
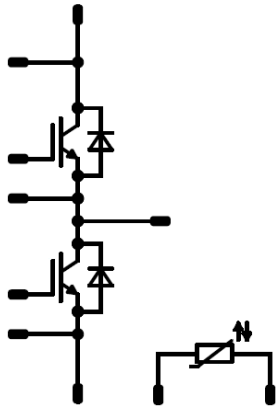




Vincotech

VINcoDUAL E3	1200 V / 450 A
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Features</div> <ul style="list-style-type: none"> Low V_{CEsat} with the new 7th gen Mitsubishi chip generation Max Junction Temperature T_{vjmax} 175°C Solid cover technology for higher reliability Industry standard housing Press-fit pin and pre-applied Phase Change Thermal Interface Material available 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">VINco E3</div> 
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Target applications</div> <ul style="list-style-type: none"> Industrial Drives Power Supply UPS 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Schematic</div> 
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Types</div> <ul style="list-style-type: none"> A0-VS122PA450M7-L758F70 A0-VP122PA450M7-L758F70T 	

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Half Bridge Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_c	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	429	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	900	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	817	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C



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Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Half Bridge Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	355	A
Repetitive peak forward current	I_{FRM}		900	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	613	W
Maximum junction temperature	T_{jmax}		175	°C

Module Properties

Thermal Properties

Storage temperature	T_{stg}		-40...+125	°C
Operation temperature under switching condition	T_{top}		-40...($T_{jmax} - 25$)	°C

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage $t_p = 2\text{ s}$	4000	V
Creepage distance			18,1	mm
Clearance			16,2	mm
Comparative Tracking Index	CTI		> 200	



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Characteristic Values

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

Half Bridge Switch

Static

Parameter	Symbol	Conditions	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$		10		0,045	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15			450	25 125 150		1,53 1,78 1,85	2,05	V
Collector-emitter cut-off current	I_{CES}		0	1200			25			480	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		
Reverse transfer capacitance	C_{res}								960		
Gate charge	Q_g		15	600	450		25		3000		nC

Thermal

Parameter	Symbol	Conditions	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK							0,12		K/W

Dynamic

Parameter	Symbol	Conditions	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	$R_{goff} = 2 \Omega$ $R_{gon} = 2 \Omega$	± 15	600	453		25		556		ns
Rise time	t_r							125	565		
								150	567		
								25	88		
Turn-off delay time	$t_{d(off)}$							125	103		
								150	104		
		25	407								
Fall time	t_f	125	443								
		150	453								
		25	69								
Turn-on energy (per pulse)	E_{on}	125	93								
		150	98								
		25	48,694								
Turn-off energy (per pulse)	E_{off}	125	66,455								
		150	72,932								
		25	31,670								
		125	43,726								
		150	46,687								
		25									



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Characteristic Values

Parameter	Symbol	Conditions					Value			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		1,66 1,88	2,1		V
Reverse leakage current	I_R		1200		25			270		μA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK					0,16			K/W
Dynamic										
Peak recovery current	I_{RRM}				25 125 150		251 267 282			A
Reverse recovery time	t_{rr}				25 125 150		379 481 535			ns
Recovered charge	Q_r	$di/dt = 5760$ A/μs $di/dt = 4536$ A/μs $di/dt = 4907$ A/μs	±15	600	453	25 125 150	38,550 60,941 69,427			μC
Reverse recovered energy	E_{rec}					25 125 150	13,202 21,232 23,990			mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150	1111 937 1042			A/μs
Thermistor										
Rated resistance	R					25	5			kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 493$ Ω				100	-5	+5		%
Power dissipation	P					25		245		mW
Power dissipation constant						25		1,4		mW/K
B-value	$B_{(25/50)}$	Tol. ±2 %				25		3375		K
B-value	$B_{(25/100)}$	Tol. ±2 %				25		3437		K
Vincotech NTC Reference									K	

