



Vincotech

B0-SP122PB600M7-PT00F78T

datasheet

flowDUAL S3

1200 V / 600 A

Topology features

- Common emitter point Half Bridge
- Temperature sensor

Component features

- Easy paralleling
- Low turn-off losses
- Low collector emitter saturation voltage
- Positive temperature coefficient
- Short tail current
- Switching optimized for EMC

Housing features

- Base isolation: Al_2O_3
- CTI600 housing material
- Compact, baseplate-less housing
- VINcoPress Technology
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

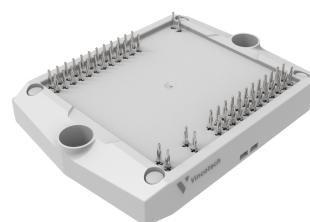
Target applications

- Embedded Drives
- Industrial Drives

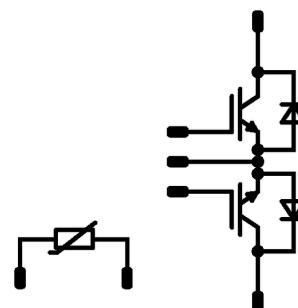
Types

- B0-SP122PB600M7-PT00F78T

flow S3 12 mm housing



Schematic





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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
AC Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	364	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	535	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	9,5	μs
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

AC Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	298	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	431	W
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

Module Properties

Thermal Properties

Storage temperature	T_{stg}		-40...+125	$^{\circ}\text{C}$
Operation temperature under switching condition	T_{jop}		-40...+($T_{jmax} - 25$)	$^{\circ}\text{C}$

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage* $t_p = 2\text{ s}$	6000	V
Creepage distance			>12,7	mm
Clearance			>12,7	mm
Comparative Tracking Index	CTI		≥ 600	

*100 % tested in production



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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	

AC Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$			10	0,06	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		600	25 125 150		1,51 1,72 1,79	1,85 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			300	µA
Gate-emitter leakage current	I_{GES}		20	0		25			1500	nA
Internal gate resistance	r_g							0,667		Ω
Input capacitance	C_{ies}	0	10			25		111000		pF
Output capacitance	C_{oes}							3300		pF
Reverse transfer capacitance	C_{res}							1260		pF
Gate charge	Q_g	$V_{CC} = 600$ V	0/15		600	25		3600		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						0,18		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 2 \Omega$ $R_{goff} = 2 \Omega$	±15	600	600	25 125 150		604,38 611,07 614,8		ns
Rise time	t_r					25 125 150		141,51 155,2 157,32		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		391,43 423,07 431,14		ns
Fall time	t_f					25 125 150		91,46 106,87 112,88		ns
Turn-on energy (per pulse)	E_{on}					25 125 150		63,68 82,45 88,46		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		55,6 68,69 72,01		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	

AC Diode

Static

Forward voltage	V_F				600	25 125 150		1,67 1,83 1,83	2,1 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1200$ V				25			120	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						0,22		K/W
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Dynamic

Peak recovery current	I_{RM}	$di/dt=4055$ A/µs $di/dt=3764$ A/µs $di/dt=4068$ A/µs	± 15	600	600	25 125 150		295,48 321,58 333,51		A
Reverse recovery time	t_{rr}					25 125 150		279,31 445,12 503,37		ns
Recovered charge	Q_r					25 125 150		41,69 67,52 76,98		µC
Reverse recovered energy	E_{rec}					25 125 150		14,25 23,24 26,55		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		2415,45 1657,14 1545,76		A/µs



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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	

Thermistor

Static

Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$				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	

⁽¹⁾ Value at chip level

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



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AC Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

