



flowSPFC 0

650 V / 75 A

Topology features

- Kelvin Emitter for improved switching performance
- Symmetric Boost PFC
- Temperature sensor

Component features

- High speed and smooth switching
- Low gate charge
- Very low collector emitter saturation voltage

Housing features

- Base isolation: Al₂O₃
- Clip-in, reliable mechanical connection, qualified for wave soldering
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Solder pin

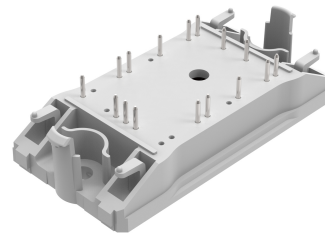
Target applications

- UPS

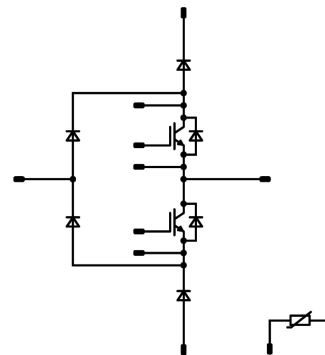
Types

- 10-FZ071SA075S501-L525L58

flow 0 12 mm housing



Schematic





Vincotech

10-FZ071SA075S501-L525L58
datasheet

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
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Boost Switch

Collector-emitter voltage	V_{CES}		650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	59	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	225	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	86	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
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	59	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	225	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	78	W
Maximum junction temperature	T_{jmax}		175	°C

Boost Sw. Protection Diode

Peak repetitive reverse voltage	V_{RRM}		650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s \leq 80\text{ °C}$	20 ⁽¹⁾	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	33	W
Maximum junction temperature	T_{jmax}		175	°C

⁽¹⁾ limited by I_{FRM}



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Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Rectifier Diode				
Peak repetitive reverse voltage	V_{RRM}		1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	75	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	490	A
Surge current capability	I^2t		1200	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	86	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* $t_p = 2\text{ s}$	6000	V
Creepage distance			>12,7	mm
Clearance			9,15	mm
Comparative Tracking Index	CTI		≥ 200	

*100 % tested in production



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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
		V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	

Boost Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00075	25	3,2	4	4,8	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		75	25 125 150		1,56 1,56 1,59	1,75 ⁽²⁾	V
Collector-emitter cut-off current	I_{CES}		0	650		25			50	μA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}							4500		pF
Output capacitance	C_{oes}	$f = 1$ Mhz	0	25		25		130		pF
Reverse transfer capacitance	C_{res}							17		pF
Gate charge	Q_g	$V_{CC} = 520$ V	15		75	25		164		nC

Thermal

Thermal resistance junction to sink ⁽³⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,1		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$					25 125 150		23,6 23,8 23,6		ns
Rise time	t_r	$R_{gon} = 4$ Ω $R_{goff} = 4$ Ω				25 125 150		10,8 12 12,4		ns
Turn-off delay time	$t_{d(off)}$		0/15	350	75	25 125 150		126,6 145,4 149,8		ns
Fall time	t_f					25 125 150		22,44 30,04 36,41		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 2,49$ μC $Q_{tFWD} = 4,66$ μC $Q_{tFWD} = 5,38$ μC				25 125 150		0,379 0,605 0,681		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,854 1,24 1,36		mWs



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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				75	25 125 150		1,53 1,49 1,46	1,92 ⁽²⁾	V
Reverse leakage current	I_R	$V_r = 650$ V				25			3,8	μA
Thermal										
Thermal resistance junction to sink ⁽³⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,22		K/W
Dynamic										
Peak recovery current	I_{RM}					25 125 150		92,46 115,92 122,8		A
Reverse recovery time	t_{rr}					25 125 150		52,47 83,93 94,03		ns
Recovered charge	Q_r	$di/dt=8536$ A/μs $di/dt=6881$ A/μs $di/dt=6458$ A/μs	0/15	350	75	25 125 150		2,49 4,66 5,38		μC
Reverse recovered energy	E_{rec}					25 125 150		0,672 1,27 1,46		mWs
Peak rate of fall of recovery current	$(di_r/dt)_{max}$					25 125 150		2911 2634 2713		A/μs



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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
		V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	V_{CE} [V]	T_j [°C]	Min	Typ	Max	

Boost Sw. Protection Diode

Static

Forward voltage	V_F				10	25 125	1,23	1,67 1,56	1,87 ⁽²⁾	V
Reverse leakage current	I_R	$V_r = 650$ V				25			0,14	μA

Thermal

Thermal resistance junction to sink ⁽³⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						2,87		K/W
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Rectifier Diode

Static

Forward voltage	V_F				25	25 125 150		0,987 0,898 0,875	1,21 ⁽²⁾ 1,1 ⁽²⁾	V
Reverse leakage current	I_R	$V_r = 1600$ V				25			50	μA

Thermal

Thermal resistance junction to sink ⁽³⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,82		K/W
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Vincotech

Characteristic Values

Parameter	Symbol	Conditions					Values			Unit	
		V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	V_{CE} [V]	V_F [V]	I_D [A]	I_C [A]	I_F [A]		T_j [°C]

Thermistor

Static

Rated resistance	R					25		22		kΩ
Deviation of R100	$A_{R/R}$	$R_{100} = 1484 \Omega$				100	-5		5	%
Power dissipation	P					25		130		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 1 \%$						3962		K
B-value	$B_{(25/100)}$	Tol. $\pm 1 \%$						4000		K
Vincotech Thermistor Reference									I	

⁽²⁾ Value at chip level

⁽³⁾ Only valid with pre-applied Vincotech thermal interface material.

