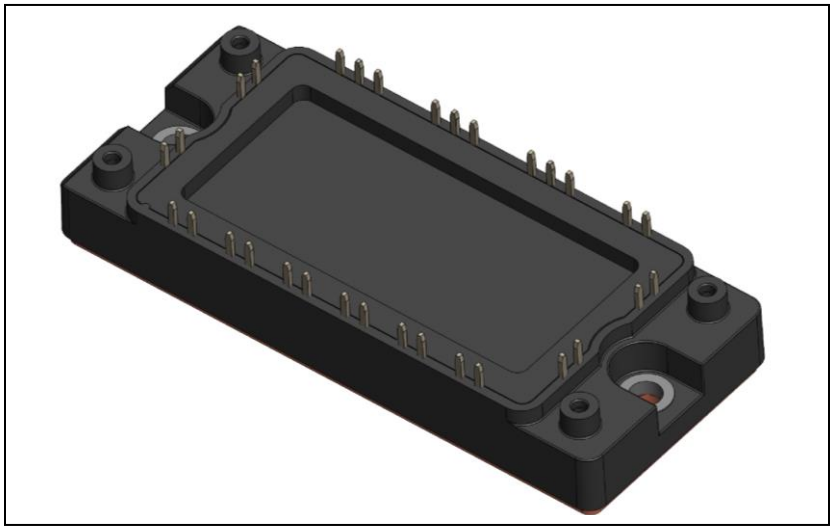
QJE1210SB1
Preliminary

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

Six-Pack (Three Phase)
SiC MOSFET Module
100 Amperes/ 1200Volts/ 13mΩ



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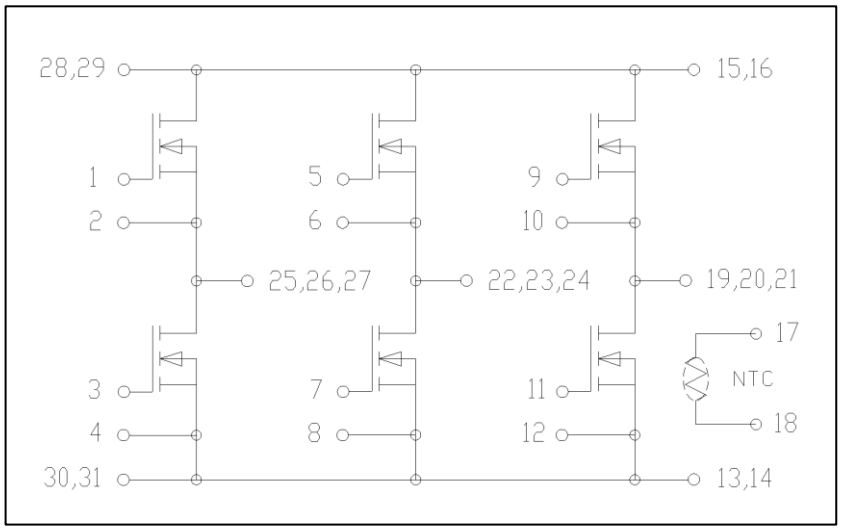

Description:
Powerex Silicon Carbide MOSFET Modules are designed for use in high frequency applications. Each module consists of six MOSFET Silicon Carbide Transistors. All Components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

Features:
☐ Junction Temperature: 175°C
☐ Industry Leading $Rds_{(on)}$
☐ High Speed Switching
☐ Low Switching Losses
☐ Low Capacitance
☐ Low Drive Requirement
☐ High Power Density
☐ Isolated Baseplate
☐ Aluminum Nitride Isolation
☐ Wolfspeed® 3rd Generation Chips