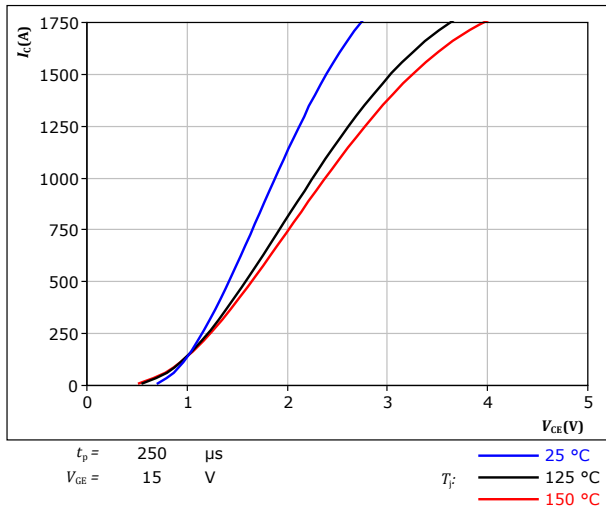


figure 2. IGBT

Typical output characteristics

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

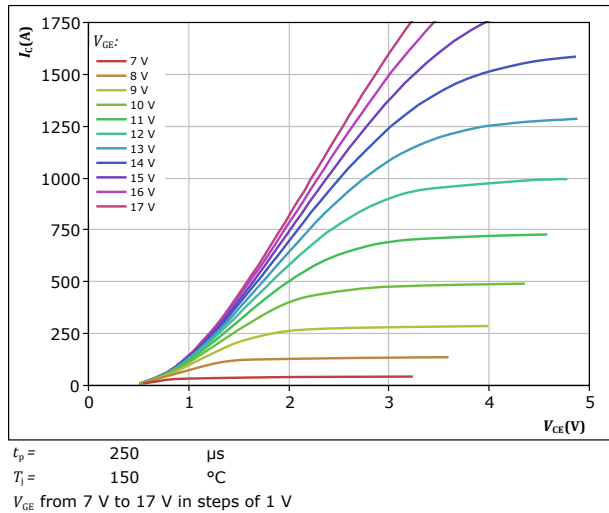


figure 3. IGBT

Typical transfer characteristics

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

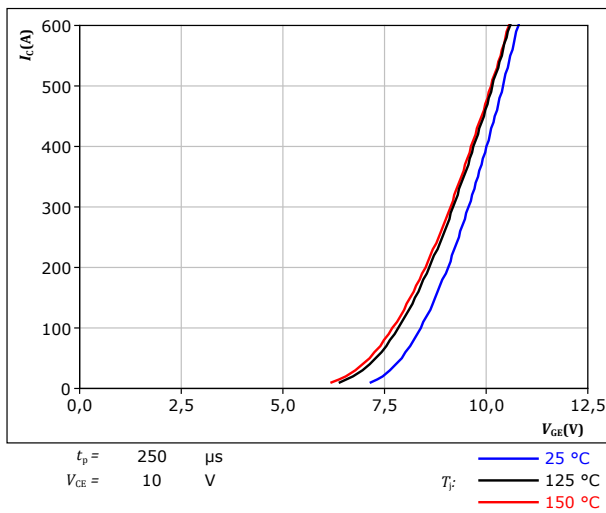
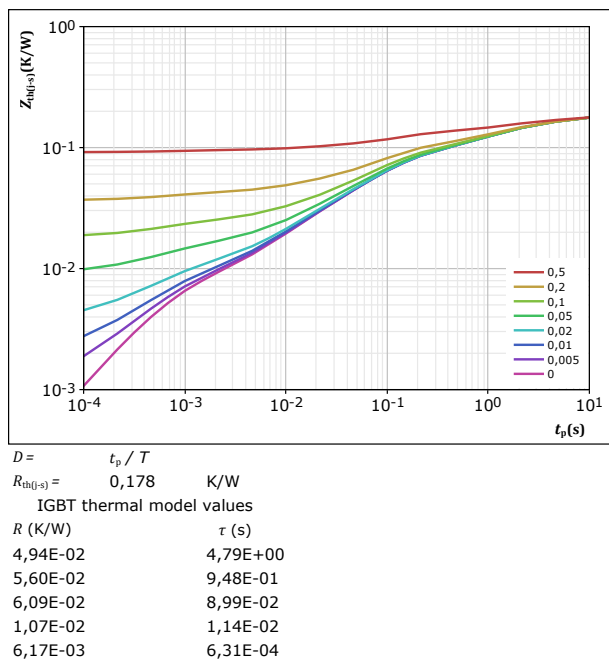


figure 4. IGBT

Transient thermal impedance as a function of pulse width

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





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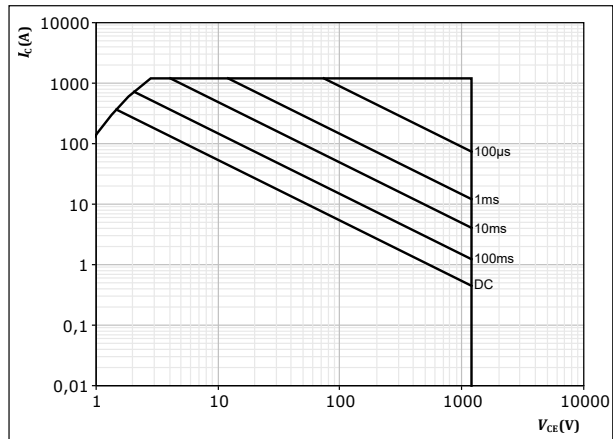
datasheet

AC Switch Characteristics

figure 5. IGBT

Safe operating area

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

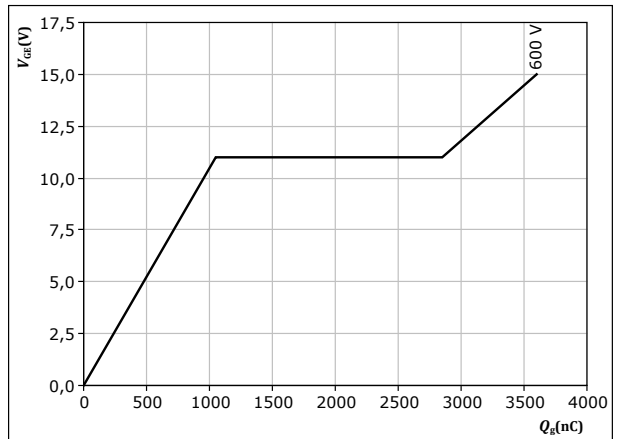


$D = \text{single pulse}$
 $T_s = 80 \text{ } ^\circ\text{C}$
 $V_{GE} = 15 \text{ V}$
 $T_j = T_{jmax}$