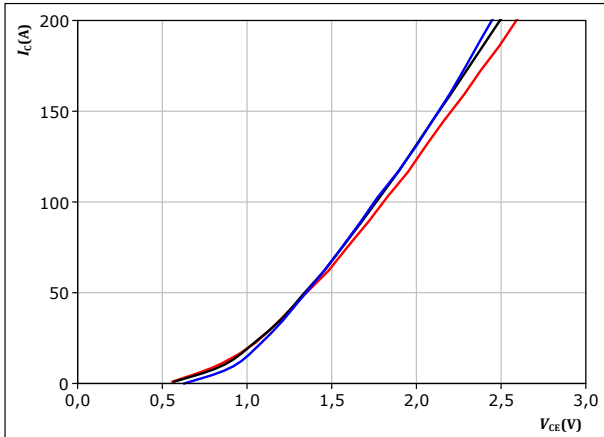


Boost Switch Characteristics

figure 1. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$



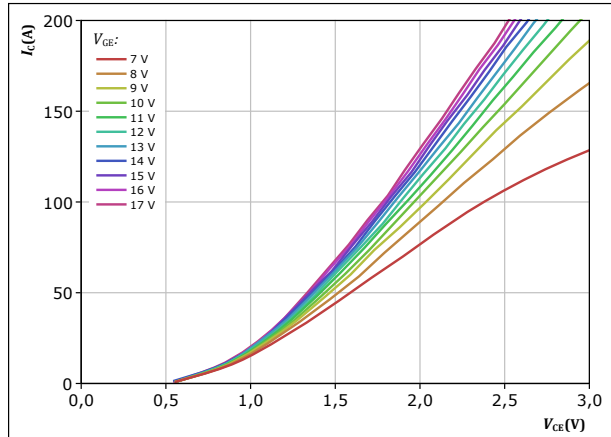
$t_p = 250 \mu s$
 $V_{GE} = 15 V$

T_j : 25 °C (blue line)
125 °C (black line)
150 °C (red line)

figure 2. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

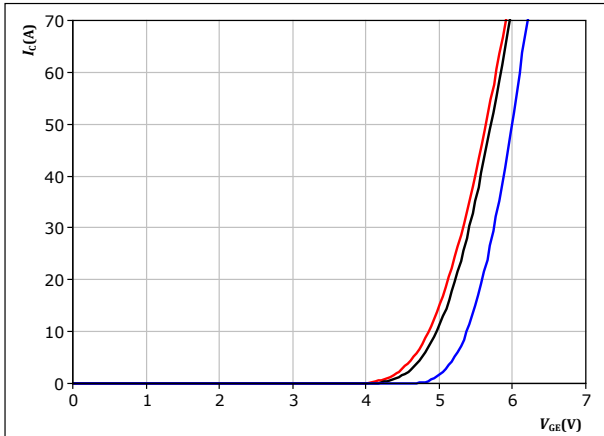


$t_p = 250 \mu s$
 $T_j = 150 \text{ °C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$



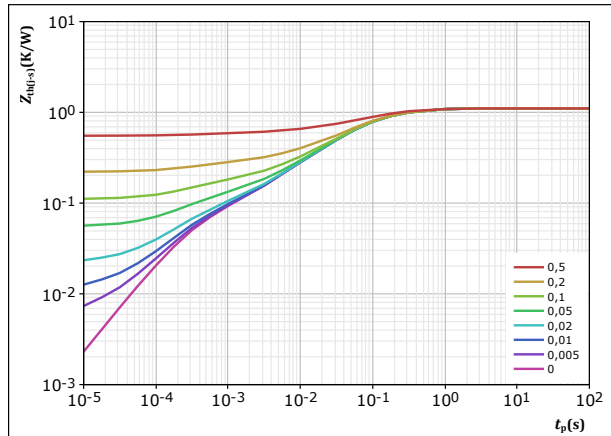
$t_p = 250 \mu s$
 $V_{CE} = 10 V$

T_j : 25 °C (blue line)
125 °C (black line)
150 °C (red line)

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,104 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
2,16E-01	4,05E-01
6,30E-01	6,87E-02
1,62E-01	1,13E-02
3,68E-02	2,51E-03
6,02E-02	3,09E-04

