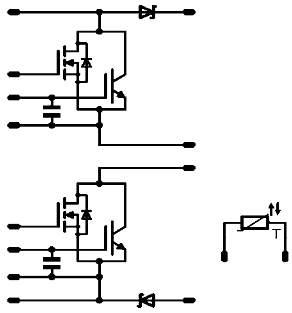
flow Boost0 — 600V/84A PS*

Features
- *PS: 2x84A parallel switch (75A IGBT and 99mΩ C6)
- ultrafast IGBT with C6 MOSFET and SiC buck diodes
- symmetric booster
- ultra fast switching frequency
- low inductance layout

flow0 12mm housing

Target Applications
- solar inverter
- UPS

Schematic



Types
- FZ06NBA084FP

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Input Boost IGBT					
Collector-emitter break down voltage	V_{CE}			600	V
DC collector current	I_C	$T_j=T_jmax$	$T_h=80°C$ $T_c=80°C$	58 76	A
Repetitive peak collector current	I_{Cpulse}	t_p limited by T_jmax		225	A
Power dissipation per IGBT	P_{tot}	$T_j=T_jmax$	$T_h=80°C$ $T_c=80°C$	111 169	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j≤125°C$ $V_{GE}=15V$		10 480	μs V
Maximum Junction Temperature	T_jmax			175	°C
Input Boost FWD					
Peak Repetitive Reverse Voltage	V_{RRM}	$T_j=25°C$		600	V
DC forward current	I_F	$T_j=T_jmax$	$T_h=80°C$ $T_c=80°C$	49 63	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_jmax		210	A
Power dissipation per Diode	P_{tot}	$T_j=T_jmax$	$T_h=80°C$ $T_c=80°C$	88 133	W
Maximum Junction Temperature	T_jmax			175	°C

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Input Boost MOSFET					
Drain to source breakdown voltage	V_{DS}			600	V
DC drain current	I_D	T_j=$T_j$max	T_h=80°C T_c=80°C	17 19	A
Pulsed drain current	I_{Dpulse}	t_p limited by $T_j$max	Tc=25°C	112	A
Power dissipation	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	111 169	W
Gate-source peak voltage	Vgs			±20	V
Maximum Junction Temperature	$T_j$max			150	°C
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{op}			-40…+(Tjmax - 25)	°C
Insulation Properties					
Insulation voltage	V_{is}	t=2s	DC voltage	4000	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	mm

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	Unit
Input Boost IGBT *										
Gate emitter threshold voltage	$V_{GE(th)}$	VCE=VGE			0,00025	Tj=25°C Tj=150°C	3,5	4,5	6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		75	Tj=25°C Tj=150°C		2,12 2,24	2,72	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	600		Tj=25°C Tj=150°C			250	uA
Gate-emitter leakage current	I_{GES}		±20	0		Tj=25°C Tj=150°C			400	nA
Integrated Gate resistor	R_{gint}							none		Ω
Input capacitance	C_{ies}	f=1MHz	0	30		Tj=25°C		4000		pF
Output capacitance	C_{oss}							400		pF
Reverse transfer capacitance	C_{rss}							115		
Gate charge	Q_{Gate}		15	400	75	Tj=25°C		94		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,85		K/W

* see dynamic characteristic at **MosFET**

Parameter	Symbol	Conditions	V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	Unit
Input Boost FWD										
Diode forward voltage	V_F				48	Tj=25°C Tj=125°C		1,55 1,69	1,75	V
Peak reverse recovery current	I_{RRM}	Rgon=4 Ω **	15	350	77	Tj=25°C Tj=125°C		52 43		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		11 12		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=125°C		0,47 0,60		μC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=125°C		12292 9335		A/μs
Reverse recovered energy	Erec					Tj=25°C Tj=125°C		0,078 0,128		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,10		K/W
Input Boost MOSFET										
Static drain to source ON resistance	$R_{ds(on)}$		10		15	Tj=25°C Tj=125°C		97 193		mΩ
Gate threshold voltage	$V_{(GS)th}$		V_{DS}=V_{GS}		0,00121	Tj=25°C Tj=125°C	2,5	3	3,5	V
Gate to Source Leakage Current	I_{gss}		20	0		Tj=25°C Tj=125°C			100	nA
Zero Gate Voltage Drain Current	I_{dss}		0	600		Tj=25°C Tj=125°C			5	uA
Turn On Delay Time	$t_{d(ON)}$	Rgon=4 Ω ** Rgoff=4 Ω **	15	350	77	Tj=25°C Tj=125°C		17 16		ns
Rise Time	t_r					Tj=25°C Tj=125°C		6 7		
Turn off delay time	$t_{d(OFF)}$					Tj=25°C Tj=125°C		105 124		
Fall time	t_f					Tj=25°C Tj=125°C		6 7		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=125°C		0,15 0,29		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=125°C		0,40 0,84		
Total gate charge	Q_g		0-10	480	18,1	Tj=25°C		119		nC
Gate to source charge	Q_{gs}							14		
Gate to drain charge	Q_{gd}							61		
Input capacitance	C_{iss}	f=1MHz	0	100		Tj=25°C		2660		pF
Output capacitance	C_{oss}							154		
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,05		K/W

** see gate drive conditions at characteristic figures

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
IGBT gate capacitor										
C value	C							4,7		nF
Thermistor										
Rated resistance*	R_{25}	Tol. ±13%				Tj=25°C	19,1	22	24,9	kΩ
	R_{100}	Tol. ±5%				Tj=100°C	1411	1486	1560	Ω
Power dissipation	P					Tj=25°C		210		mW
B-value	$B_{(25/100)}$	Tol. ±3%				Tj=25°C		4000		K