figure 6. IGBT

Gate voltage vs gate charge

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



$I_C = 600 \text{ A}$
 $T_j = 25 \text{ } ^\circ\text{C}$



AC Diode Characteristics

figure 7. FWD

Typical forward characteristics
 $I_F = f(V_F)$

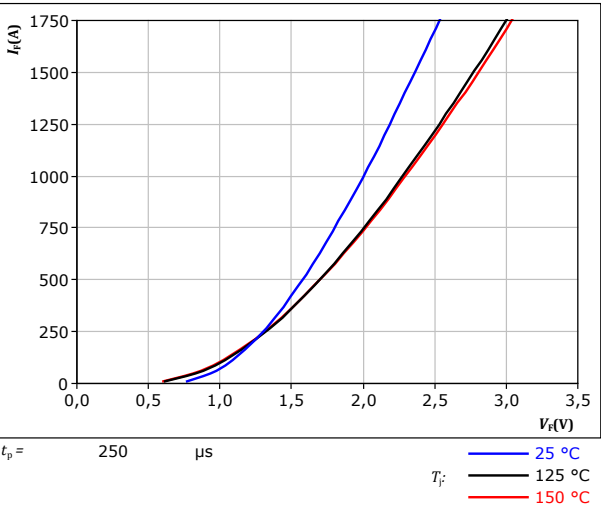
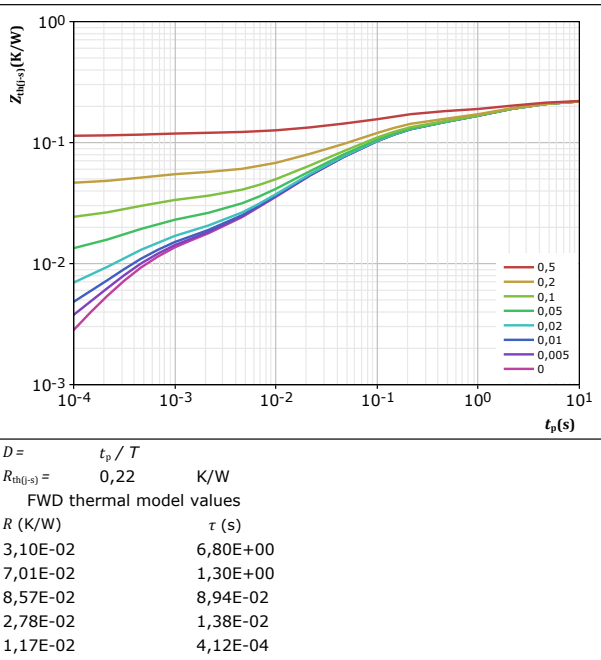


figure 8. FWD

Transient thermal impedance as a function of pulse width
 $Z_{th(j-s)} = f(t_p)$





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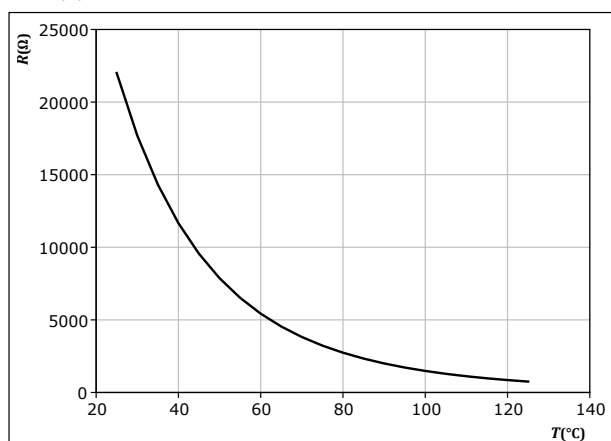
Thermistor Characteristics

figure 9.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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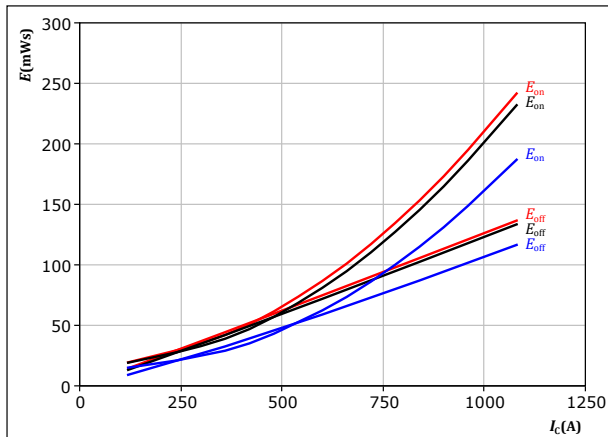
AC Switching Characteristics

