



flowNPFC 1 SiC

650 V / 150 A

Topology features

- Integrated DC capacitor
- Neutral Boost PFC
- SiC MOSFET
- Temperature sensor

Component features

- High Blocking Voltage with low drain source on state resistance
- High speed SiC-MOSFET technology
- Resistant to Latch-up

Housing features

- Base isolation: Al₂O₃
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

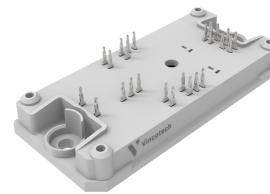
Target applications

- Charging Stations
- Energy Storage Systems
- UPS

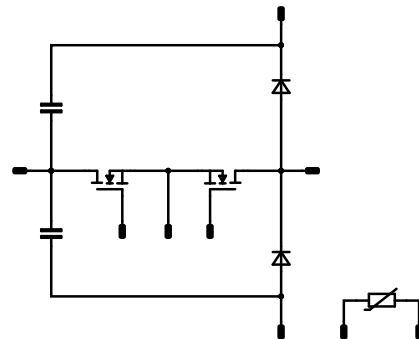
Types

- 10-PY07LBA015ME-PG08J68T

flow 1 12 mm housing



Schematic





Vincotech

10-PY07LBA015ME-PG08J68T
datasheet

Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
Boost Switch				
Drain-source voltage	V_{DSS}		650	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	77	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	396	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	145	W
Gate-source voltage	V_{GSS}		-4 / 15	V
		dynamic	-8 / 19	
Maximum Junction Temperature	T_{jmax}		175	°C
Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	73	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	273	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 25\text{ °C}$	390	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	172	W
Maximum junction temperature	T_{jmax}		175	°C
Capacitor (DC)				
Maximum DC voltage	V_{MAX}		630	V
Operation Temperature	T_{op}		-55 ... 125	°C



Vincotech

10-PY07LBA015ME-PG08J68T
datasheet

Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
-----------	--------	------------	-------	------

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
Isolation voltage	V_{isol}	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			>12,7	mm
Clearance			8,01	mm
Comparative Tracking Index	CTI		≥ 600	

*100 % tested in production



Vincotech

10-PY07LBA015ME-PG08J68T
datasheet

Characteristic Values

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

Boost Switch

Static

Drain-source on-state resistance	$r_{DS(on)}$		15		52,8	25 125 150		18,5 21,8 23,5	20 ⁽¹⁾	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$	0		0,01452	25	1,8	2,6	3,6	V
Gate to Source Leakage Current	I_{GSS}		15	0		25		30	300	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	650		25		3	96	μA
Internal gate resistance	r_g							1		Ω
Gate charge	Q_g		-4/15	400	52,8	25		189		nC
Short-circuit input capacitance	C_{iss}	$f = 1 \text{ Mhz}$	0	600	0	25		4800		pF
Short-circuit output capacitance	C_{oss}							300		
Reverse transfer capacitance	C_{rss}							24		
Diode forward voltage	V_{SD}		0		26,4	25		4,8		V

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						0,66		K/W
--	---------------	---	--	--	--	--	--	------	--	-----

Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 8 \Omega$ $R_{goff} = 8 \Omega$	0/15	350	75	25		23,9		ns
Rise time	t_r					125		20,8		
						150		20,17		
						25		22,43		
Turn-off delay time	$t_{d(off)}$					125		19,43		
						150		18,92		
						25		110,84		
Fall time	t_f	125		124,69						
		150		128,71						
		25		14,53						
Turn-on energy (per pulse)	E_{on}	125		15,73						
		150		16,53						
		25		0,565						
Turn-off energy (per pulse)	E_{off}	125		0,458						
		150		0,444						
		25		0,664						
		125		0,667						
		150		0,679						



Vincotech

10-PY07LBA015ME-PG08J68T
datasheet

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			60	25 125 150		1,5 1,86 2,01	1,8 ⁽¹⁾		V
Reverse leakage current	I_R	$V_r = 1200$ V			25		105	600		μA
Thermal										
Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					0,55			K/W
Dynamic										
Peak recovery current	I_{RM}				25 125 150		26,56 29,79 30,04			A
Reverse recovery time	t_{rr}				25 125 150		16,74 16,63 16,63			ns
Recovered charge	Q_r	$di/dt=3707$ A/μs $di/dt=4228$ A/μs $di/dt=4715$ A/μs	0/15	350	75	25 125 150	0,266 0,299 0,301			μC
Reverse recovered energy	E_{rec}				25 125 150		0,039 0,05 0,052			mWs
Peak rate of fall of recovery current	$(di_r/dt)_{max}$				25 125 150		3964,7 4356,99 4308,46			A/μs



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		

Capacitor (DC)

Static

Capacitance	C	DC bias voltage = 0 V				25		100		nF
Tolerance							-10		10	%
Dissipation factor		$f = 1$ kHz				25		2,5		%

Thermistor

Static

Rated resistance	R					25		22		k Ω
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. ± 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. MOSFET

