
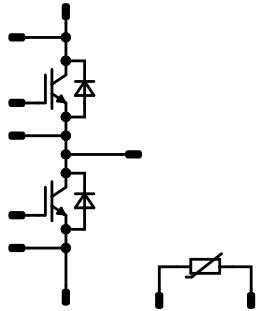




VINcoDUAL E3	1200 V / 450 A
<p data-bbox="375 443 478 472"><b>Features</b></p> <ul data-bbox="135 495 603 622" style="list-style-type: none"><li>• IGBT Mitsubishi gen 7 technology with low V CEsat</li><li>• and improved EMC behavior</li><li>• New SoLid Cover Technology for higher reliability</li><li>• Industry standard housing</li><li>• Press-fit pin and pre-applied phase-change</li><li>• Thermal Interface Material available</li></ul>	<p data-bbox="997 443 1300 472"><b>VINco E3s 17 mm housing</b></p> 
<p data-bbox="316 864 539 893"><b>Target applications</b></p> <ul data-bbox="135 913 300 981" style="list-style-type: none"><li>• Industrial Drives</li><li>• Power Supply</li><li>• UPS</li></ul>	<p data-bbox="1086 831 1209 860"><b>Schematic</b></p> 
<p data-bbox="391 1037 464 1066"><b>Types</b></p> <ul data-bbox="135 1086 406 1115" style="list-style-type: none"><li>• A0-VS122PA450M7-L758F70</li></ul>	



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## Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
<b>Half-Bridge Switch</b>				
Collector-emitter voltage	$V_{CES}$		1200	V
Collector current (DC current)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	422	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	900	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	792	W
Gate-emitter voltage	$V_{GES}$		$\pm 20$	V
Short circuit ratings	$t_{SC}$	$V_{GE} = 15\text{ V}$ , $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	9,5	$\mu\text{s}$
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## Half-Bridge Diode

Peak repetitive reverse voltage	$V_{RRM}$		1200	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	346	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	900	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	613	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
Isolation voltage	$V'_{isol}$	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			18,1	mm
Clearance			16,2	mm
Comparative Tracking Index	CTI		$\geq 200$	

\*100 % tested in production



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### Characteristic Values

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

#### Half-Bridge Switch

##### Static

Gate-emitter threshold voltage	$V_{GE(th)}$			10	0,045	25	5,4	6	6,6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		450	25 125 150		1,53 1,78 1,86	1,85 <sup>(1)</sup>	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	$r_g$							1		Ω
Input capacitance	$C_{ies}$							90000		pF
Output capacitance	$C_{oes}$		0	10		25		2640		pF
Reverse transfer capacitance	$C_{res}$							960		pF
Gate charge	$Q_g$	$V_{CC} = 600$ V	15		450	25		3000		nC

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,12		K/W
--	---------------	---------------------------------------	--	--	--	--	--	------	--	-----

##### Dynamic

Turn-on delay time	$t_{d(on)}$					25 125 150		408 421 418		ns
Rise time	$t_r$					25 125 150		57 67 73		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		342 379 389		ns
Fall time	$t_f$					25 125 150		66,09 94,9 122,54		ns
Turn-on energy (per pulse)	$E_{on}$	$Q_{tFWD} = 40,86$ μC $Q_{tFWD} = 64,23$ μC $Q_{tFWD} = 80,75$ μC				25 125 150		32,95 46,12 57,96		mWs
Turn-off energy (per pulse)	$E_{off}$					25 125 150		31,59 42,45 55,6		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		

#### Half-Bridge Diode

##### Static

Forward voltage	$V_F$				450	25 125 150		1,67 1,89 1,9	2,1 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_T = 1200$ V				25			120	μA

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,16		K/W
--	---------------	---------------------------------------	--	--	--	--	--	------	--	-----

##### Dynamic

Peak recovery current	$I_{RRM}$					25 125 150		347,35 372,81 412,54		A
Reverse recovery time	$t_{rr}$					25 125 150		263,47 430,04 433,06		ns
Recovered charge	$Q_r$	$di/dt=8123$ A/μs $di/dt=6768$ A/μs $di/dt=9620$ A/μs	±15	600	450	25 125 150		40,86 64,23 80,75		μC
Reverse recovered energy	$E_{rec}$					25 125 150		15,88 24,81 31,62		mWs
Peak rate of fall of recovery current	$(di_r/dt)_{max}$					25 125 150		3020 2564 3852		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	

### Thermistor

#### Static

Rated resistance	$R$					25		5		kΩ
Deviation of $R_{100}$	$A_{R/R}$	$R_{100} = 493 \Omega$				100	-5		5	%
Power dissipation	$P$							245		mW
Power dissipation constant	$d$					25		1,4		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 2 \%$						3375		K
B-value	$B_{(25/100)}$	Tol. $\pm 2 \%$						3437		K
Vincotech Thermistor Reference									K	

<sup>(1)</sup> Value at chip level

<sup>(2)</sup> Only valid with pre-applied Vincotech thermal interface material.