figure 10.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

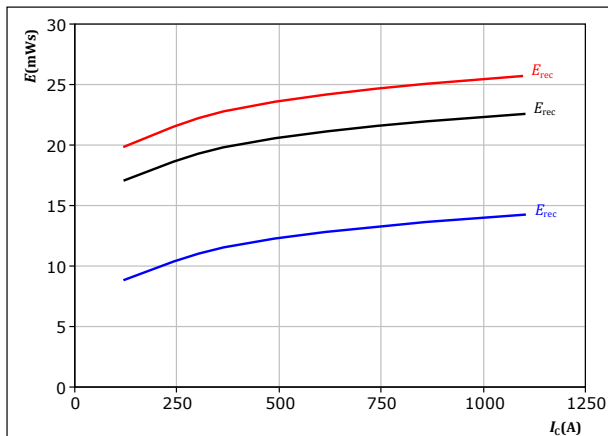
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 12.

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
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

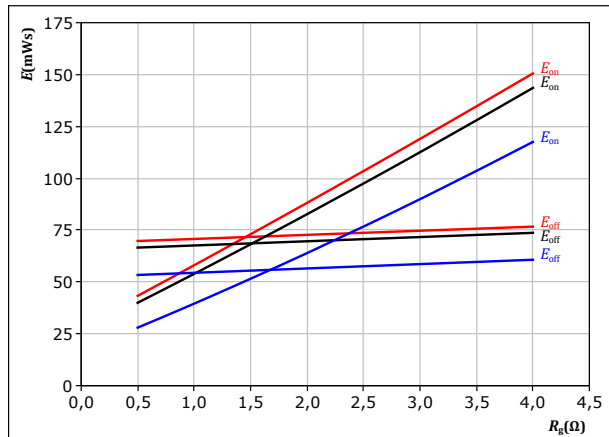
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 11.

IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 600$ A

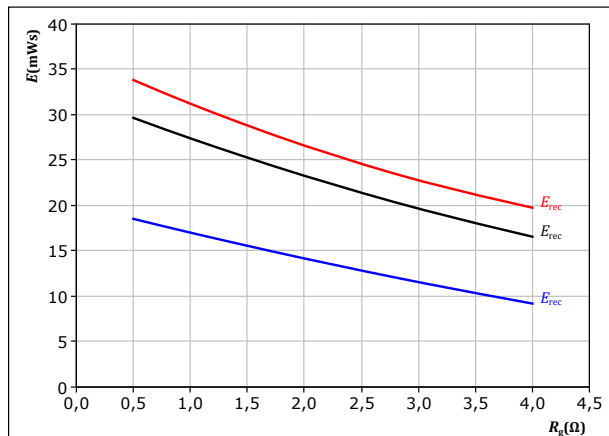
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 13.

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

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 600$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



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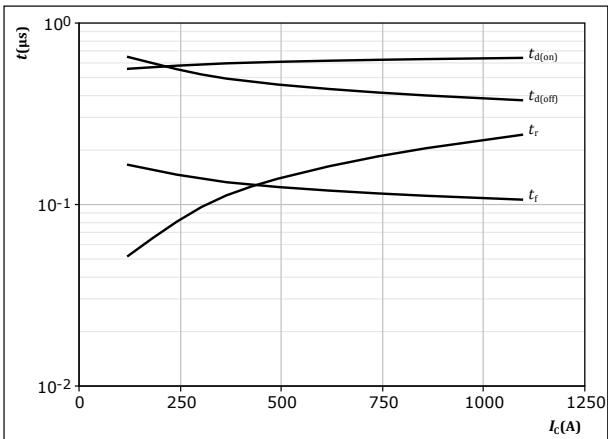
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datasheet

AC Switching Characteristics

figure 14.

IGBT

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



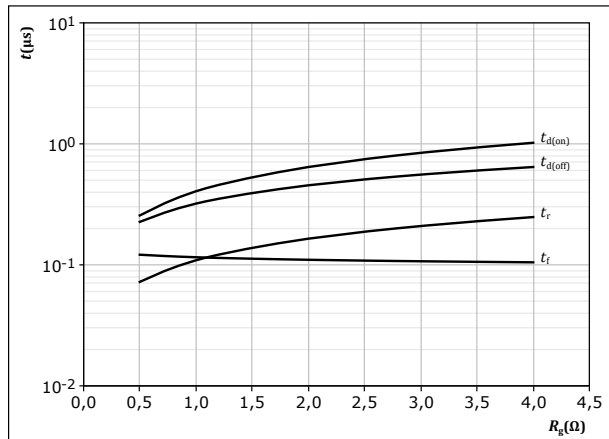
With an inductive load at

$T_j = 150$ °C
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

figure 15.

