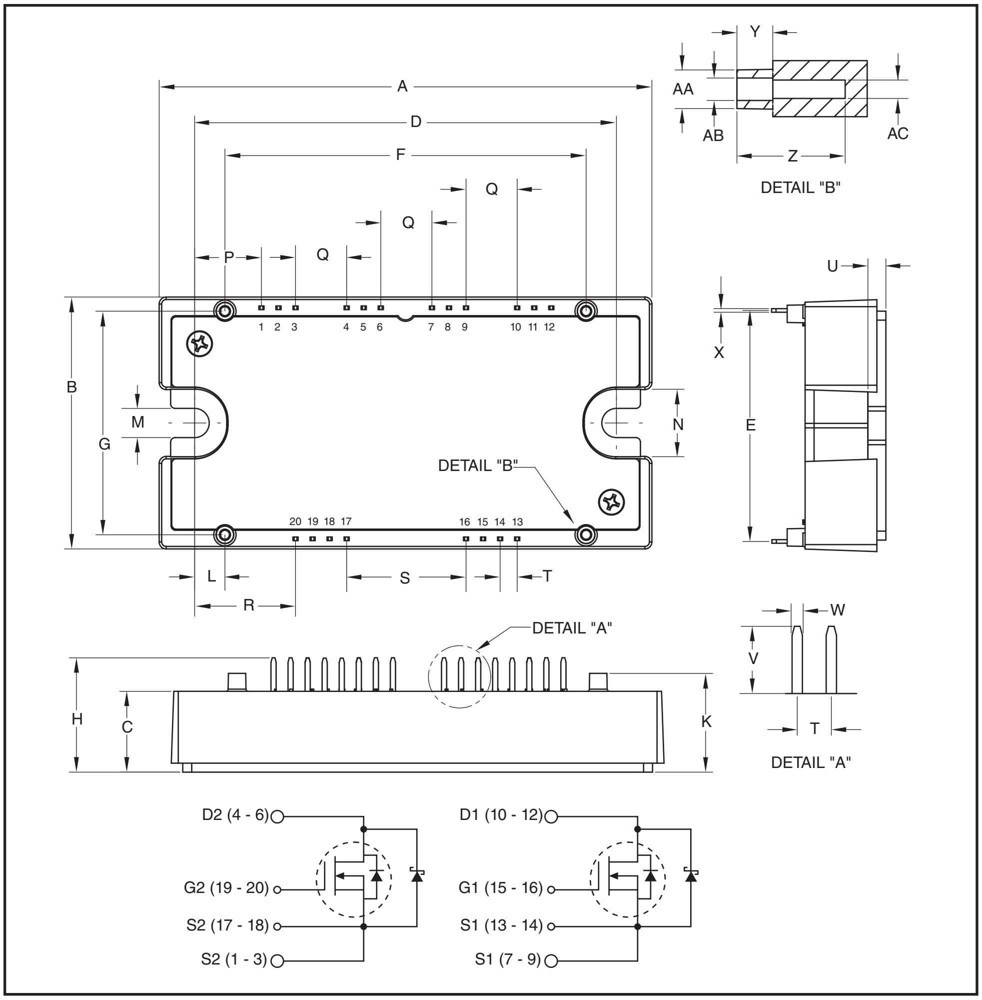
QJD1210010 Preliminary

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

Split Dual SiC MOSFET Module

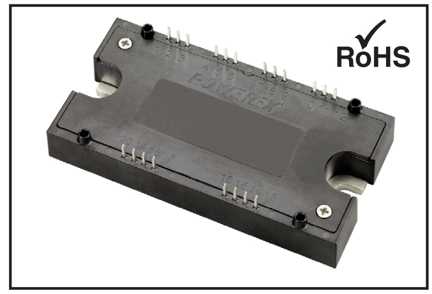
100 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.32	109.8
B	2.21	56.1
C	0.71	18.0
D	3.70±0.02	94.0±0.5
E	2.026	51.46
F	3.17	80.5
G	1.96	49.8
H	1.00	25.5
K	0.87	22.0
L	0.266	6.75
M	0.26	6.5
N	0.59	15.0
P	0.586	14.89

Dimensions	Inches	Millimeters
Q	0.449	11.40
R	0.885	22.49
S	1.047	26.6
T	0.15	3.80
U	0.16	4.0
V	0.30	7.5
W	0.045	1.15
X	0.03	0.8
Y	0.16	4.0
Z	0.47	12.1
AA	0.17 Dia.	4.3 Dia.
AB	0.10 Dia.	2.5 Dia.
AC	0.08 Dia.	2.1 Dia.



