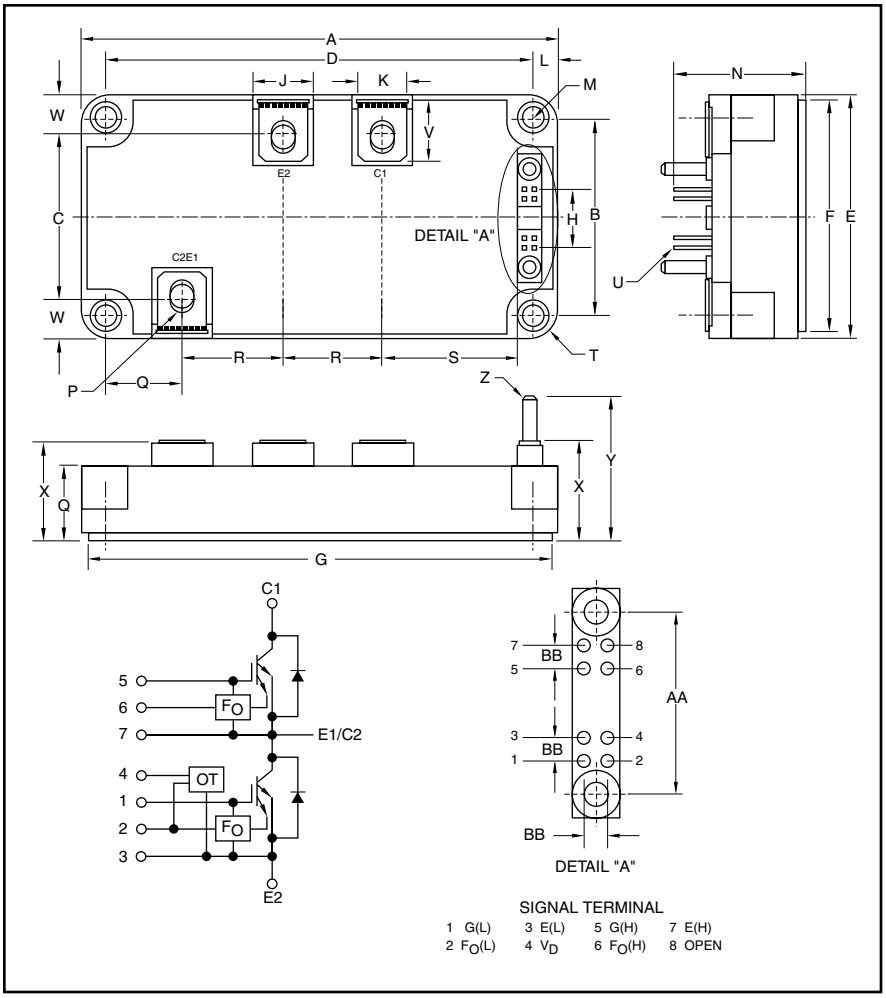
Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

Dual IGBTMOD™ Compact IGBT Series Module

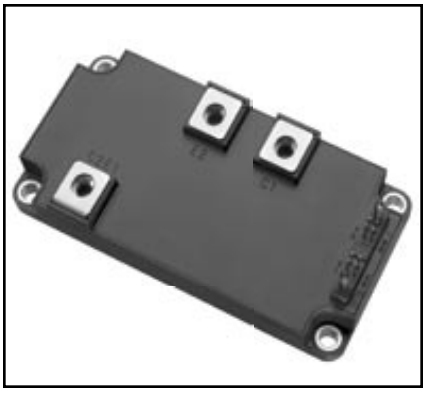
400 Amperes/600 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.80±0.04	122.0±1.0
B	1.97±0.01	50.0±0.3
C	1.61±0.03	41.0±0.8
D	4.33±0.01	110.0±0.3
E	2.44±0.04	62.0±1.0
F	2.32±0.02	59.0±0.5
G	4.69±0.02	119.0±0.5
H	0.60	15.24
J	0.63	16.0
K	0.51	13.0
L	0.24	6.0
M	0.22 Dia.	5.5 Dia.
N	1.42±0.03	36.0±0.8

