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



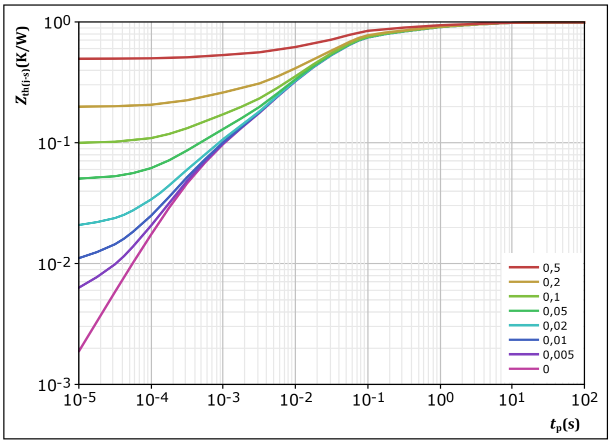
t_p = 250 µs

T_j: 25 °C, 125 °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

$R_{th(j-s)}$ = 0,991 K/W

FWD thermal model values

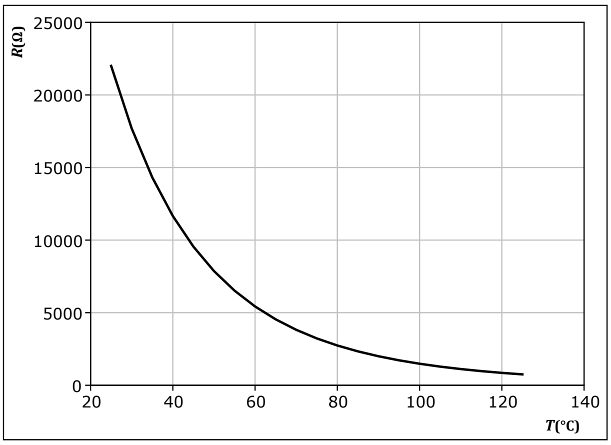
R (K/W)	τ (s)
9,66E-02	3,26E+00
1,54E-01	3,87E-01
5,19E-01	3,68E-02
1,59E-01	5,49E-03
6,34E-02	4,34E-04

Thermistor Characteristics

figure 10. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

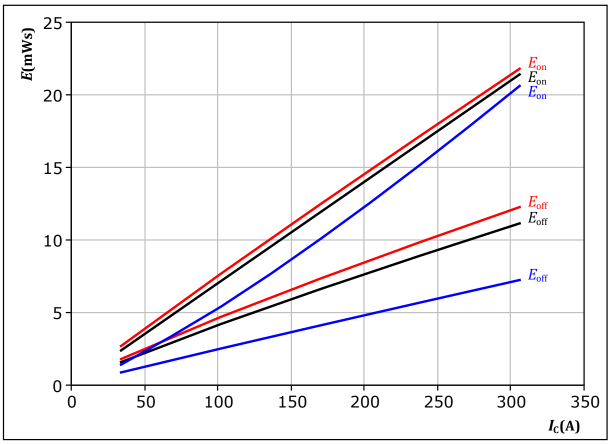


Boost Switching Characteristics

figure 11. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



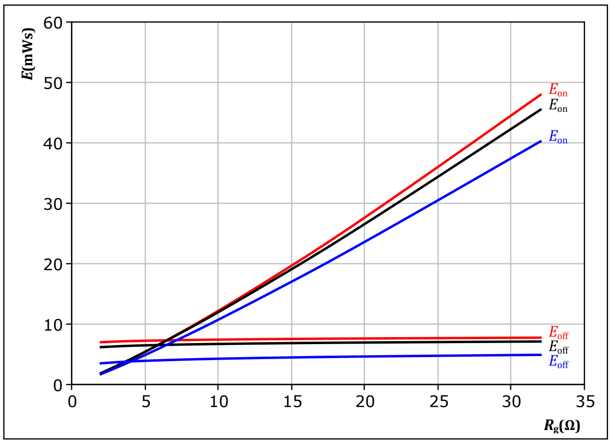
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	8	Ω		150 °C
R_{goff} =	8	Ω		

