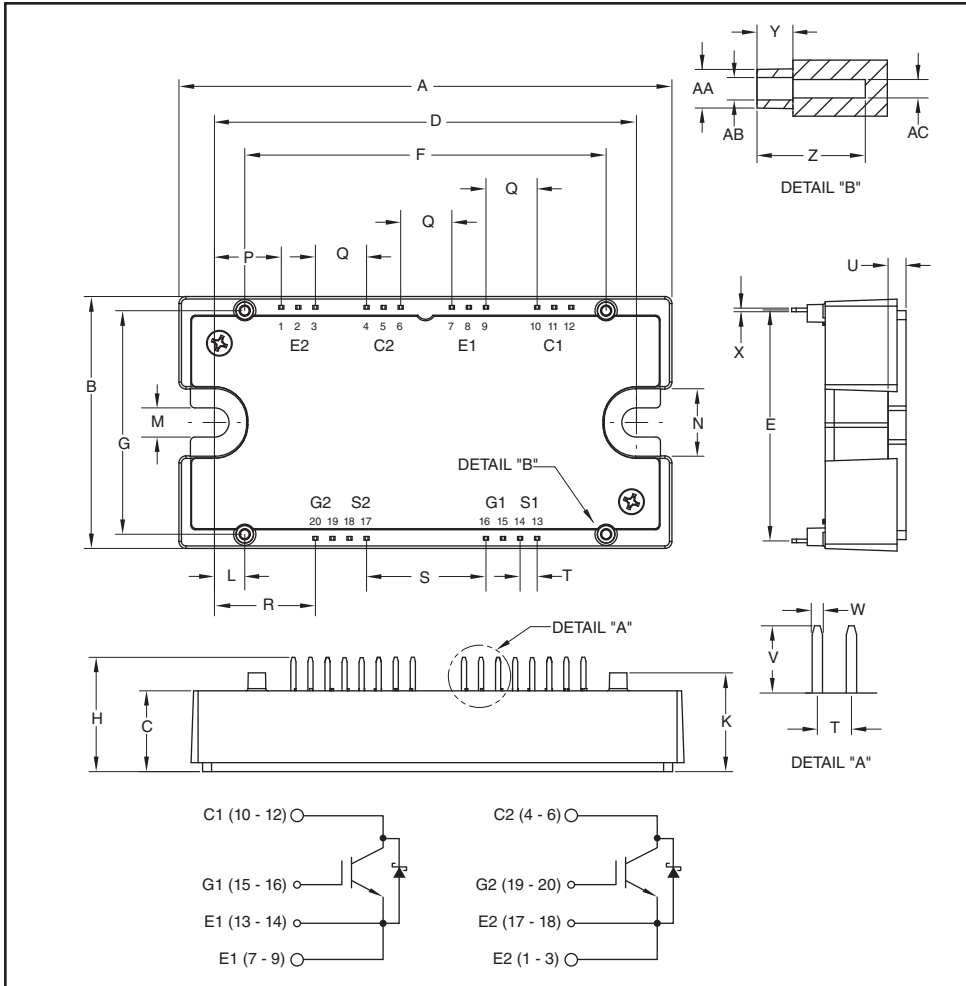


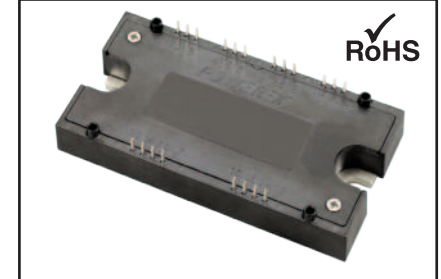
Split Dual Si/SiC Hybrid IGBT Module 150 Amperes/1200 Volts



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 IGBT Modules are designed for use in high frequency applications; upwards of 30 kHz for hard switching applications and 80 kHz for soft switching applications. 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 ESW(off)
- ☐ Aluminum Nitride Isolation
- ☐ **Discrete Super-Fast Recovery Free-Wheel Silicon Carbide Schottky Diode**
- ☐ Low Internal Inductance
- ☐ 2 Individual Switches per Module
- ☐ Isolated Baseplate for Easy Heat Sinking
- ☐ 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