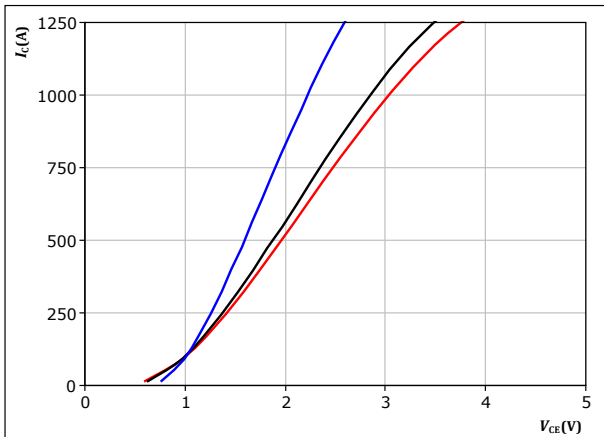


## Half-Bridge Switch Characteristics

**figure 1.** IGBT

Typical output characteristics

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



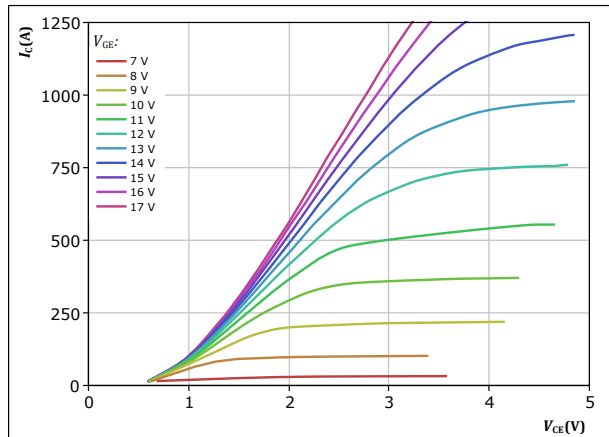
$t_p = 250 \mu s$   
 $V_{GE} = 15 V$

$T_j:$  — 25 °C  
— 125 °C  
— 150 °C

**figure 2.** IGBT

Typical output characteristics

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

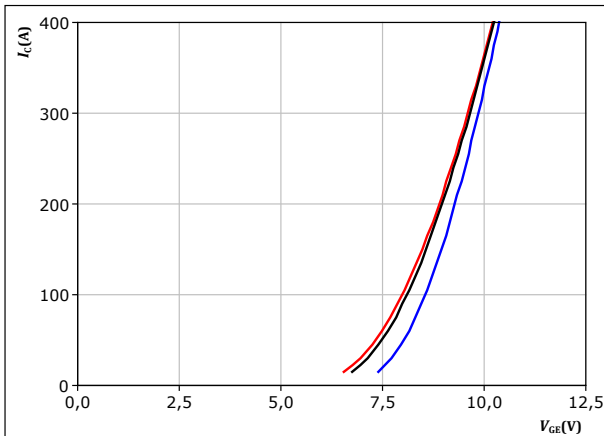


$t_p = 250 \mu s$   
 $T_j = 150 \text{ °C}$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

**figure 3.** IGBT

Typical transfer characteristics

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



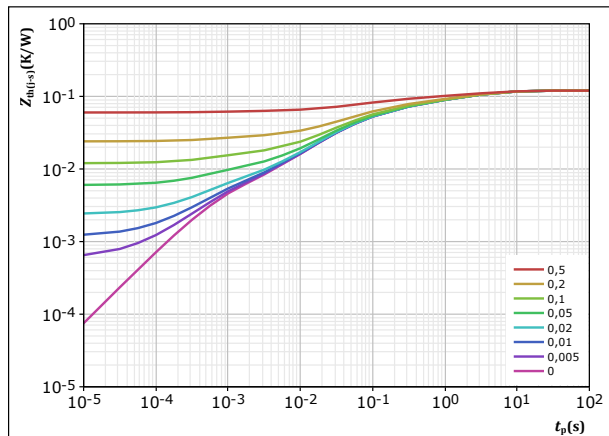
$t_p = 250 \mu s$   
 $V_{CE} = 10 V$

$T_j:$  — 25 °C  
— 125 °C  
— 150 °C

**figure 4.** IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,12 \text{ K/W}$

IGBT thermal model values

$R$ (K/W)	$\tau$ (s)
2,37E-02	4,78E+00
2,54E-02	1,20E+00
2,85E-02	1,98E-01
2,95E-02	4,71E-02
8,84E-03	1,33E-02
4,12E-03	6,77E-04