IGBT

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



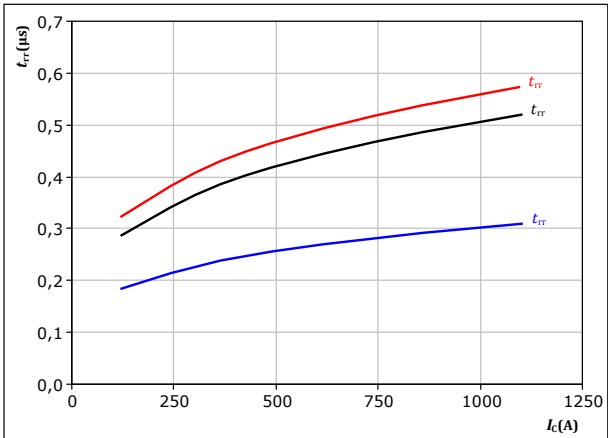
With an inductive load at

$T_j = 150$ °C
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 600$ A

figure 16.

FWD

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



With an inductive load at

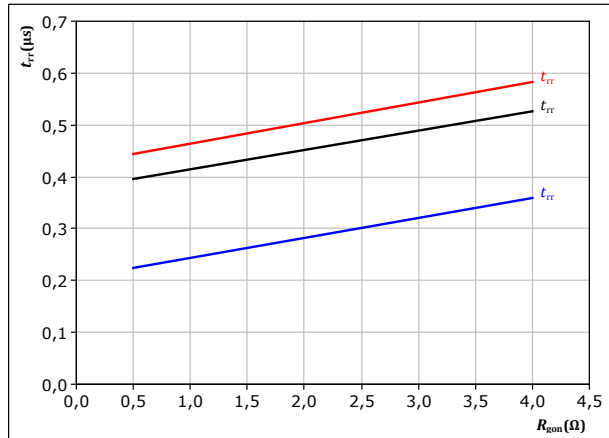
$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 17.

FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor
 $t_{rr} = f(R_{gon})$



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 600$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



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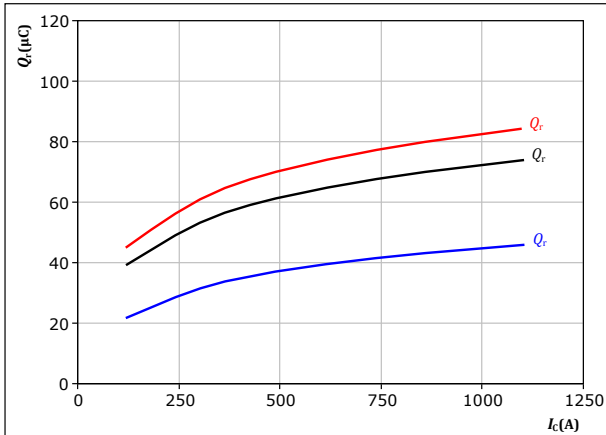
AC Switching Characteristics

figure 18.

FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

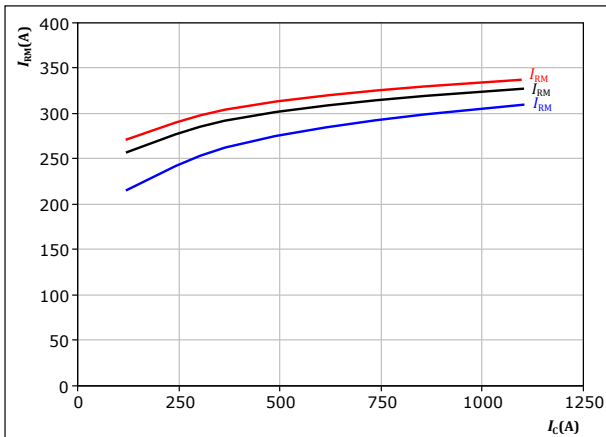
T_j : 25 °C
125 °C
150 °C

figure 20.

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
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

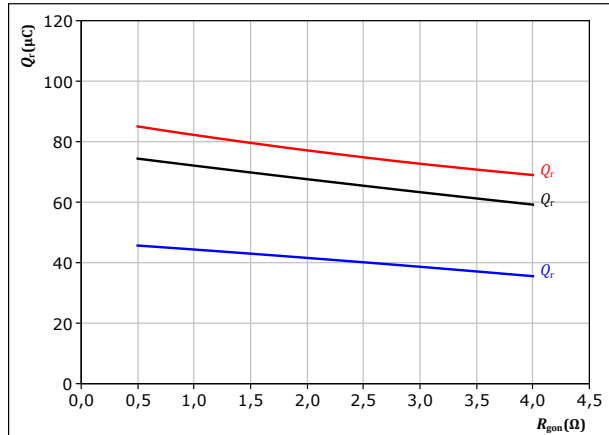
T_j : 25 °C
125 °C
150 °C

figure 19.

FWD

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

$$Q_r = f(R_{gon})$$



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 600$ A

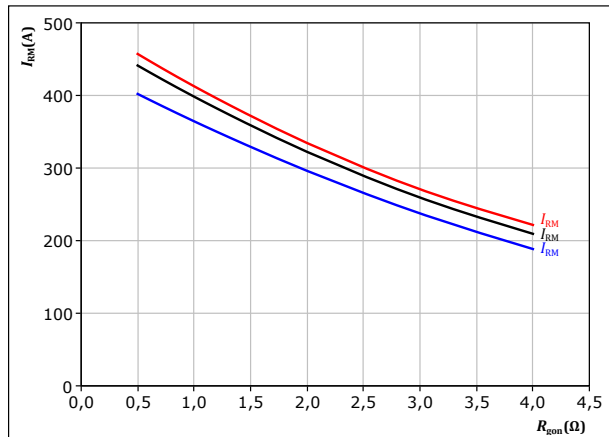
T_j : 25 °C
125 °C
150 °C

figure 21.