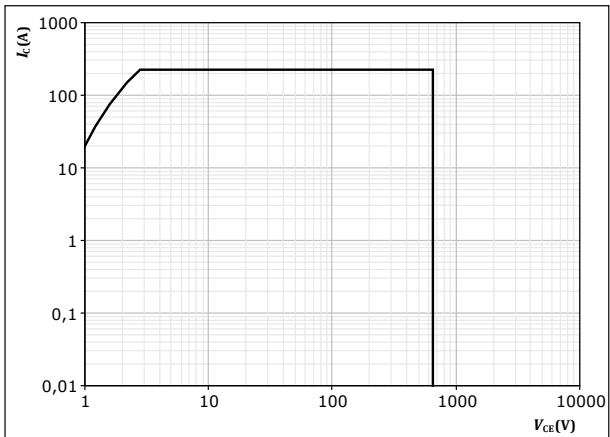


Boost Switch Characteristics

figure 5. IGBT

Safe operating area

$$I_C = f(V_{CE})$$



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



Boost Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

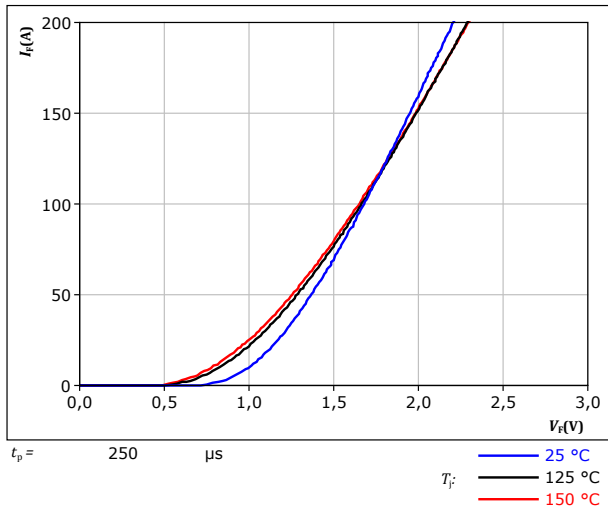
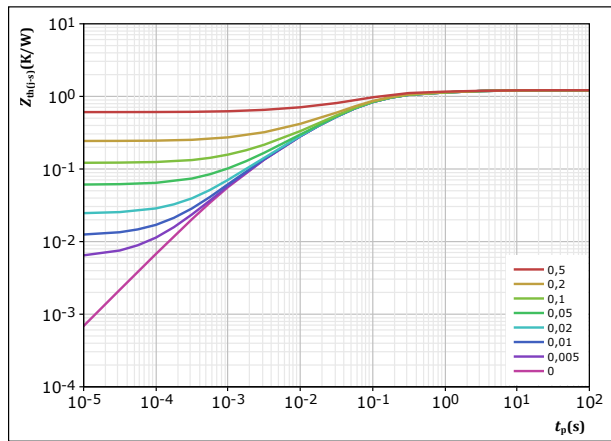


figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,215 \text{ K/W}$
 FWD thermal model values

R (K/W)	τ (s)
5,70E-02	4,14E+00
1,13E-01	8,84E-01
4,50E-01	1,20E-01
4,13E-01	3,77E-02
1,42E-01	7,04E-03
4,07E-02	1,20E-03

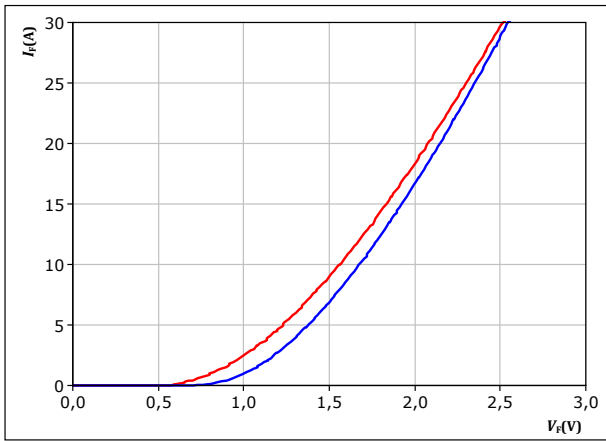


Boost Sw. Protection Diode Characteristics

figure 8. FWD

Typical forward characteristics

$$I_F = f(V_F)$$



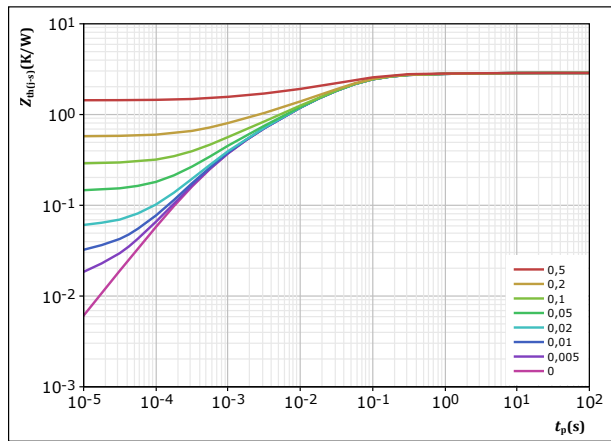
$t_p = 250\ \mu\text{s}$

T_j : — 25 °C
— 125 °C

figure 9. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 2,873\ \text{K/W}$

FWD thermal model values

R (K/W)	τ (s)
6,53E-02	3,94E+00
1,48E-01	4,48E-01
1,31E+00	5,96E-02
7,32E-01	1,36E-02
4,04E-01	2,79E-03
2,11E-01	5,37E-04



Rectifier Diode Characteristics

figure 10. Rectifier

Typical forward characteristics

$$I_F = f(V_F)$$

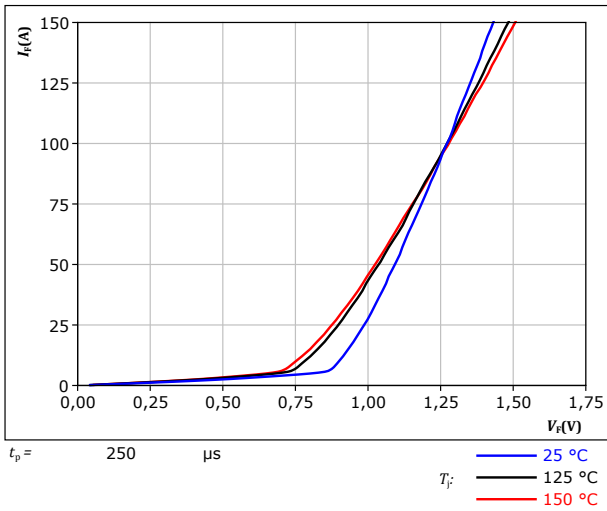
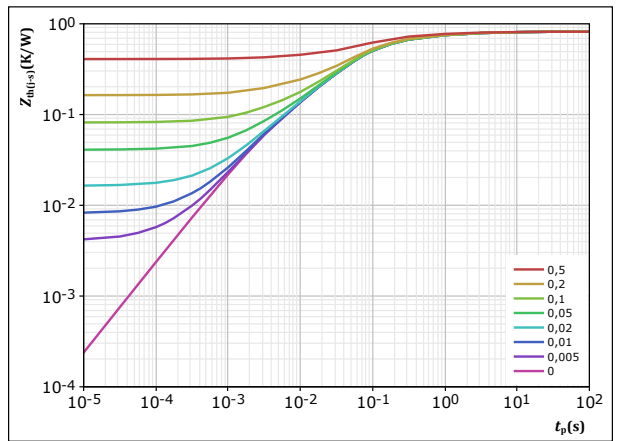


figure 11. Rectifier

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,818$ K/W
 Rectifier thermal model values