Typical output characteristics
 $I_D = f(V_{DS})$

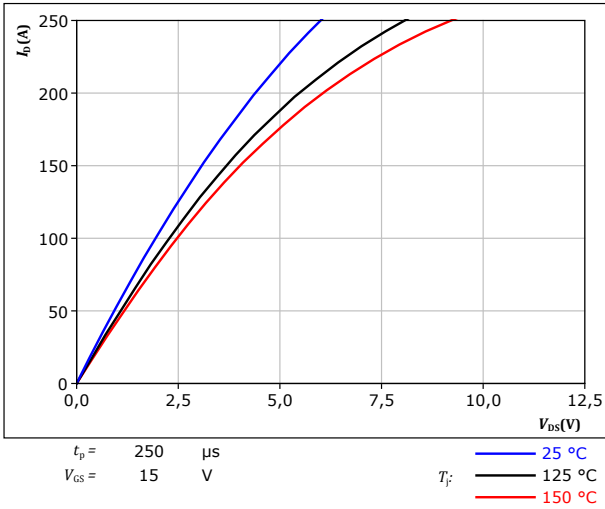


figure 2. MOSFET

Typical output characteristics
 $I_D = f(V_{DS})$

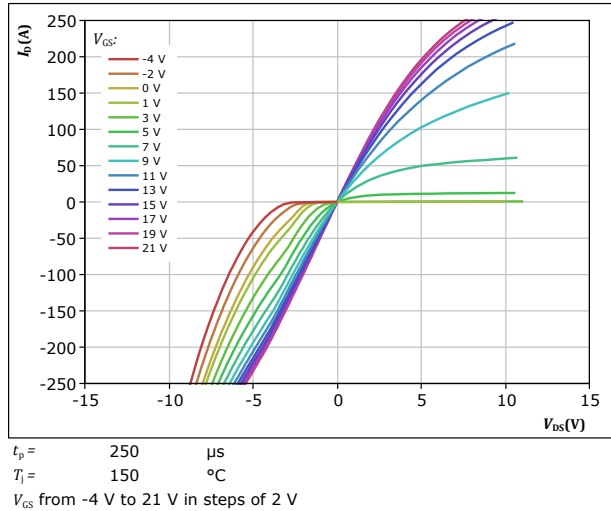


figure 3. MOSFET

Typical transfer characteristics
 $I_D = f(V_{GS})$

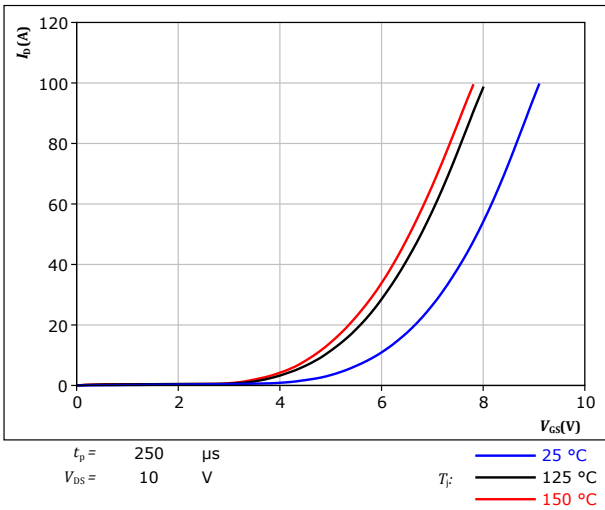
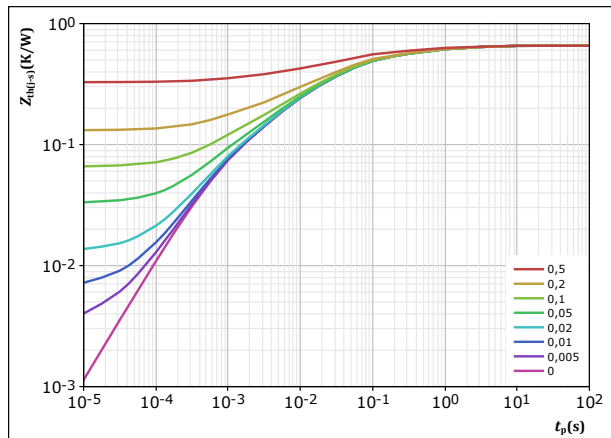


figure 4. MOSFET

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



MOSFET thermal model values

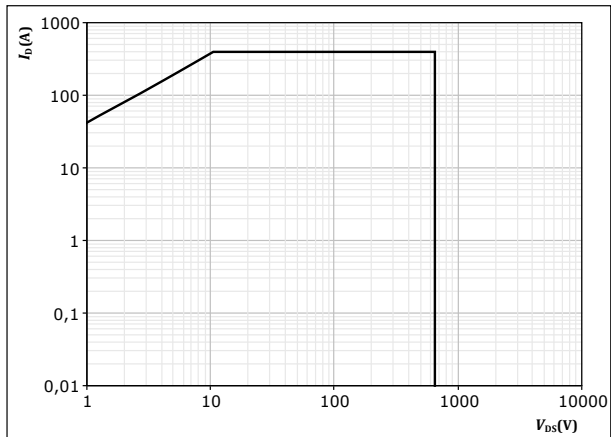
R (K/W)	τ (s)
6,01E-02	2,25E+00
1,33E-01	2,60E-01
2,67E-01	3,60E-02
1,37E-01	5,59E-03
5,88E-02	7,21E-04