QID1215005
Split Dual Si/SiC Hybrid IGBT Module

150 Amperes/1200 Volts

Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

Ratings	Symbol	QID1215003	Units
Junction Temperature	T_j	-40 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to 150	$^\circ\text{C}$
Collector-Emitter Voltage (G-E Short)	V_{CES}	1200	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	± 20	Volts
Collector Current ($T_C = 25^\circ\text{C}$)	I_C	150*	Amperes
Peak Collector Current	I_{CM}	300*	Amperes
Emitter Current** ($T_C = 25^\circ\text{C}$)	I_E	150*	Amperes
Repetitive Peak Emitter Current ($T_C = 25^\circ\text{C}$)**	I_{EM}	300*	Amperes
Maximum Collector Dissipation ($T_C = 25^\circ\text{C}$, $T_j \leq 150^\circ\text{C}$)	P_C	960	Watts
Mounting Torque, M6 Mounting	—	40	in-lb
Weight	—	270	Grams
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	V_{ISO}	2500	Volts

IGBT Electrical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, $V_{GE} = 0\text{V}$	—	—	1.0	mA
Gate Leakage Current	I_{GES}	$V_{GE} = V_{GES}$, $V_{CE} = 0\text{V}$	—	—	0.5	μA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 15\text{mA}$, $V_{CE} = 10\text{V}$	4.5	6.0	7.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 150\text{A}$, $V_{GE} = 15\text{V}$, $T_j = 25^\circ\text{C}$	—	5.0	6.5	Volts
		$I_C = 150\text{A}$, $V_{GE} = 15\text{V}$, $T_j = 125^\circ\text{C}$	—	5.0	—	Volts
Total Gate Charge	Q_G	$V_{CC} = 600\text{V}$, $I_C = 150\text{A}$, $V_{GE} = 15\text{V}$	—	680	—	nC
Input Capacitance	C_{ies}	$V_{CE} = 10\text{V}$, $V_{GE} = 0\text{V}$	—	—	24	nf
Output Capacitance	C_{oes}		—	—	2.0	nf
Reverse Transfer Capacitance	C_{res}		—	—	0.45	nf
Inductive	Turn-on Delay Time	$V_{CC} = 600\text{V}$, $I_C = 150\text{A}$, $V_{GE1} = V_{GE2} = 15\text{V}$, $R_G = 2.1\Omega$,	—	—	TBD	ns
Load	Rise Time		—	—	TBD	ns
Switch	Turn-off Delay Time		—	—	TBD	ns
Time	TimeFall Time	Inductive Load Switching Operation	—	—	TBD	ns

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

**Represents characteristics of the anti-parallel, emitter-to-collector silicon carbide Schottky diode (FWDI).

QID1215005**Split Dual Si/SiC Hybrid IGBT Module**

150 Amperes/1200 Volts

Reverse Schottky Diode Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Diode Forward Voltage	V_{FM}	$I_F = 150\text{A}$, $V_{GE} = -5\text{V}$	—	1.45	1.75	Volts
		$I_F = 150\text{A}$, $V_{GE} = -5\text{V}$, $T_j = 175^\circ\text{C}$	—	1.95	2.35	Volts
Diode Reverse Current	I_R	$V_R = 1200\text{V}$	—	1.8	10	mA
		$V_R = 1200$, $T_j = 175^\circ\text{C}$	—	12	66.6	mA
Diode Capacitive Charge	Q_C	$V_R = 1200\text{V}$, $I_F = 150\text{A}$, $di/dt = 2200\text{A}/\mu\text{s}$	—	600	—	nC