R (K/W)	τ (s)
3,88E-02	6,63E+00
1,02E-01	9,24E-01
2,75E-01	1,59E-01
3,47E-01	4,48E-02
4,81E-02	3,54E-03
6,71E-03	1,09E-02

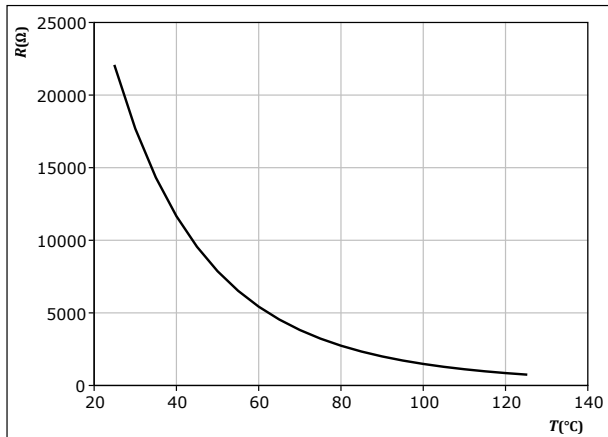


Thermistor Characteristics

figure 12. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$



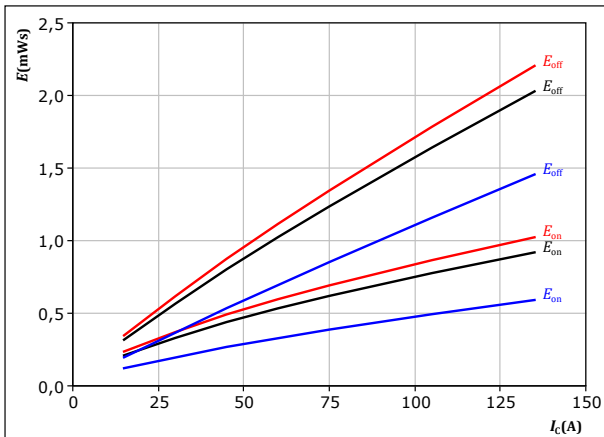


Boost Switching Characteristics

figure 13. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



With an inductive load at

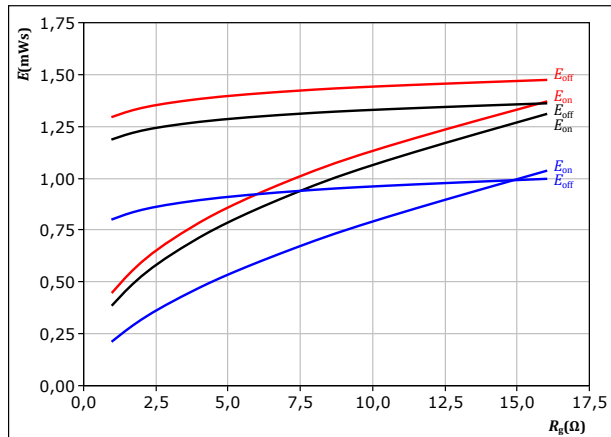
$V_{CE} = 350$ V
 $V_{GE} = 0/15$ V
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω

T_j : — 25 °C
— 125 °C
— 150 °C

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

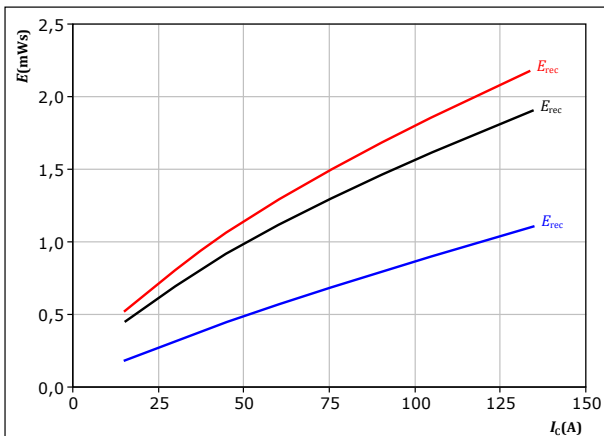
$V_{CE} = 350$ V
 $V_{GE} = 0/15$ V
 $I_c = 75$ A

T_j : — 25 °C
— 125 °C
— 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

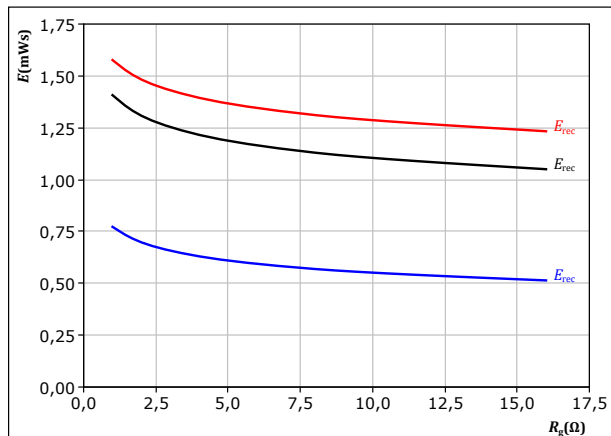
$V_{CE} = 350$ V
 $V_{GE} = 0/15$ V
 $R_{gon} = 4$ Ω