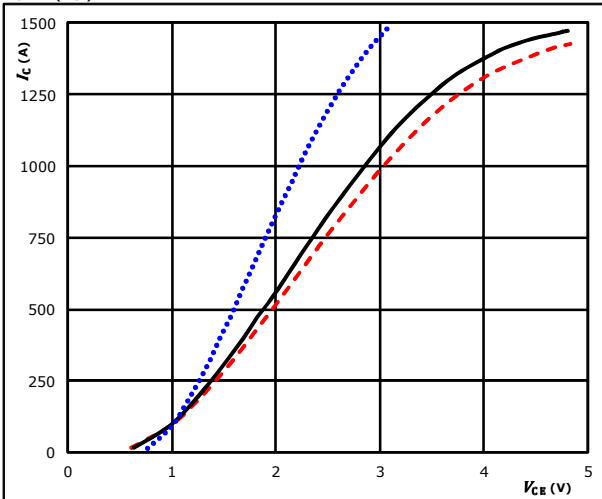


Half Bridge Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

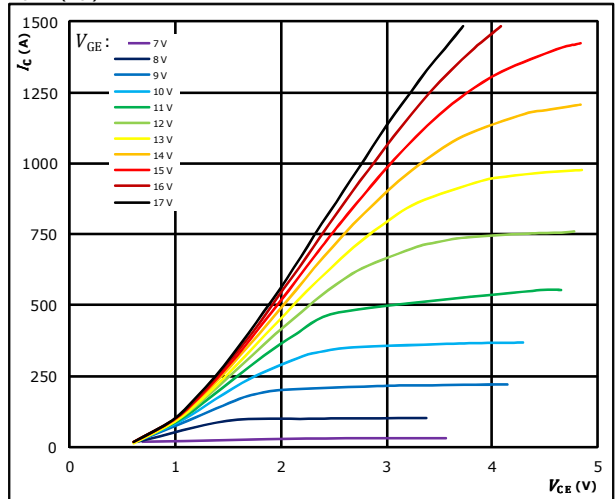


$t_p = 250 \mu s$ $T_j = 25 \text{ }^\circ C$
 $V_{GE} = 15 \text{ V}$ $T_j = 125 \text{ }^\circ C$ ———
 $T_j = 150 \text{ }^\circ C$ - - - - -

figure 2. IGBT

Typical output characteristics

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

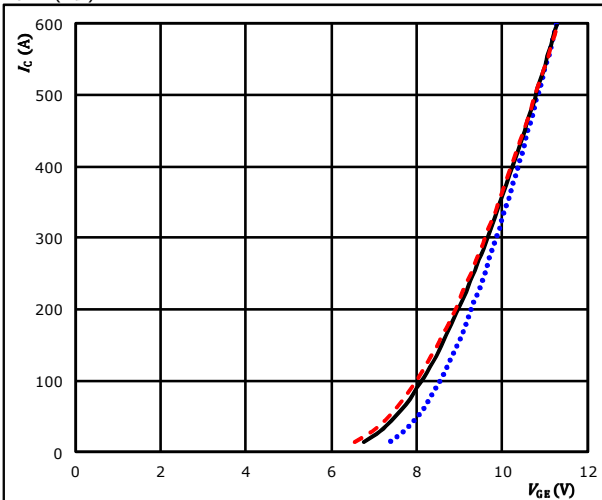


$t_p = 250 \mu s$ $T_j = 125 \text{ }^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

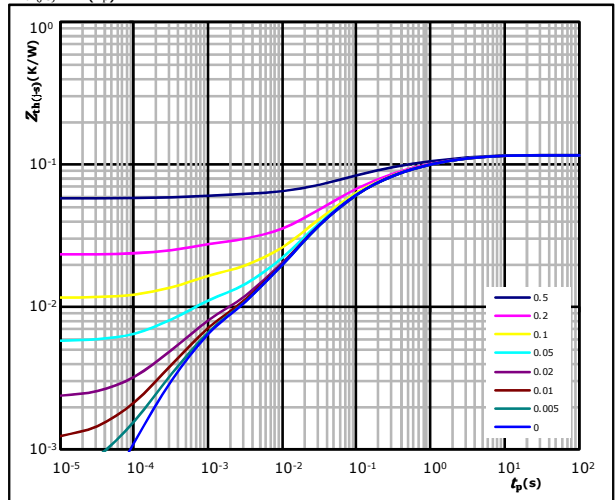


$t_p = 100 \mu s$ $T_j = 25 \text{ }^\circ C$
 $V_{CE} = 0 \text{ V}$ $T_j = 125 \text{ }^\circ C$ ———
 $T_j = 150 \text{ }^\circ C$ - - - - -

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



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

IGBT thermal model values

R (K/W)	τ (s)
1,38E-02	3,34E+00
2,90E-02	6,14E-01
3,73E-02	1,17E-01
2,80E-02	2,74E-02
2,71E-03	5,18E-03
5,51E-03	5,36E-04