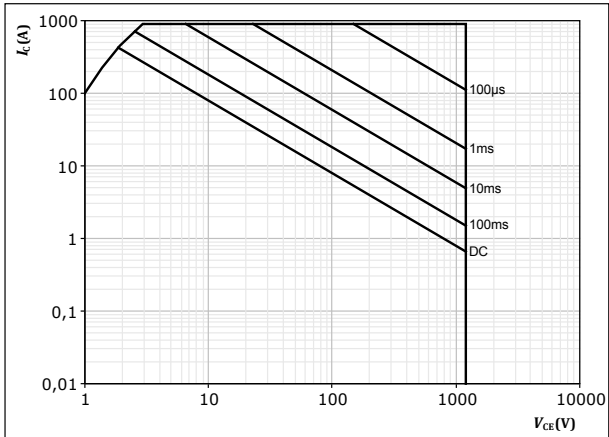


## Half-Bridge Switch Characteristics

**figure 5.** IGBT

Safe operating area

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



$D =$  single pulse

$T_s = 80$  °C

$V_{CE} = 15$  V

$T_j = T_{jmax}$

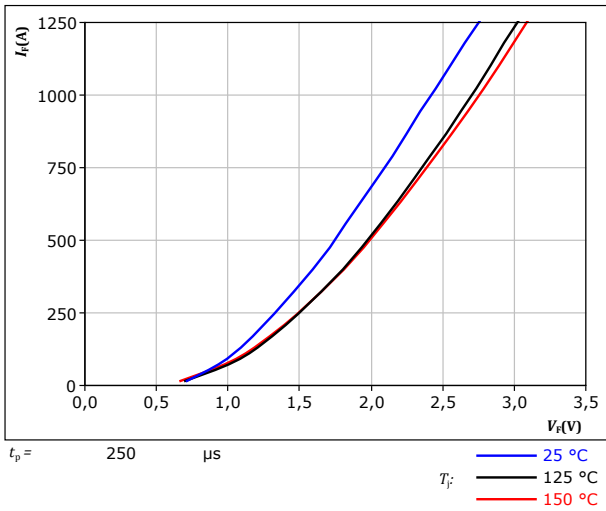


## Half-Bridge Diode Characteristics

**figure 6.** FWD

Typical forward characteristics

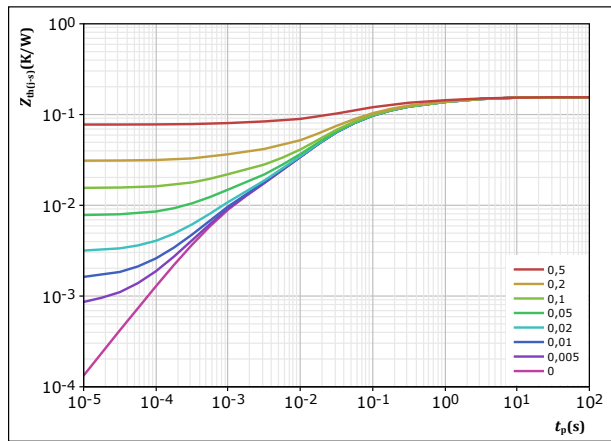
$$I_F = f(V_F)$$



**figure 7.** FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,155 \text{ K/W}$   
 FWD thermal model values

$R$ (K/W)	$\tau$ (s)
1,07E-02	4,93E+00
2,30E-02	1,02E+00
4,13E-02	1,62E-01
4,89E-02	4,06E-02
2,30E-02	1,26E-02
8,01E-03	7,94E-04



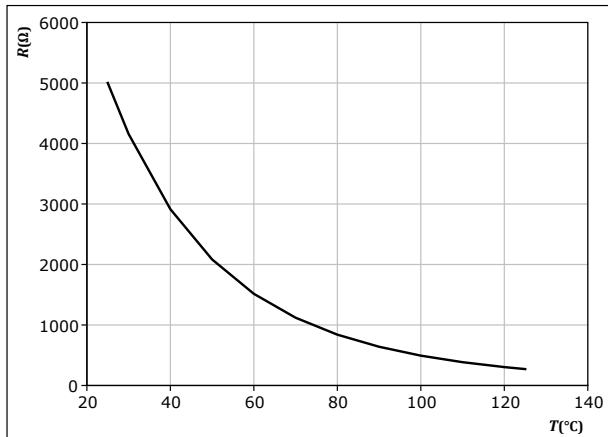


## Thermistor Characteristics

**figure 8.** Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

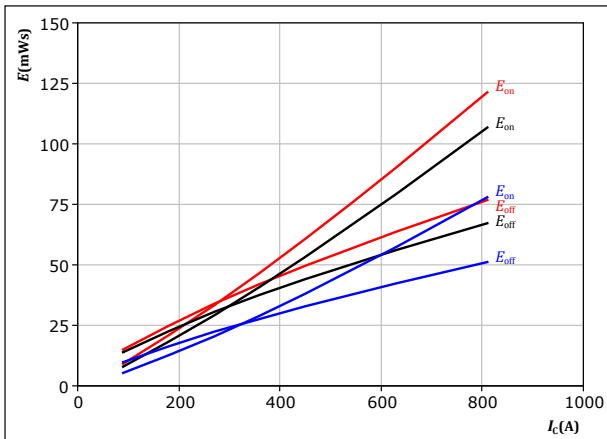




## Half-Bridge Switching Characteristics

**figure 9.** IGBT

Typical switching energy losses as a function of collector current  
 $E = f(I_c)$

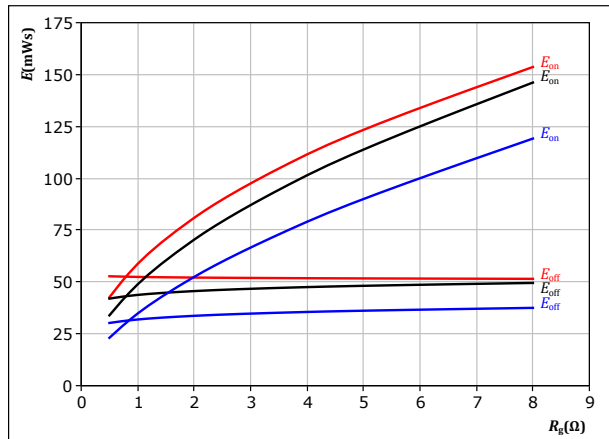


With an inductive load at  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 1$   $\Omega$   
 $R_{goff} = 1$   $\Omega$