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

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 600$ A

T_j : 25 °C
125 °C
150 °C



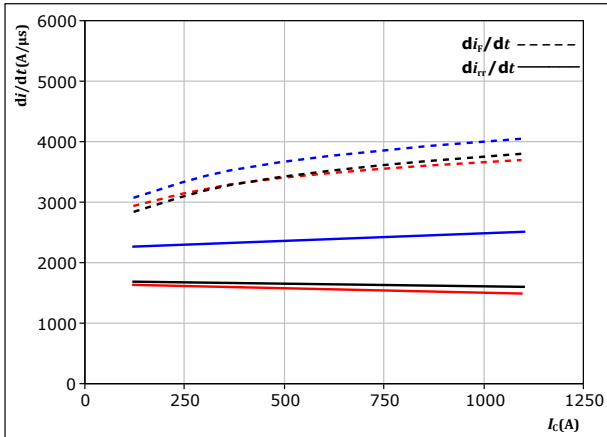
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AC Switching Characteristics

figure 22. FWD

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



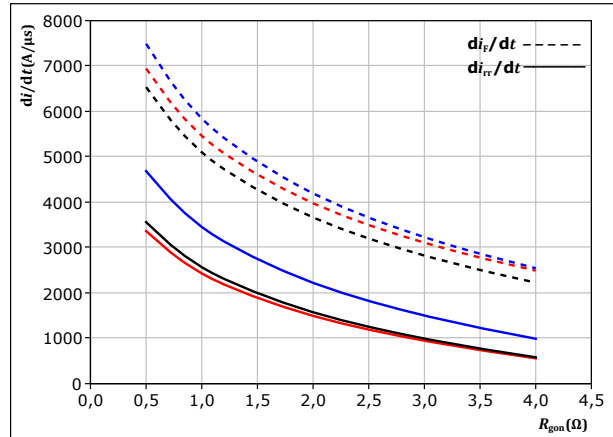
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 23. FWD

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor
 $di_f/dt, di_r/dt = f(R_{gon})$



With an inductive load at

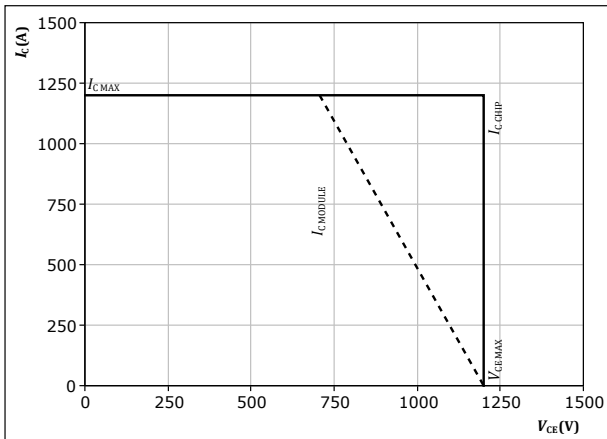
$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 600$ A

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 24. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 150$ °C
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω