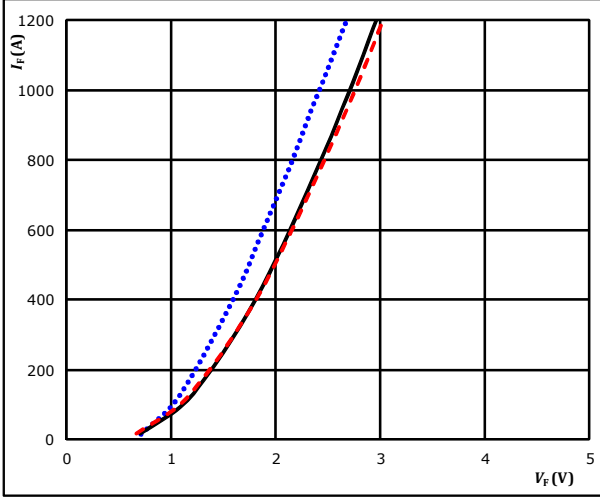


Half Bridge Diode Characteristics

figure 1. Diode

Typical forward characteristics

$$I_F = f(V_F)$$

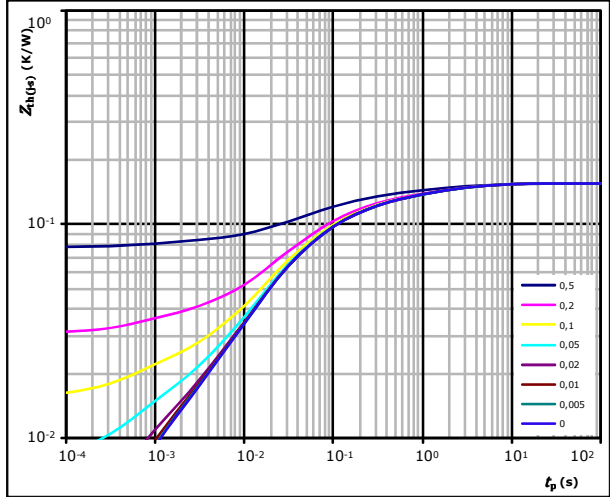


$t_p = 250 \mu s$
 T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. Diode

Transient thermal impedance as a function of pulse width

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



$$D = \frac{t_p}{T}$$

$$R_{th(j-s)} = 0,16 \text{ K/W}$$

Diode thermal model values

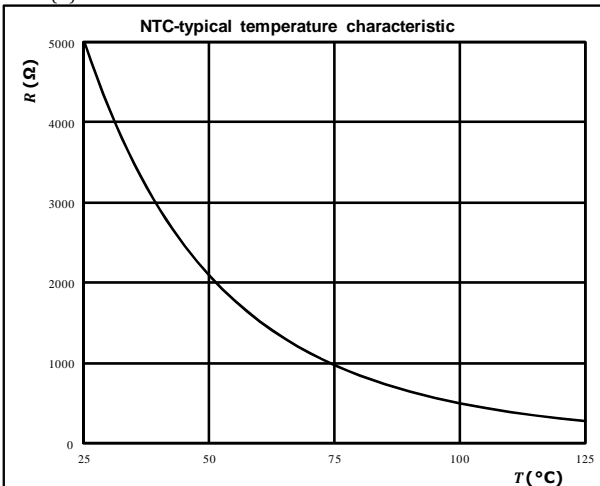
R (K/W)	τ (s)
1,07E-02	1,64E+00
2,30E-02	3,40E-01
4,13E-02	5,39E-02
4,89E-02	1,35E-02
2,30E-02	4,19E-03
8,01E-03	2,65E-04

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic
as a function of temperature

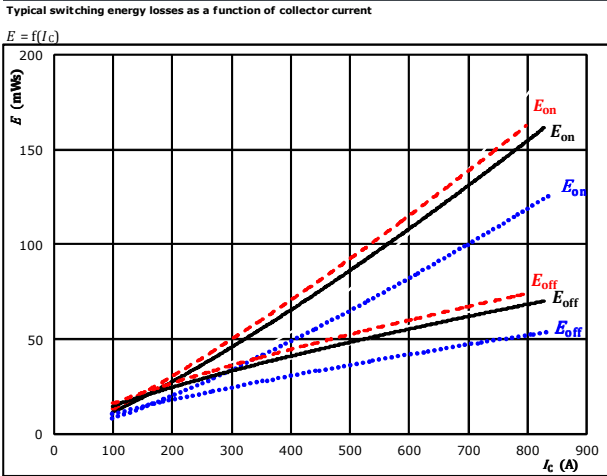
$$R = f(T)$$





Half Bridge Switch Switching Characteristics

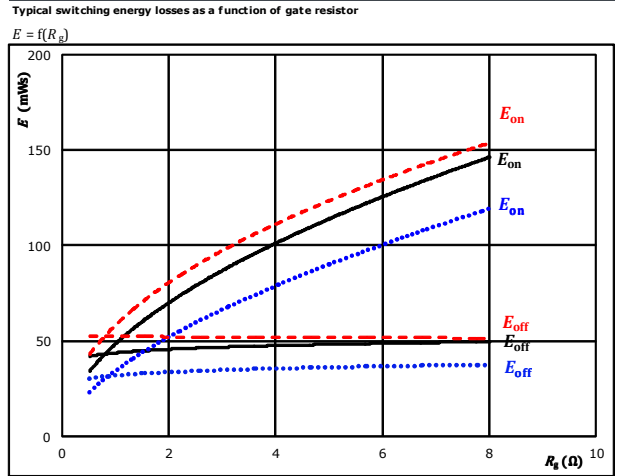
figure 1. IGBT



With an inductive load at

$V_{CE} = 600$ V	$T_j: 25$ °C
$V_{GE} = \pm 15$ V	125 °C	————
$R_{gon} = 2$ Ω	150 °C	- - - -
$R_{goff} = 2$ Ω		