Thermal and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

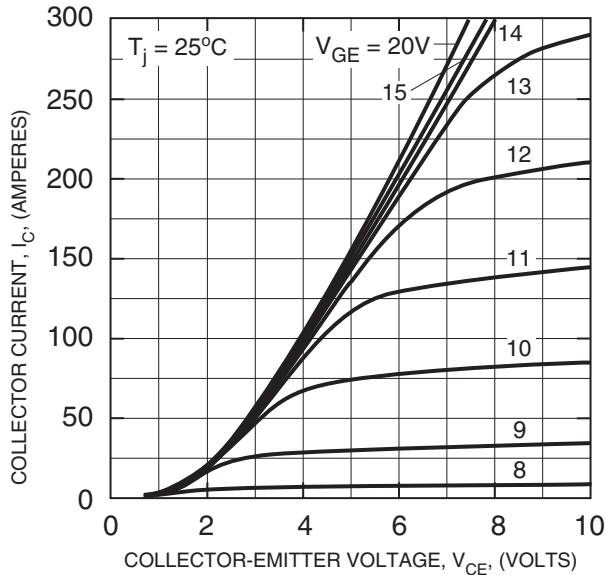
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)Q}$	Per IGBT 1/2 Module, T_C Reference Point Under Chips	—	—	0.13	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{th(j-c)D}$	Per FWDi 1/2 Module, T_C Reference T_C Reference Point Under Chips	—	—	0.25	$^\circ\text{C}/\text{W}$
Contact Thermal Resistance	$R_{th(c-f)}$	Per 1/2 Module, Thermal Grease Applied	—	0.04	—	$^\circ\text{C}/\text{W}$
External Gate Resistance	R_G		3.1	—	31	Ω
Internal Inductance	L_{int}	IGBT Part	—	10	—	nH

QID1215005

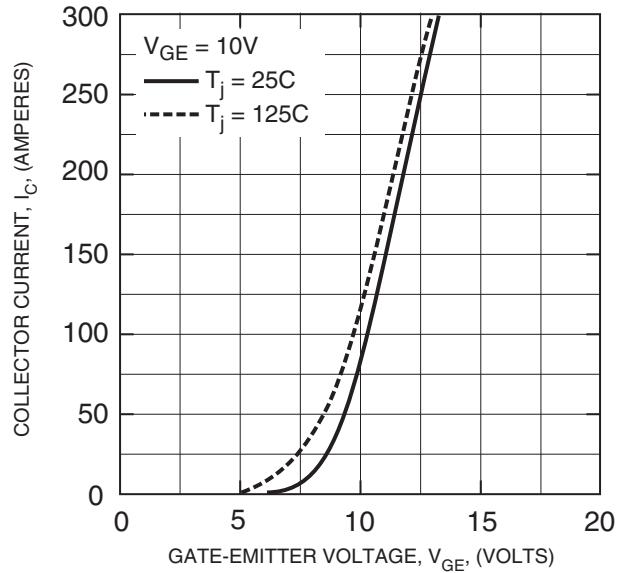
Split Dual Si/SiC Hybrid IGBT Module

150 Amperes/1200 Volts

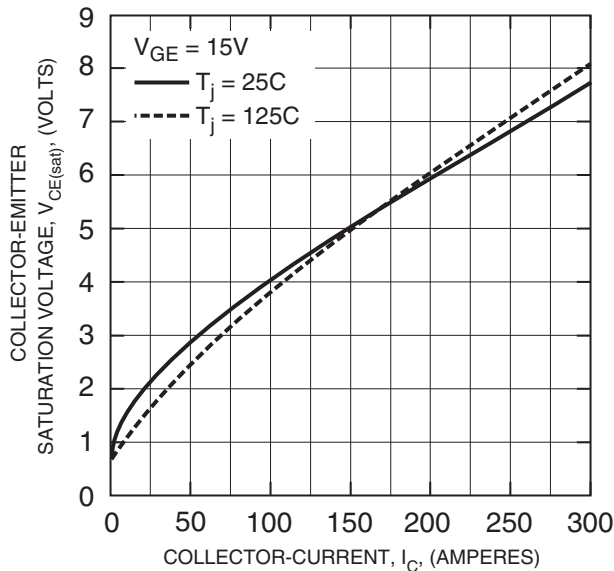
OUTPUT CHARACTERISTICS
(TYPICAL)