figure 12. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



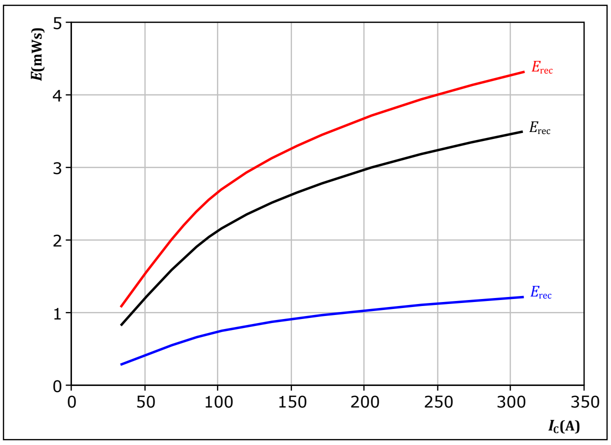
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	170	A		150 °C

figure 13. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



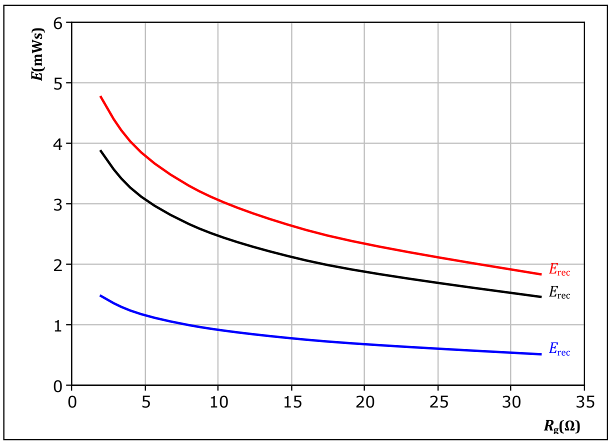
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	8	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

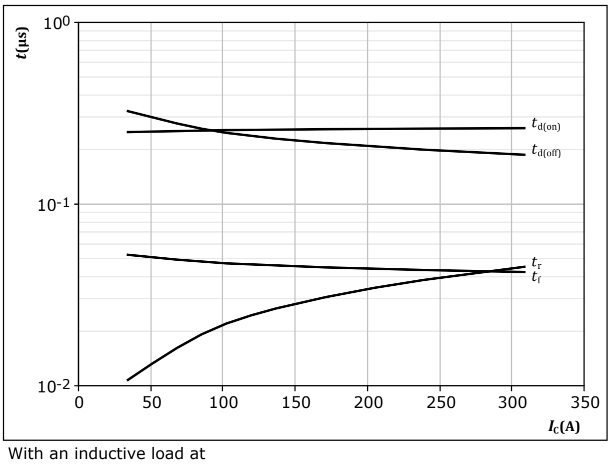
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	170	A		150 °C

Boost Switching Characteristics

figure 15. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



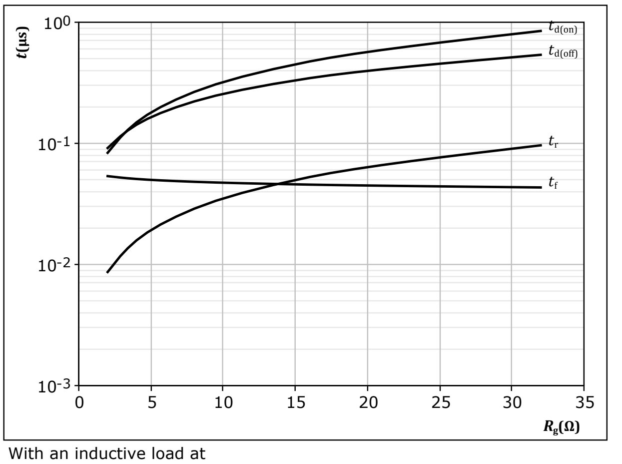
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 16. **IGBT**

Typical switching times as a function of gate resistor

t = f(R_g)