T_j : — 25 °C
— 125 °C
— 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

$V_{CE} = 350$ V
 $V_{GE} = 0/15$ V
 $I_c = 75$ A

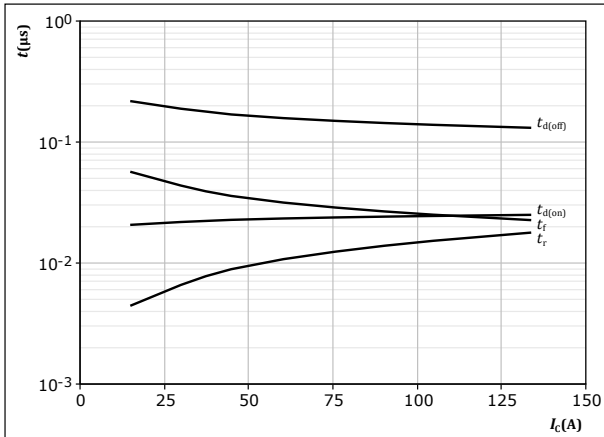
T_j : — 25 °C
— 125 °C
— 150 °C



Boost Switching Characteristics

figure 17. IGBT

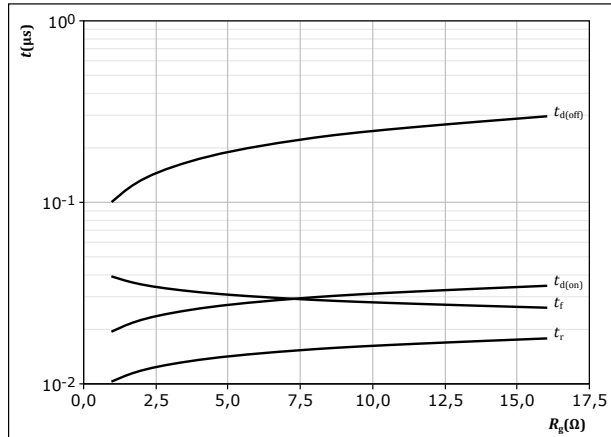
Typical switching times as a function of collector current
 $t = f(I_c)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = 0/15 \text{ V}$
 $R_{gon} = 4 \text{ } \Omega$
 $R_{goff} = 4 \text{ } \Omega$

figure 18. IGBT

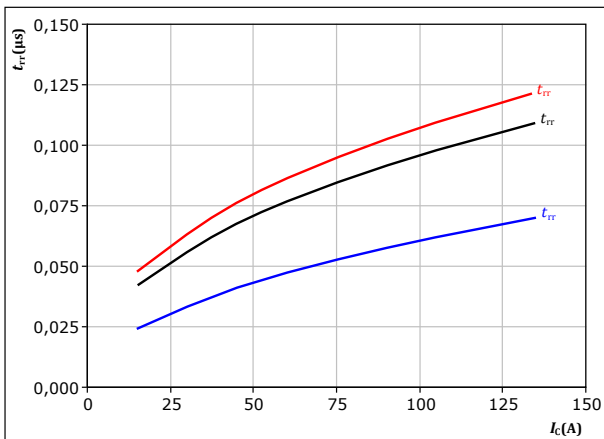
Typical switching times as a function of IGBT turn on gate resistor
 $t = f(R_g)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = 0/15 \text{ V}$
 $I_c = 75 \text{ A}$

figure 19. FWD

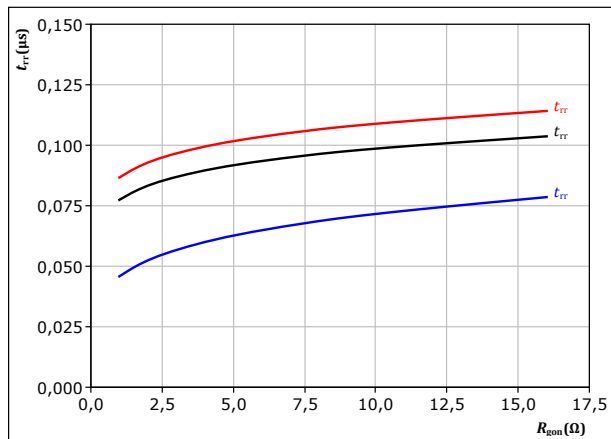
Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_c)$



With an inductive load at
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = 0/15 \text{ V}$
 $R_{gon} = 4 \text{ } \Omega$
 $T_j:$ — 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
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = 0/15 \text{ V}$
 $I_c = 75 \text{ A}$
 $T_j:$ — 25 °C
 — 125 °C
 — 150 °C

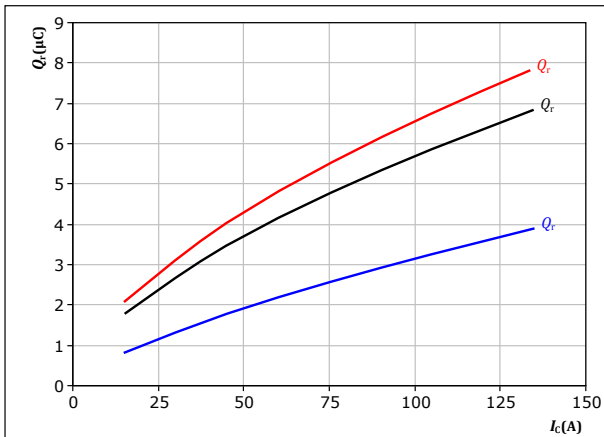


Boost Switching Characteristics

figure 21. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

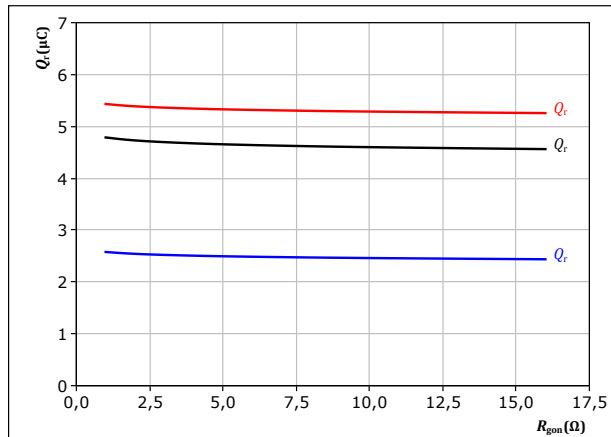
$V_{CE} = 350 \text{ V}$
 $V_{GE} = 0/15 \text{ V}$
 $R_{gon} = 4 \ \Omega$

