Technical Information

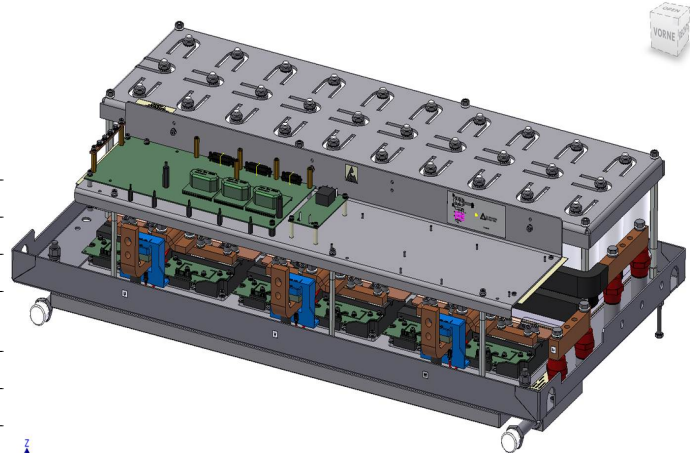ModSTACK™   **6MS24017P43W39873**

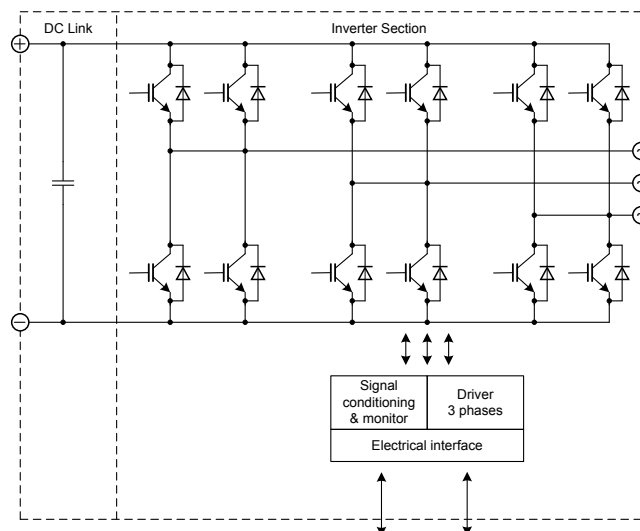**Infineon**

General information

IGBT Stack for typical voltages up to 690 V$_{RMS}$
Rated output current 1100 A$_{RMS}$

· High power converter
· Wind power
· Motor drives

· IHM module with IGBT4
· AlSiC baseplate

Topology	B6I
Application	Inverter
Load type	Resistive, inductive
Semiconductor (Inverter Section)	6x FF1200R17KP4_B2
DC Link	12 mF
Heatsink	Water cooled
Implemented sensors	Current, voltage, temperature
Driver signals IGBT	Electrical
Sales - name	6MS24017P43W39873
SP - No.	SP001151298

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Absolute maximum rated values

Collector-emitter voltage	IGBT; T_{vj} = 25°C	V_{CES}	1700	V
Repetitive peak reverse voltage	Diode; T_{vj} = 25°C	V_{RRM}	1700	V
DC link voltage	No switching; t= 5s, once a day	V_{DC}	1450	V
Insulation management	according to installation height of 2000 m	V_{line}	690	V_{RMS}
Insulation test voltage	according to EN 50178, f = 50 Hz, t = 5 s	V_{ISOL}	2.5	kV_{RMS}
Continuous current inverter section		I_{AC2}	1100	A_{RMS}
Junction temperature	under switching conditions	T_{vjop}	150	°C
Storage temperature min.		T_{stor}	-40	°C
Storage temperature max.		T_{stor}	65	°C
Operational ambient temperature min.		T_{amb}	-25	°C
Operational ambient temperature max.		T_{amb}	55	°C
Inlet temperature coolant min.		T_{inlet}	-25	°C
Inlet temperature coolant max.		T_{inlet}	65	°C
Auxiliary voltage		V_{aux}	30	V
Switching frequency inverter section		f_{sw2}	3.5	kHz