$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C

**figure 10.** IGBT

Typical switching energy losses as a function of gate resistor  
 $E = f(R_g)$

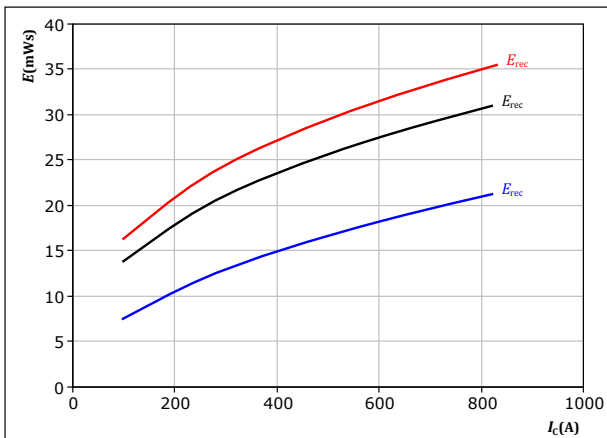


With an inductive load at  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 450$  A

$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C

**figure 11.** FWD

Typical reverse recovered energy loss as a function of collector current  
 $E_{rec} = f(I_c)$

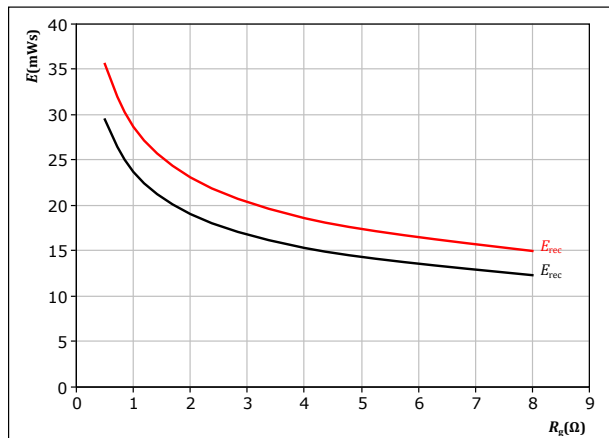


With an inductive load at  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 1$   $\Omega$

$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C

**figure 12.** 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  
 $V_{GE} = \pm 15$  V  
 $I_c = 450$  A

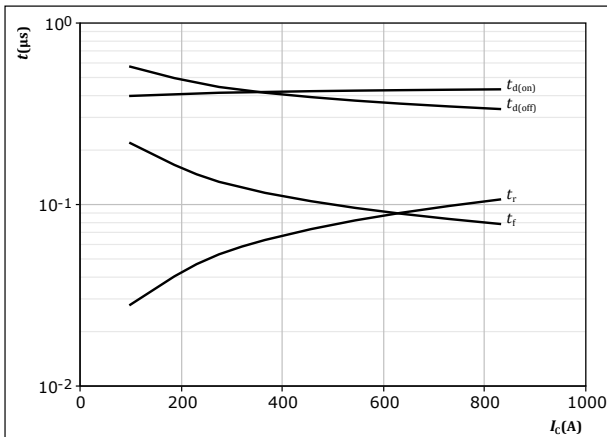
$T_j$ : — 125 °C  
 — 150 °C



## Half-Bridge Switching Characteristics

**figure 13.** IGBT

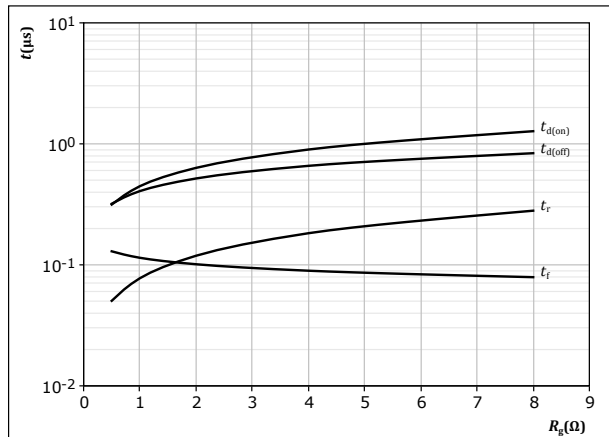
Typical switching times as a function of collector current  
 $t = f(I_c)$



With an inductive load at  
 $T_j = 150 \text{ }^\circ\text{C}$   
 $V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{g(on)} = 1 \text{ } \Omega$   
 $R_{g(off)} = 1 \text{ } \Omega$

**figure 14.** IGBT

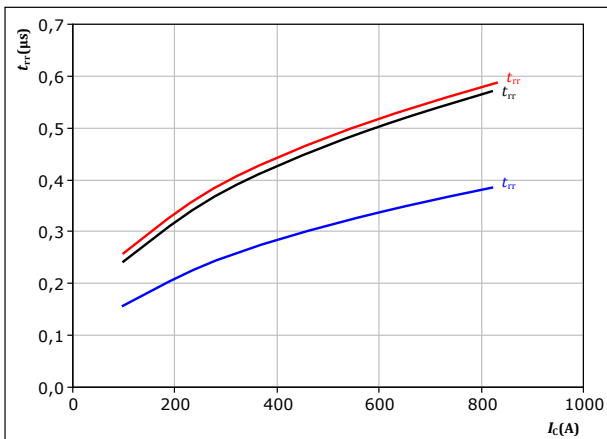
Typical switching times as a function of gate resistor  
 $t = f(R_g)$