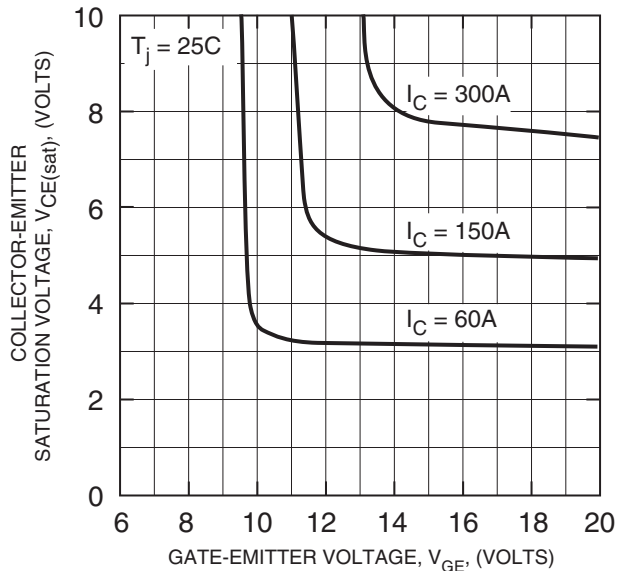
TRANSFER CHARACTERISTICS
(TYPICAL)



COLLECTOR-EMITTER
SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL)



COLLECTOR-EMITTER
SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL)