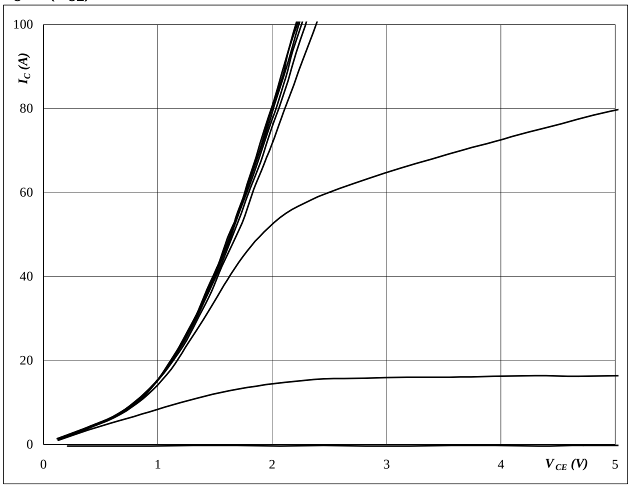
* see details on **Thermistor** charts on ***Figure 2.***

Input Boost

Figure 1 IGBT+MOSFET

Typical output characteristics

$I_C = f(V_{CE})$



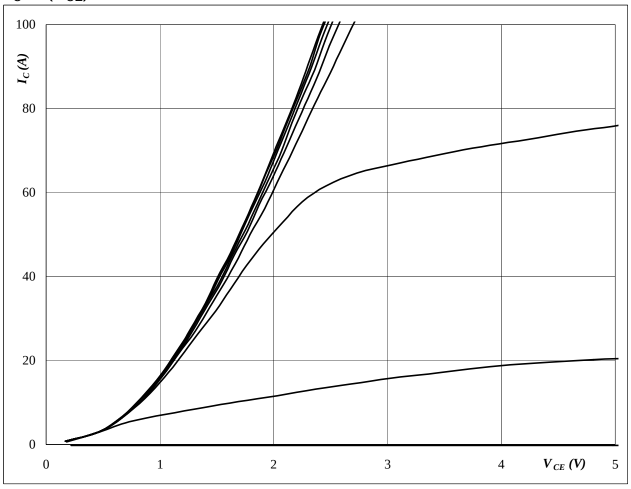
At

t_p =	250	µs
T_j =	25	°C
V_{GE} from	3 V to 19 V in steps of 2 V	

Figure 2 IGBT+MOSFET

Typical output characteristics

$I_C = f(V_{CE})$



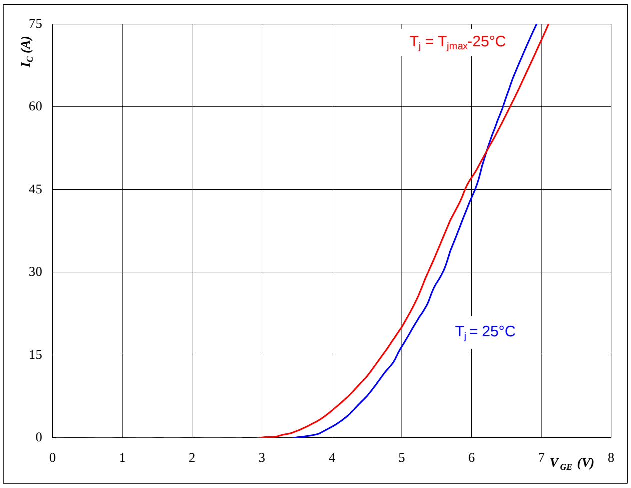
At

t_p =	250	µs
T_j =	126	°C
V_{GE} from	3 V to 19 V in steps of 2 V	

Figure 3 IGBT+MOSFET

Typical transfer characteristics

$I_C = f(V_{GE})$



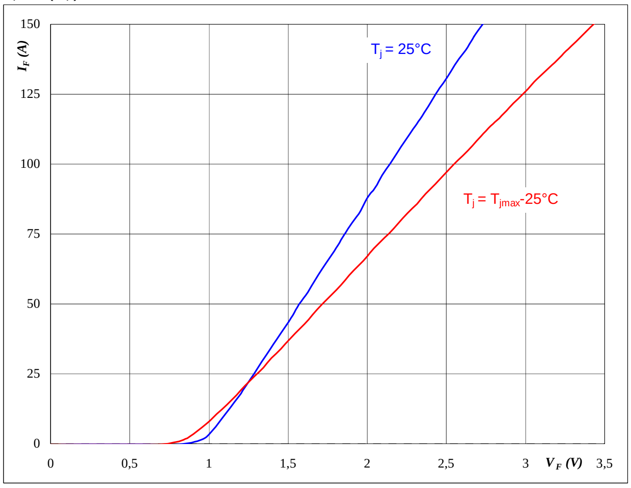
At

t_p =	250	µs
V_{CE} =	10	V

Figure 4 FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

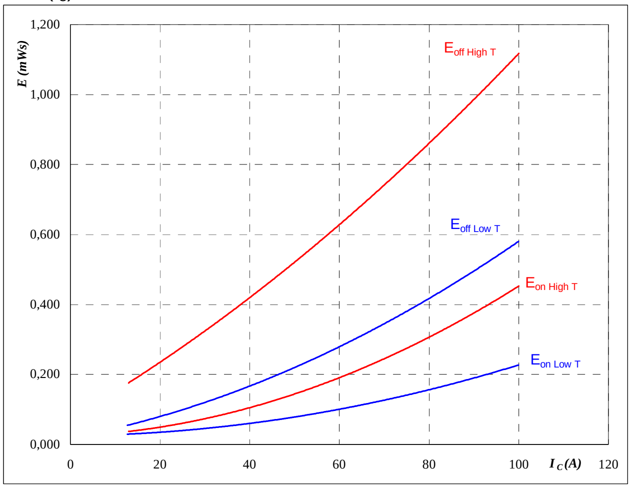
t_p =	250	µs

Input Boost

Figure 5 IGBT+MOSFET

Typical switching energy losses
as a function of collector current

E = f(I_C)