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

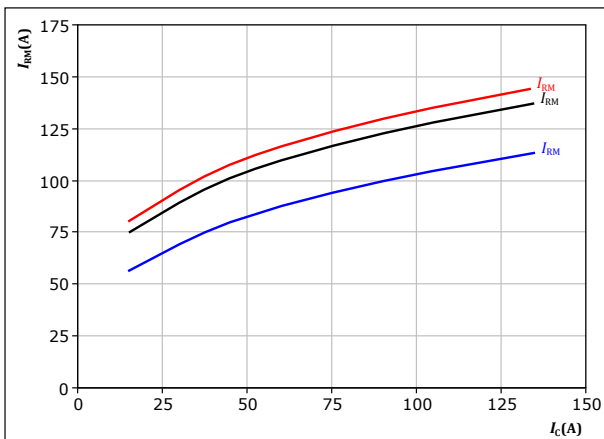
$V_{CE} = 350 \text{ V}$
 $V_{GE} = 0/15 \text{ V}$
 $I_c = 75 \text{ A}$

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

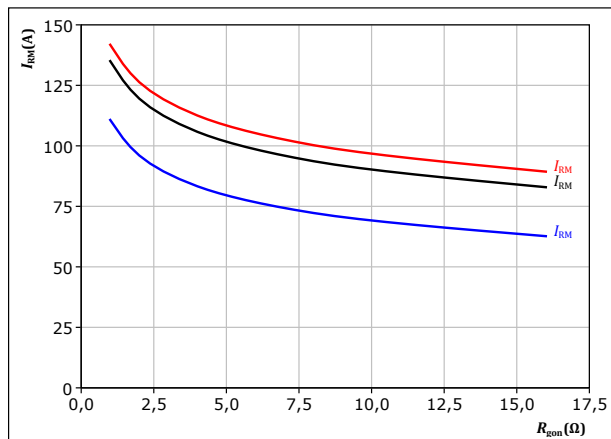
$V_{CE} = 350 \text{ V}$
 $V_{GE} = 0/15 \text{ V}$
 $R_{gon} = 4 \ \Omega$

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

$V_{CE} = 350 \text{ V}$
 $V_{GE} = 0/15 \text{ V}$
 $I_c = 75 \text{ A}$

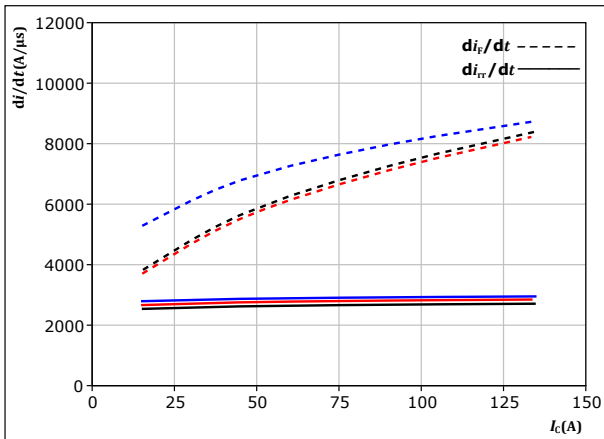
T_j : — 25 °C
 — 125 °C
 — 150 °C



Boost Switching Characteristics

figure 25. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_C)$



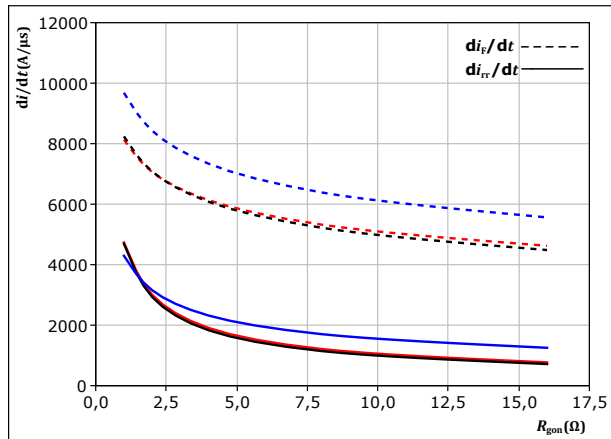
With an inductive load at

$V_{CE} = 350$ 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

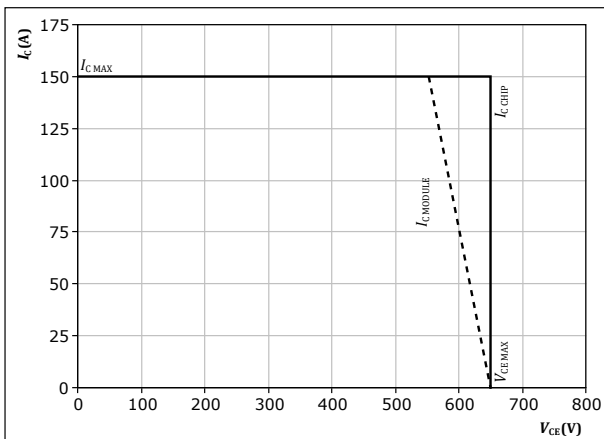
$V_{CE} = 350$ V
 $V_{GE} = 0/15$ V
 $I_C = 75$ A