Dimensions	Inches	Millimeters
P	M6	M6
Q	0.79±0.03	20.0±0.8
R	1.02±0.03	26.0±0.8
S	1.44±0.03	36.7±0.8
T	0.24 Rad.	6.0 Rad.
U	0.02	0.64
V	0.60	15.3
W	0.41±0.03	10.5±0.8
X	1.02 -0.01/+0.04	26.0-0.3/+1.0
Y	1.48 -0.02/+0.04	37.5-0.5/+1.0
Z	0.01 Dia.	3.0 Dia.
AA	1.00±0.023	25.4±0.6
BB	0.10	2.54



Description:
Powerex Dual IGBTMOD™ Compact IGBT Series Modules are designed for use in switching applications. Each module consists of two IGBT Transistors in a half-bridge configuration, with each transistor having a reverse-connected super-fast recovery free-wheel diode. All components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

Features:
- ☐ Over-Current and Over-Temperature Protection
- ☐ Low $V_{CE(sat)}$
- ☐ Isolated Baseplate for Easy Heat Sinking

Applications:
- ☐ AC Motor Control
- ☐ Motion/Servo Control
- ☐ UPS
- ☐ Welding Power Supplies
- ☐ Laser Power Supplies

Ordering Information:
Example: Select the complete part number from the table below -i.e. MG400J2YS61A is a 600V (V_{CES}), 400 Ampere Dual IGBTMOD™ Compact IGBT Series Module.

Type	Current Rating Amperes	V_{CES} Volts (x 10)
MG	400	60

MG400J2YS61A
Dual IGBTMOD™
Compact IGBT Series Module
400 Amperes/600 Volts

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

Characteristics	Symbol	MG400J2YS61A	Units
Power Device Junction Temperature	T_j	-20 to 150	°C
Storage Temperature	T_{stg}	-40 to 125	°C
Operating Temperature Range	T_{ope}	-20 ~ 100	°C
Mounting Torque, M5 Mounting Screws	—	31	in-lb
Mounting Torque, M6 Main Terminal Screws	—	40	in-lb
Module Weight (Typical)	—	375	Grams
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	V_{ISO}	2500	Volts

IGBT Inverter Sector

Collector-Emitter Voltage	V_{CES}	600	Volts
Gate-Emitter Voltage	V_{GES}	±20	Volts
Collector Current (T_C = 25°C)	I_C	400	Amperes
Peak Collector Current (T_C = 25°C)	I_{CP}	800	Amperes
Emitter Current (T_C = 25°C)	I_E	400	Amperes
Peak Emitter Current (T_C = 25°C)	I_{EM}	800	Amperes
Collector Dissipation (T_C = 25°C)	P_C	2160	Watts

IGBT Control Sector

Control Voltage (OT)	V_D	20	Volts
Fault Input Voltage	VF_O	20	Volts
Fault Input Current	IF_O	20	mA

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
IGBT Inverter Sector						
Gate Leakage Current	I_{GES}	V_{GE} = ±20V, V_{CE} = 0V	—	—	-4 / +3	mA
		V_{GE} = 10V, V_{CE} = 0V	—	—	100	nA
Collector-Emitter Cutoff Current	I_{CES}	V_{CE} = 600V, V_{GE} = 0V	—	—	1.0	mA
Gate-Emitter Cutoff Voltage	$V_{GE(off)}$	V_{CE} = 5V, I_C = 400mA	6.0	7.0	8.0	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C = 400A, T_j = 25°C	—	1.9	2.2	Volts
		V_{GE} = 15V, I_C = 400A, T_j = 125°C	—	—	2.5	Volts
Input Capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V, f = 1MHz	—	85	—	nF
Inductive Load	$t_{d(on)}$	V_{CC} = 300V, I_C = 400A, V_{GE} = ±15V, R_G = 7.5Ω	0.1	—	1.0	µs
Switching	t_{off}		—	—	2.0	µs
Times	t_f		—	—	0.25	µs
Reverse Recovery Time	t_{rr}		—	—	0.5	µs
Emitter-Collector Voltage	V_{EC}	I_E = 400A	—	1.8	2.2	Volts

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400 Amperes/600 Volts

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Control Sector						
Fault Output Current	O_C	V_{GE} = 15V	480	—	—	A
Over-Temperature	O_T	—	100	—	125	°C
Fault Output Delay Time	$t_{d(Fo)}$	V_{CC} = 300V, V_{GE} = ±15V	—	—	6.5	µs

