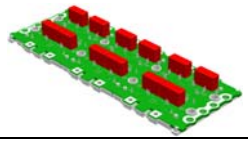
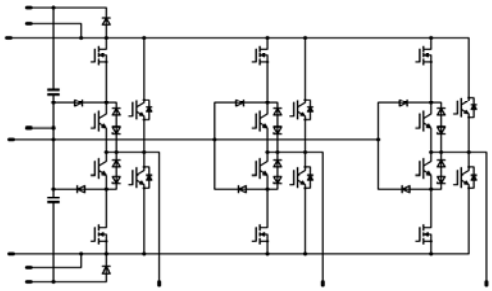
flowMNPC 4w **1200V/600A**

Features
- High Efficient Advanced Paralleled NPC Topology
- Asymmetrical Inductance with Interface for Optional Regeneration of Switching Losses
- High Power Screw Interface
- Integrated DC-Snubber Capacitors
- Temperature Sensor

Target Applications
- Solar Inverter
- UPS
- High Frequency Motor Drive

Types
- 70-W612A3C600SH-M600F

flowMNPC 4w housing


Schematic


Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Snubber FWD (D3)					
Repetitive peak reverse voltage	V_{RRM}			600	V
Forward current per diode	I_{FAV}	DC current	T_h=80°C T_c=80°C	117 156	A
Surge forward current	I_{FSM}	t_p=10ms		600	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	173 262	W
Maximum Junction Temperature	$T_j$max			175	°C
Buck MOSFET (T1)					
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	122 150	A
Pulsed drain current	I_{Dpulse}	t_p limited by $T_j$max		1088	A
Power dissipation	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	354 537	W
Gate-source peak voltage	V_{GS}			±20	V
Maximum Junction Temperature	$T_j$max			150	°C

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Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Neutral Point Inv FWD (D4 , D5)					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25°C		600	V
DC forward current	I_F	T_j=$T_j$max	T_h=80°C T_c=80°C	2 3	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		8	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	16 24	W
Maximum Junction Temperature	$T_j$max			150	°C
Neutral Point IGBT (T2)					
Collector-emitter break down voltage	V_{CE}			600	V
DC collector current	I_C	T_j=$T_j$max	T_h=80°C T_c=80°C	405 535	A
Repetitive peak collector current	I_{Cpulse}	t_p limited by $T_j$max		1800	A
Power dissipation per IGBT	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	602 913	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150°C V_{GE}=15V		6 360	µs V
Maximum Junction Temperature	$T_j$max			175	°C
Neutral Point FWD (D1)					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25°C		600	V
DC forward current	I_F	T_j=$T_j$max	T_h=80°C T_c=80°C	142 182	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		1800	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	353 535	W
Maximum Junction Temperature	$T_j$max			175	°C
Buck Inverse FWD (D13)					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25°C		600	V
DC forward current	I_F	T_j=$T_j$max	T_h=80°C T_c=80°C	18 20	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		tbd.	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	32 49	W
Maximum Junction Temperature	$T_j$max			175	°C