Boost Switch Characteristics

figure 5. MOSFET

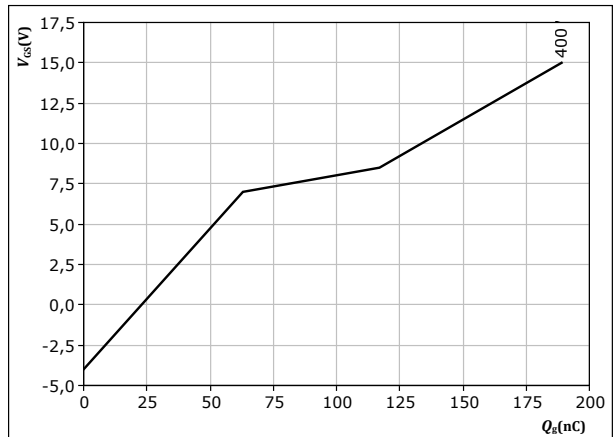
Safe operating area
 $I_D = f(V_{DS})$



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

figure 6. MOSFET

Gate voltage vs gate charge
 $V_{GS} = f(Q_g)$



$I_D = 17.6$ A
 $T_j = 25$ °C



Boost Diode Characteristics

figure 7. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

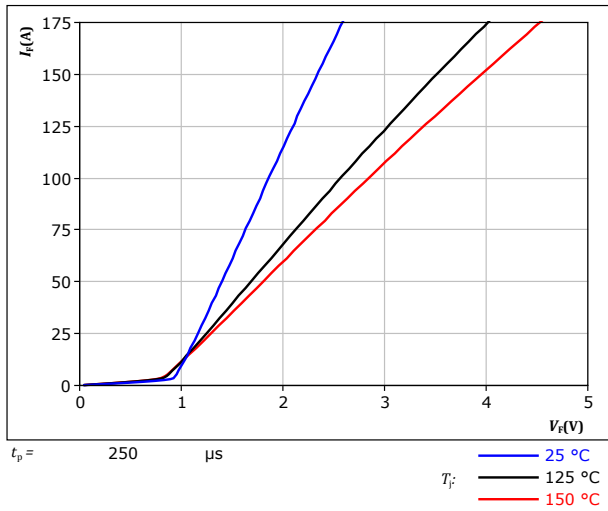
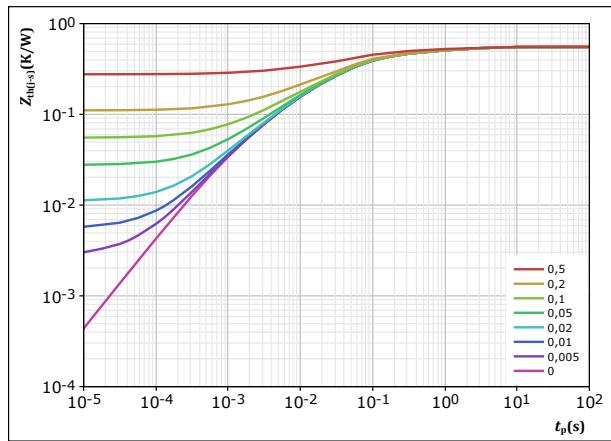


figure 8. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,553 \text{ K/W}$
 FWD thermal model values

R (K/W)	τ (s)
7,04E-02	2,17E+00
1,22E-01	2,02E-01
2,51E-01	3,93E-02
9,18E-02	5,73E-03
1,84E-02	8,83E-04

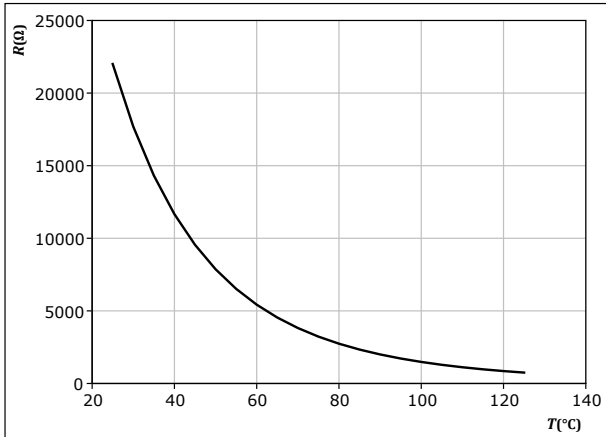


Thermistor Characteristics

figure 9. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

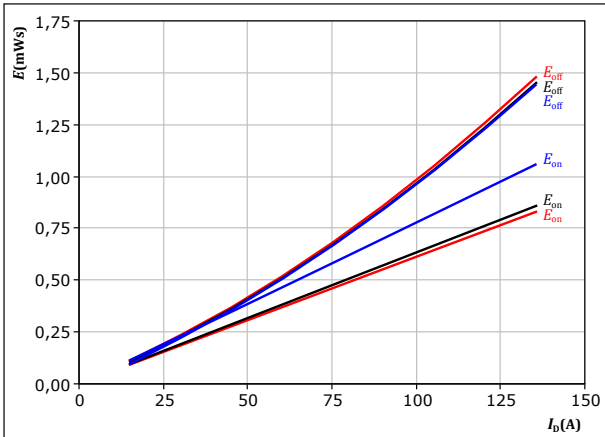




Boost Switching Characteristics

figure 10. MOSFET

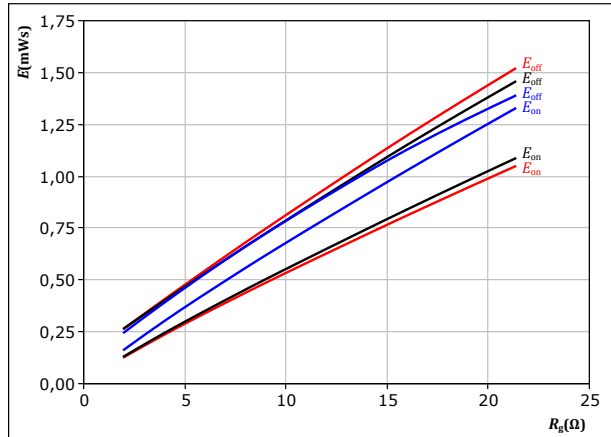
Typical switching energy losses as a function of drain current
 $E = f(I_D)$