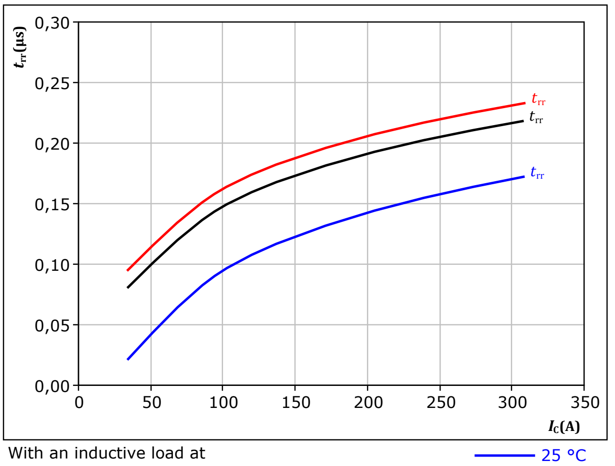
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	170	A

figure 17. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

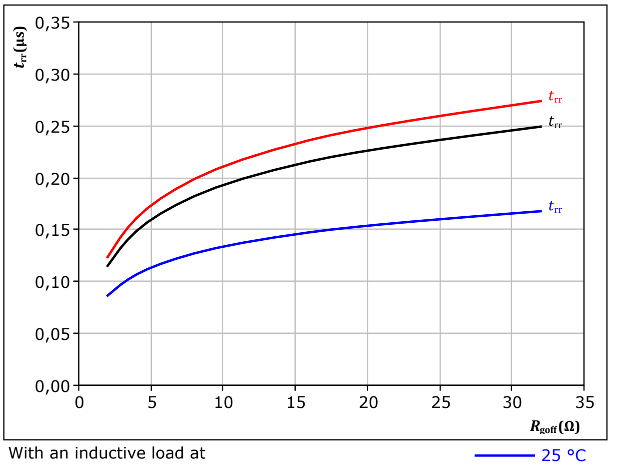
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	8	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 18. **FWD**

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

t_{rr} = f(R_{goff})



With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	170	A

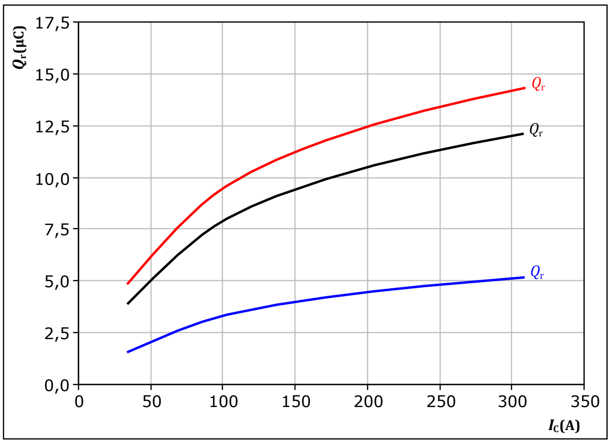
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 19. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$