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Half Bridge IGBT (T3)				
Collector-emitter break down voltage	V_{CE}		1200	V
DC collector current	I_C	T_j=$T_j$max; T_h=80°C	294	A
		T_j=$T_j$max; T_c=80°C	384	
Repetitive peak collector current	I_{Cpuls}	t_p limited by $T_j$max	1200	A
Power dissipation per IGBT	P_{tot}	T_j=$T_j$max; T_h=80°C	531	W
		T_j=$T_j$max; T_c=80°C	805	
Gate-emitter peak voltage	V_{GE}		±20	V
Short circuit ratings	t_{SC}	T_j≤150°C	10	µs
	V_{CC}	V_{GE}=15V	800	V
Maximum Junction Temperature	$T_j$max		175	°C
Half Bridge Inverse FWD (D6)				
Peak Repetitive Reverse Voltage	V_{RRM}	T_c=25°C	1200	V
DC forward current	I_F	T_j=$T_j$max; T_h=80°C	12	A
		T_j=$T_j$max; T_c=80°C	15	
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max	28	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max; T_h=80°C	32	W
		T_j=$T_j$max; T_c=80°C	48	
Maximum Junction Temperature	$T_j$max		150	°C
Half Bridge FWD (D2)				
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25°C	1200	V
DC forward current	I_F	T_j=$T_j$max; T_h=80°C	172	A
		T_j=$T_j$max; T_c=80°C	231	
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max	1800	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max; T_h=80°C	312	W
		T_j=$T_j$max; T_c=80°C	473	
Maximum Junction Temperature	$T_j$max		175	°C
DC link Capacitor (C1)				
Max.DC voltage	V_{MAX}	Tc=25°C	25	V
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					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	
Snubber FWD (D3)										
Forward voltage	V_F				200	Tj=25°C Tj=150°C	1,2	1,6	1,9	V
Threshold voltage (for power loss calc. only)	V_{to}				600	Tj=25°C Tj=150°C		tbd. tbd.		V
Slope resistance (for power loss calc. only)	r_t				600	Tj=25°C Tj=150°C		tbd. tbd.		Ω
Reverse current	I_r			600		Tj=25°C Tj=150°C			0,66	mA
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,55		K/W
Thermal resistance chip to case per chip	R_{thJC}							0,36		
Buck MOSFET (T1)										
Static drain to source ON resistance	$R_{DS(on)}$		10		178	Tj=25°C Tj=125°C		0,009		Ω
Gate threshold voltage	$V_{(GS)th}$	VGS=VDS			0,0118	Tj=25°C Tj=125°C	2,4	3	3,6	V
Gate to Source Leakage Current	I_{gss}		0	20		Tj=25°C Tj=125°C			400	nA
Zero Gate Voltage Drain Current	I_{dss}		600	0		Tj=25°C Tj=125°C			20000	nA
Turn On Delay Time	$t_{d(ON)}$	Rgoff=X Ω Rgon=X Ω	±15	600	600	Tj=25°C Tj=125°C		tbd. tbd.		ns
Rise Time	t_r					Tj=25°C Tj=125°C		tbd. tbd.		
Turn off delay time	$t_{d(OFF)}$					Tj=25°C Tj=125°C		tbd. tbd.		
Fall time	t_f					Tj=25°C Tj=125°C		tbd. tbd.		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=125°C		tbd. tbd.		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=125°C		tbd. tbd.		
Total gate charge	Q_g		0/10	480	178	Tj=25°C		1160		nC
Gate to source charge	Q_{gs}							144		
Gate to drain charge	Q_{gd}							600		
Input capacitance	C_{iss}	f=1MHz	0	100		Tj=25°C		26120		pF
Output capacitance	C_{oss}							1440		
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,20		K/W
Thermal resistance chip to case per chip	R_{thJC}							0,13		
Neutral Point Inv FWD (D4 , D5)										
Diode forward voltage	V_F				8	Tj=25°C Tj=125°C		9,07 9,43		V
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						4,36		K/W
Thermal resistance chip to case per chip	R_{thJC}							2,88		

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	
Neutral Point IGBT (T2)										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,0096	Tj=25°C Tj=150°C	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		600	Tj=25°C Tj=150°C	1,05	1,45	1,85	V
Collector-emitter cut-off incl. Diode	I_{CES}		0	600		Tj=25°C Tj=150°C			0,0304	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=150°C			2400	nA
Integrated Gate resistor	R_{gint}							0,5		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=X Ω Rgon=X Ω	±15	600	600	Tj=25°C Tj=150°C		tbd. tbd.		ns
Rise time	t_r					Tj=25°C Tj=150°C		tbd. tbd.		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=150°C		tbd. tbd.		
Fall time	t_f					Tj=25°C Tj=150°C		tbd. tbd.		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=150°C		tbd. tbd.		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=150°C		tbd. tbd.		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		36960		pF
Output capacitance	C_{oss}							2304		
Reverse transfer capacitance	C_{rss}							1096		
Gate charge	Q_{Gate}		±15	480	600	Tj=25°C		3760		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,16		K/W
Thermal resistance chip to case per chip	R_{thJC}							0,10		
Neutral Point FWD (D1)										
Diode forward voltage	V_F				600	Tj=25°C Tj=125°C	1,2	1,60	1,9	V
Reverse leakage current	I_r			600		Tj=25°C Tj=150°C			3840	µA
Peak reverse recovery current	I_{RRM}	Rgon=X Ω	±15	600	600	Tj=25°C Tj=125°C		tbd. tbd.		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		tbd. tbd.		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=125°C		tbd. tbd.		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=125°C		tbd. tbd.		A/µs
Reverse recovered energy	Erec					Tj=25°C Tj=125°C		tbd. tbd.		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,27		K/W
Thermal resistance chip to case per chip	R_{thJC}							0,18		
Buck Inverse FWD (D13)										
Diode forward voltage	V_F				15	Tj=25°C Tj=150°C	1,25	1,6	1,95	V
Peak reverse recovery current	I_{RRM}	Rgon=X Ω	±15	600	600	Tj=25°C Tj=150°C		tbd. tbd.		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=150°C		tbd. tbd.		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=150°C		tbd. tbd.		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=150°C		tbd. tbd.		A/µs
Reverse recovery energy	E_{rec}					Tj=25°C Tj=150°C		tbd. tbd.		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						2,94		K/W
Thermal resistance chip to case per chip	R_{thJC}							1,94		

