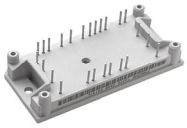
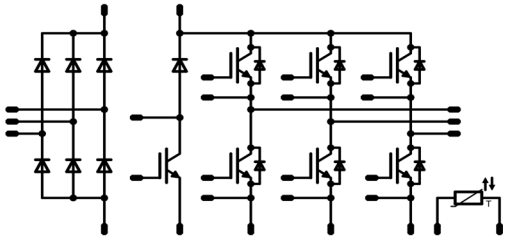
flowPIM 1 3rd gen — **1200V/25A**

Features
- 3~ rectifier, BRC, Inverter, NTC
- Very compact housing, easy to route
- IGBT4 / EmCon4 technology for low saturation losses and improved EMC behaviour

flowPIM1 housing


Target Applications
- Motor Drives
- Power Generation

Schematic


Types
- V23990-P589-A41-PM

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Input Rectifier Diode					
Repetitive peak reverse voltage	V_{RRM}			1600	V
Forward current per diode	I_{FAV}	DC current	T_h=80°C	33	A
Surge forward current	I_{FSM}	t_p=10ms	T_j=25°C	250	A
I^2t-value	I^2t			310	A^2s
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C	38	W
Maximum Junction Temperature	$T_j$max			150	°C
Inverter Transistor					
Collector-emitter break down voltage	V_{CE}			1200	V
DC collector current	I_C	T_j=$T_j$max	T_h=80°C	27	A
Repetitive peak collector current	I_{Cpulse}	t_p limited by $T_j$max	T_h=80°C	75	A
Power dissipation per IGBT	P_{tot}	T_j=$T_j$max	T_h=80°C	72	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150°C V_{GE}=15V		10 800	µs V
Maximum Junction Temperature	$T_j$max			175	°C

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter Diode					
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	27	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max	T_h=80°C	50	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C	51	W
Maximum Junction Temperature	$T_j$max			175	°C
BRC Transistor					
Collector-emitter break down voltage	V_{CE}			1200	V
DC collector current	I_C	T_j=$T_j$max	T_h=80°C	20	A
Repetitive peak collector current	I_{Cpuls}	t_p=1ms	T_h=80°C	45	A
Power dissipation per IGBT	P_{tot}	T_j=$T_j$max	T_h=80°C	64	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150°C V_{GE}=15V		10 800	µs V
Maximum Junction Temperature	$T_j$max			175	°C
BRC Diode					
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	16	A
Repetitive peak forward current	I_{FRM}	t_p=1ms	T_h=80°C	20	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C	39	W
Maximum Junction Temperature	$T_j$max			175	°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=1min		4000	V_{DC}
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	
Input Rectifier Diode										
Forward voltage	V_F				50	Tj=25°C Tj=125°C	0.8	1.31 1.32	1.6	V
Threshold voltage (for power loss calc. only)	V_{to}					Tj=25°C Tj=125°C		0.93 0.83		V
Slope resistance (for power loss calc. only)	r_t					Tj=25°C Tj=125°C		0.008 0.01		Ω
Reverse current	I_r			1500		Tj=25°C Tj=150°C		 2	0.02	mA
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50µm λ=0.61W/mK						1.78		K/W
Thermal resistance chip to case per chip	R_{thJC}							n.a.		
Transistor Inverter										
Gate emitter threshold voltage	$V_{GE(th)}$	VCE=VGE			0.00085	Tj=25°C Tj=150°C	5	5.8	6.5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		25	Tj=25°C Tj=150°C		1.87 2.32	2.2	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	1200		Tj=25°C Tj=150°C			0.25	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=150°C			200	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=32Ohm Rgon=32Ohm	±15	600	25	Tj=25°C Tj=150°C		127		ns
Rise time	t_r					Tj=25°C Tj=150°C		32		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=150°C		286		
Fall time	t_f					Tj=25°C Tj=150°C		118		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=150°C		3		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=150°C		2.16		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		1.43		nF
Output capacitance	C_{oss}							0.115		
Reverse transfer capacitance	C_{rss}							0.085		
Gate charge	Q_{Gate}		±15	600	25	Tj=25°C Tj=150°C		120		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50µm λ=0.61W/mK						1.31		K/W
Thermal resistance chip to case per chip	R_{thJC}							n.a.		
Diode Inverter										
Diode forward voltage	V_F				25	Tj=25°C Tj=150°C		1.93 1.91	2.2	V
Reverse leakage current	I_R			1200		Tj=25°C Tj=150°C			10	µA
Peak reverse recovery current	I_{RRM}	Rgoff=32Ohm Rgon=32Ohm	±15	600	25	Tj=25°C Tj=150°C		 21.68		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=150°C		 588		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=150°C		 4.94		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=150°C		 48		A/µs
Reverse recovered energy	Erec					Tj=25°C Tj=150°C		 1.97		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50µm λ=0.61W/mK						1.85		K/W
Thermal resistance chip to case per chip	R_{thJC}									