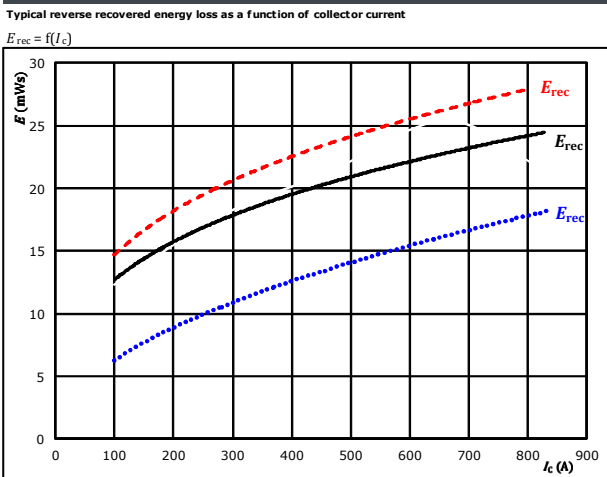
figure 2. IGBT



With an inductive load at

$V_{CE} = 600$ V	$T_j: 25$ °C
$V_{GE} = \pm 15$ V	125 °C	————
$I_C = 453$ A	150 °C	- - - -

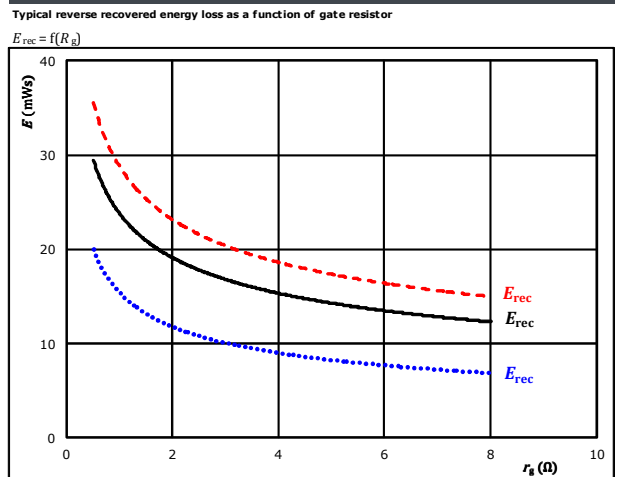
figure 3. FWD



With an inductive load at

$V_{CE} = 600$ V	$T_j: 25$ °C
$V_{GE} = \pm 15$ V	125 °C	————
$R_{gon} = 2$ Ω	150 °C	- - - -

figure 4. FWD



With an inductive load at

$V_{CE} = 600$ V	$T_j: 25$ °C
$V_{GE} = \pm 15$ V	125 °C	————
$I_C = 453$ A	150 °C	- - - -



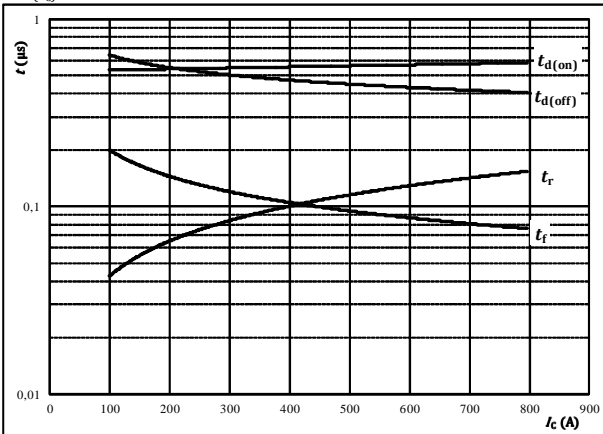
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Half Bridge Switch Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



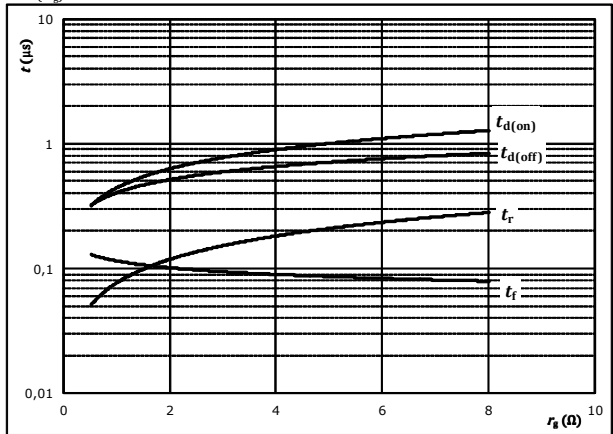
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{g(on)} =$	2	Ω
$R_{g(off)} =$	2	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



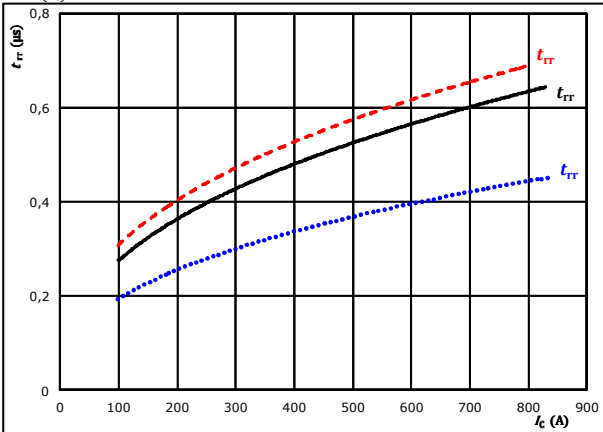
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_C =$	453	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_C)$$

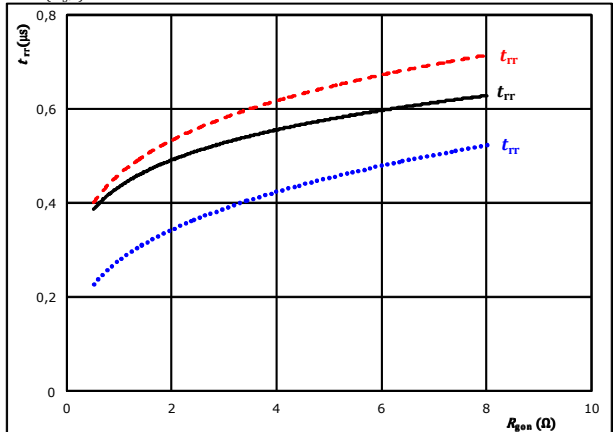


At	$V_{CE} =$	600	V	$T_j:$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$R_{g(on)} =$	2	Ω		150 °C	-----

figure 8. FWD

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

$$t_{rr} = f(R_{g(on)})$$



At	$V_{CE} =$	600	V	$T_j:$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$I_C =$	453	A		150 °C	-----