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_{Eoff} = integrating time for E_{off})

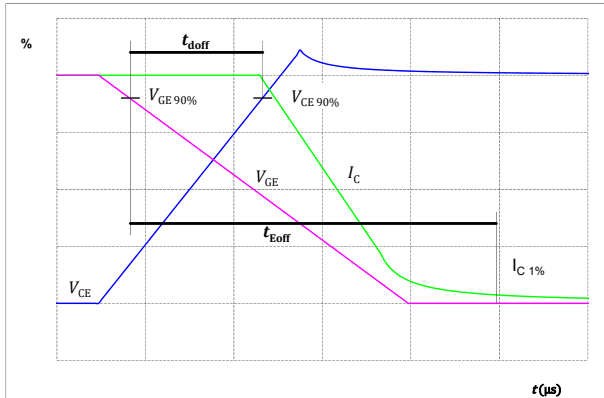


figure 29. IGBT

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

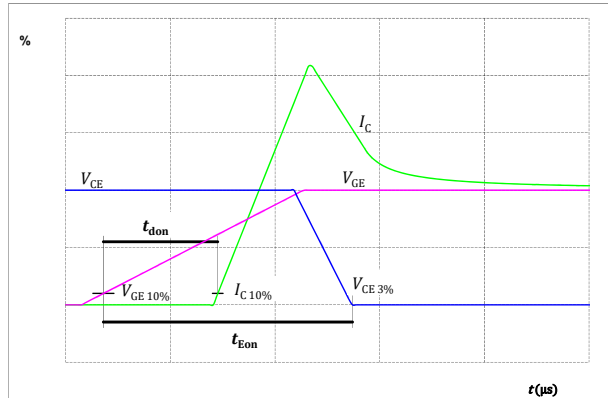


figure 30. IGBT

Turn-off Switching Waveforms & definition of t_f

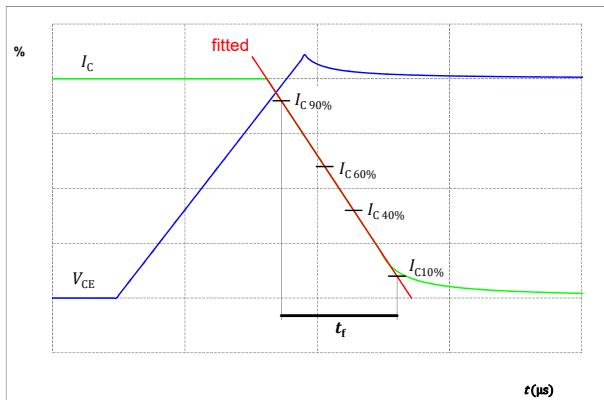
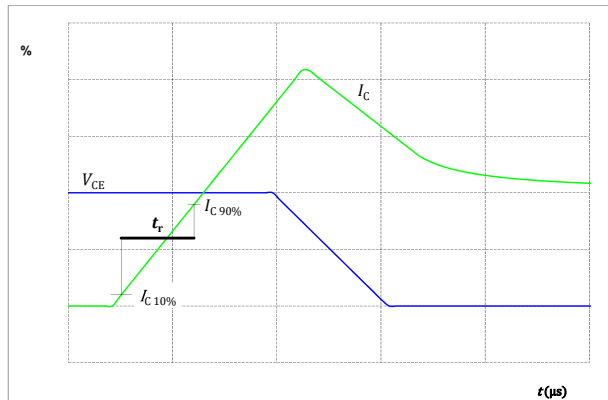


figure 31. IGBT

Turn-on Switching Waveforms & definition of t_r





Boost Switching Definitions

figure 32. FWD

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

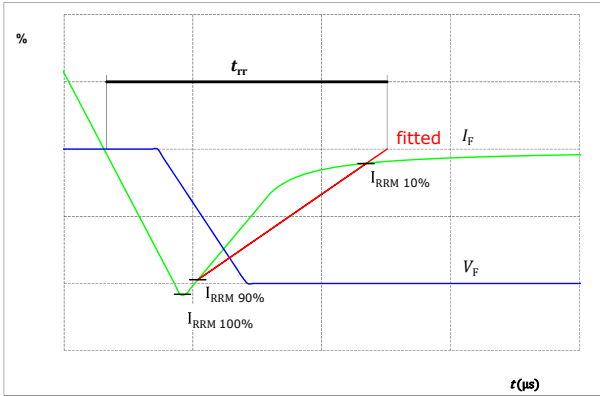
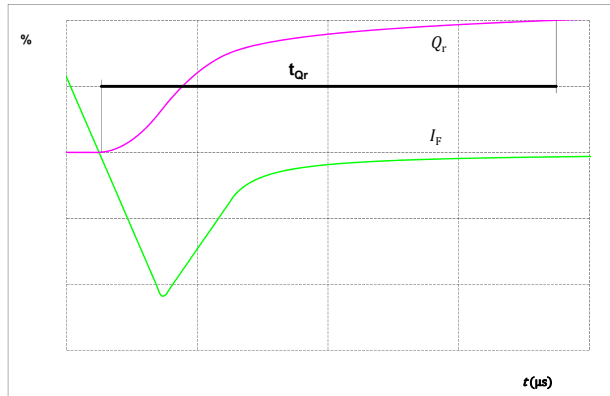


figure 33. FWD

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





Vincotech

10-FZ071SA075S501-L525L58
datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	10-FZ071SA075S501-L525L58
With thermal paste (5,2 W/mK, PTM6000HV)	10-FZ071SA075S501-L525L58-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-FZ071SA075S501-L525L58-/3/