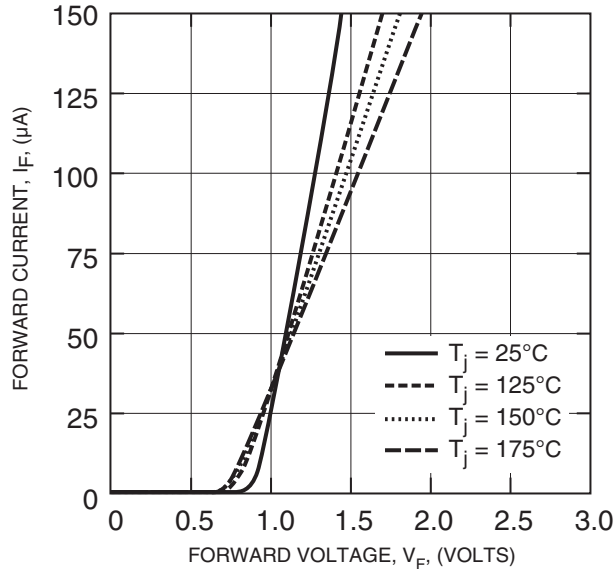


QID1215005

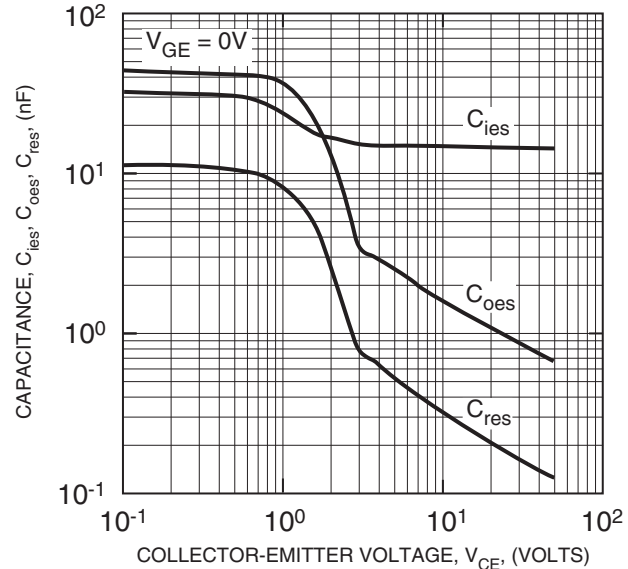
Split Dual Si/SiC Hybrid IGBT Module

150 Amperes/1200 Volts

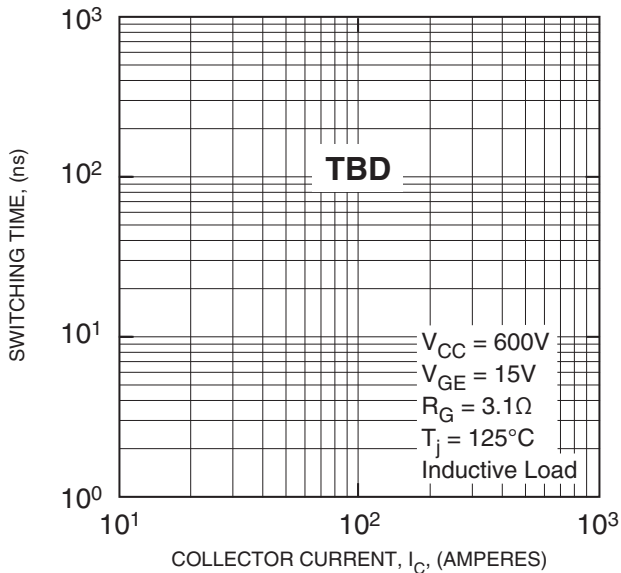
**FREE-WHEEL SCHOTTKY DIODE
FORWARD CHARACTERISTICS
(TYPICAL)**



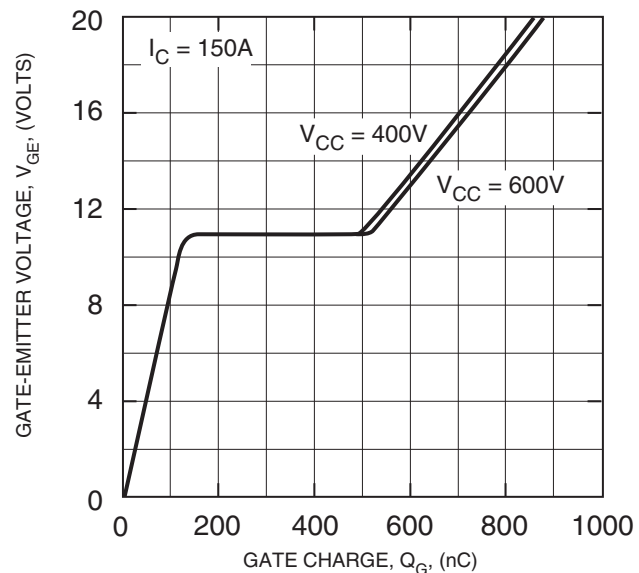
**CAPACITANCE VS. V_{CE}
(TYPICAL)**



**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**



GATE CHARGE VS. V_{GE}

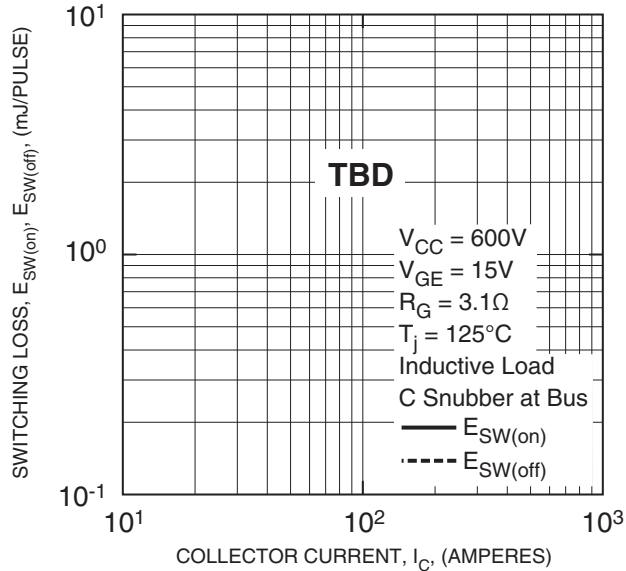