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	
Half Bridge IGBT (T3)										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,0152	Tj=25°C Tj=125°C	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		400	Tj=25°C Tj=125°C	1,55	1,80	2,08	V
Collector-emitter cut-off incl diode	I_{CES}		0	1200		Tj=25°C Tj=125°C			0,052	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=125°C			2400	nA
Integrated Gate resistor	R_{gint}							1,88		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=X Ω Rgon=X Ω	±15	600	600	Tj=25°C Tj=125°C		tbd. tbd.		ns
Rise time	t_r					Tj=25°C Tj=125°C		tbd. tbd.		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=125°C		tbd. tbd.		
Fall time	t_f					Tj=25°C Tj=125°C		tbd. tbd.		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=125°C		tbd. tbd.		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=125°C		tbd. tbd.		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		24600		pF
Output capacitance	C_{oss}							1620		
Reverse transfer capacitance	C_{rss}							1380		
Gate charge	Q_{Gate}		15	480	75	Tj=25°C		1920		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,18		K/W
Thermal resistance chip to case per chip	R_{thJC}							0,12		
Half Bridge Inverse FWD (D6)										
Diode forward voltage	V_F				7	Tj=25°C Tj=125°C		2,49 1,99		V
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						2,30		K/W
Thermal resistance chip to case per chip	R_{thJC}							1,52		
Half Bridge FWD (D2)										
Diode forward voltage	V_F				300	Tj=25°C Tj=150°C		2,14	2,46	V
Reverse leakage current	I_r			1200		Tj=25°C Tj=150°C			360	µA
Peak reverse recovery current	I_{RRM}	Rgon=X Ω	±15	600	600	Tj=25°C Tj=150°C		tbd. tbd.		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=150°C		tbd. tbd.		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=150°C		tbd. tbd.		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=150°C		tbd. tbd.		A/µs
Reverse recovery energy	E_{rec}					Tj=25°C Tj=150°C		tbd. tbd.		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,30		K/W
Thermal resistance chip to case per chip	R_{thJC}							0,20		
DC link Capacitor (C1)										
C value	C							47		nF
Thermistor										
Rated resistance	R					T=25°C		22000		Ω
Deviation of R25	ΔR/R	R100=1486 Ω				T=100°C	-5		+5	%
Power dissipation	P					T=25°C		200		mW
Power dissipation constant						T=25°C		2		mW/K
B-value	B(25/50)	Tol. ±3%				T=25°C		3950		K
B-value	B(25/100)	Tol. ±3%				T=25°C		3996		K
Vincotech NTC Reference									B	