With an inductive load at  
 $T_j = 150 \text{ }^\circ\text{C}$   
 $V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 450 \text{ A}$

**figure 15.** FWD

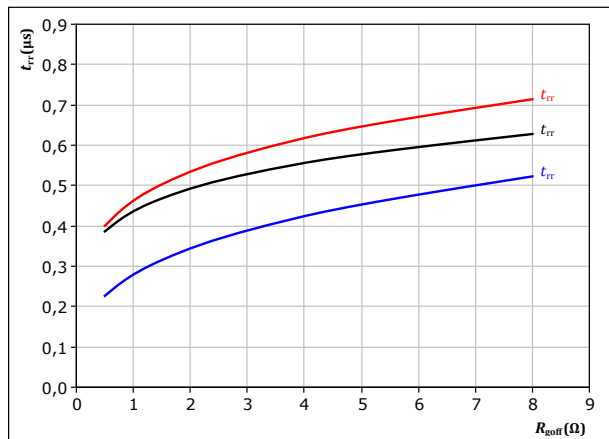
Typical reverse recovery time as a function of collector current  
 $t_{rr} = f(I_c)$



With an inductive load at  
 $V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{g(on)} = 1 \text{ } \Omega$   
 $T_j:$  — 25 °C  
 — 125 °C  
 — 150 °C

**figure 16.** FWD

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



With an inductive load at  
 $V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 450 \text{ A}$   
 $T_j:$  — 25 °C  
 — 125 °C  
 — 150 °C

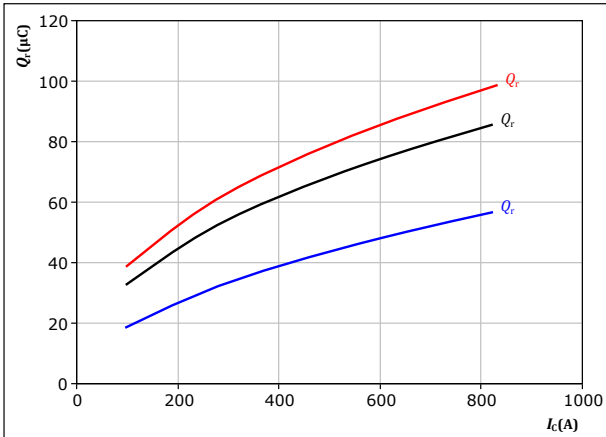


## Half-Bridge Switching Characteristics

**figure 17.** FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

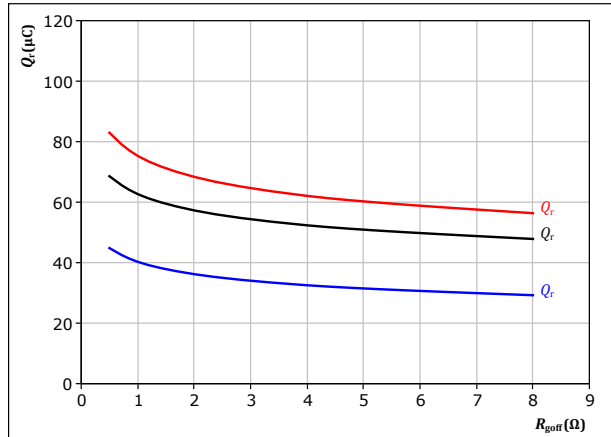
$V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{goff} = 1 \ \Omega$

$T_j$ : — 25 °C  
— 125 °C  
— 150 °C

**figure 18.** FWD

Typical recovered charge as a function of turn off gate resistor

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



With an inductive load at

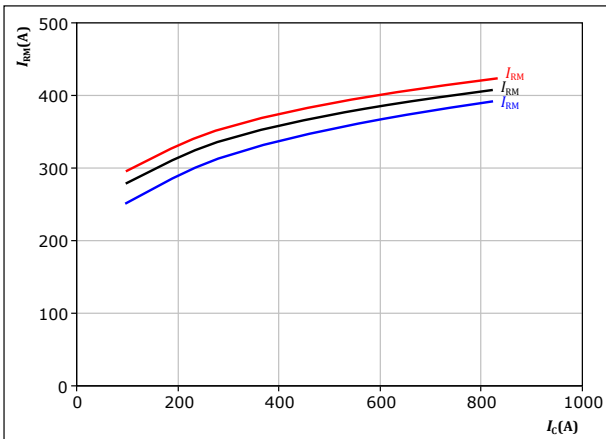
$V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 450 \text{ A}$

$T_j$ : — 25 °C  
— 125 °C  
— 150 °C

**figure 19.** FWD

Typical peak reverse recovery current as a function of collector current

$$I_{RM} = f(I_c)$$



With an inductive load at

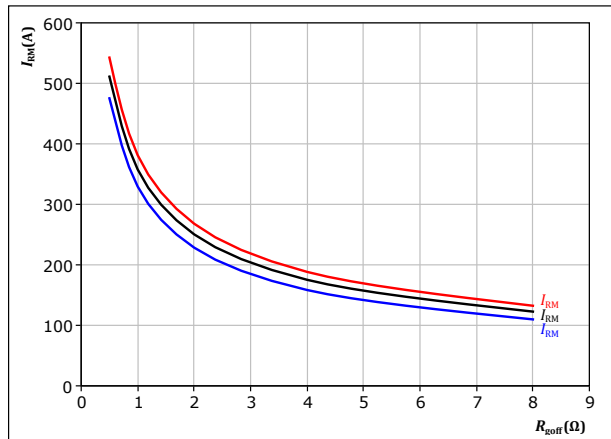
$V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{goff} = 1 \ \Omega$