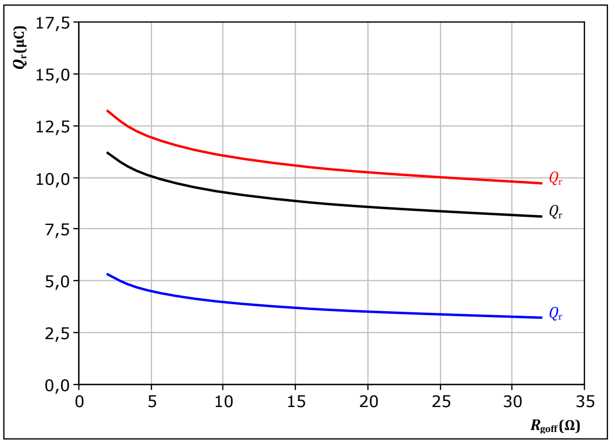
With an inductive load at

V_{CE} =	600	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
R_{gon} =	8	Ω	

figure 20. **FWD**

Typical recovered charge as a function of turn off gate resistor

$Q_r = f(R_{goff})$



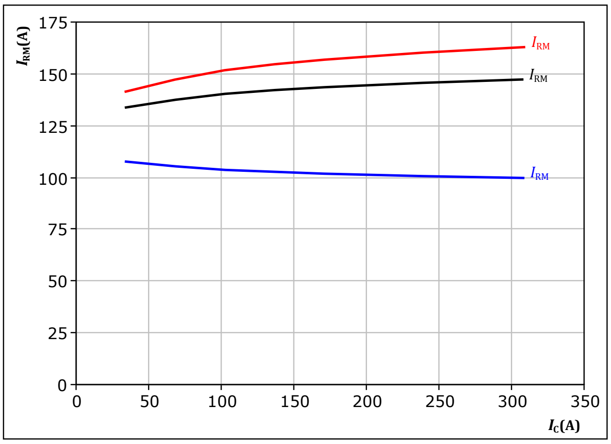
With an inductive load at

V_{CE} =	600	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
I_C =	170	A	

figure 21. **FWD**

Typical peak reverse recovery current as a function of collector current

$I_{RM} = f(I_C)$



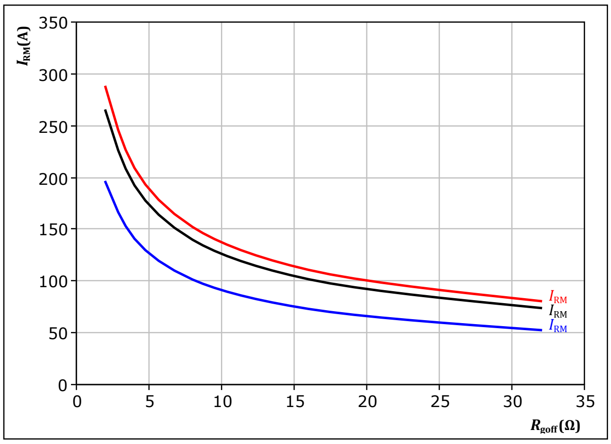
With an inductive load at

V_{CE} =	600	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
R_{gon} =	8	Ω	

figure 22. **FWD**

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

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



With an inductive load at

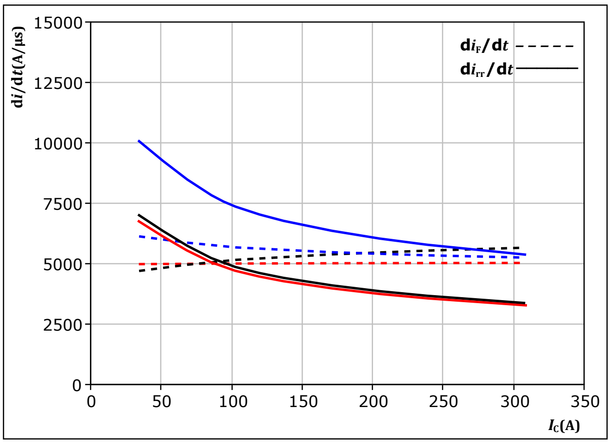
V_{CE} =	600	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
I_C =	170	A	

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)



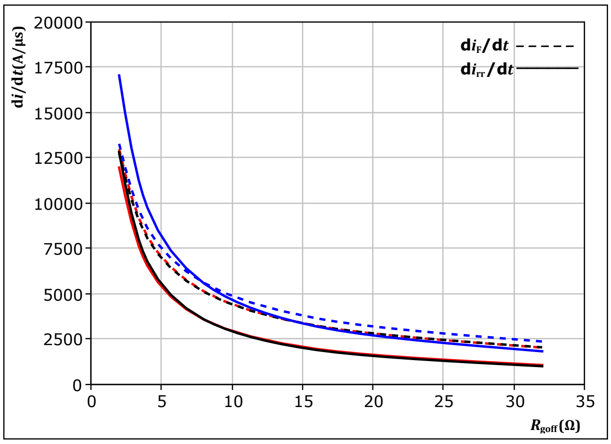
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 24. **FWD**

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

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



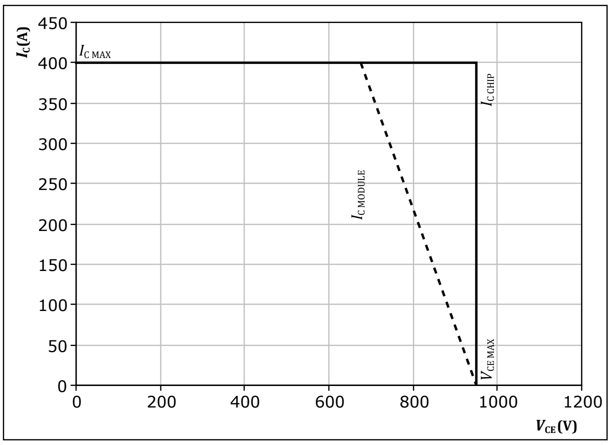
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	170	A		150 °C

figure 25. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At	T_j =	150	°C
	R_{gon} =	8	Ω
	R_{goff} =	8	Ω