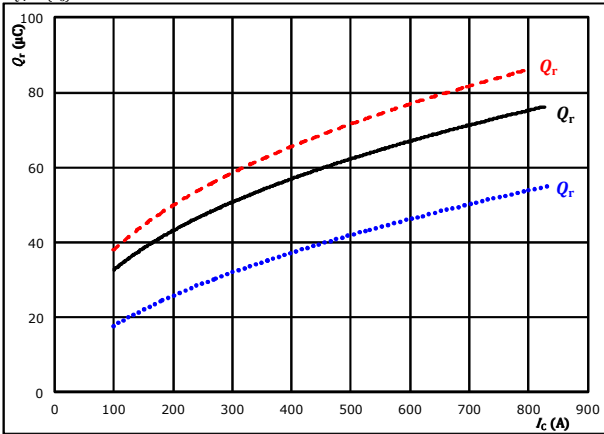


Half Bridge Switch Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

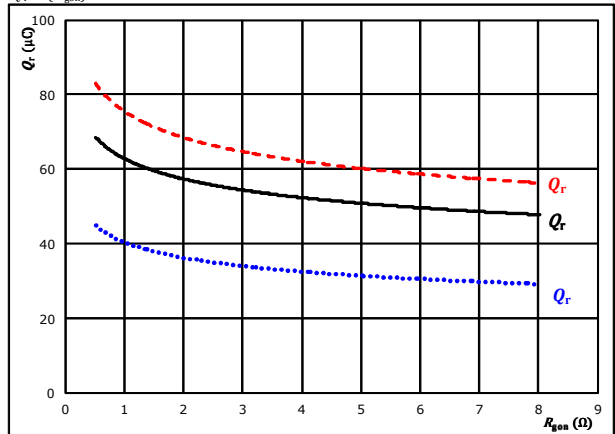


At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $R_{gdn} = 2$ Ω $T_j = 150$ °C - - - -

figure 10. FWD

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

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

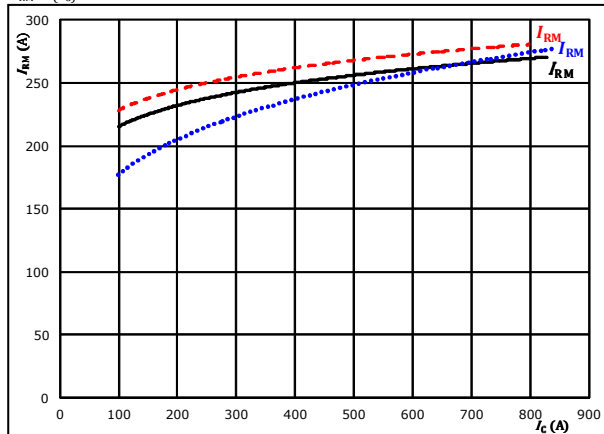


At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $I_c = 453$ A $T_j = 150$ °C - - - -

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

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

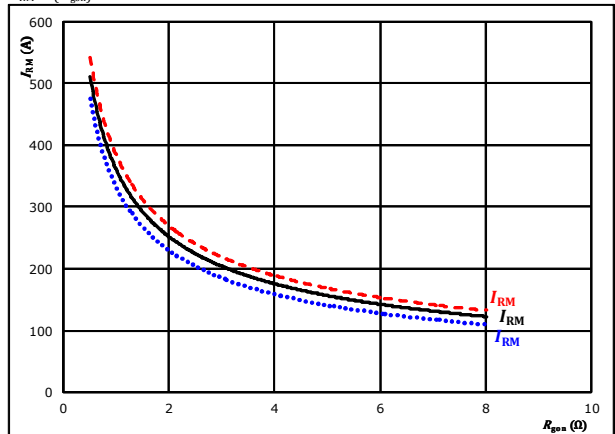


At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $R_{gdn} = 2$ Ω $T_j = 150$ °C - - - -

figure 12. FWD

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

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



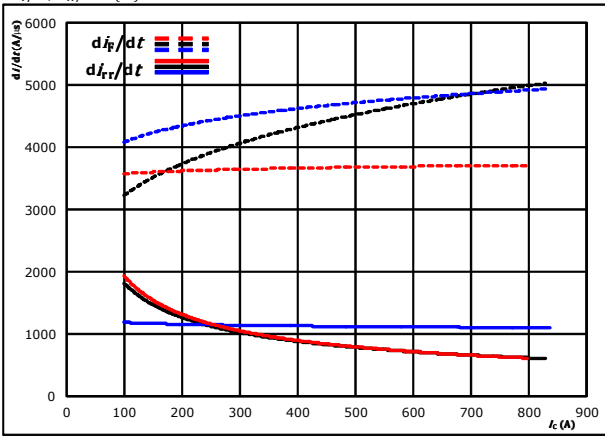
At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $I_c = 453$ A $T_j = 150$ °C - - - -