With an inductive load at

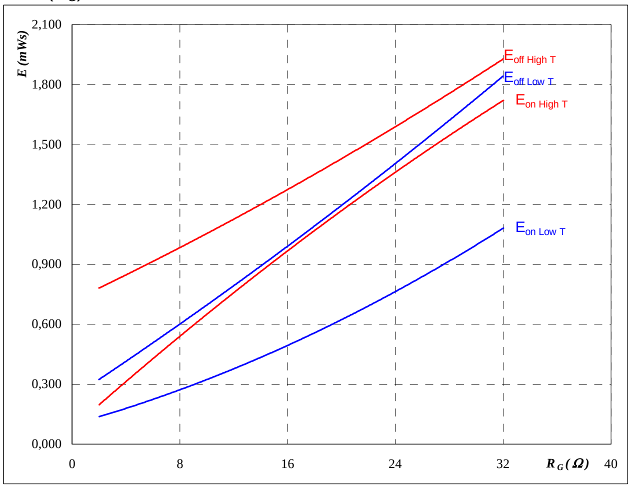
T_j =	25/126	°C
V_{CE} =	350	V
V_{GE} =	15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

MOSFET turn off delayed by 100ns

Figure 6 IGBT+MOSFET

Typical switching energy losses
as a function of gate resistor

E = f(R_G)



With an inductive load at

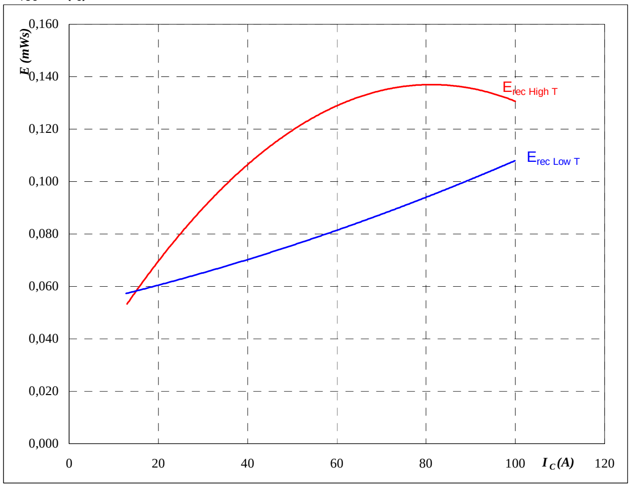
T_j =	25/126	°C
V_{CE} =	350	V
V_{GE} =	15	V
I_C =	78	A

MOSFET turn off delayed by 100ns

Figure 7 FWD

Typical reverse recovery energy loss
as a function of collector current

E_{rec} = f(I_c)



With an inductive load at

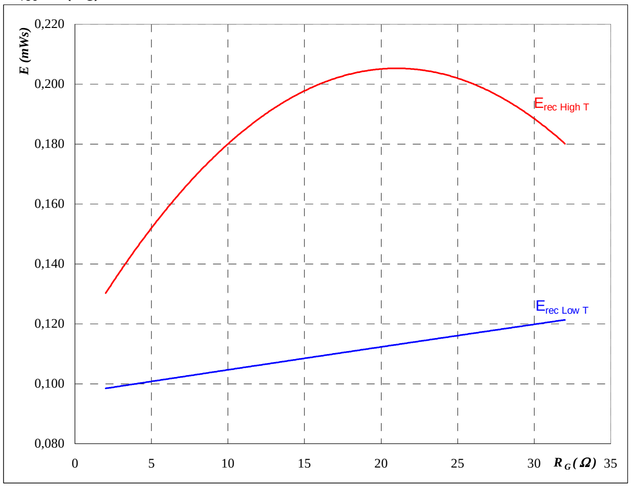
T_j =	25/126	°C
V_{CE} =	350	V
V_{GE} =	15	V
R_{gon} =	4	Ω

MOSFET turn off delayed by 100ns

Figure 8 FWD

Typical reverse recovery energy loss
as a function of gate resistor

E_{rec} = f(R_G)