Boost Switching Definitions

figure 26. **IGBT**

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

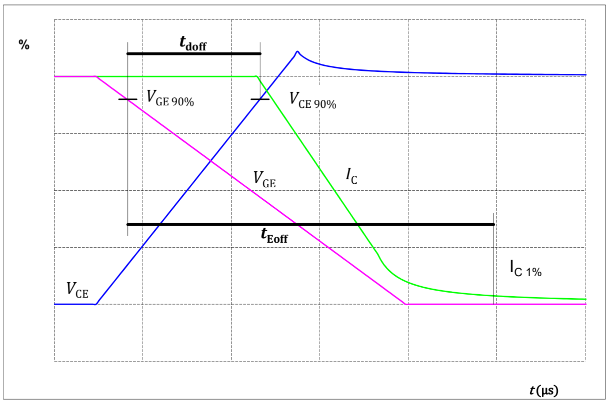


figure 27. **IGBT**

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

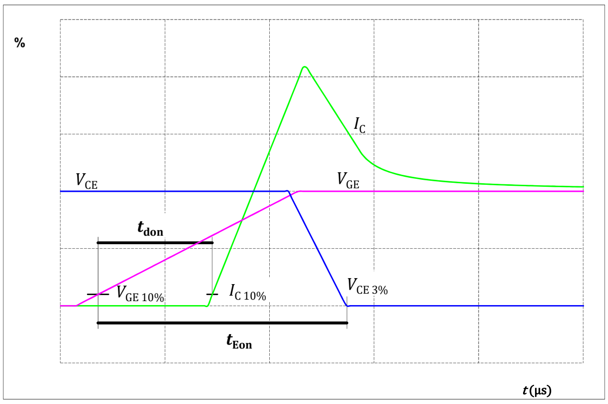


figure 28. **IGBT**

Turn-off Switching Waveforms & definition of t_f

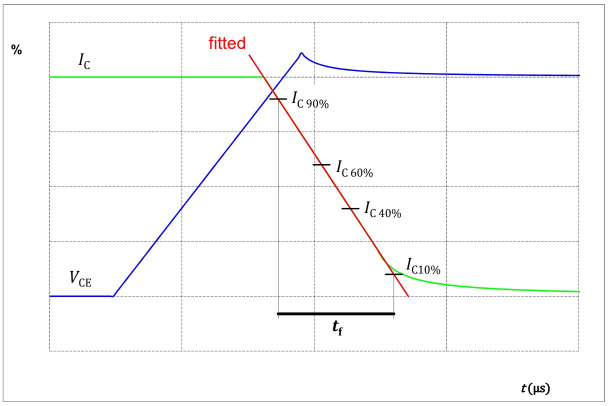
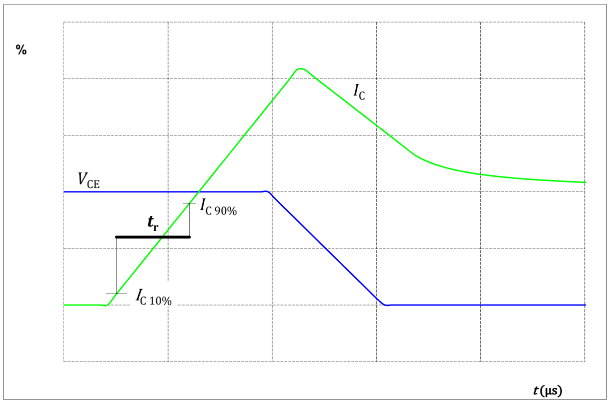


figure 29. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Boost Switching Definitions

figure 30.	FWD

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

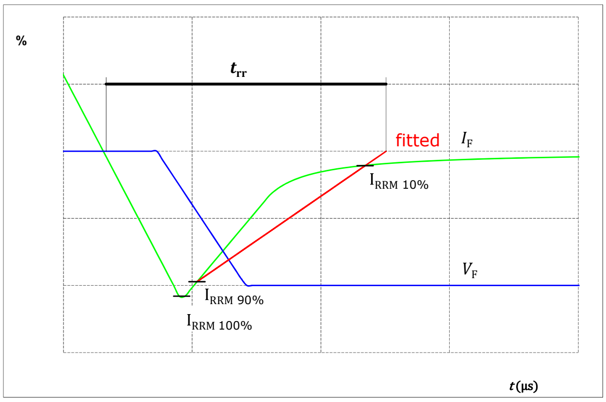
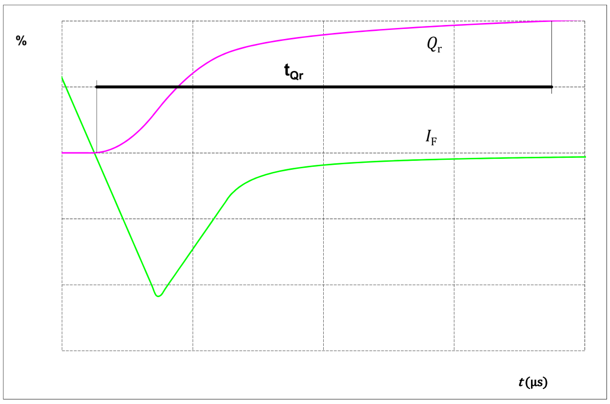