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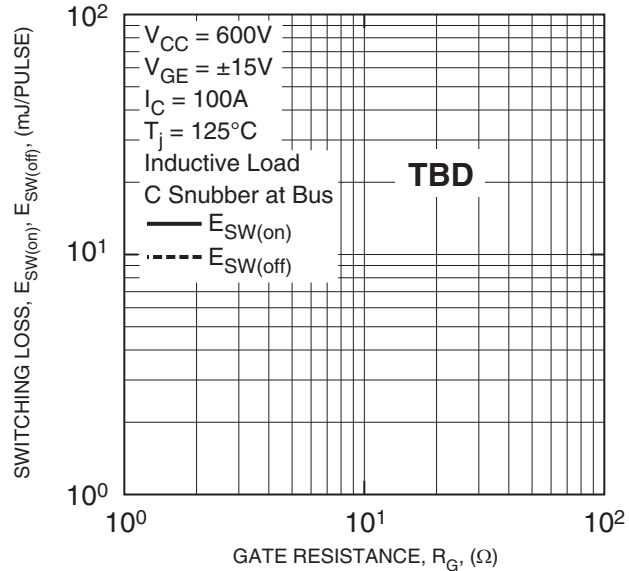
Split Dual Si/SiC Hybrid IGBT Module

150 Amperes/1200 Volts

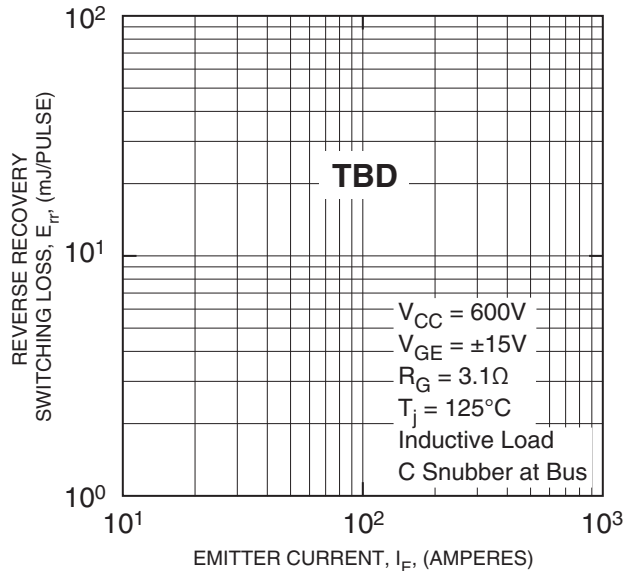
SWITCHING LOSS VS.
COLLECTOR CURRENT
(TYPICAL)



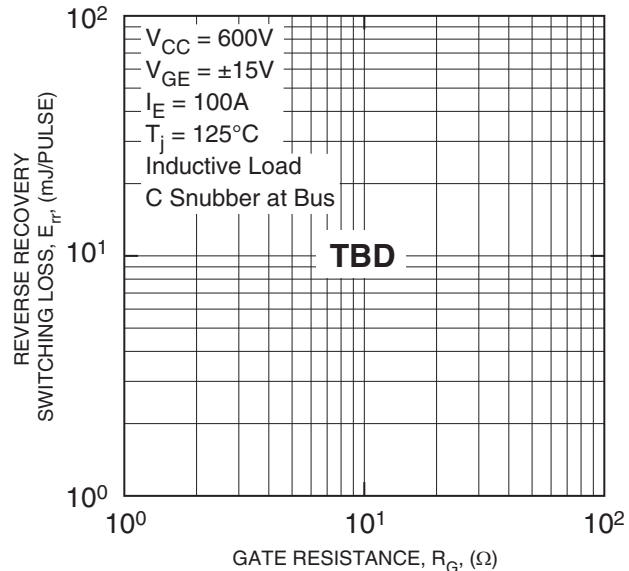
SWITCHING LOSS VS.
GATE RESISTANCE
(TYPICAL)



REVERSE RECOVERY SWITCHING LOSS VS.
EMITTER CURRENT
(TYPICAL)



REVERSE RECOVERY SWITCHING LOSS VS.
GATE RESISTANCE
(TYPICAL)



QID1215005

Split Dual Si/SiC Hybrid IGBT Module

150 Amperes/1200 Volts