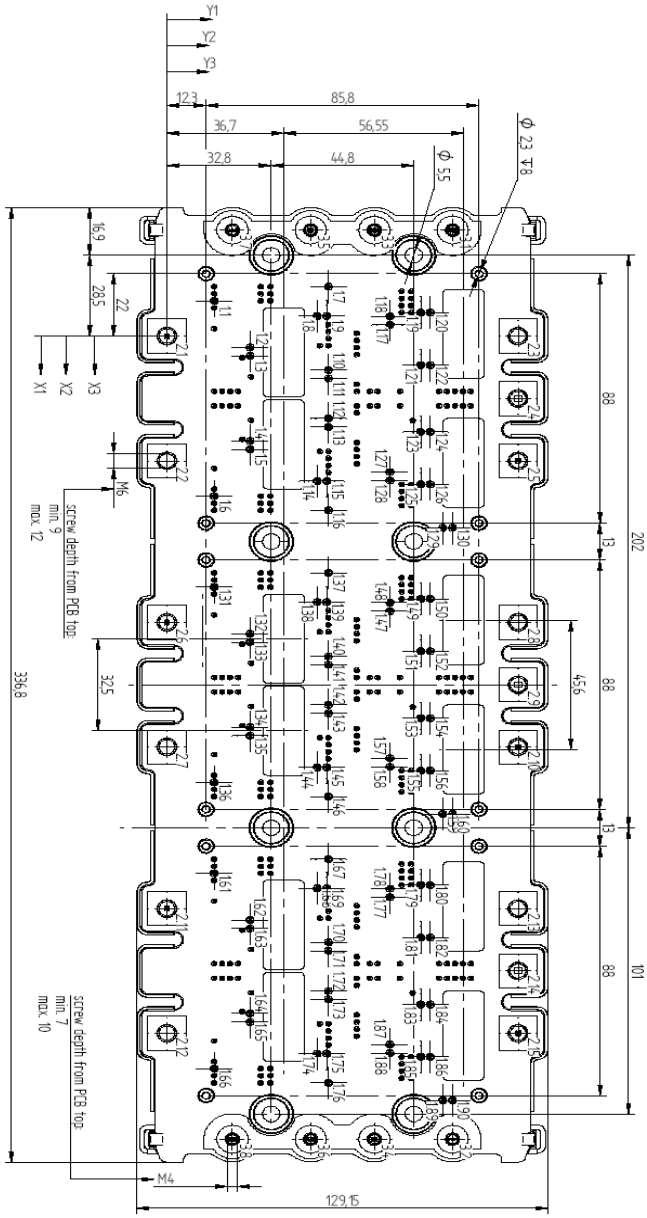
Outline

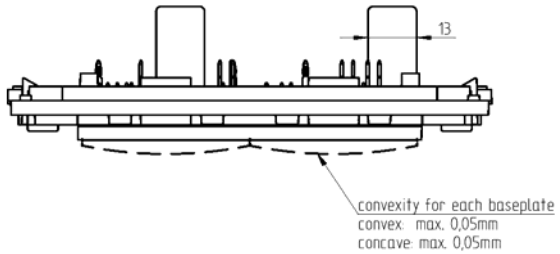
Outline

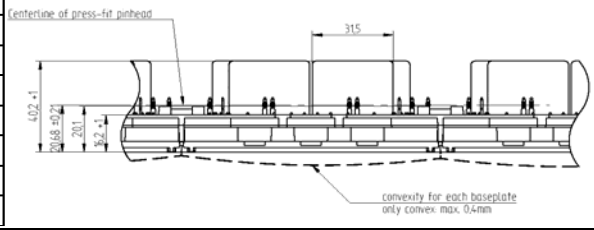
Driver pins			Driver pins			Driver pins		
Pin	X1	Y1	Pin	X1	Y1	Pin	X1	Y1
1.1	-12,45	14,85	1.31	88,55	14,85	1.61	189,55	14,85
1.2	4	26,15	1.32	105	26,15	1.62	206	26,15
1.3	7	26,15	1.33	108	26,15	1.63	209	26,15
1.4	37	26,15	1.34	138	26,15	1.64	239	26,15
1.5	40	26,15	1.35	141	26,15	1.65	242	26,15
1.6	56,45	14,85	1.36	157,45	14,85	1.66	258,45	14,85
1.7	-17,45	50,75	1.37	83,55	50,75	1.67	184,55	50,75
1.8	-7,15	47,25	1.38	93,85	47,25	1.68	194,85	47,25
1.9	-7,15	50,25	1.39	93,85	50,25	1.69	194,85	50,25
1.10	11,95	50,75	1.40	112,95	50,75	1.70	213,95	50,75
1.11	14,95	50,75	1.41	115,95	50,75	1.71	216,95	50,75
1.12	29,05	50,75	1.42	130,05	50,75	1.72	231,05	50,75
1.13	32,05	50,75	1.43	133,05	50,75	1.73	234,05	50,75
1.14	51,15	47,25	1.44	152,15	47,25	1.74	253,15	47,25
1.15	51,15	50,25	1.45	152,15	50,25	1.75	253,15	50,25
1.16	61,45	50,75	1.46	162,45	50,75	1.76	263,45	50,75
1.17	-4	70,1	1.47	97	70,1	1.77	198	70,1
1.18	-7	70,1	1.48	94	70,1	1.78	195	70,1
1.19	-8,3	79,8	1.49	92,7	79,8	1.79	193,7	79,8
1.20	-8,3	82,8	1.50	92,7	82,8	1.80	193,7	82,8
1.21	10,2	79,8	1.51	111,2	79,8	1.81	212,2	79,8
1.22	10,2	82,8	1.52	111,2	82,8	1.82	212,2	82,8
1.23	33,8	79,8	1.53	134,8	79,8	1.83	235,8	79,8
1.24	33,8	82,8	1.54	134,8	82,8	1.84	235,8	82,8
1.25	52,3	79,8	1.55	153,3	79,8	1.85	254,3	79,8
1.26	52,3	82,8	1.56	153,3	82,8	1.86	254,3	82,8
1.27	48	70,1	1.57	149	70,1	1.87	250	70,1
1.28	51	70,1	1.58	152	70,1	1.88	253	70,1
1.29	67,65	86,7	1.59	168,65	86,7	1.89	269,65	86,7
1.30	67,65	89,8	1.60	168,65	89,8	1.90	269,65	89,8