figure 31.	FWD

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



Ordering Code

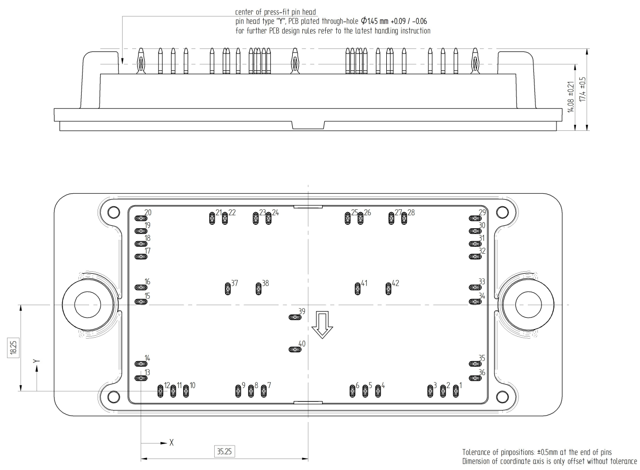
Version	Ordering Code
Without thermal paste	30-PT10B2A200S706-PA79L98Y
With thermal paste (3,4 W/mK, PSX-P7)	30-PT10B2A200S706-PA79L98Y-/3/

Marking

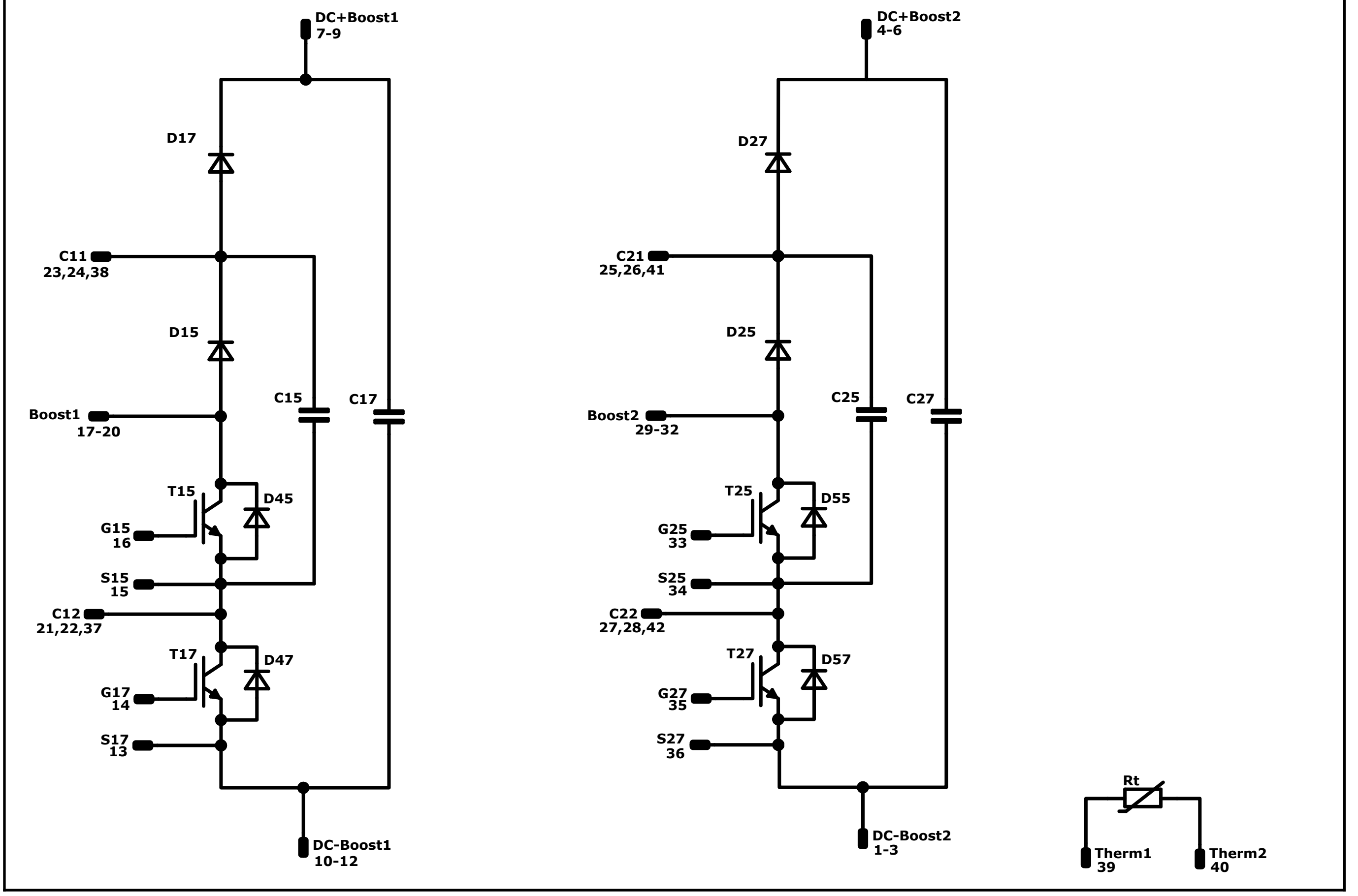
<table>
<tr><td rowspan="4"></td><td rowspan="2">Text</td><td colspan="2">Name</td><td>Date code</td><td>UL & VIN</td><td>Lot</td><td>Serial</td></tr>
<tr><td colspan="2">NN-NNNNNNNNNNNNNN-TTTTTTVV</td><td>WWYY</td><td>UL VIN</td><td>LLLLL</td><td>SSSS</td></tr>
<tr><td rowspan="2">Datamatrix</td><td>Type&Ver</td><td>Lot number</td><td>Serial</td><td>Date code</td><td></td><td></td></tr>
<tr><td>TTTTTTTVV</td><td>LLLLL</td><td>SSSS</td><td>WWYY</td><td></td><td></td></tr>
</table>