With an inductive load at
 $V_{DS} = 350$ V
 $V_{GS} = 0/15$ V
 $R_{gon} = 8$ Ω
 $R_{goff} = 8$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 11. MOSFET

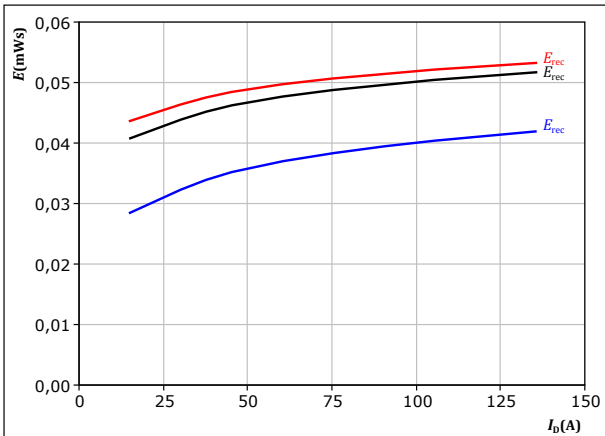
Typical switching energy losses as a function of MOSFET turn on gate resistor
 $E = f(R_g)$



With an inductive load at
 $V_{DS} = 350$ V
 $V_{GS} = 0/15$ V
 $I_D = 75$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 12. FWD

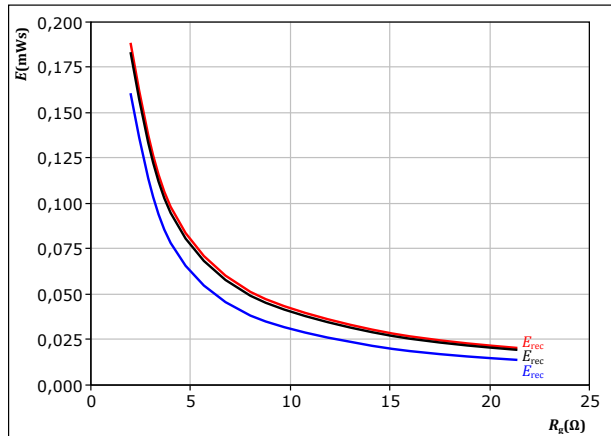
Typical reverse recovered energy loss as a function of drain current
 $E_{rec} = f(I_D)$



With an inductive load at
 $V_{DS} = 350$ V
 $V_{GS} = 0/15$ V
 $R_{gon} = 8$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 13. FWD

Typical reverse recovered energy loss as a function of MOSFET turn on gate resistor
 $E_{rec} = f(R_g)$



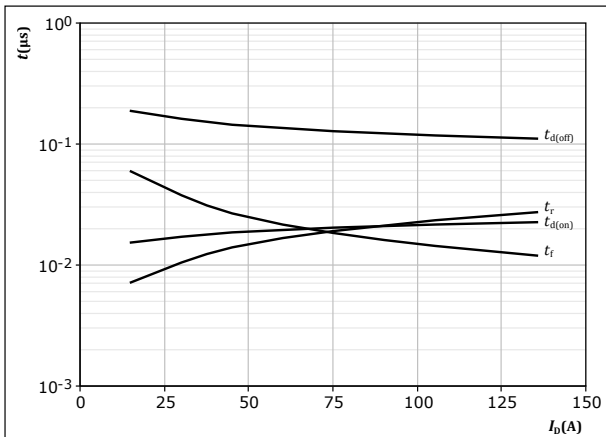
With an inductive load at
 $V_{DS} = 350$ V
 $V_{GS} = 0/15$ V
 $I_D = 75$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)



Boost Switching Characteristics

figure 14. MOSFET

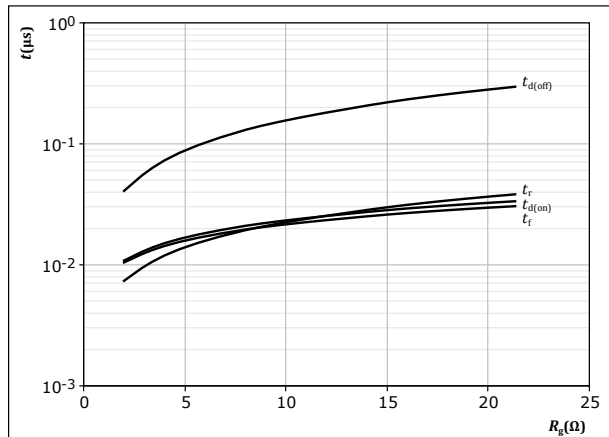
Typical switching times as a function of drain current
 $t = f(I_D)$