Half Bridge Switch Switching Characteristics

figure 13. FWD

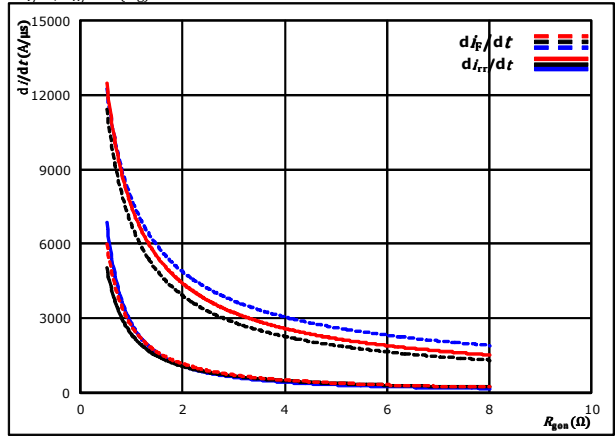
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 600$ V $T_j = 25$ °C (dotted blue)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (solid black)
 $R_{gon} = 2$ Ω $T_j = 150$ °C (dashed red)

figure 14. FWD

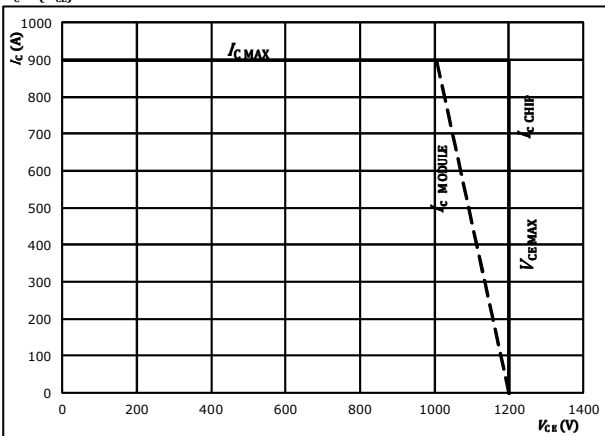
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{gon})$



At $V_{CE} = 600$ V $T_j = 25$ °C (dotted blue)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (solid black)
 $I_c = 453$ A $T_j = 150$ °C (dashed red)

figure 15. IGBT

Reverse bias safe operating area
 $I_c = f(V_{ce})$



At $T_j = 175$ °C
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω



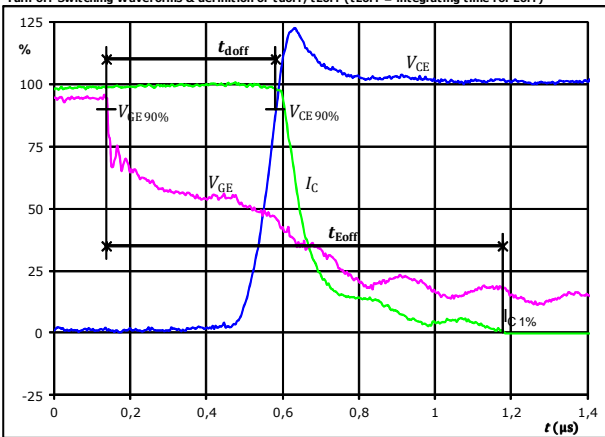
Half Bridge Switch Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	2 Ω
R_{goff}	=	2 Ω

figure 1. IGBT

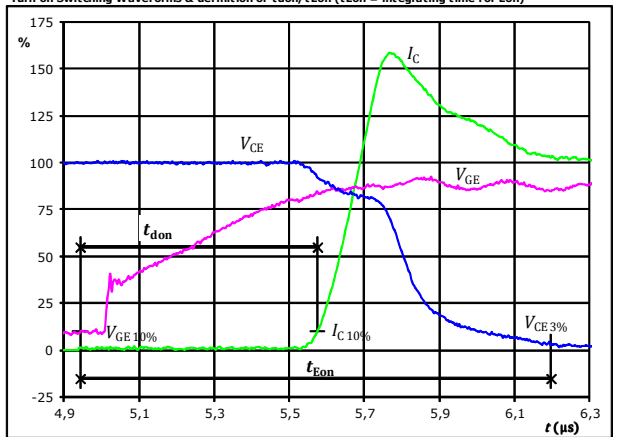
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	459	A
$t_{doff} =$	0,443	μ s
$t_{Eoff} =$	1,040	μ s

figure 2. IGBT

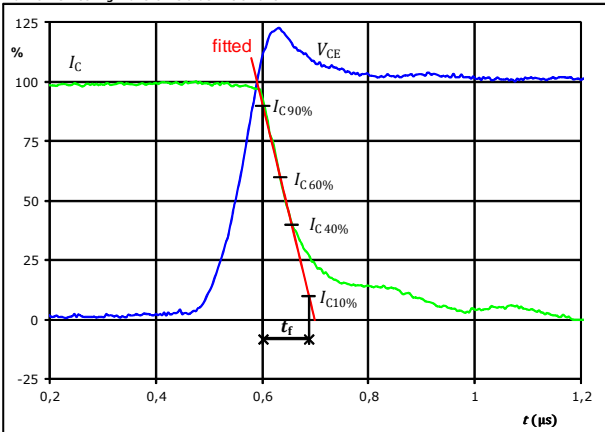
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	459	A
$t_{don} =$	0,565	μ s
$t_{Eon} =$	1,254	μ s