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AC Switching Definitions

figure 25. IGBT

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

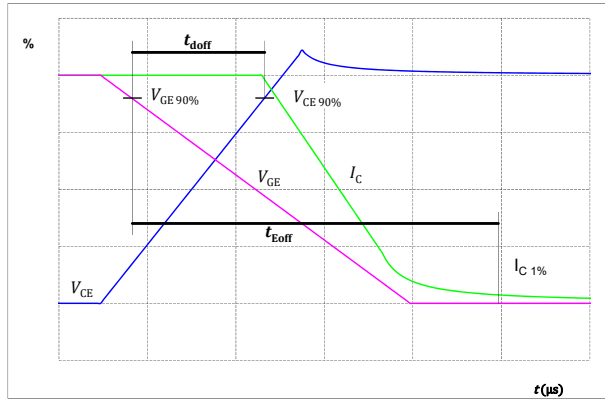


figure 26. IGBT

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

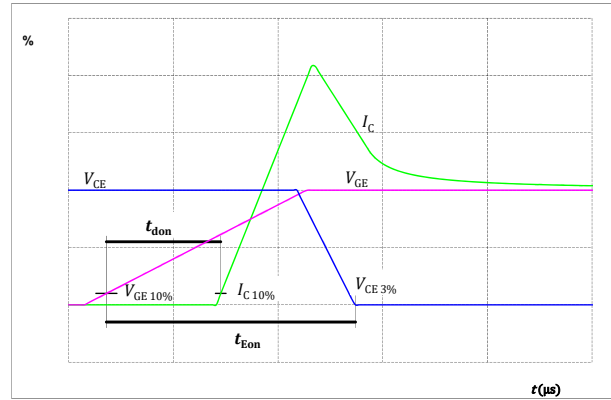


figure 27. IGBT

Turn-off Switching Waveforms & definition of t_f

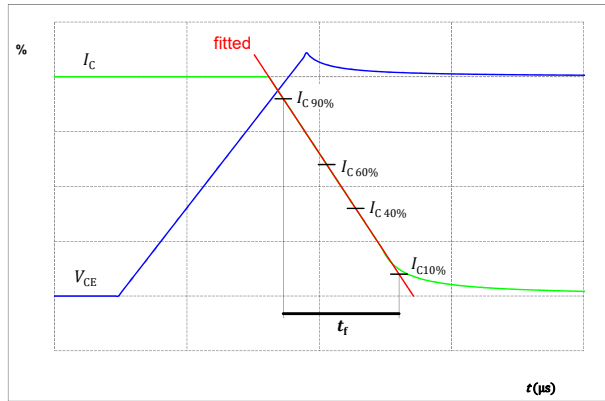
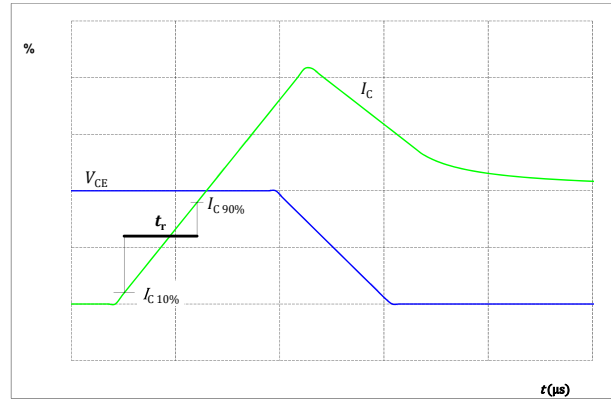


figure 28. IGBT

Turn-on Switching Waveforms & definition of t_r





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AC Switching Definitions

figure 29.

FWD

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

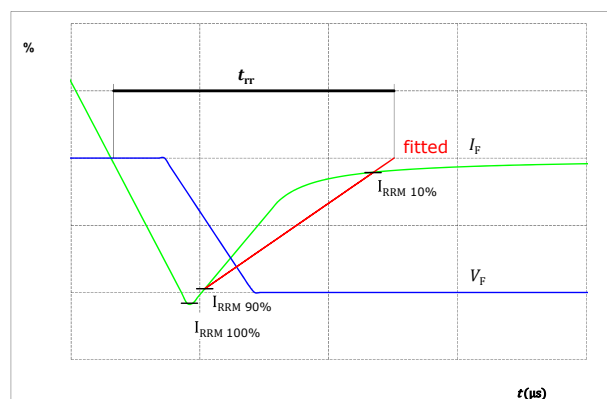
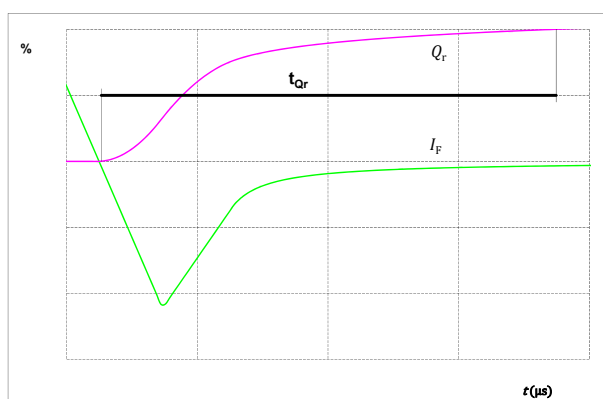


figure 30.