With an inductive load at

T_j =	25/126	°C
V_{CE} =	350	V
V_{GE} =	15	V
I_C =	78	A

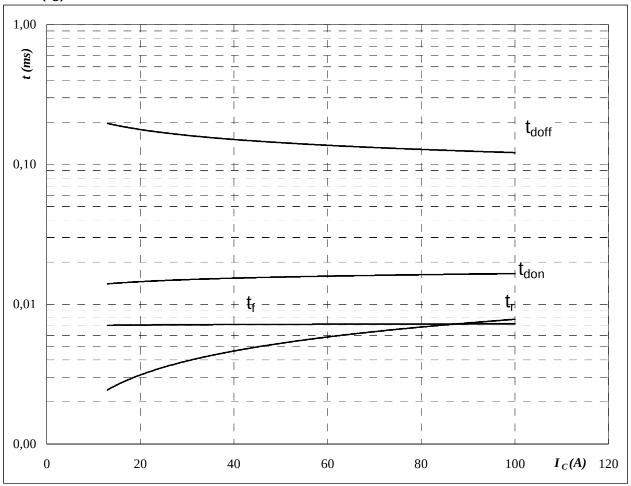
MOSFET turn off delayed by 100ns

Input Boost

Figure 9 IGBT+MOSFET

Typical switching times as a function of collector current

$t = f(I_C)$



With an inductive load at

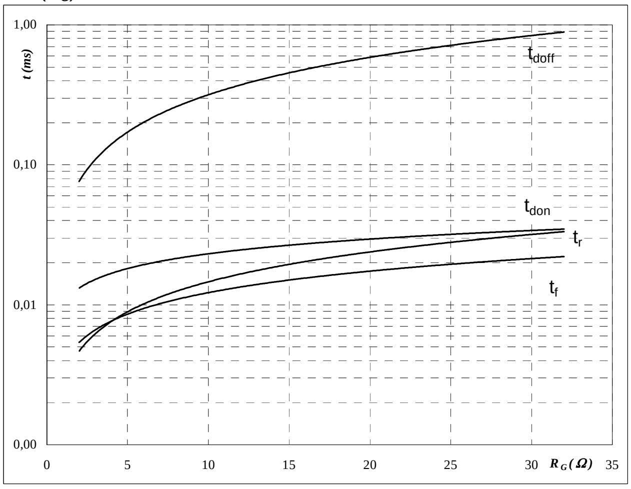
T_j =	126	°C
V_{CE} =	350	V
V_{GE} =	15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

MOSFET turn off delayed by 100ns

Figure 10 IGBT+MOSFET

Typical switching times as a function of gate resistor

$t = f(R_G)$



With an inductive load at

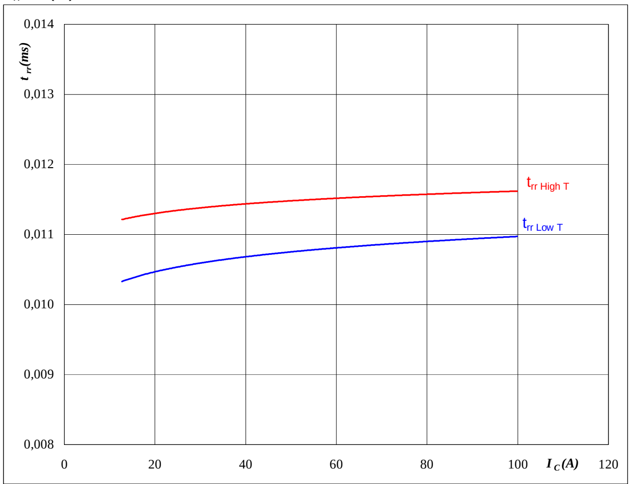
T_j =	126	°C
V_{CE} =	350	V
V_{GE} =	15	V
I_C =	78	A

MOSFET turn off delayed by 100ns

Figure 11 FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(Ic)$



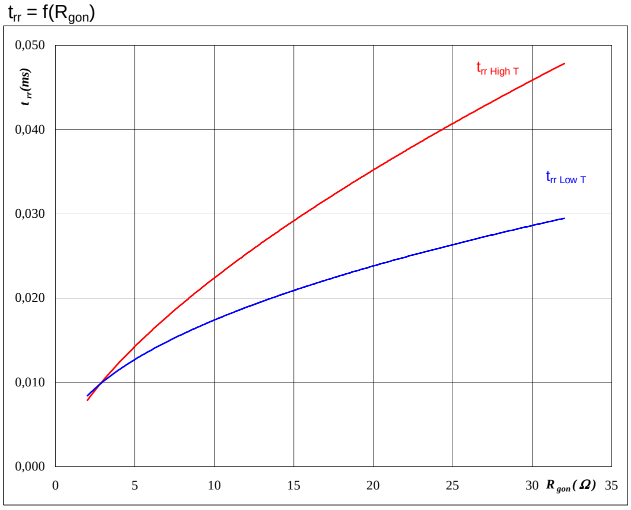
At

T_j =	25/126	°C
V_{CE} =	350	V
V_{GE} =	15	V
R_{gon} =	4	Ω

Figure 12 FWD

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

$t_{rr} = f(R_{gon})$



At

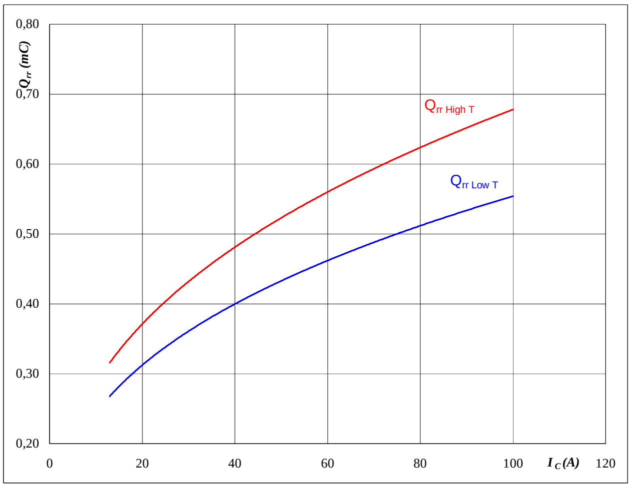
T_j =	25/126	°C
V_R =	350	V
I_F =	78	A
V_{GE} =	15	V