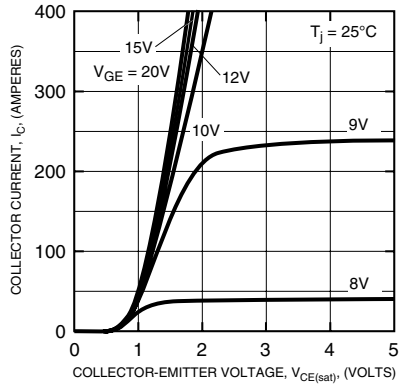
Thermal Characteristics

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	IGBT (Per 1/2 Module)	—	—	0.057	°C/Watt
	$R_{th(j-c)D}$	FWDi (Per 1/2 Module)	—	—	0.068	°C/Watt
Contact Thermal Resistance	$R_{th(c-f)}$	—	—	0.013	—	°C/Watt

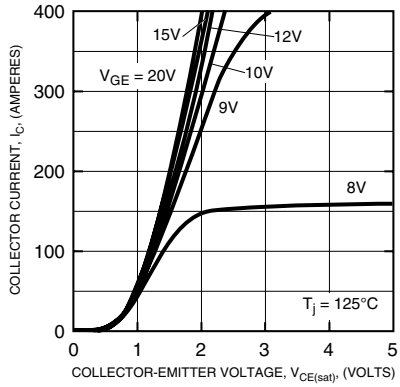
Recommended Conditions for Use

Characteristic	Symbol	Condition	Value	Units
Supply Voltage	V_{CC}	Applied across C1-E2 Terminals	≤375	Volts
Gate Voltage	V_{GE}	—	13.8 ~ 16	Volts
Gate Resistance	R_G	—	≥7.5	Ω
Switching Frequency	f_C	—	0 ~ 20	kHz

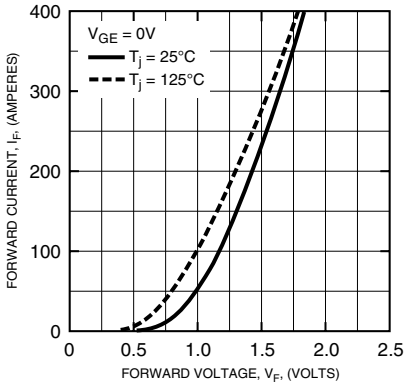
OUTPUT CHARACTERISTICS (TYPICAL)



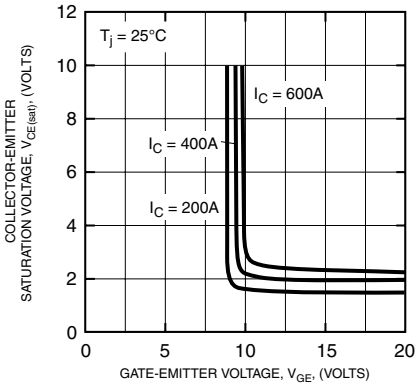
OUTPUT CHARACTERISTICS (TYPICAL)



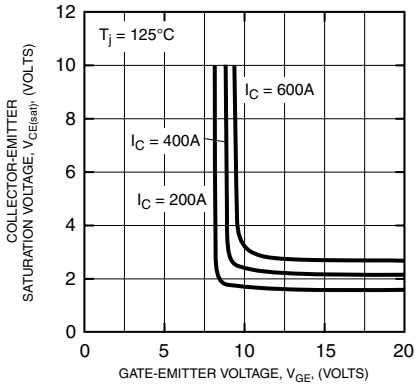
FREE-WHEEL DIODE CHARACTERISTICS (TYPICAL)



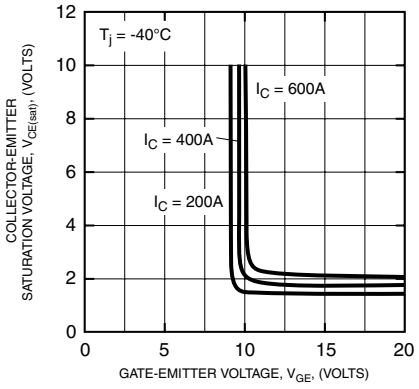
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)

