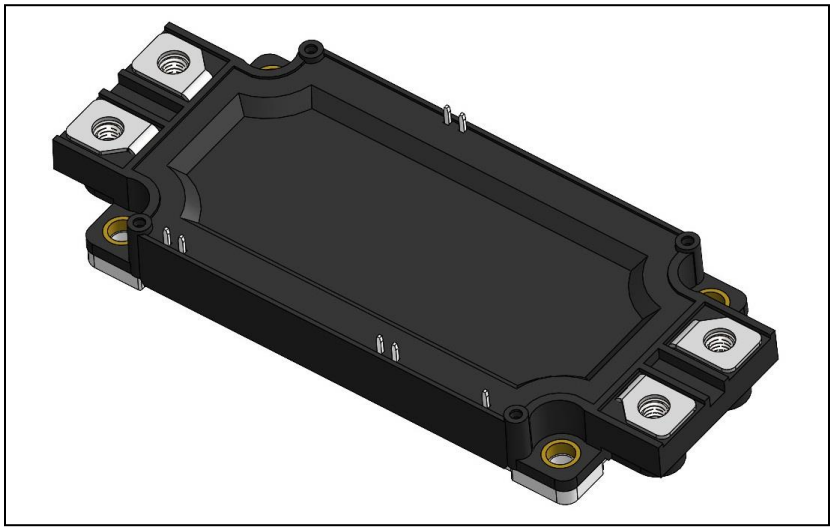
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
www.pwrx.com

Dual Si/SiC
Hybrid IGBT Module
400 Amperes / 1200 Volts



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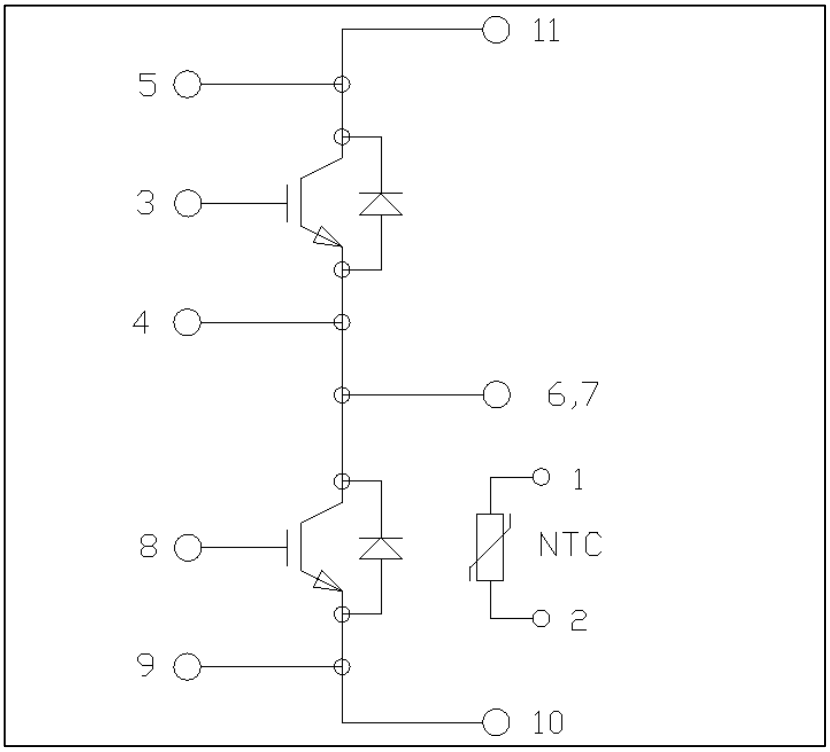

Description:
Powerex IGBT Modules are designed for use for frequency up to 20 kHz. Each module consists of two IGBT Transistors with each transistor having a reverse connected super-fast recovery free-wheel silicon carbide Schottky diode. All components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

Features:
☐ Low Switching Losses
☐ **Super-Fast Recovery Free-Wheel Silicon Carbide Schottky Diode**
☐ High Power Density
☐ Isolated Baseplate
☐ Aluminum Nitride Isolation

Applications:
☐ Energy Saving Power Systems
☐ High Frequency Type Power Systems
☐ High Temperature Power Systems

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Absolute Maximum Ratings, T_j = 25°C unless otherwise specified