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

June 02, 2020

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

Characteristics	Symbol	QJE1210SB1	Units
Drain-Source Voltage (G-S Short)	V_{DSS}	1200	Volts
Gate-Source Voltage	V_{GSS}	-4 / +15	Volts
Drain Current (Continuous) at T_C=85°C	I_D	100	Amperes
Drain Current (Pulsed)*1	$I_{D(pulse)}$	200	Amperes
Maximum Power Dissipation (T_C=25°C, T_J< 175°C)	P_D	250	Watts
Junction Temperature	T_J	-40 to 175	°C
Storage Temperature	T_{stg}	-40 to 150	°C
Mounting Torque, M5 Mounting Screws	—	5	Nm
Module Weight (Typical)	—	180	Grams
Isolation Voltage	V_{ISO}	3000	Volts

*1 Pulse width and repetition rate should be such that device junction temperature (T_J) does not exceed $T_{J(MAX)}$ rating.

DC Characteristics, T_J=25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Drain Source Leakage Current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V			0.5	mA
		T_J=175°C			TBD	mA
Gate Source Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=15V			1000	nA
Recommended Gate Source Voltage	V_{GS}			-4/15V		Volts
Maximum Gate Source Voltage	$V_{GS(max)}$	V_{DS}=0V			-8/19V	
Gate Source Threshold Voltage	V_{th}	V_{GS}=V_{DS}, I_{DS}=26.5mA	1.8	2.5	3.6	Volts
Drain Source On-Resistance	$R_{DS(on)}$	V_{GS}=15V I_{SD}=180A	10	13	18	mΩ
		T_J=175°C		21		mΩ
Internal Gate Source Series Resistance Per MOSFET	$R_{gate(esr)}$	V_{GS}=0V, f=1MHz, Drain Floating		6.7		Ω

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Dynamic Characteristics, T_J=25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance	C_{ISS}	V_{GS}=0V, V_{DS}=1000V, f=1MHz		7.6		nF
Output Capacitance	C_{OSS}			284		pF
Reverse Transfer Capacitance	C_{RSS}			18		pF
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=120V, V_{GS}= -4 to 15V, I_D=100A, $R_{G(max)}$=0Ω		TBD		nS
Rise Time	t_R			TBD		nS
Turn-Off Delay Time	$t_{D(off)}$			TBD		nS
Fall Time	t_F			TBD		nS
Turn-On Energy	E_{on}	V_{DD}=600V, V_{GS}=-4 to 15V, I_D=100A, R_G=0Ω T_J=175°C		2.6		mJ
Turn-Off Energy	E_{off}			2.4		mJ
Recovery Energy	`E_{rr}			0.38		mJ
Total Gate Charge	Q_G	V_{DD}=800V, V_{GS}=-4 to 15V I_D=100A, T_j=25°C		260		nC

Body Diode, T_J=25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Reverse Recovery Current, Peak	I_{RR}	V_{GS}=-4V, I_D=100A		65		Amps
Reverse Recovery Charge	Q_{RR}	V_R=800V, di/dt=3000A/µs		1.8		µC
Diode Forward Voltage	V_{SD}	V_{GS}=-4V I_{SD}=32.1A		4.6		V
		T_J=175°C		4.2		V

Thermal Resistance Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per MOSFET			0.045	°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