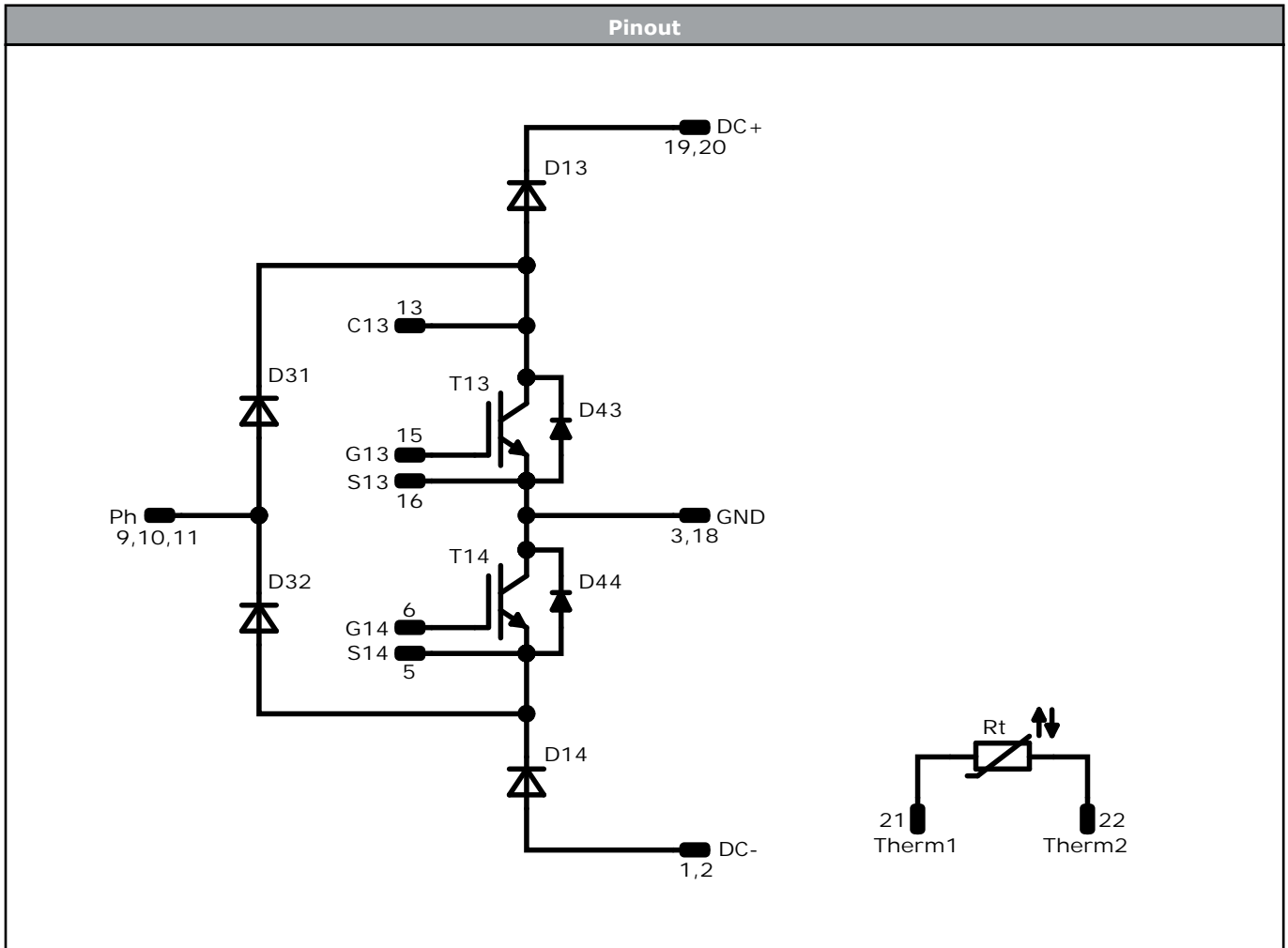
Marking						
	Text	Name	Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNN- TTTTTIVV	WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code	
		TTTTTIVV	LLLLL	SSSS	WWYY	

Pin table [mm]			
Pin	X	Y	Function
1	33,6	0	DC-
2	30,8	0	DC-
3	22	0	GND
4	not assembled		
5	12,9	0	S14
6	10,1	0	G14
7	not assembled		
8	not assembled		
9	0	7,1	Ph
10	0	9,9	Ph
11	0	12,7	Ph
12	not assembled		
13	0	22,6	C13
14	not assembled		
15	10,1	22,6	G13
16	12,9	22,6	S13
17	not assembled		
18	22	22,6	GND
19	30,8	22,6	DC+
20	33,6	22,6	DC+
21	33,6	14,8	Therm1
22	33,6	8,2	Therm2

Tolerance of pinpositions: ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance



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Identification					
ID	Component	Voltage	Current	Function	Comment
T14, T13	IGBT	650 V	75 A	Boost Switch	
D14, D13	FWD	650 V	75 A	Boost Diode	
D44, D43	FWD	650 V	10 A	Boost Sw. Protection Diode	
D31, D32	Rectifier	1600 V	50 A	Rectifier Diode	
Rt	Thermistor			Thermistor	



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Packaging instruction				
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for <i>flow 0</i> packages see vincotech.com website.

Package data
Package data for <i>flow 0</i> 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 UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}=175^{\circ}\text{C}$ and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.



Document No.:	Date:	Modification:	Pages
10-FZ071SA075S501-L525L58-D3-14	26 Mar. 2024	New Datasheet format, module is unchanged	

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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.