Input Boost

Figure 13 FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



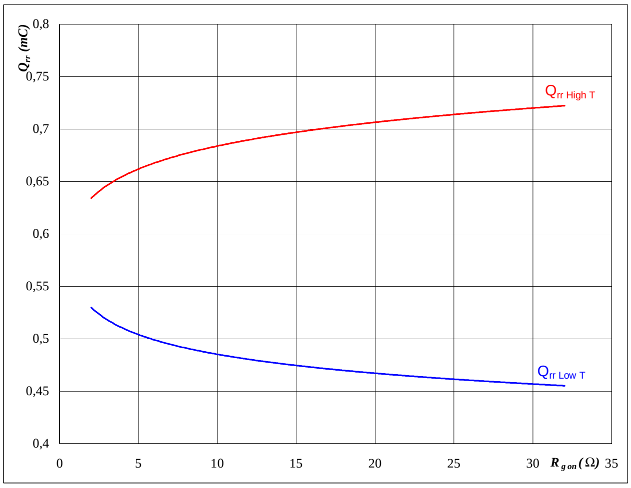
At

T_j =	25/126	°C
V_{CE} =	350	V
V_{GE} =	15	V
R_{gon} =	4	Ω

Figure 14 FWD

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

$Q_{rr} = f(R_{gon})$



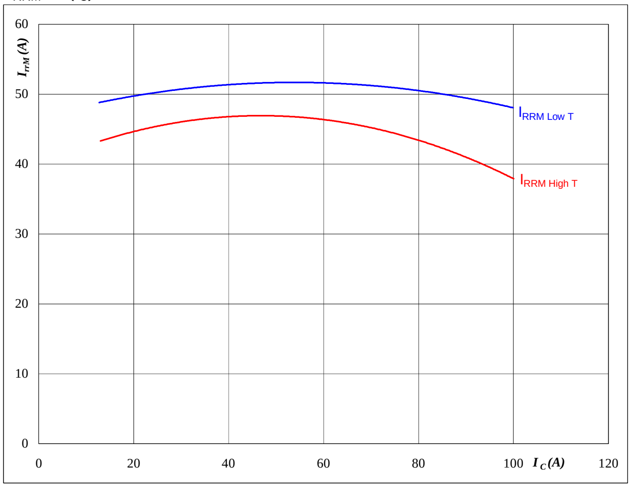
At

T_j =	25/126	°C
V_R =	350	V
I_F =	78	A
V_{GE} =	15	V

Figure 15 FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



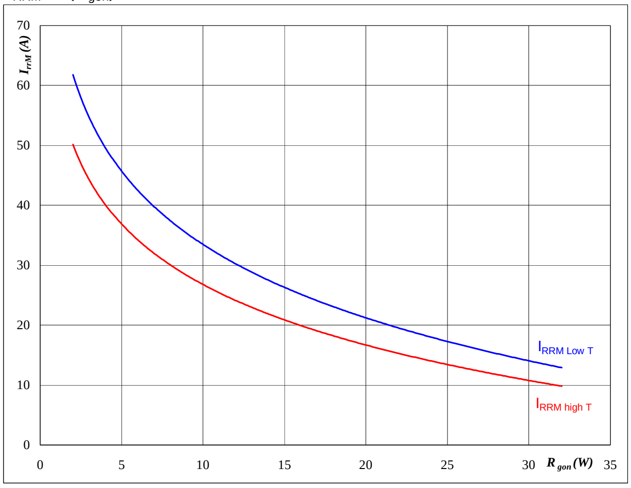
At

T_j =	25/126	°C
V_{CE} =	350	V
V_{GE} =	15	V
R_{gon} =	4	Ω

Figure 16 FWD

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

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



At

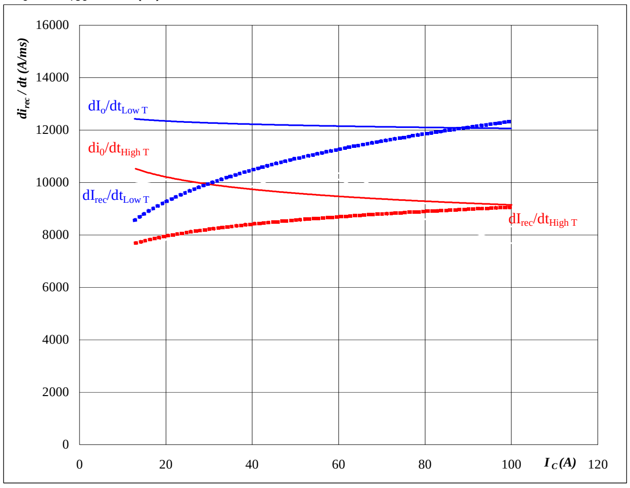
T_j =	25/126	°C
V_R =	350	V
I_F =	78	A
V_{GE} =	15	V