Notes
Further maximum ratings are specified in the following dedicated sections

Characteristic values

DC Link

			min.	typ.	max.	
Rated voltage		V_{DC}		1100		V
Over voltage shutdown	within 150 µs			1250		V
Capacitor	1 s, 30 p, rated tol. ±10 %	C_{DC}		12		mF
		type		Foil		
Maximum ripple current	per device, T_{amb} = 55 °C	I_{ripple}			49	A_{RMS}
Balance or discharge resistor	per DC link unit	R_b		6		kΩ

Notes
Operation above 1100 V subject to reduced operating time according to EN 61071

Inverter Section

			min.	typ.	max.	
Rated continuous current	V_{DC} = 1050 V, V_{AC} = 690 V_{RMS}, cos(φ) = 0.9, $f_{AC\ sine}$ = 50 Hz, f_{sw} = 2600 Hz, T_{inlet} = 40°C, $T_j \leq$ 150 °C	I_{AC}		1000		A_{RMS}
Continuous current at low frequency	V_{DC} = 1050 V, V_{AC} = 690 V_{RMS}, cos(φ) = -0.9, $f_{AC\ sine}$ = 12 Hz, f_{sw} = 2300 Hz, T_{inlet} = 40 °C, $T_j \leq$ 150 °C	$I_{AC\ low}$		1100		A_{RMS}
Rated continuous current for 150% overload capability	$I_{AC\ 150\%}$ = 1100 A_{RMS}, $t_{on\ over}$ = 0.01 s, $t_{recovery}$ = 135 s	$I_{AC\ over1}$			1767	A_{RMS}
Over current shutdown	within 15 µs	$I_{AC\ OC}$		2500		A_{peak}
Power losses	I_{AC} = 1000 A, V_{DC} = 1050 V, V_{AC} = 690 V_{RMS}, cos(φ) = 0.9, $f_{AC\ sine}$ = 50 Hz, f_{sw} = 2600 Hz, T_{inlet} = 40 °C, $T_j \leq$ 150 °C	P_{loss}			14500	W

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Controller interface

			min.	typ.	max.	
Driver and interface board	ref. to separate Application Note			DR111		
			min.	typ.	max.	
Auxiliary voltage		V_{aux}	18	24	30	V
Auxiliary power requirement	V_{aux} = 24 V	P_{aux}		40		W
Digital input level	resistor to GND 1.8 kΩ, capacitor to GND 4 nF, logic high = on, min. 15 mA	$V_{in\ low}$	0		4	V
		$V_{in\ high}$	11		15	V
Digital output level	open collector, logic low = no fault, max. 15 mA	$V_{out\ low}$	0		1.5	V
		$V_{out\ high}$		15		V
Analog current sensor output inverter section	load max 1 mA, @ 1100 A$_{RMS}$	$V_{IU\ ana2}$ $V_{IV\ ana2}$ $V_{IW\ ana2}$		5		V
Analog DC link voltage sensor output	load max 1 mA, @ 1100 V	$V_{DC\ ana}$		7.9		V
Analog temperature sensor output inverter section (NTC)	@T_{NTC} = 65 °C, corresponds to T_j = 137 °C at rated conditions	$V_{Theta\ NTC2}$		8.5		V
Analog temperature sensor output inverter section (Simulated)	@T_{NTC} = 68 °C, corresponds to T_j = 137 °C at rated conditions	$V_{Theta\ sim2}$		9.4		V
Over temperature shutdown inverter section	load max 1 mA	$V_{Error\ OT2}$		9.9		V
Minimum on time (IGBT)		$t_{on\ min}$	10			µs
Minimum off time (IGBT)		$t_{off\ min}$	11			µs