With an inductive load at
 $T_j = 150 \text{ }^\circ\text{C}$
 $V_{DS} = 350 \text{ V}$
 $V_{GS} = 0/15 \text{ V}$
 $R_{g(on)} = 8 \text{ } \Omega$
 $R_{g(off)} = 8 \text{ } \Omega$

figure 15. MOSFET

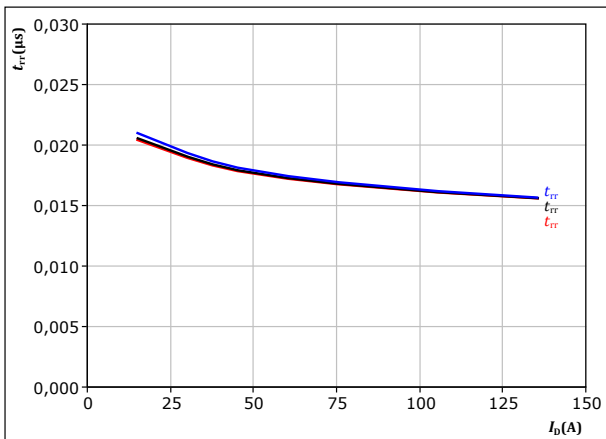
Typical switching times as a function of MOSFET turn on gate resistor
 $t = f(R_g)$



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

figure 16. FWD

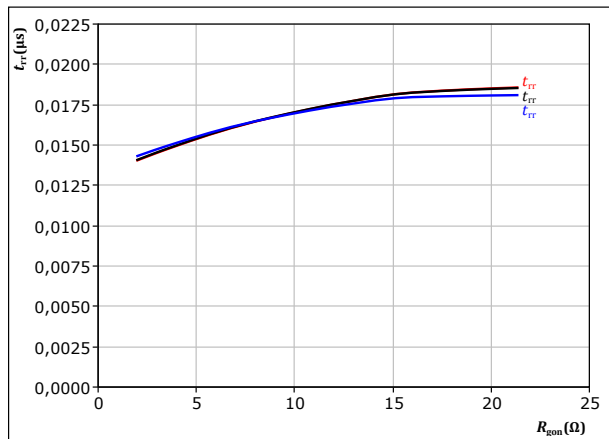
Typical reverse recovery time as a function of drain current
 $t_{rr} = f(I_D)$



At $V_{DS} = 350 \text{ V}$
 $V_{GS} = 0/15 \text{ V}$
 $R_{g(on)} = 8 \text{ } \Omega$
 $T_j:$ — 25 °C
 — 125 °C
 — 150 °C

figure 17. FWD

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



At $V_{DS} = 350 \text{ V}$
 $V_{GS} = 0/15 \text{ V}$
 $I_D = 75 \text{ A}$
 $T_j:$ — 25 °C
 — 125 °C
 — 150 °C

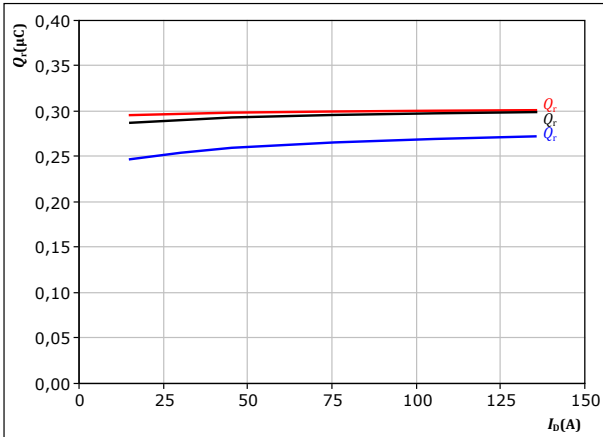


Boost Switching Characteristics

figure 18. FWD

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$



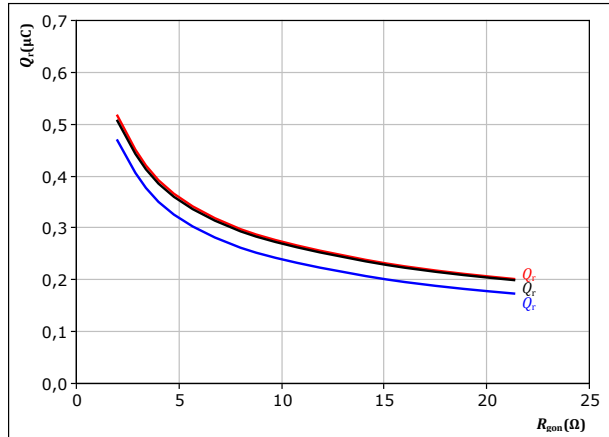
At $V_{DS} = 350$ V
 $V_{GS} = 0/15$ V
 $R_{gon} = 8$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 19. FWD

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

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



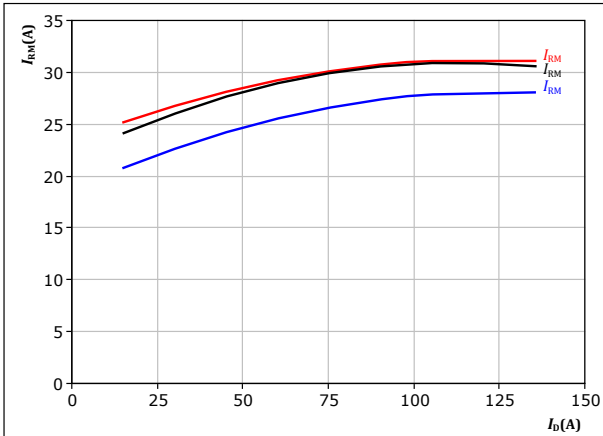
At $V_{DS} = 350$ V
 $V_{GS} = 0/15$ V
 $I_D = 75$ A