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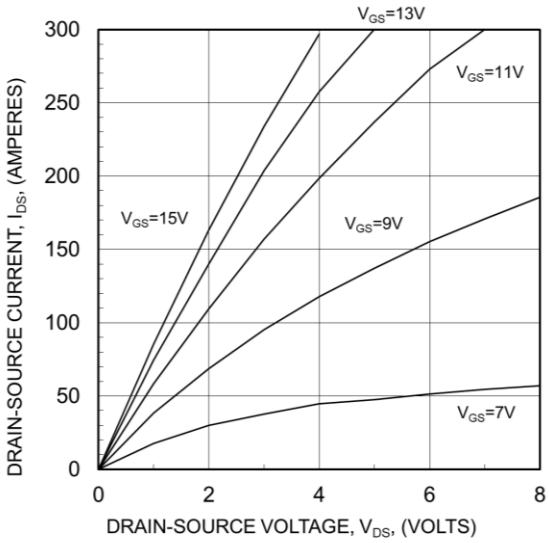
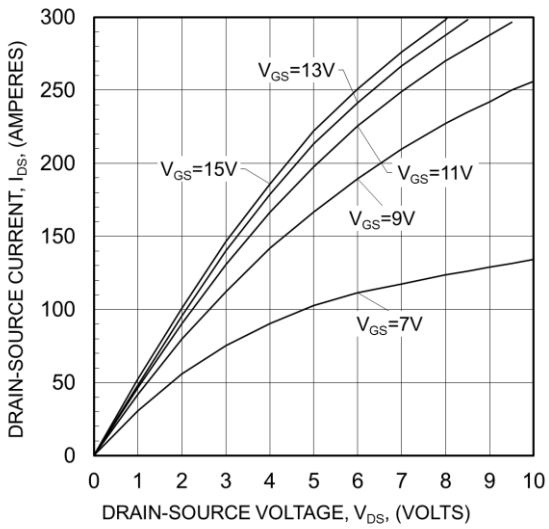
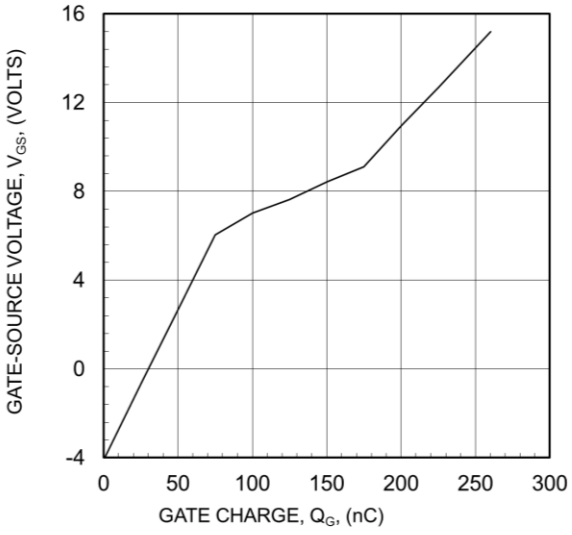
OUTPUT CHARACTERISTICS
T_j = 25°C, t_P< 200 µs



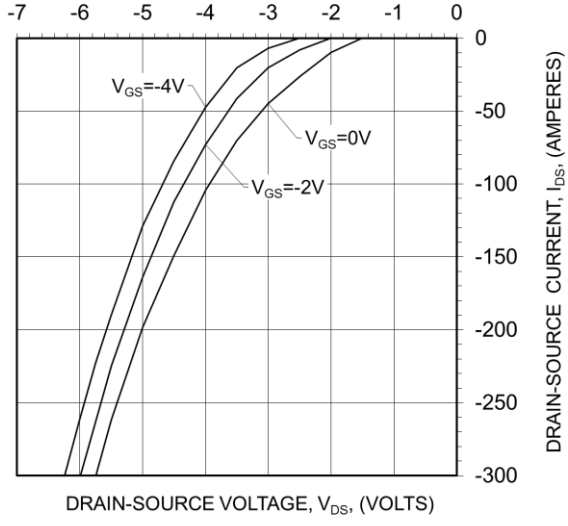
OUTPUT CHARACTERISTICS
T_j = 175°C, t_P< 200 µs