System data

				min.	typ.	max.	
EMC robustness	according to IEC 61800-3 at named interfaces	power	V_{Burst}		2		kV
		control	V_{Burst}		1		kV
		aux (24V)	V_{surge}		1		kV
Storage temperature			T_{stor}	-40		65	°C
Operational ambient temperature	PCB, DC link capacitor, bus bar, excluding cooling medium		$T_{op\ amb}$	-25		55	°C
Cooling air velocity	PCB, DC link capacitor, bus bar, standard atmosphere		V_{air}	2			m/s
Humidity	no condensation		Rel. F	0		85	%
Vibration	according to IEC 60721					10	m/s²
Shock	according to IEC 60721					100	m/s²
Protection degree					IP00		
Pollution degree					2		
Dimensions	width x depth x height			1090	596	260	mm
Weight						105	kg

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Heatsink water cooled

			min.	typ.	max.	
Water flow	according to coolant specification from Infineon	$\Delta V/\Delta t$	20			dm³/min
Water pressure					8	bar
Coolant inlet temperature		T_{inlet}	-40		45	°C
Thermal resistance heatsink to ambient	per switch	$R_{th,ha}$		0.03		K/W
Cooling channel material				Aluminum		

Notes
Composition of coolant: Water and 52 vol. % Antifrogen N

Overview of optional components

|	Unit 1 (not installed	Inverter Section	Unit 3 (not installed)
Voltage sensor		✕	
Current sensor		✕	
Temperature sensor		✕	
Temperature simulation		✕	
DC link capacitors		✕	
Collector-emitter Active Clamping		✕	

Notes
Setting of Active Clamping TVS-Diodes: V_Z = 1200V/1600V MA111. Reduce short circuit protection above 1200V DC.
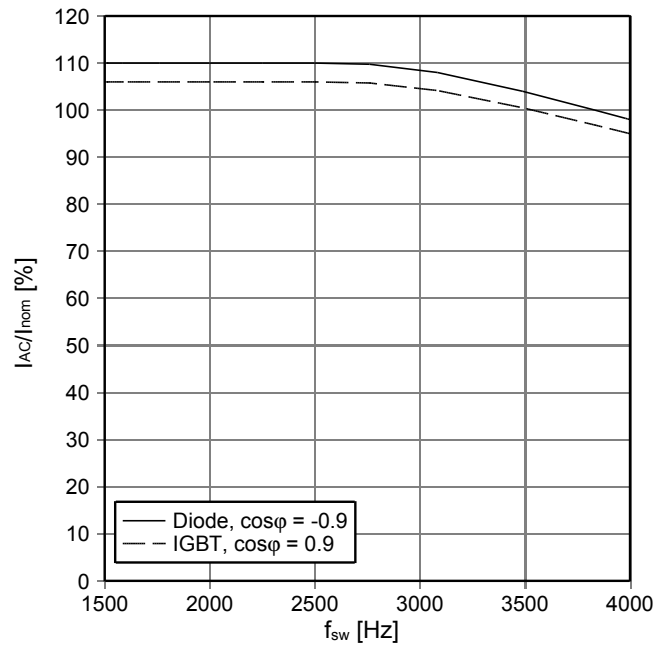
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f$_{AC\ sine}$ - derating curve IGBT (motor), Diode (generator)
V$_{DC}$ = 1050 V, V$_{AC}$ = 690 V, f$_{sw}$ = 2.6 kHz, cosφ = 0.9
T$_{inlet}$ = 40 °C and nom. cooling conditions
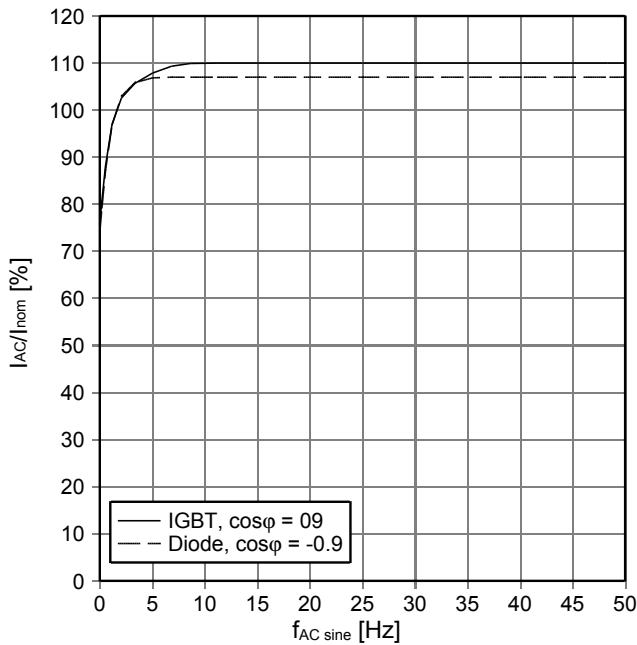
f$_{sw}$ - derating curve IGBT (motor), Diode (generator)
V$_{DC}$ = 1050 V, V$_{AC}$ = 690 V, f$_{AC\ sine}$ = 50 Hz, cosφ = 0.9
T$_{inlet}$ = 40 °C and nom. cooling conditions