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 20. FWD

Typical peak reverse recovery current as a function of drain current

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



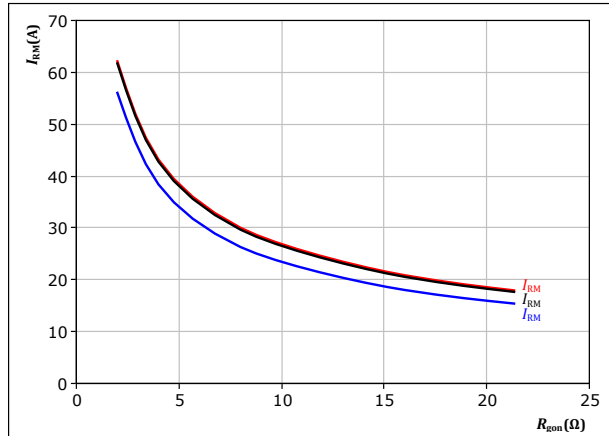
At $V_{DS} = 350$ V
 $V_{GS} = 0/15$ V
 $R_{gon} = 8$ Ω

T_j : — 25 °C
 — 125 °C
 — 150 °C

figure 21. FWD

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

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



At $V_{DS} = 350$ V
 $V_{GS} = 0/15$ V
 $I_D = 75$ A

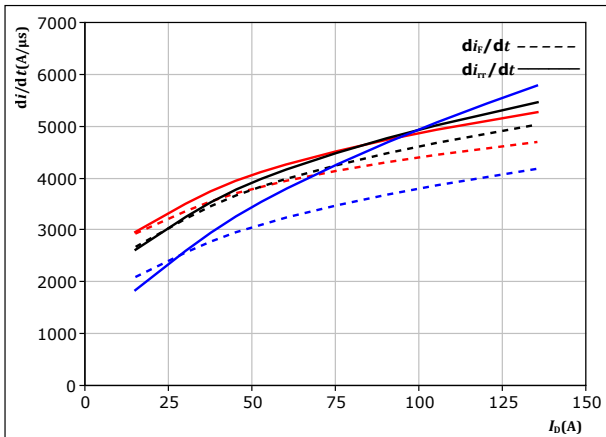
T_j : — 25 °C
 — 125 °C
 — 150 °C



Boost Switching Characteristics

figure 22. FWD

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

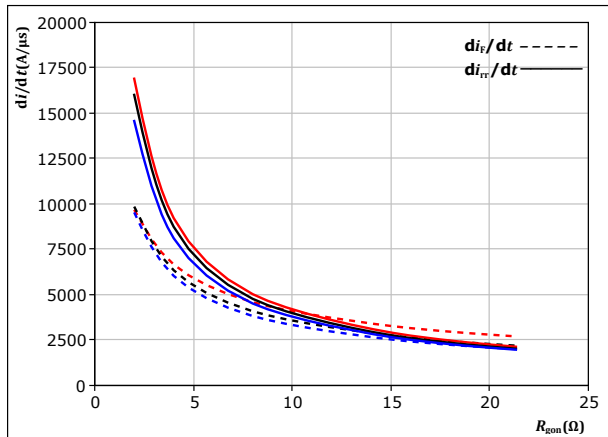


At $V_{DS} = 350$ V
 $V_{GS} = 0/15$ V
 $R_{g(on)} = 8$ Ω

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

figure 23. FWD

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



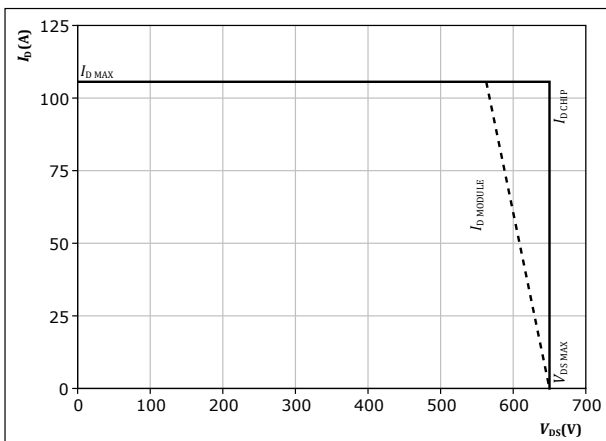
At $V_{DS} = 350$ V
 $V_{GS} = 0/15$ V
 $I_D = 75$ A