GATE CHARGE
I_{DS} = 100 A, I_{GS} = 50 mA, V_{DS}= 800 V, T_J = 25°C



BODY DIODE CHARACTERISTICS
T_J = 175 °C, t_P< 200 µs



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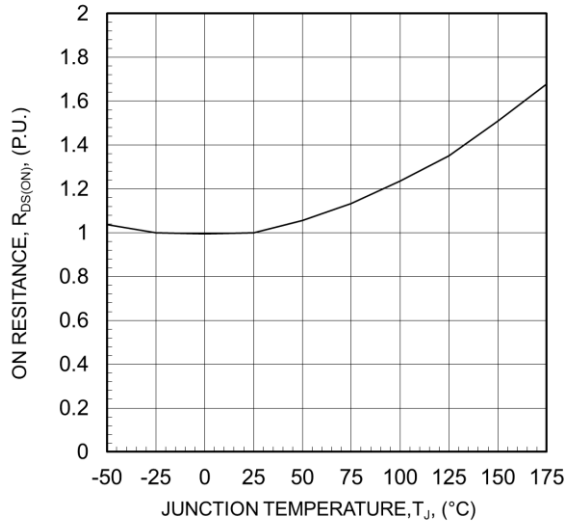
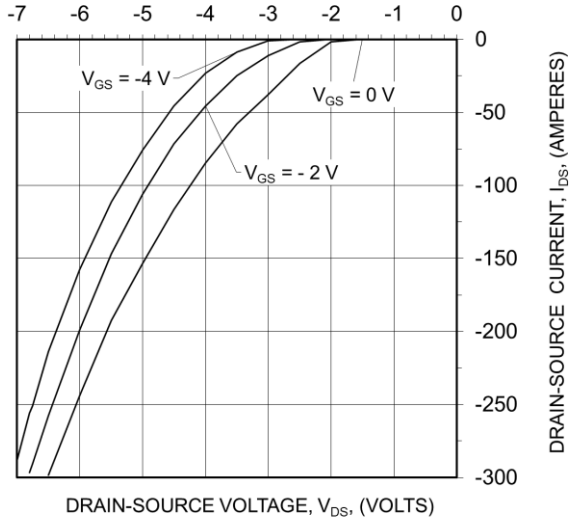
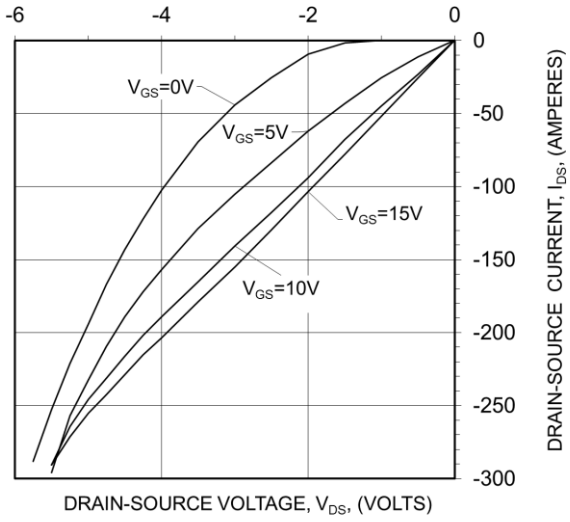
NORMALIZED ON-RESISTANCE VS. TEMPERATURE
I_{DS} = 100 A, V_{GS} = 15 V, t_P< 200 µs



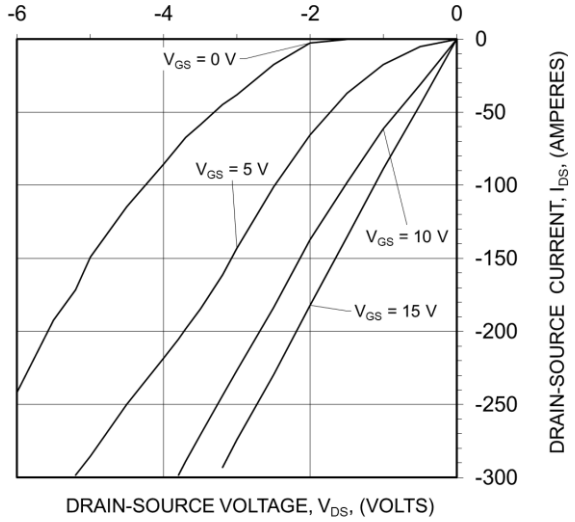
BODY DIODE CHARACTERISTICS
T_J = 25 °C, t_P< 200 µs