Characteristics	Symbol	QID1240SA1	Units
Operating Junction Temperature	T_{jop}	–40 to 150	°C
Storage Temperature	T_{stg}	–40 to 150	°C
Collector-Emitter Voltage (G-E Short)	V_{CES}	1200	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	±20	Volts
Collector Current (TC = 25°C)	I_C	400*	Volts
Peak Collector Current	I_{CM}	800*	Amperes
Emitter Current** (TC = 25°C)	I_E	400*	Amperes
Repetitive Peak Emitter Current (TC = 25°C, tp = 10ms, Half Sine Pulse)**	I_{EM}	TBD*	Amperes
Maximum Collector Dissipation (TC = 25°C, Tj ≤ 150°C)	P_C	2450	W
Operating Junction Temperature, Continuous operation (under switching)	$T_{j\,op}$	-40 to 150	°C
Maximum Case Temperature*1	$T_{c\,max}$	150	°C
Maximum Junction Temperature	T_{jmax}	175	°C
Mounting Torque, M6 Mounting Screws	—	5	Nm
Module Weight (Typical)	—	270	Grams
Isolation Voltage	V_{ISO}	3500	Volts

*1 Case temperature (T_C) and heat sink temperature (T_S) are defined on the each surface (mounting side) of base plate and heat sink under the chips.
*2 Pulse width and repetition rate should be such that device junction temperature (T_J) does not exceed $T_{J\,(MAX)}$ rating.
*3 Junction temperature (T_{vj}) should not increase beyond $T_{J\,(MAX)}$ rating.

DC Characteristics, T_J=25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Drain Source Leakage Current	I_{CES}	V_{CE}=1200V, V_{GE}=0V	-	-	1.0	mA
Gate Source Leakage Current	I_{GES}	V_{CE}=0V, V_{GE}=±20V	-	-	0.5	µA
Gate Source Threshold Voltage	$V_{GE(th)}$	V_{CE}=10V, I_C=10mA	5.4	6.0	6.6	Volts
Collector-Emitter Saturation Voltage (chip)	$V_{CE(sat)}$	I_C = 400A, V_{GE} = 15V, Tj = 25°C	-	1.55	1.8	Volts
		I_C = 400A, V_{GE} = 15V, Tj = 125°C		1.75		Volts
		I_C = 400A, V_{GE} = 15V, Tj = 150°C	-	1.80	-	Volts
Stray Inductance	L_s	P-N	-	10	-	nH

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Dynamic Characteristics, T_J=25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance	C_{ies}	V_{CE}=10V, V_{GE}=0V	-	91.2	-	nF
Output Capacitance	C_{oes}		-	3.2	-	nF
Reverse Transfer Capacitance	C_{res}		-	1.2	-	nF
Turn-On Delay Time	$t_{d(on)}$	V_{CC}=600V, V_{GE}= ±15V I_C=400A, R_G=1.2Ω Inductive Load	-	300	-	ns
Rise Time	t_r		-	100	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	500	-	ns
Fall Time	t_f		-	150	-	ns
Turn-On Energy	E_{on}	V_{CC}=600V, V_{GE}= ±15V I_C=400A, R_G=0.78Ω, T_j=150°C Inductive Load	-	6.5	-	mJ
Turn-Off Energy	E_{off}		-	16	-	mJ
Recovery Energy	E_{rec}		-	1.3	-	mJ
Total Gate Charge	Q_G	V_{CC}=600V, V_{GE}=±15V, I_C=400A	-	2.8	-	µC
Internal Gate Resistance	r_g	Per Switch	-	1.0	-	Ω

Anti-parallel SiC Shottky Diode, T_J=25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Capacitive Charge	Q_C	V_{CC}=600V, V_{GE}=±15V, I_E=400A	-	TBD	-	µC
Diode Forward Voltage	V_{EC}	V_{GE}=0V, I_E=400A	-	1.53	-	V
		T_j=125°C	-	2.05	-	V

Thermal Resistance Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per IGBT, ½ Module	-	-	0.04	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per Diode, ½ Module	-	-	0.10	°C/W
Contact Thermal Resistance	$R_{th(c-s)}$	Per Module, Thermal Grease Applied	-	0.07	-	°C/W

NTC Thermistor Part

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Zero Power Resistance	R_{25}	T_C=25°C	4.85	5.00	5.15	kΩ
Deviation of Resistance	ΔR/R	T_C=100°C, R_{100}=493Ω	-7.3	-	+7.8	%
B constant	$B_{(25/50)}$	$B_{(25/50)}=\ln(R_{25}/R_{50}) / (1/T_{25} - 1/T_{50})$*4	__	3375	__	K
Power Dissipation	P_{25}	T_C=25°C	__	__	10	mW

*4 R25: Resistance at Absolute Temperature T25 (K), R50: Resistance at Absolute Temperature T50 (K), T25 = 25(°C) + 273.15 = 298.15(K), T50 = 50(°C) + 273.15 = 323.15(K)

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