Low current connections			
M4 screw	X3	Y3	Function
3.1	-37,4	89,8	TR+
3.2	283,4	89,8	TR+
3.3	-37,4	65,2	DC+
3.4	283,4	65,2	DC+
3.5	-37,4	45,2	DC-
3.6	283,4	45,2	DC-
3.7	-37,4	20,6	TR-
3.8	283,4	20,6	TR-

Power connections			
M6 screw	X2	Y2	Function
2.1	0	0	Phase-
2.2	44	0	Phase+
2.3	0	110,4	DC+
2.4	22	110,4	Neutral
2.5	44	110,4	DC-
2.6	101	0	Phase-
2.7	145	0	Phase+
2.8	101	110,4	DC+
2.9	123	110,4	Neutral
2.10	145	110,4	DC-
2.11	202	0	Phase-
2.12	246	0	Phase+
2.13	202	110,4	DC+
2.14	224	110,4	Neutral
2.15	246	110,4	DC-





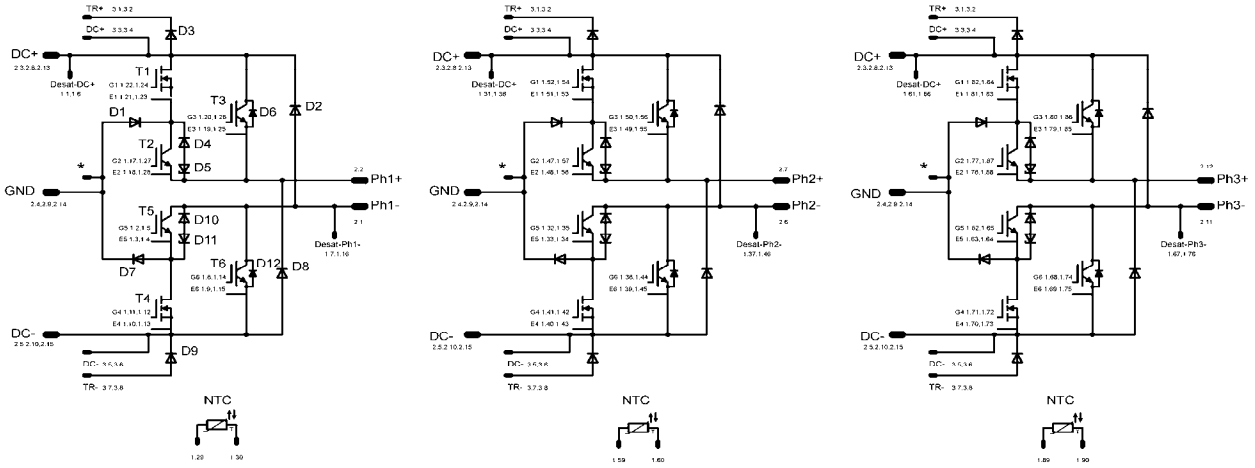


Ordering Code and Marking - Pinout

Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	70-W612A3C600SH-M600F	M600F	M600F

Pinout



*Around low inductive side connections; top surface of the PCB

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.