Input Boost

Figure 17 FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current

$dI_0/dt, dI_{rec}/dt = f(Ic)$



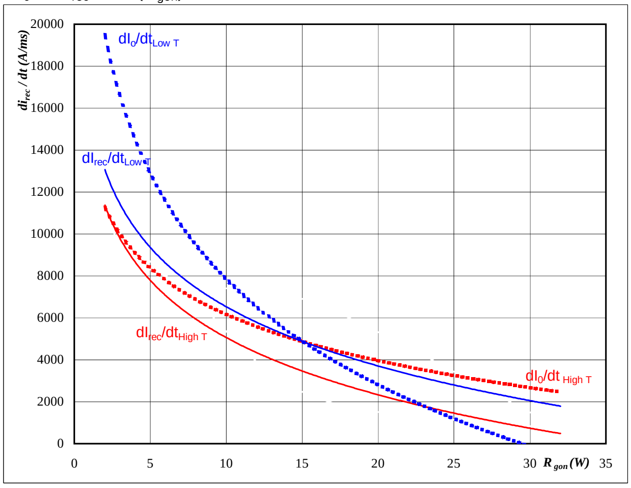
At

T_j =	25/126	°C
V_{CE} =	350	V
V_{GE} =	15	V
R_{gon} =	4	Ω

Figure 18 FWD

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

$dI_0/dt, dI_{rec}/dt = f(R_{gon})$



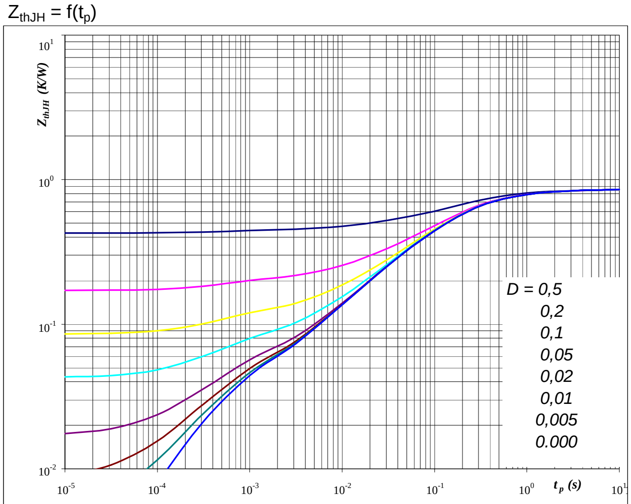
At

T_j =	25/126	°C
V_R =	350	V
I_F =	78	A
V_{GE} =	15	V

Figure 19 IGBT

IGBT transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	0,85	K/W

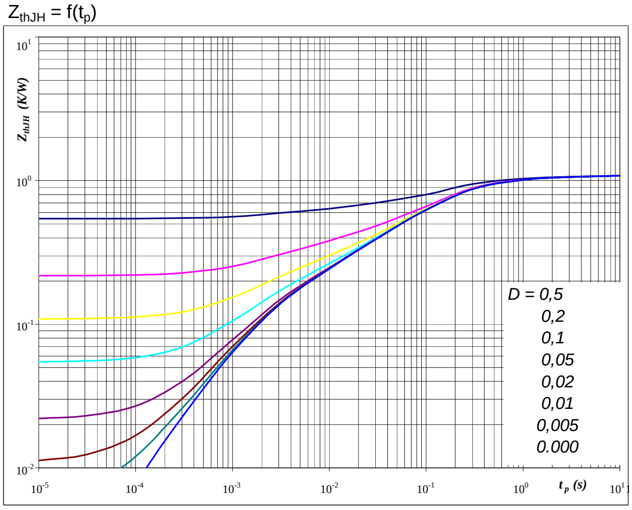
IGBT thermal model values

R (C/W)	Tau (s)
0,10	1,8E+00
0,32	2,8E-01
0,30	8,4E-02
0,09	1,2E-02
0,04	5,0E-04

Figure 20 FWD

FRED transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	1,09	K/W

FRED thermal model values

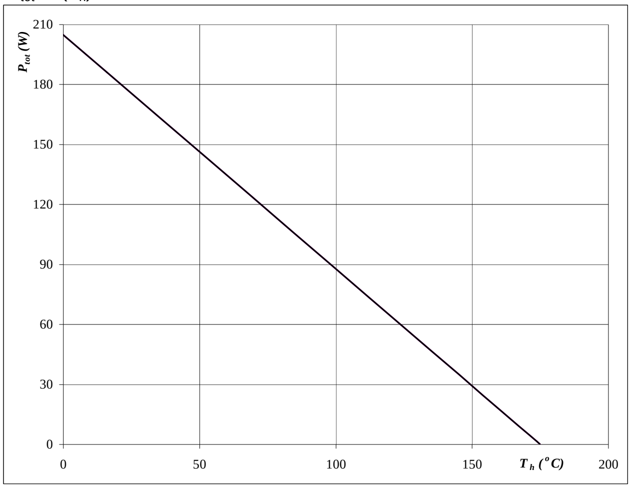
R (C/W)	Tau (s)
0,06	4,1E+00
0,22	5,0E-01
0,55	1,1E-01
0,16	1,1E-02
0,10	1,6E-03