$T_j$ : — 25 °C  
— 125 °C  
— 150 °C

**figure 20.** FWD

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

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



With an inductive load at

$V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 450 \text{ A}$

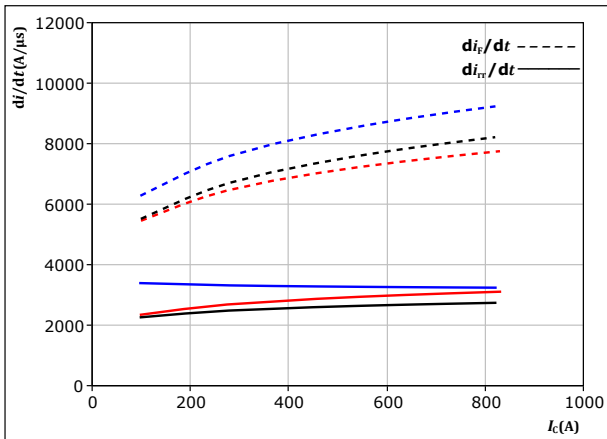
$T_j$ : — 25 °C  
— 125 °C  
— 150 °C



## Half-Bridge Switching Characteristics

**figure 21.** FWD

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



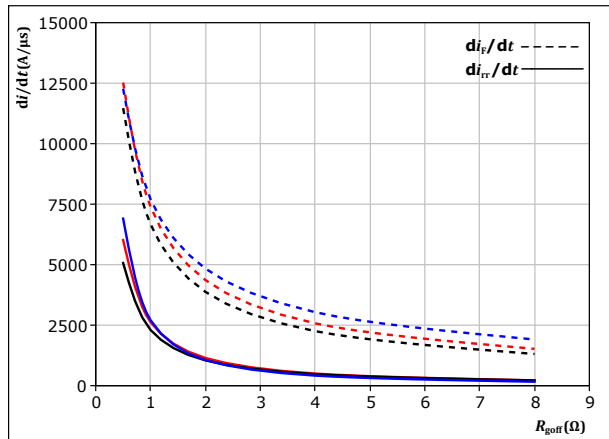
With an inductive load at

$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{goff} = 1$   $\Omega$

$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C

**figure 22.** 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

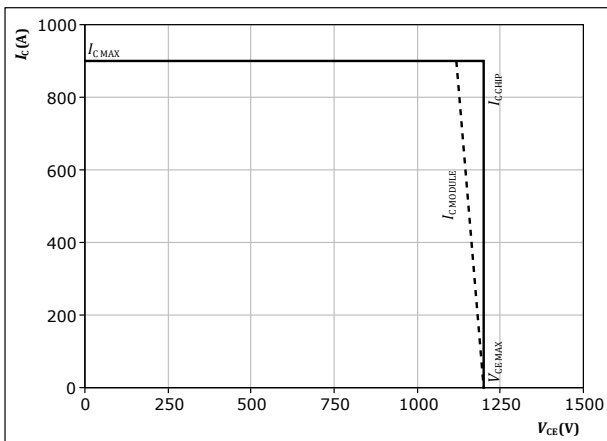
$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 450$  A