Description:
Powerex Silicon Carbide MOSFET Modules are designed for use in high frequency applications. Each module consists of two MOSFET Silicon Carbide Transistors with each transistor having a reverse connected 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:
- ☐ Junction Temperature: 175°C
- ☐ Silicon Carbide Chips
- ☐ Low Internal Inductance
- ☐ Industry Leading RDS(on)
- ☐ High Speed Switching
- ☐ Low Switching Losses
- ☐ Low Capacitance
- ☐ Low Drive Requirement
- ☐ Fast 100A Free Wheeling Schottky Diode
- ☐ High Power Density
- ☐ Isolated Baseplate
- ☐ Aluminum Nitride Isolation
- ☐ 2 Individual Switches per Module
- ☐ Copper Baseplate
- ☐ RoHS Compliant

Applications:
- ☐ Energy Saving Power Systems such as:
  Fans; Pumps; Consumer Appliances
- ☐ High Frequency Type Power Systems such as:
  UPS; High Speed Motor Drives; Induction Heating; Welder; Robotics
- ☐ High Temperature Power Systems such as:
  Power Electronics in Electric Vehicle and Aviation Systems

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

Ratings	Symbol	QJD1210010	Units
Drain-Source Voltage (G-S Short)	V_{DSS}	1200	Volts
Gate-Source Voltage	V_{GSS}	-5 / +25	Volts
Drain Current (Continuous) at T_C = 150°C	I_D	100	Amperes
Drain Current (Pulsed)*	$I_{D(pulse)}$	250	Amperes
Maximum Power Dissipation (T_C = 25°C, T_j < 175°C)	P_D	1080	Watts
Junction Temperature	T_j	-40 to 175	°C
Storage Temperature	T_{stg}	-40 to 150	°C
Mounting Torque, M6 Mounting Screws	—	40	in-lb
Module Weight (Typical)	—	270	Grams
V Isolation Voltage	V_{RMS}	3000	Volts

* Pulse width and repetition rate should be such that device junction temperature (T_j) does not exceed $T_{j(max)}$ rating.

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MOSFET Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	I_D = 50µA, V_{GS} = 0	1200	—	—	Volts
Zero Gate Voltage Drain Current**	I_{DSS}	V_{GS} = 0, V_{DS} = 1200V	—	0.35	2.6	mA
Zero Gate Voltage Drain Current**	I_{DSS}	V_{GS} = 0, V_{DS} = 1200V, T_j = 175°C	—	0.40	4.0	mA
Gate Leakage Current	I_{GSS}	V_{DS} = 0, V_{GS} = 20V	—	—	1.5	µA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 10mA	1.5	2.5	5.0	Volts
		V_{DS} = V_{GS}, I_D = 10mA, T_j = 175°C	1.0	1.7	5.0	Volts
Drain-Source On Resistance	$R_{DS(on)}$	I_D = 100A, V_{GS} = 20V	—	15	25	mΩ
		I_D = 100A, V_{GS} = 20V, T_j = 175°C	—	20	32	mΩ
Gate to Source Charge	Q_{gs}	V_{DD} = 800V, I_D = 100A	—	140	—	nC
Gate to Drain Charge	Q_{gd}	V_{DD} = 800V, I_D = 100A	—	220	—	nC
Total Gate Charge	Q_G	V_{CC} = 800V, I_C = 100A, V_{GS} = -5/20V	—	500	—	nC
Body Diode Forward Voltage	V_{SD}	I_F = 50A, V_{GS} = -5V	—	4.0	—	Volts
Input Capacitance	C_{iss}	V_{GS} = 0, V_{DS} = 800V, f = 1MHz	—	10.2	—	nF
Output Capacitance	C_{oss}		—	1.0	—	nF
Reverse Transfer Capacitance	C_{rss}		—	0.1	—	nF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 800V, I_D = 100A,	—	17.2	—	ns
Rise Time	t_r	V_{GS} = -2/20V,	—	13.6	—	ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 6.8Ω	—	62	—	ns
Fall Time	t_f	Inductive Load	—	35.6	—	ns