T$_{inlet}$ - derating curve IGBT (motor), Diode (generator)
V$_{DC}$ = 1050 V, V$_{AC}$ = 690 V$_{RMS}$, f$_{AC\ sine}$ = 50 Hz, cosφ = 0.9
nom. cooling conditions
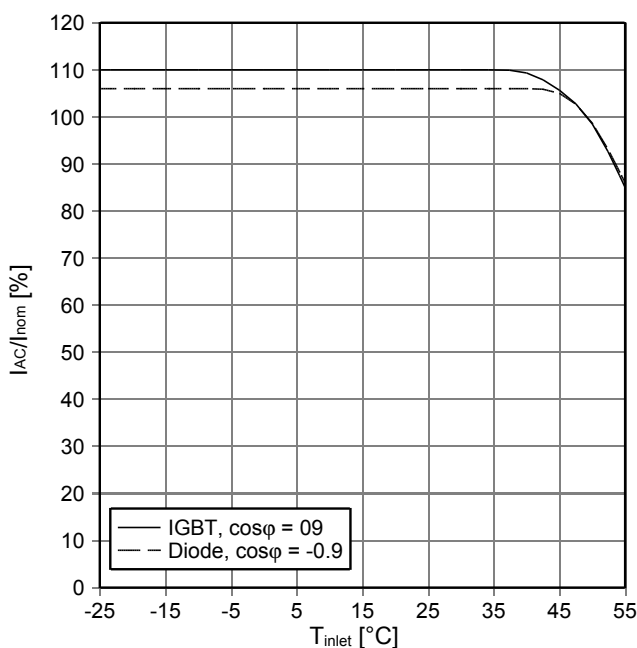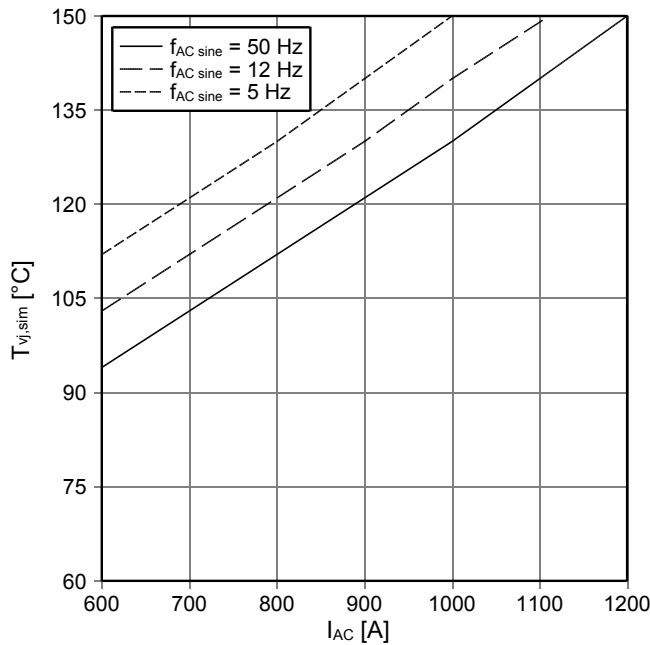