Input Boost

Figure 21 IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



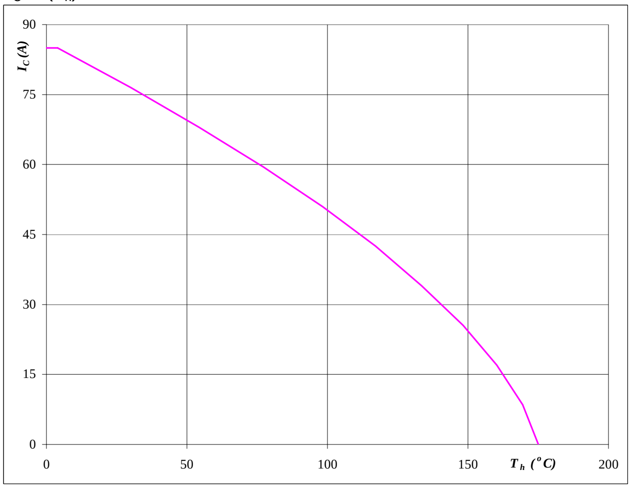
At

T_j = 175 °C

Figure 22 IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

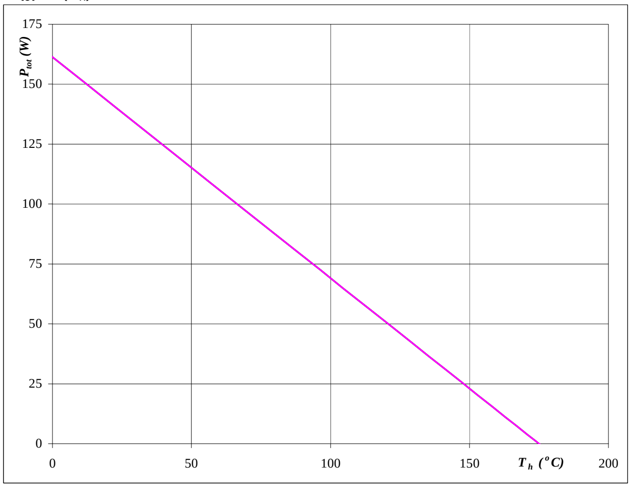
T_j = 175 °C

V_{GE} = 15 V

Figure 23 FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



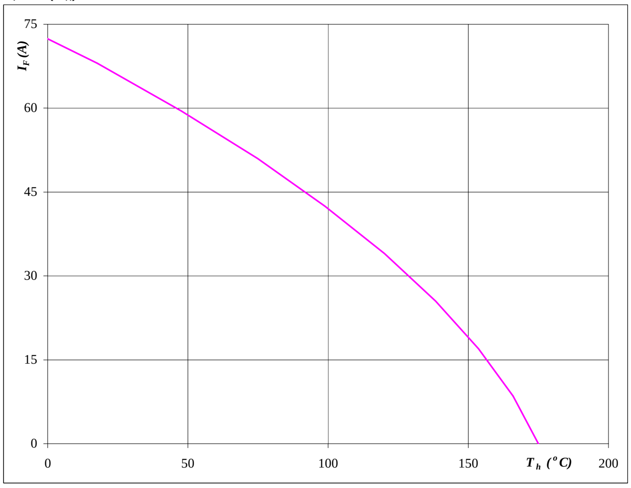
At

T_j = 175 °C

Figure 24 FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

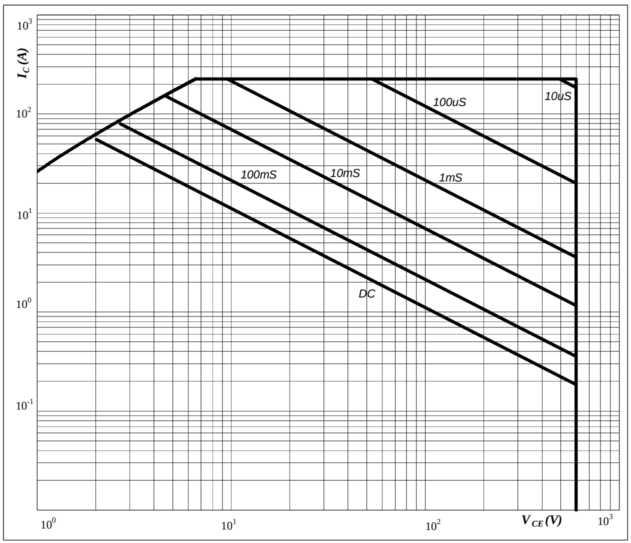
T_j = 175 °C

Input Boost

Figure 25 — IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



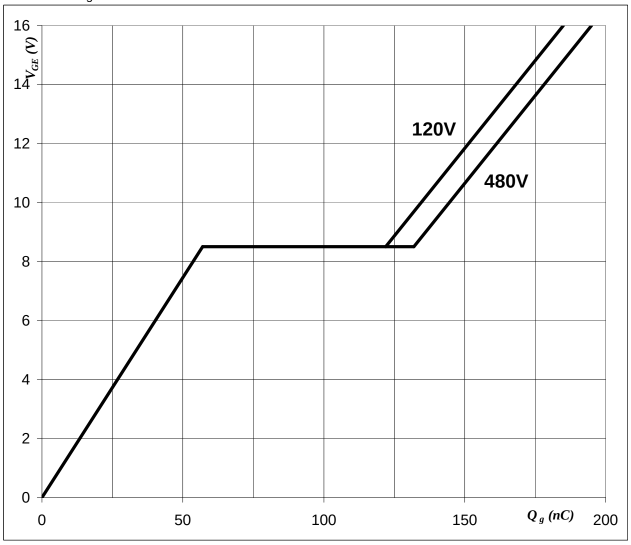
At

D =	single pulse	
Th =	80	ºC
V_{GE} =	15	V
T_j =	T_{jmax}	ºC

Figure 26 — IGBT

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



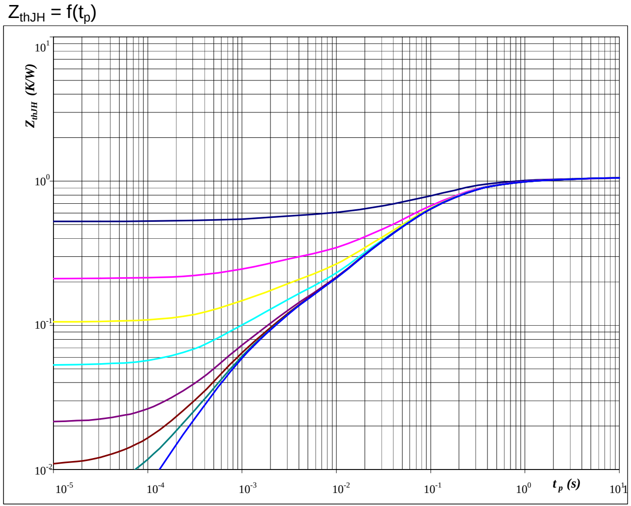
At

$I_{G(REF)}$=1mA, R_L=15Ω

Figure 27 — MOSFET

MOSFET transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	1,05	K/W

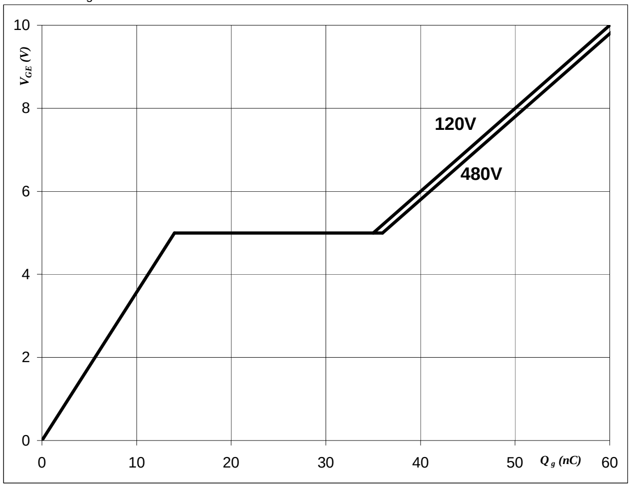
MOSFET thermal model values

R (C/W)	Tau (s)
0,06	3,4E+00
0,23	4,0E-01
0,53	8,8E-02
0,15	1,5E-02
0,08	1,3E-03
0,05	4,7E-04