**Total module leakage includes MOSFET leakage plus reverse Schottky diode leakage.

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Reverse Schottky Diode Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Diode Forward Voltage	V_{FM}	I_F = 100A, V_{GS} = -5V	—	1.6	2.0	Volts
		I_F = 100A, V_{GS} = -5V, T_j = 175°C	—	2.5	3.2	Volts
Diode Capacitive Charge	Q_C	V_R = 1200V, I_F = 100A, di/dt = 4000A/µs	—	550	—	nC

Thermal and Mechanical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction-to-Case	$R_{th(j-c)}$	MOSFET Part	—	—	0.138	°C/W
Thermal Resistance, Junction-to-Case	$R_{th(j-c)}$	Diode Part	—	—	0.243	°C/W
Contact Thermal Resistance	$R_{th(c-s)}$	Per 1/2 Module, Thermal Grease Applied	—	0.04	—	°C/W
Internal Inductance	L_{int}	MOSFET Part	—	10	—	nH

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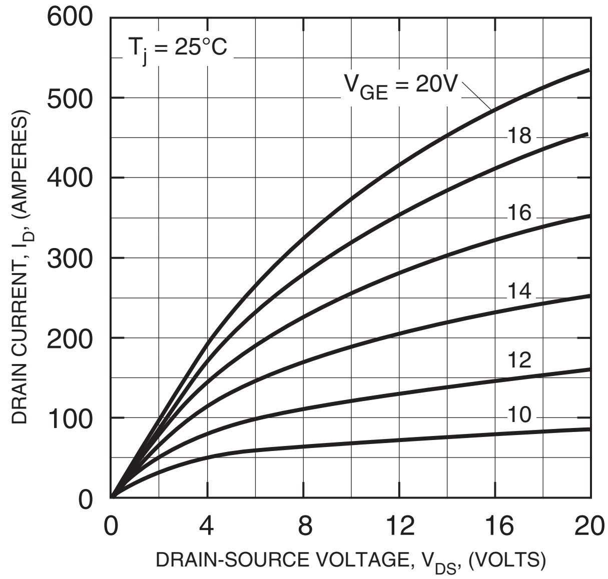
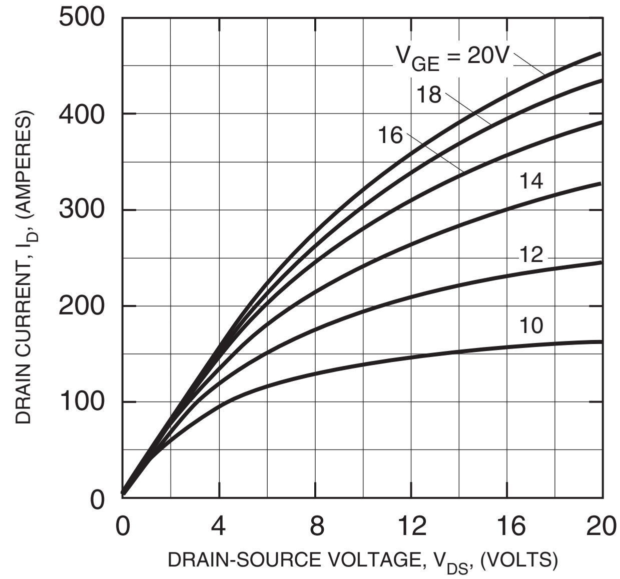
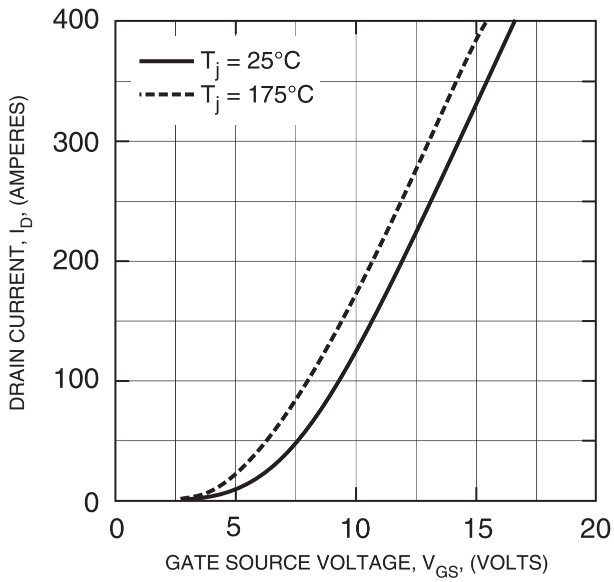
TYPICAL OUTPUT CHARACTERISTICS
(T_j = 25°C)