Analog temperature sensor output V$_{Theta\ NTC}$
Sensing NTC of IGBT module
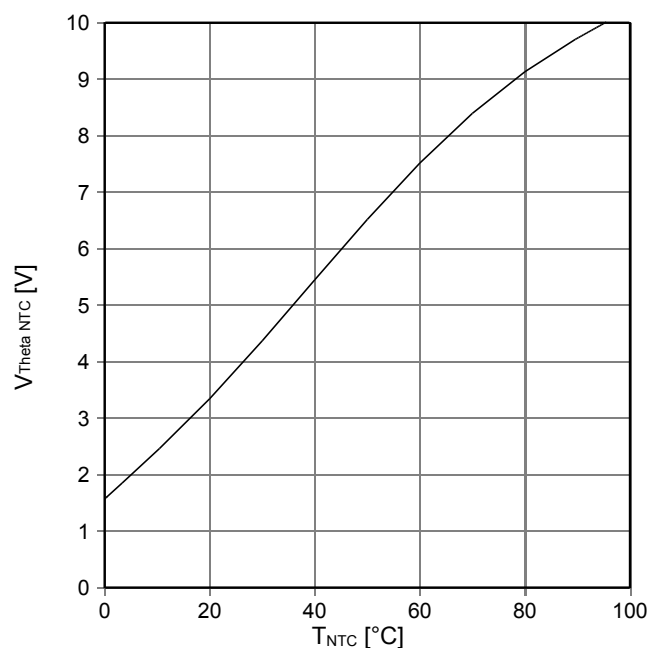
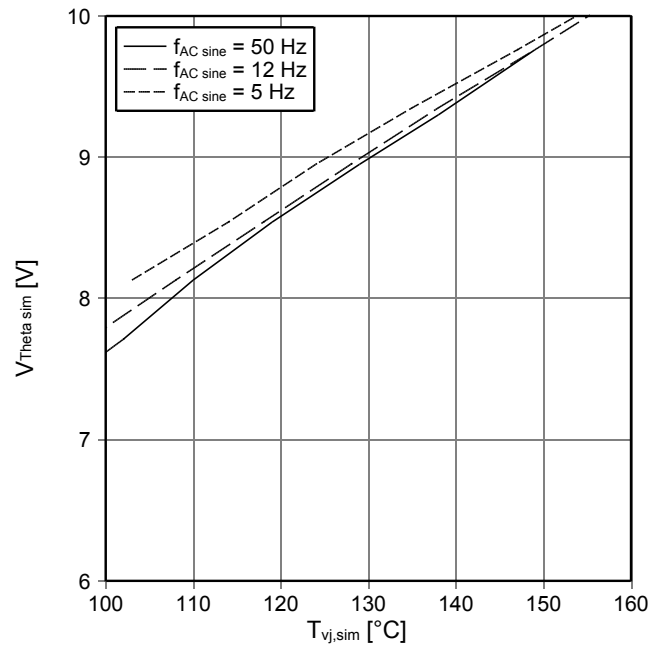| prepared by: OW	date of publication: 2016-02-09
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T$_{vj,sim}$ vs. I$_{AC}$ - Simulated junction temperatur
V$_{DC}$ = 1100 V, V$_{AC}$ = 690 V$_{RMS}$, f$_{sw}$ = 2.6 kHz,
T$_{inlet}$ = 40 °C and nom. cooling conditions

Analog temperature sensor output V$_{Theta\ sim}$
V$_{DC}$ = 1100 V, V$_{AC}$ = 690 V$_{RMS}$, f$_{sw}$ = 2.6 kHz,
nom. cooling conditions