Figure 28 — MOSFET

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



At

I_C =	18	A

Thermistor

Figure 1	Thermistor

Typical NTC characteristic
as a function of temperature
$R_T = f(T)$

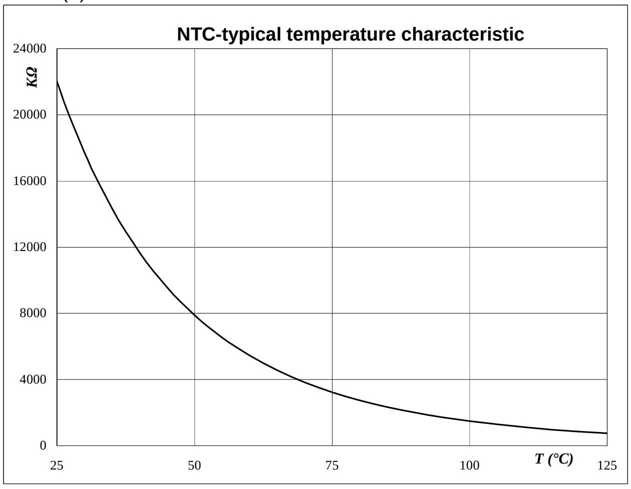


Figure 2	Thermistor

Typical NTC resistance values

$$R(T) = R_{25} \cdot e^{\left(B_{25/100} \cdot \left(\frac{1}{T} - \frac{1}{T_{25}}\right)\right)} \quad [\Omega]$$

Ordering Code and Marking - Outline - Pinout

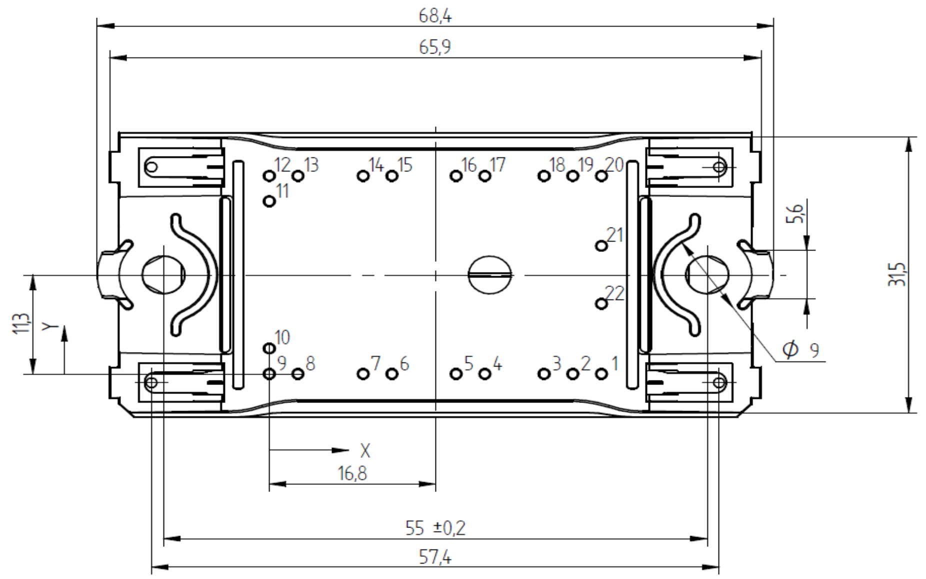
Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-FZ06NBA084FP-M306L48	M306L48	M306L48

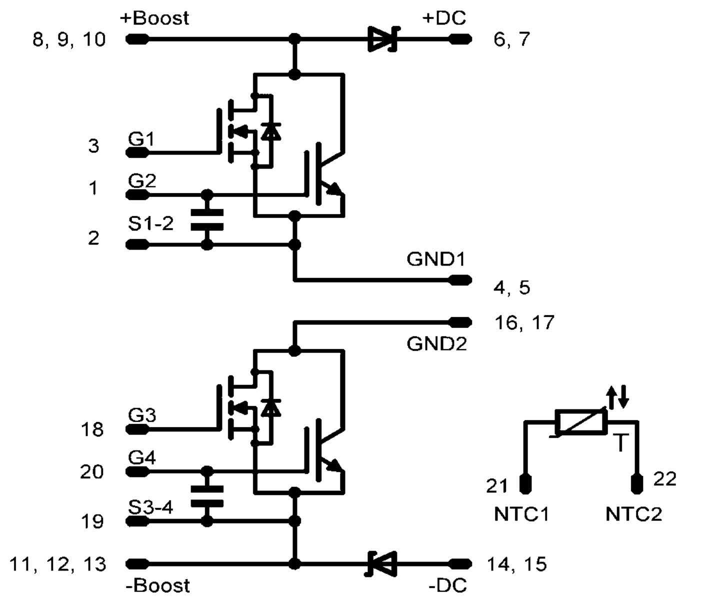
Outline

Pin table

Pin	X	Y
1	33,6	0
2	30,7	0
3	27,8	0
4	21,8	0
5	18,9	0
6	12,4	0
7	9,5	0
8	2,9	0
9	0	0
10	0	2,9
11	0	19,7
12	0	22,6
13	2,9	22,6
14	9,5	22,6
15	12,4	22,6
16	18,9	22,6
17	21,8	22,6
18	27,8	22,6
19	30,7	22,6
20	33,6	22,6
21	33,6	14,6
22	33,6	8



Pinout



PRODUCT STATUS DEFINITIONS

Datasheet Status	Product Status	Definition
Target	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. The data contained is exclusively intended for technically trained staff.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data may be published at a later date. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff.
Final	Full Production	This datasheet contains final specifications. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff.

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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.