figure 3. IGBT

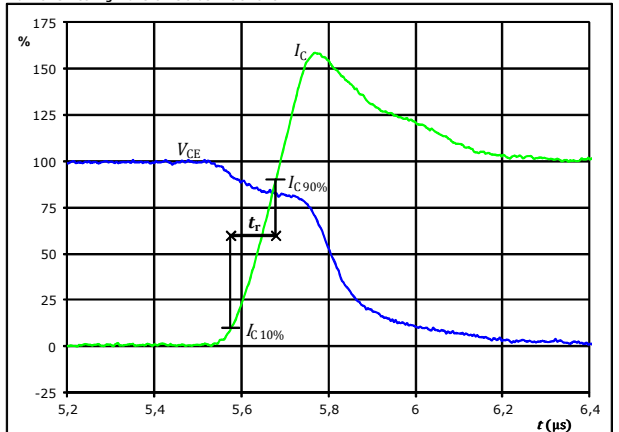
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	600	V
$I_C(100\%) =$	459	A
$t_f =$	0,093	μ s

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



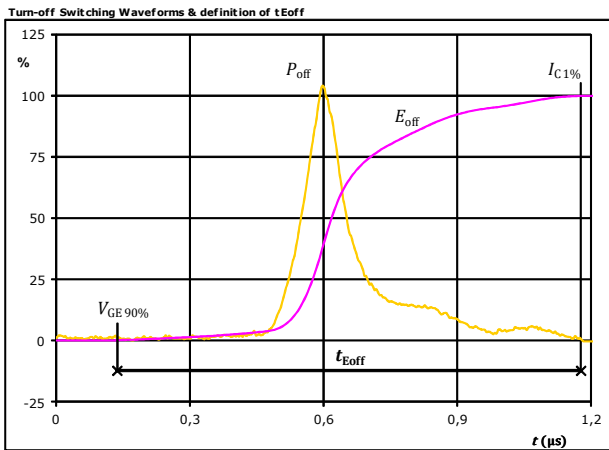
$V_C(100\%) =$	600	V
$I_C(100\%) =$	459	A
$t_r =$	0,103	μ s



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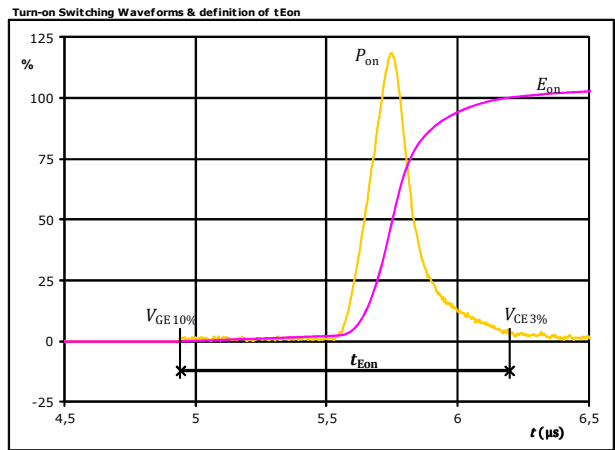
Half Bridge Switch Switching Characteristics

figure 5. IGBT



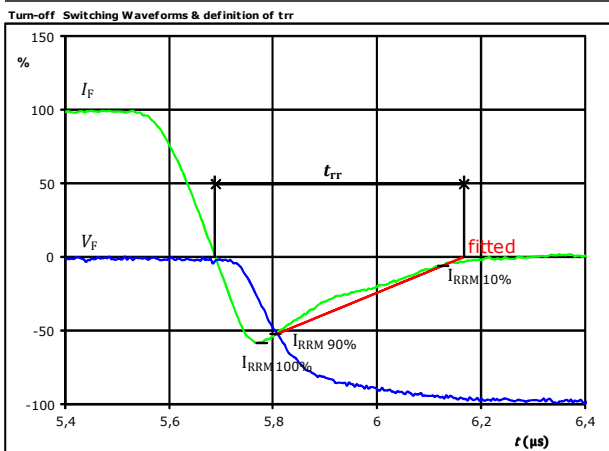
$P_{off}(100\%) = 275,62$ kW
 $E_{off}(100\%) = 43,73$ mJ
 $t_{Eoff} = 1,04$ µs

figure 6. IGBT



$P_{on}(100\%) = 275,62$ kW
 $E_{on}(100\%) = 66,46$ mJ
 $t_{Eon} = 1,25$ µs

figure 7. FWD



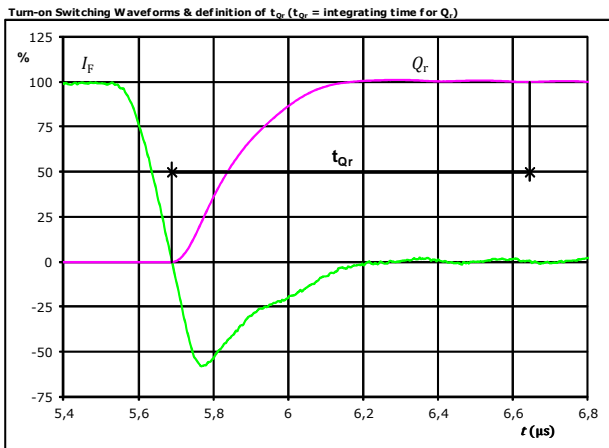
$V_F(100\%) = 600$ V
 $I_F(100\%) = 459$ A
 $I_{RRM}(100\%) = -267$ A
 $t_{rr} = 0,481$ µs