Z$_{th,ha}$ - thermal impedance heatsink to ambient per switch
nom. cooling conditions

i:	1	2	3	4
r$_i$[K/W]:	0.0184	0.0045	0.00092	0.0063
τ$_i$[s]:	7.17	22.18	22.2	136.12
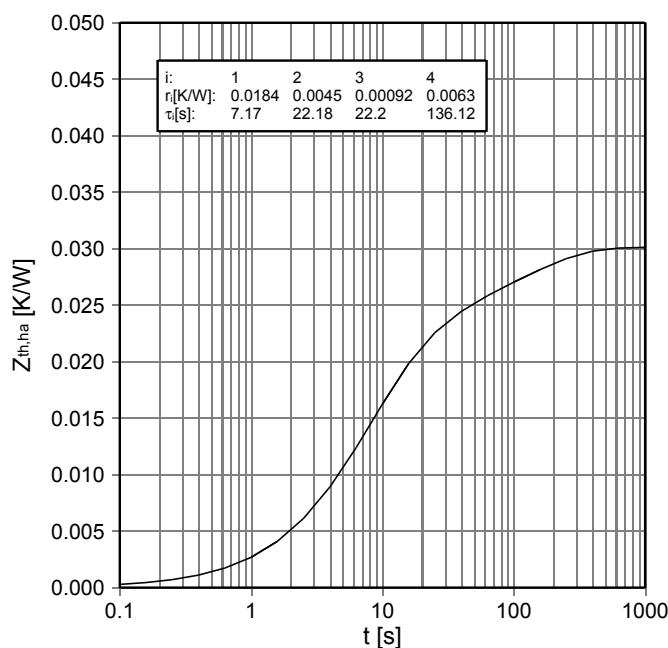
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Mechanical drawing

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Circuit diagram

X2:14	PWM U BOT	
X2:15	PWM U TOP	
X2:3	PWM V BOT	
X2:4	PWM V TOP	
X2:17	PWM W BOT	
X2:18	PWM W TOP	
X2:2, X3:5	Phase U Error	
X2:16, X3:18	Phase V Error	
X2:5, X3:6	Phase W Error	
X3:19	OT Error	
X3:7	OV Error	
X3:17	OC Error	
X3:4	Sum Error	
X2:10, X2:22	$GND_{digital}$	
X3:2, X3:14	$GND_{digital}$	
X4:9, X4:14	$GND_{digital}$	
X2:8, X2:20	P24	
X3:3, X3:15	15V	
X4:15	15V	
X4:13	-15V	
X3:11	$V_{IU\,ana}$	
X3:12	$V_{IV\,ana}$	
X3:13	$V_{IW\,ana}$	
X3:10	$V_{Theta\,NTC}, V_{Theta\,sim}$	
X3:23	$V_{DC\,ana}$	
X3:24, X3:25	GND_{analog}	
X5:1	V_{aux}	
X5:2	GND	
X5:3	TE, Shield	

Signal conditioning & Gate signals

Sensor signals

Failure management

Power supply

DR110

T_{NTC} — EiceDRIVER™ — Top / Bottom — U

T_{NTC} — EiceDRIVER™ — Top / Bottom — V

T_{NTC} — EiceDRIVER™ — Top / Bottom — W

DC+
DC-

V-Option
Voltage measurement

High voltage domain
Low voltage domain

1 ... 13 / 14 ... 25 — X2 (male connector)

1 ... 13 / 14 ... 25 — X3 (male connector)

1 ... 8 / 9 ... 15 — X4 (male connector)

SV1 (jumper)
Th   Tj

Setting X3:10 = $V_{Theta\,NTC}$
(Sensing NTC of IGBT module)

Setting X3:10 = $V_{Theta\,sim}$ (default setting)
(Simulated junction temperature)

1 3 — X5 (male connector)

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