Characteristic Values

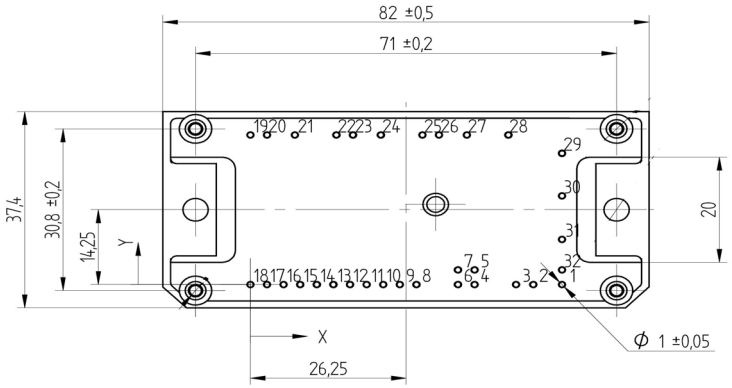
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
Transistor BRC										
Gate emitter threshold voltage	$V_{GE(th)}$	VCE=VGE			0.0005	Tj=25°C Tj=150°C	5	5.8	6.5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		30		15	Tj=25°C Tj=150°C	1.6	1.84 1.77	2.3	V
Collector-emitter cut-off	I_{CES}		0	1200		Tj=25°C Tj=150°C			0.005	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=150°C			200	nA
Integrated Gate resistor	R_{gint}							0		Ω
Turn-on delay time	$t_{d(on)}$	Rgon=32Ohm Rgoff=32Ohm	±15	600	15	Tj=25°C Tj=150°C		tbd		ns
Rise time	t_r					Tj=25°C Tj=150°C		tbd		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=150°C		tbd		
Fall time	t_f					Tj=25°C Tj=150°C		tbd		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=150°C		tbd		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=150°C		tbd		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		0.9		pF
Output capacitance	C_{oss}							0.08		
Reverse transfer capacitance	C_{rss}							0.055		
Gate charge	Q_{Gate}		±15	600	15	Tj=25°C Tj=150°C		tbd		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50µm λ=0.61W/mK						1.47		K/W
Thermal resistance chip to case per chip	R_{thJC}									
Diode BRC										
Diode forward voltage	V_F				10	Tj=25°C Tj=150°C		1.17 0.95	2.2	V
Reverse leakage current	I_r			1200		Tj=25°C Tj=150°C			5	µA
Peak reverse recovery current	I_{RRM}	Rgon=32Ohm Rgoff=32Ohm		600	15	Tj=25°C Tj=150°C		tbd		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=150°C		tbd		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=150°C		tbd		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=150°C		tbd		A/µs
Reverse recovery energy	E_{rec}					Tj=25°C Tj=150°C		tbd		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50µm λ=0.61W/mK						2.43		K/W
Thermal resistance chip to case per chip	R_{thJC}									
Thermistor										
Rated resistance	R					Tj=25°C Tj=125°C	20.9	22 0.75	23.1	kΩ
Operating current	I					Tj=25°C			0.3	mA
Power dissipation	P					Tj=25°C		200		mW
B-value	$B_{(25/50)}$	Tol. ±3%				Tj=25°C		3950		K

Package Outline and Pinout

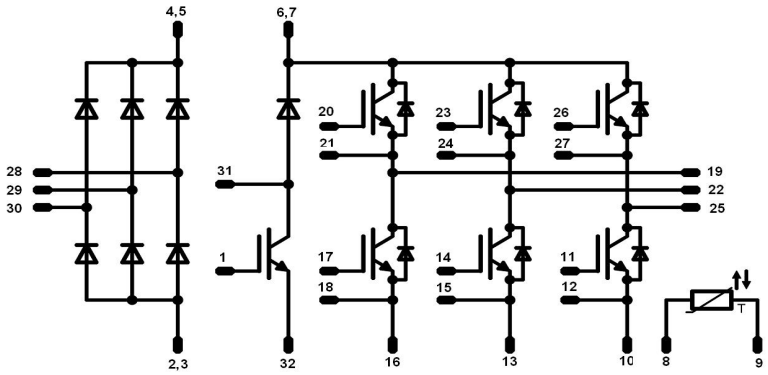
Outline

Pin table		
Pin	X	Y
1	52,55	0
2	47,7	0
3	44,8	0
4	37,8	0
5	37,8	2,8
6	35	0
7	35	2,8
8	28	0
9	25,2	0
10	22,4	0
11	19,6	0
12	16,8	0
13	14	0
14	11,2	0
15	8,4	0
16	5,6	0
17	2,8	0
18	0	0
19	0	28,5
20	2,8	28,5
21	7,5	28,5
22	14,5	28,5
23	17,3	28,5
24	22	28,5
25	29	28,5
26	31,8	28,5
27	36,5	28,5
28	43,5	28,5

Pin table		
Pin	X	Y
29	52,55	25
30	52,55	16,9
31	52,55	8,6
32	52,55	2,8



Pinout



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