3RD QUADRANT CHARACTERISTICS
T_J = 175 °C, t_P< 200 µs



3RD QUADRANT CHARACTERISTICS
T_J = 25 °C, t_P< 200 µs



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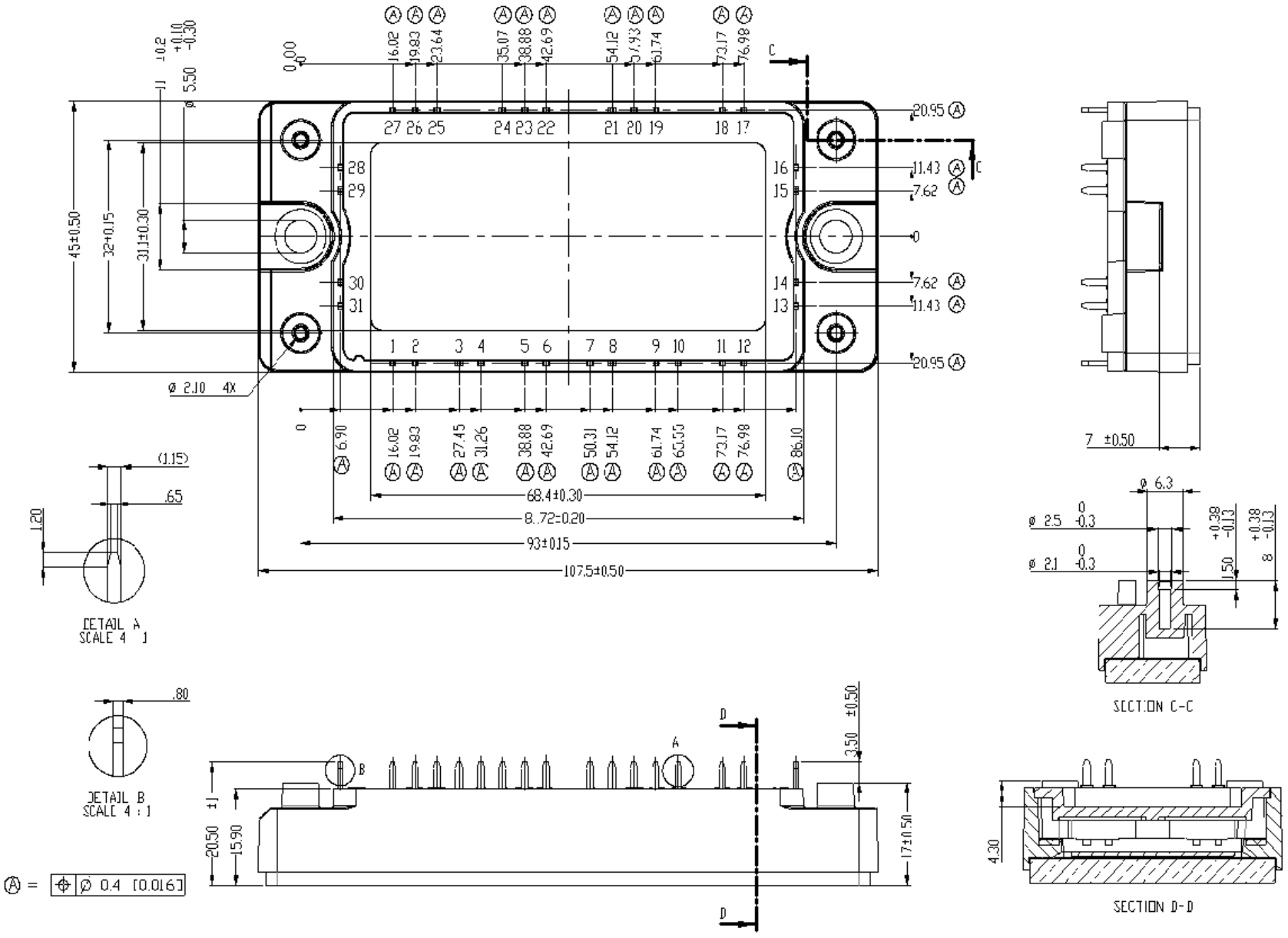

June 02, 2020