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

figure 24. MOSFET

Reverse bias safe operating area

$I_D = f(V_{DS})$



At $T_j = 150$ °C
 $R_{g(on)} = 8$ Ω
 $R_{g(off)} = 8$ Ω



Boost Switching Definitions

figure 25. MOSFET

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

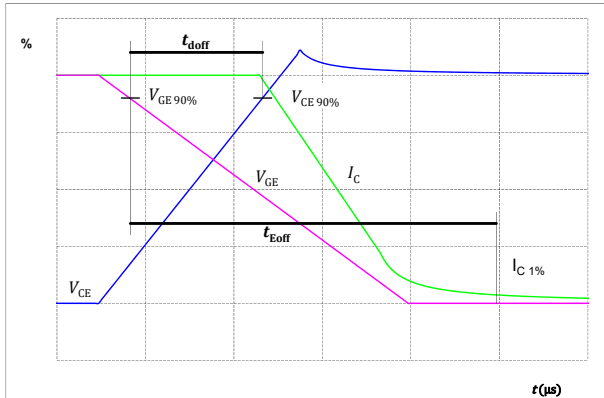


figure 26. MOSFET

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

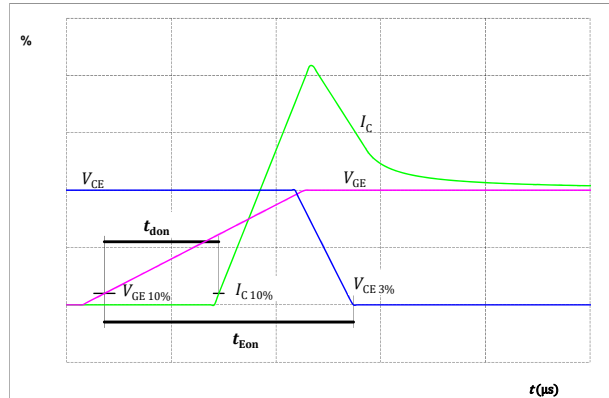


figure 27. MOSFET

Turn-off Switching Waveforms & definition of t_f

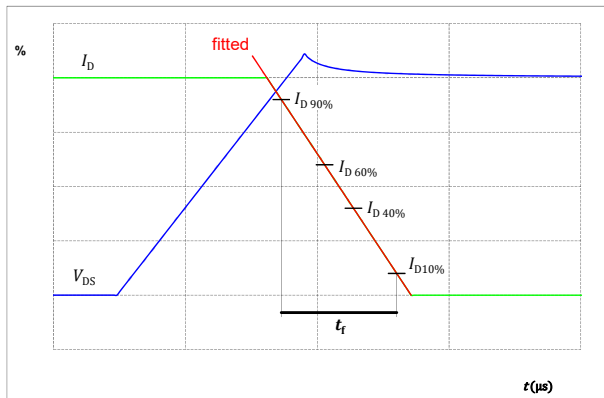
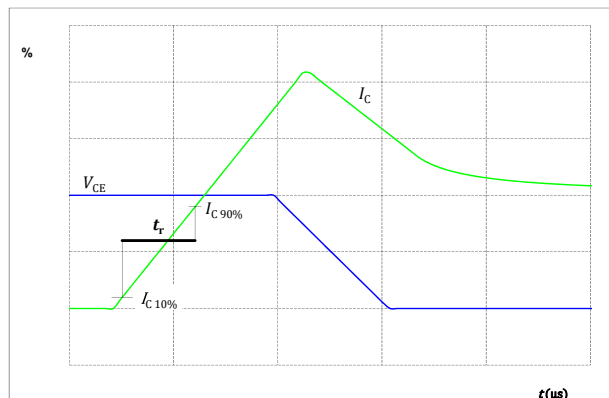


figure 28. MOSFET

Turn-on Switching Waveforms & definition of t_r





Boost Switching Definitions

figure 29. FWD

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

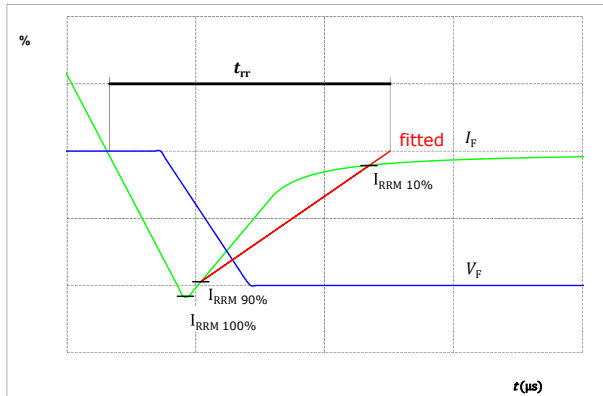


figure 30. FWD

Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})

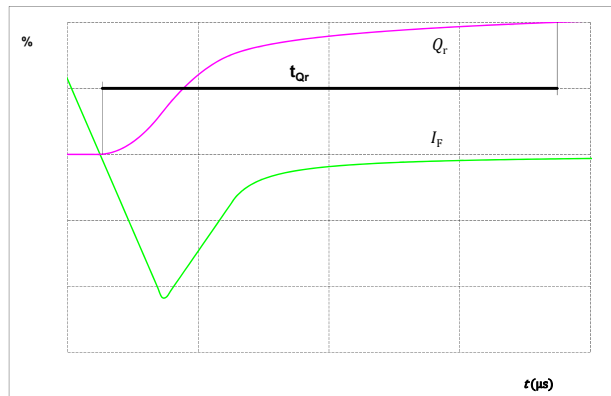
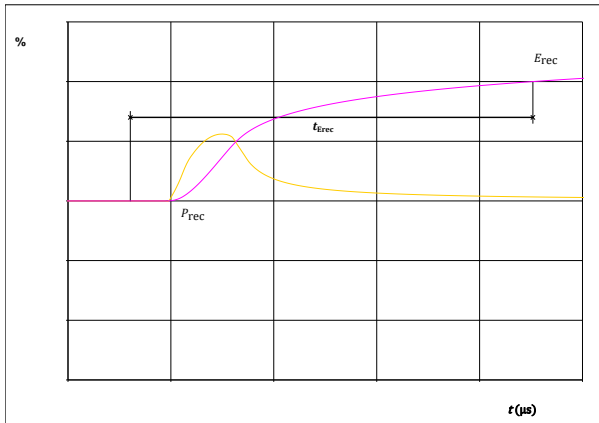