Vincotech

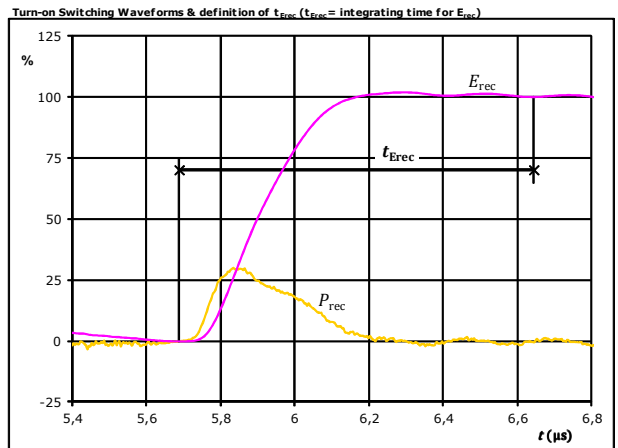
Half Bridge Switch Switching Characteristics

figure 8. FWD



I_F (100%) =	459	A
Q_r (100%) =	60,95	μC
t_{Qr} =	0,96	μs

figure 9. FWD



P_{rec} (100%) =	275,62	kW
E_{rec} (100%) =	21,24	mJ
t_{Erec} =	0,96	μs



Vincotech

Ordering Code & Marking								
Version			Ordering Code					
without thermal paste with solder pins			A0-VS122PA450M7-L758F70					
with thermal paste with solder pins			A0-VS122PA450M7-L758F70- /3/					
without thermal paste with Press-fit pins			A0-VP122PA450M7-L758F70T					
with thermal paste with Press-fit pins			A0-VP122PA450M7-L758F70T- /3/					
NN-NNNNNNNNNN-TTTTTTTV VIN WWYY LLLL SSSS			Text		VIIN	Date code	Lot	Serial
			NN-NNNNNNNNNN-TTTTTTTV		VIN	WWYY	LLLL	SSSS
			Datamatrix	Type&Ver	Lot number	Serial	Date code	
			TTTTTTTV	LLLL	SSSS	WWYY		

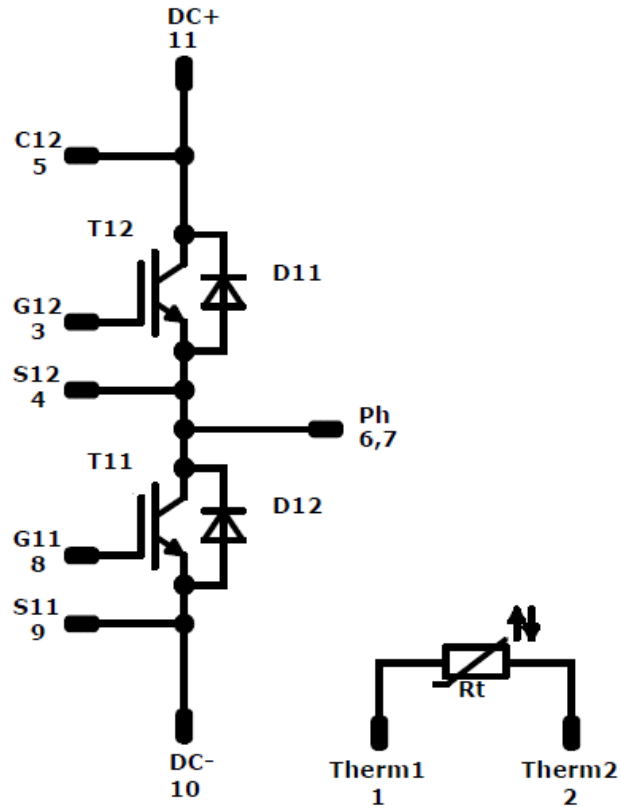
Pin table [mm]			
Pin	X	Y	Function
1	7,24	-0,45	Therm1
2	11,06	-0,45	Therm2
3	60,58	-0,45	G12
4	64,4	-0,45	S12
5	87,26	-0,45	C12
6	-	-	Ph
7	-	-	Ph
8	37,72	57,95	G11
9	33,92	57,95	S11
10	-	-	DC-
11	-	-	DC+

The technical drawing includes a top view showing a rectangular component with a central horizontal section and four mounting tabs. Dimensions include a total width of 152 mm, a central section width of 137 mm, and a distance of 122 mm between the inner mounting tabs. A central hole has a diameter of 6.99 mm. The component has four M6 screws for mounting. A side view shows a height of 62 mm and a width of 205 mm. A detail view 'A' shows a pin with a diameter of 0.65 mm and a height of 5 mm. Other dimensions include 115.5 mm, 72.4 mm, 110.6 mm, 33.92 mm, 37.72 mm, 60.58 mm, 64.4 mm, 87.26 mm, 7.75 mm, 37.5 mm, 72 mm, 39 mm, 50.40/2 mm, 57.5/40/2 mm, 15.4 mm, 17 mm, 0.45 mm, 0.8 mm, and 1.15 mm.



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Pinout



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			Half Bridge Switch	




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

Handling instruction
Handling instructions for if no series packaging available packages see vincotech.com website.

Package data
Package data for if no series packaging available packages see 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-Vx122PA450M7-L758F70x-D1-14	06 Jan. 2017		

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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.