$T_j$ : — 25 °C  
 — 125 °C  
 — 150 °C

**figure 23.** IGBT

Reverse bias safe operating area

$I_c = f(V_{CE})$



At  $T_j = 150$  °C  
 $R_{goff} = 1$   $\Omega$   
 $R_{goff} = 1$   $\Omega$



## Half-Bridge Switching Definitions

figure 24. IGBT

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

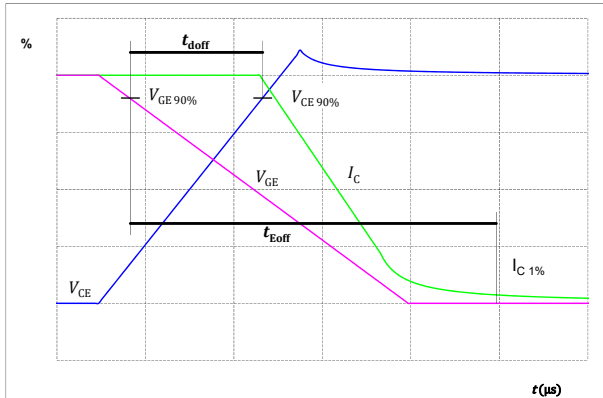


figure 25. IGBT

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

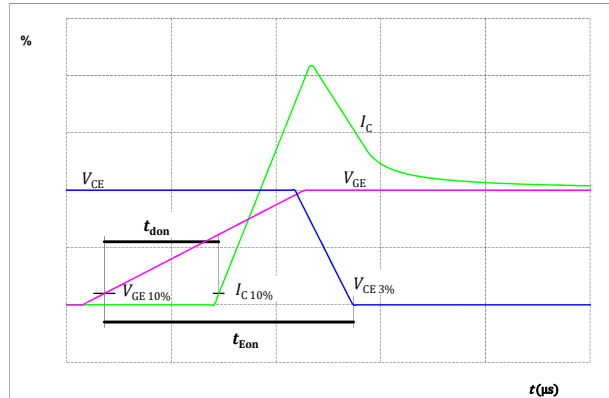


figure 26. IGBT

Turn-off Switching Waveforms & definition of  $t_f$

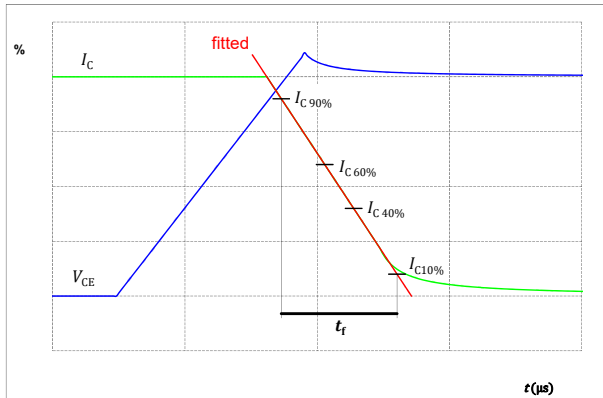
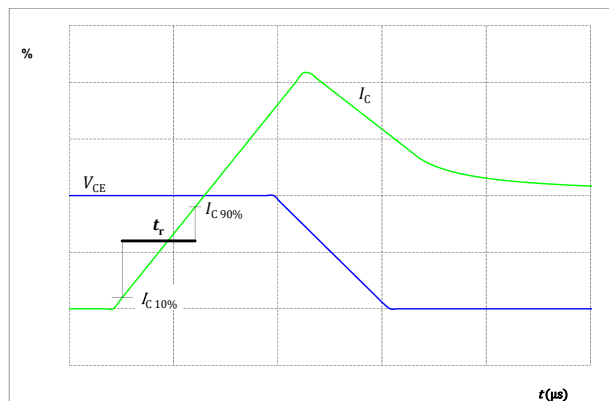


figure 27. IGBT

Turn-on Switching Waveforms & definition of  $t_r$





### Half-Bridge Switching Definitions

figure 28. FWD

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

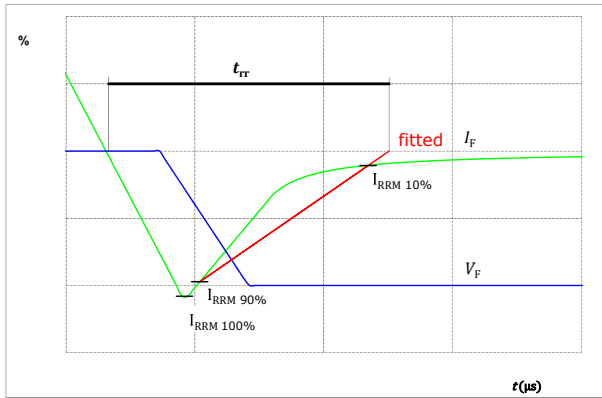
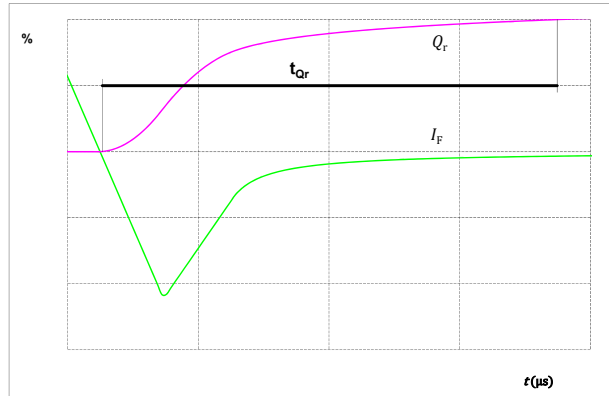


figure 29. FWD


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



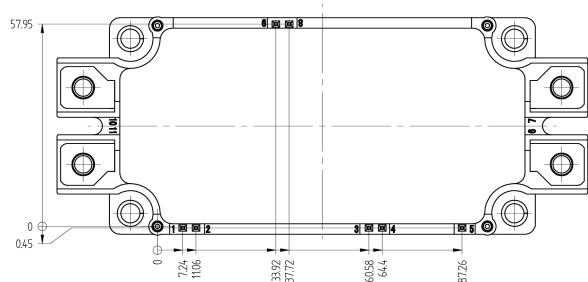


Vincotech

Ordering Code	
<b>Version</b>	<b>Ordering Code</b>
Without thermal paste	A0-VS122PA450M7-L758F70
With thermal paste (3,4 W/mK, PSX-P7)	A0-VS122PA450M7-L758F70-/3/

Marking						
 <small>NN-NNNNNNNNNN-TTTTTTVV VIN WWYY LLLL SSSS</small>	<b>Text</b>	<b>Name</b> NN-NNNNNNNNNNNNNNNN- TTTTTVV	<b>VIN</b> VIN	<b>Date code</b> WWYY	<b>Lot</b> LLLLL	<b>Serial</b> SSSS
	<b>Datamatrix</b>	<b>Type&amp;Ver</b> TTTTTVV	<b>Lot number</b> LLLLL	<b>Serial</b> SSSS	<b>Date code</b> WWYY	