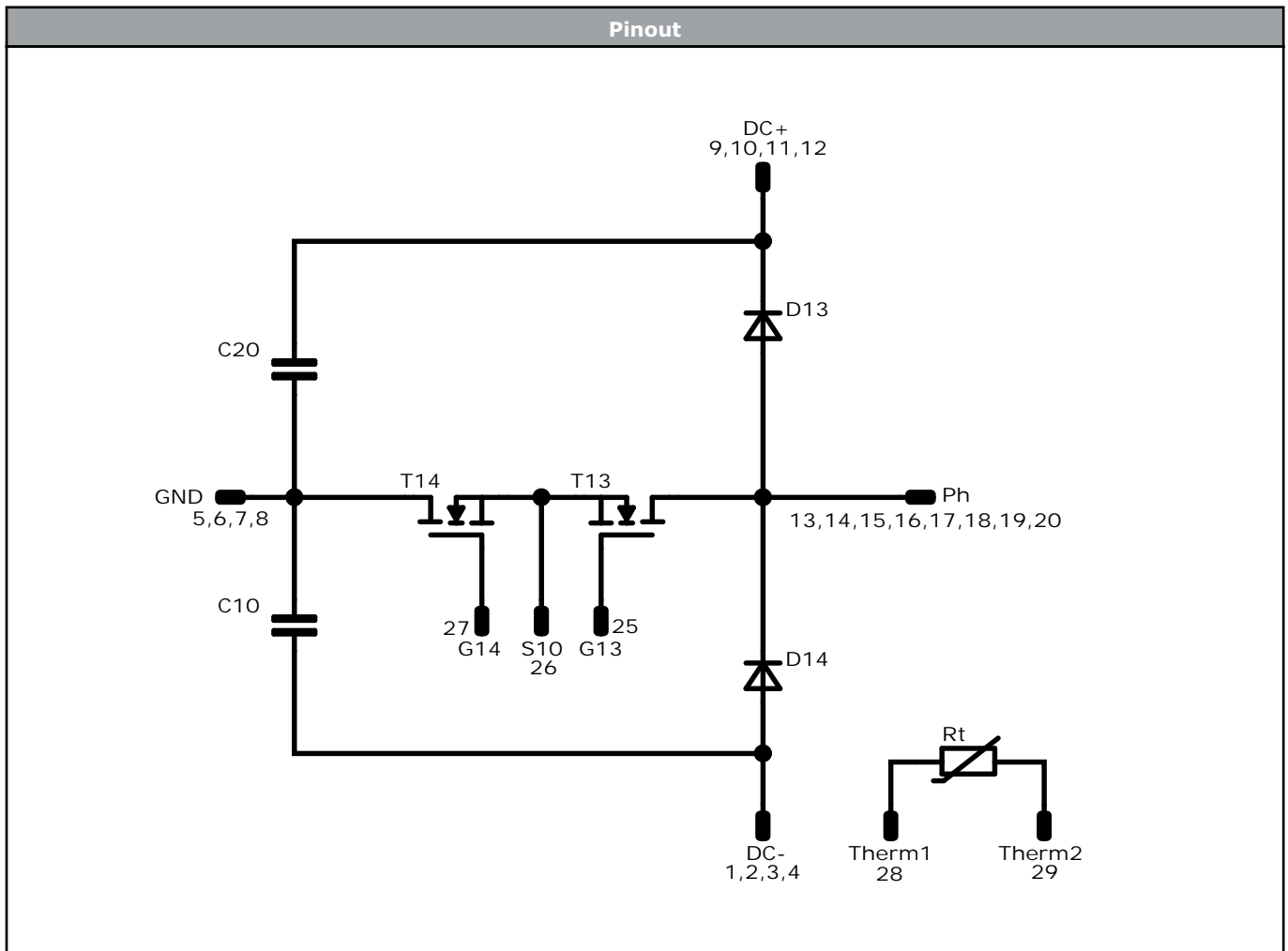
figure 31. FWD

Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec} = integrating time for E_{rec})





Vincotech



Identification					
ID	Component	Voltage	Current	Function	Comment
T13, T14	MOSFET	650 V	15 mΩ	Boost Switch	
D13, D14	FWD	1200 V	60 A	Boost Diode	
C10, C20	Capacitor	630 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	




Packaging instruction				
Standard packaging quantity (SPQ) 100	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for <i>flow 1</i> packages see vincotech.com website.

Package data
Package data for <i>flow 1</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 certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website. 

Document No.:	Date:	Modification:	Pages
10-PY07LBA015ME-PG08J68T-D1-14	26 Apr. 2023		

DISCLAIMER

The information, specifications, procedures, methods and recommendations herein (together "information") are presented by Vincotech to reader in good faith, are believed to be accurate and reliable, but may well be incomplete and/or not applicable to all conditions or situations that may exist or occur. Vincotech reserves the right to make any changes without further notice to any products to improve reliability, function or design. No representation, guarantee or warranty is made to reader as to the accuracy, reliability or completeness of said information or that the application or use of any of the same will avoid hazards, accidents, losses, damages or injury of any kind to persons or property or that the same will not infringe third parties rights or give desired results. It is reader's sole responsibility to test and determine the suitability of the information and the product for reader's intended use.

LIFE SUPPORT POLICY

Vincotech products are not authorised for use as critical components in life support devices or systems without the express written approval of Vincotech.

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.