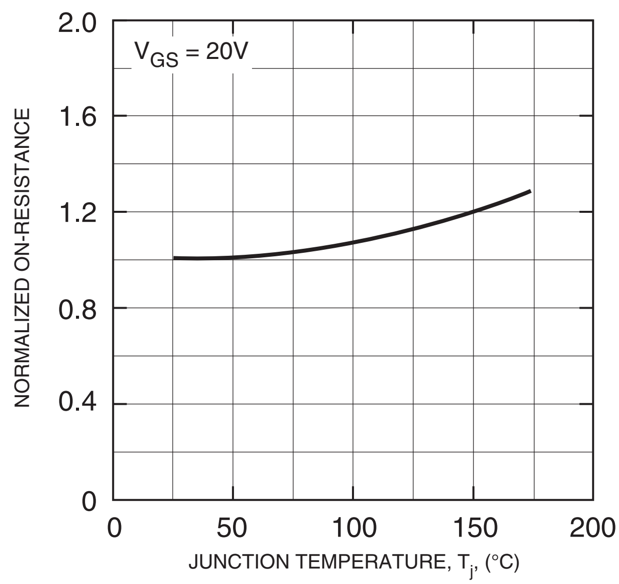
TYPICAL OUTPUT CHARACTERISTICS
(T_j = 175°C)



TRANSFER CHARACTERISTICS
(TYPICAL)