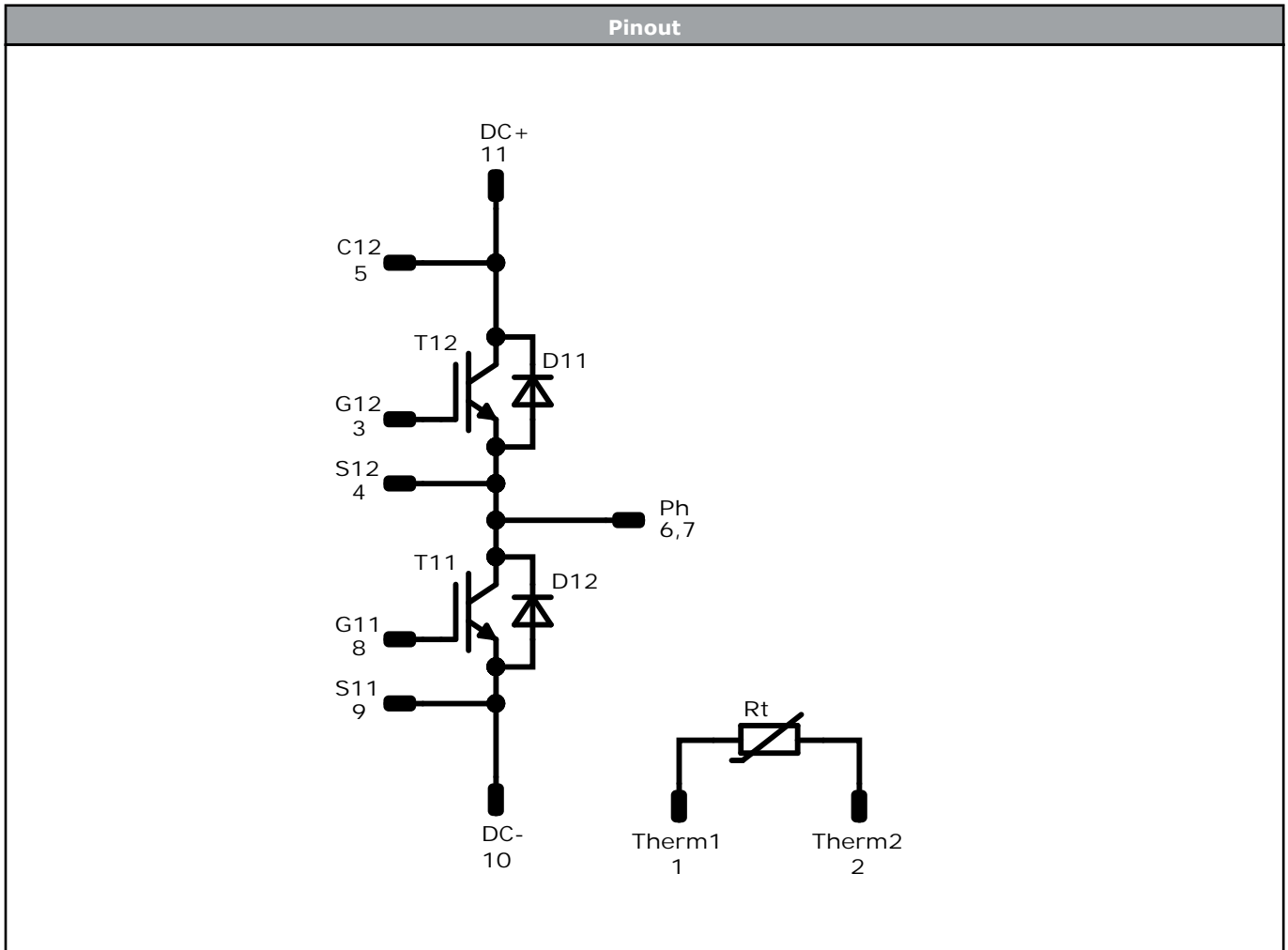
Outline				
Pin table [mm]				
Pin	X	Y	Function	
1	7,24	-0,45	Therm1	
2	11,06	-0,45	Therm2	
3	60,58	-0,45	G12	
4	64,4	-0,45	S12	
5	87,26	-0,45	C12	
6	-	-	Ph	
7	-	-	Ph	
8	37,72	57,95	G11	
9	33,92	57,95	S11	
10	-	-	DC-	
11	-	-	DC+	
12	not assembled			
13	not assembled			
14	not assembled			
15	not assembled			
16	not assembled			
17	not assembled			
18	not assembled			
19	not assembled			
20	not assembled			
21	not assembled			
22	not assembled			
23	not assembled			
24	not assembled			
25	not assembled			
26	not assembled			
27	not assembled			
28	not assembled			
29	not assembled			
30	not assembled			
31	not assembled			
32	not assembled			







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Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	450 A	Half-Bridge Switch	
D11, D12	FWD	1200 V	450 A	Half-Bridge Diode	
Rt	NTC			Thermistor	




Packaging instruction				
Standard packaging quantity (SPQ) 24	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for VINco E3s packages see vincotech.com website.

Package data
Package data for VINco E3s 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
A0-VS122PA450M7-L758F70-D5-14	27 Sep. 2021	Static characteristics of the Diode is updated R Tau pairs are updated Separated datasheet for press-fit version New datasheet format, module is unchanged	

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As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
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.