FWD

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





datasheet

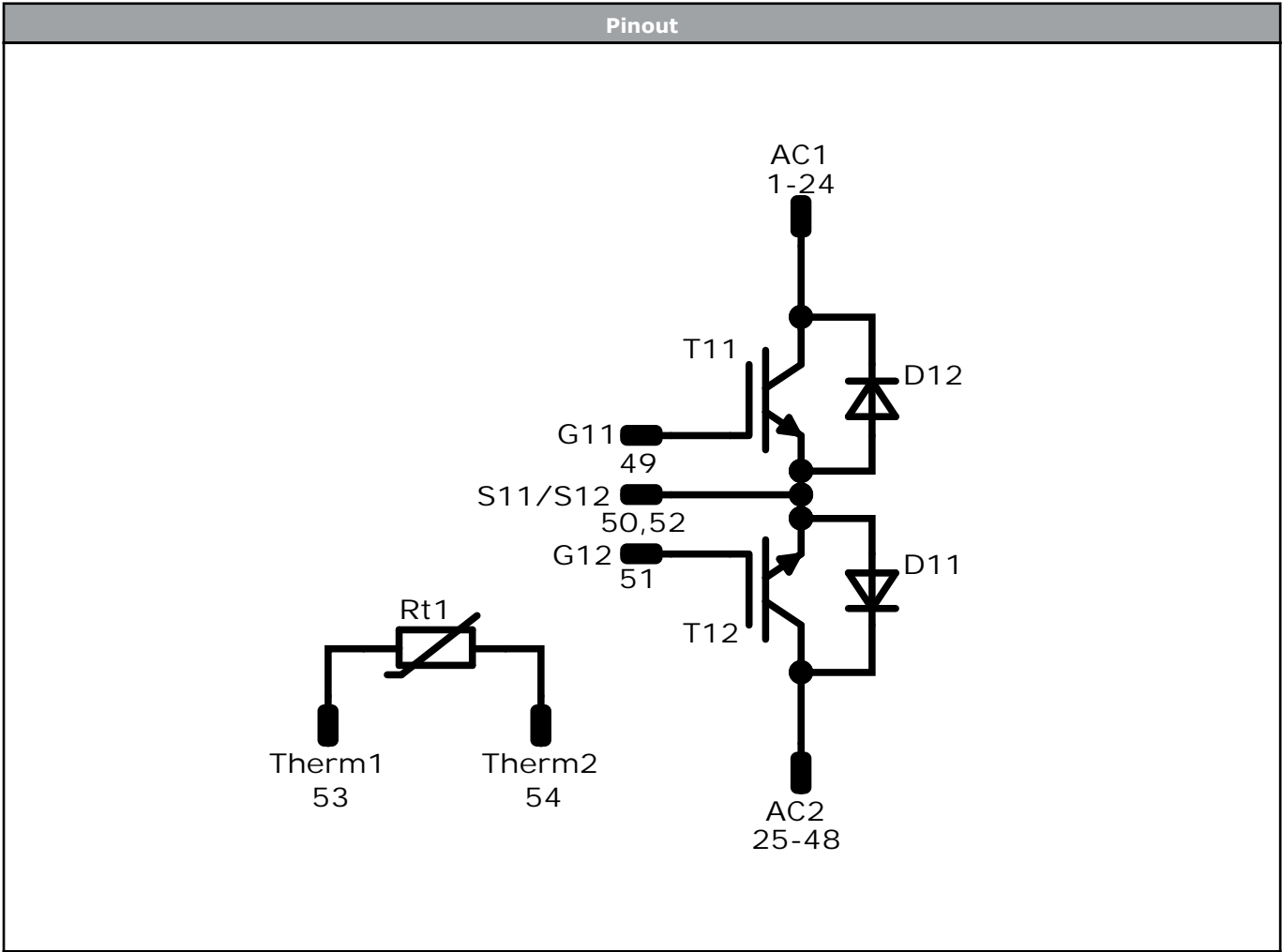
Ordering Code	
Version	Ordering Code
Without thermal paste	B0-SP122PB600M7-PT00F78T
With thermal paste (5,2 W/mK, PTM6000HV)	B0-SP122PB600M7-PT00F78T-/7/
With thermal paste (5,2 W/mK, PTM6000HV) and Protection Foil	B0-SP122PB600M7-PT00F78T-/7F/

Marking							

Outline							
Pin table [mm]							
Pin	X	Y	Function	28	28,25	0	AC2
1	0	50	AC1	29	31,25	0	AC2
2	3	50	AC1	30	34,25	0	AC2
3	6	50	AC1	31	37,25	0	AC2
4	9	50	AC1	32	40,25	0	AC2
5	12	50	AC1	33	43,25	0	AC2
6	15	50	AC1	34	46,25	0	AC2
7	18	50	AC1	35	49,25	0	AC2
8	21	50	AC1	36	52,25	0	AC2
9	24	50	AC1	37	19,25	3	AC2
10	27	50	AC1	38	22,25	3	AC2
11	30	50	AC1	39	25,25	3	AC2
12	33	50	AC1	40	28,25	3	AC2
13	0	47	AC1	41	31,25	3	AC2
14	3	47	AC1	42	34,25	3	AC2
15	6	47	AC1	43	37,25	3	AC2
16	9	47	AC1	44	40,25	3	AC2
17	12	47	AC1	45	43,25	3	AC2
18	15	47	AC1	46	46,25	3	AC2
19	18	47	AC1	47	49,25	3	AC2
20	21	47	AC1	48	52,25	3	AC2
21	24	47	AC1	49	0	3	G11
22	27	47	AC1	50	0	0	S11
23	30	47	AC1	51	52,25	47	G12
24	33	47	AC1	52	52,25	50	S12
25	19,25	0	AC2	53	9,65	3	Therm1
26	22,25	0	AC2	54	9,65	0	Therm2
27	25,25	0	AC2				



Vincotech



Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	600 A	AC Switch	
D12, D11	FWD	1200 V	600 A	AC Diode	
Rt1	Thermistor			Thermistor	



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Packaging instruction				
Standard packaging quantity (SPQ) 45	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for <i>flow</i> S3 packages see vincotech.com website.

Package data
Package data for <i>flow</i> S3 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 $T_{j,sp}=150^{\circ}\text{C}$ and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.



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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.