NORMALIZED ON-RESISTANCE
VS. TEMPERATURE



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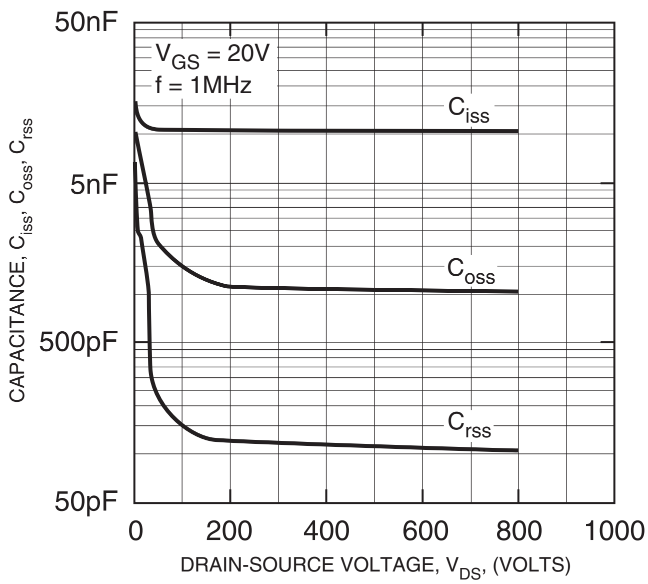
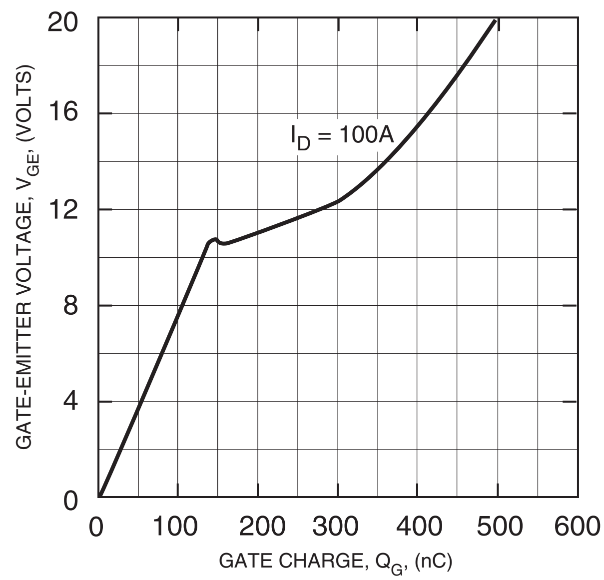
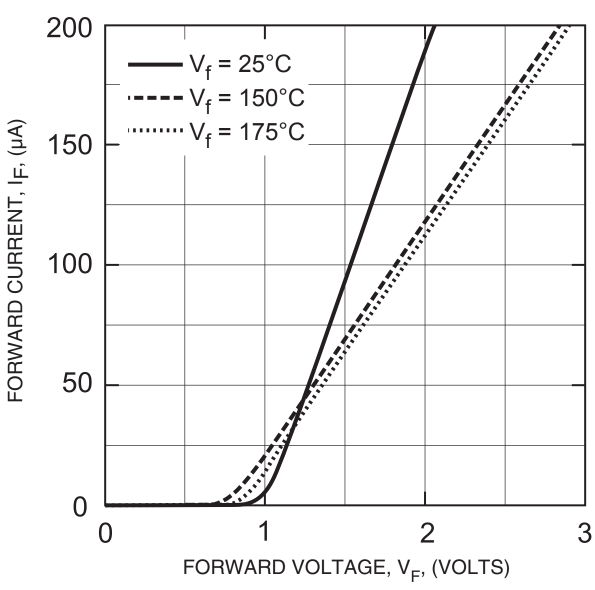
TYPICAL CAPACITANCE VS. DRAIN-SOURCE VOLTAGE



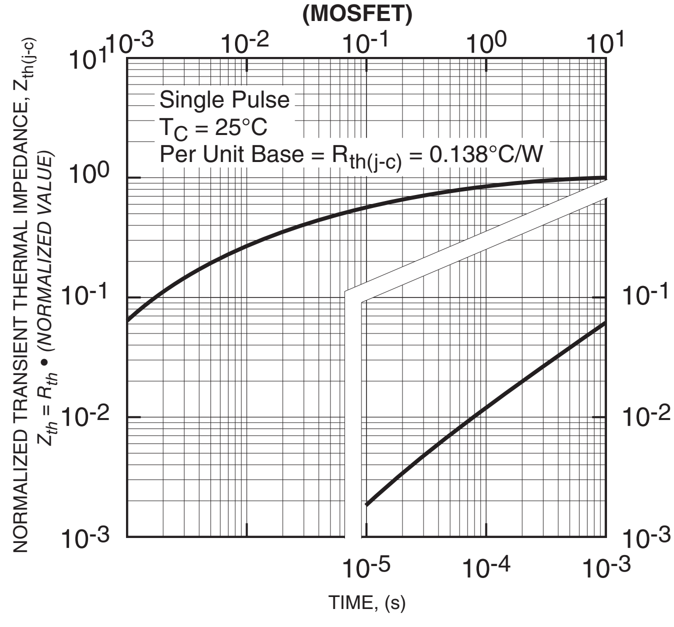
GATE CHARGE VS. V_{GE}



FREE-WHEEL SCHOTTKY DIODE FORWARD CHARACTERISTICS (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MOSFET)



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