Outline

Pin	X	Y	Function
1	66,4	0	DC-Boost2
2	63,7	0	DC-Boost2
3	61	0	DC-Boost2
4	50	0	DC+Boost2
5	47,3	0	DC+Boost2
6	44,6	0	DC+Boost2
7	25,9	0	DC+Boost1
8	23,2	0	DC+Boost1
9	20,5	0	DC+Boost1
10	9,5	0	DC-Boost1
11	6,8	0	DC-Boost1
12	4,1	0	DC-Boost1
13	0	2,75	S17
14	0	5,75	G17
15	0	18,9	S15
16	0	21,9	G15
17	0	28,4	Boost1
18	0	31,1	Boost1
19	0	33,8	Boost1
20	0	36,5	Boost1
21	15	36,5	C12
22	17,7	36,5	C12
23	24,2	36,5	C11
24	26,9	36,5	C11
25	43,6	36,5	C21
26	46,3	36,5	C21
27	52,8	36,5	C22
28	55,5	36,5	C22
29	70,5	36,5	Boost2
30	70,5	33,8	Boost2
31	70,5	31,1	Boost2
32	70,5	28,4	Boost2
33	70,5	21,9	G25
34	70,5	18,9	S25
35	70,5	5,75	G27
36	70,5	2,75	S27
37	18,3	21,6	C12
38	24,8	21,6	C11
39	32,5	15,6	Therm1
40	32,5	8,8	Therm2
41	45,7	21,6	C21
42	52,2	21,6	C22



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T15, T17, T25, T27	IGBT	950 V	200 A	Boost Switch	
D15, D17, D25, D27	FWD	950 V	200 A	Boost Diode	
D45, D47, D55 , D57	FWD	1200 V	50 A	Boost Sw. Protection Diode	
C15, C25	Capacitor	1000 V		Flying Capacitor	
C17, C27	Capacitor	1500 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 36	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 2 packages see vincotech.com website.

Package data
Package data for *flow* 2 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
30-PT10B2A200S706-PA79L98Y-D1-14	26 Oct. 2021	Initial Release	