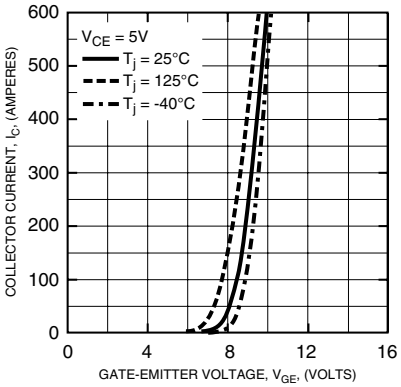


COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)

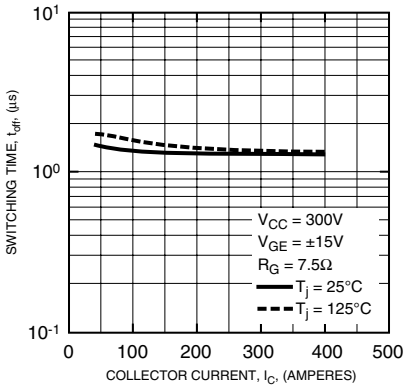


MG400J2YS61A
Dual IGBTMOD™
Compact IGBT Series Module
400 Amperes/600 Volts

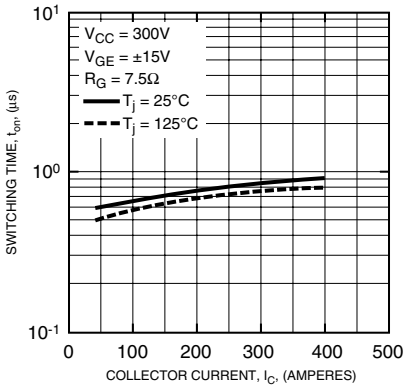
TRANSFER CHARACTERISTICS (TYPICAL)



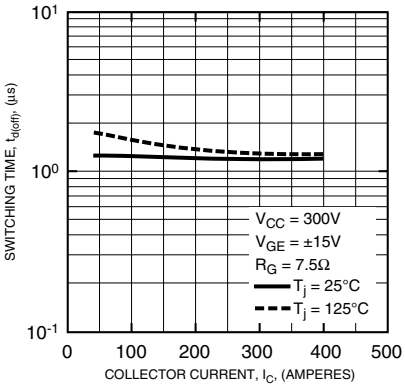
TURN-OFF TIME VS. COLLECTOR CURRENT (TYPICAL)



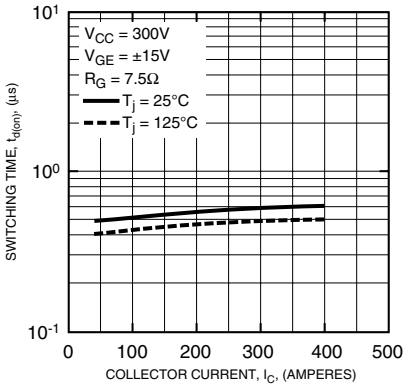
TURN-ON TIME VS. COLLECTOR CURRENT (TYPICAL)



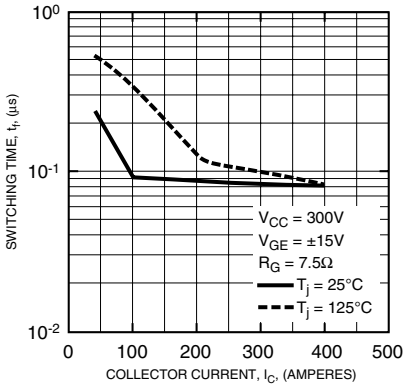
TURN-OFF DELAY TIME VS. COLLECTOR CURRENT (TYPICAL)



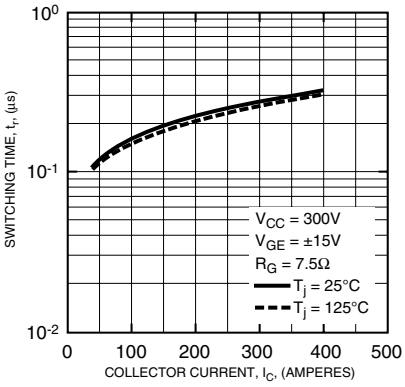
TURN-ON DELAY TIME VS. COLLECTOR CURRENT (TYPICAL)



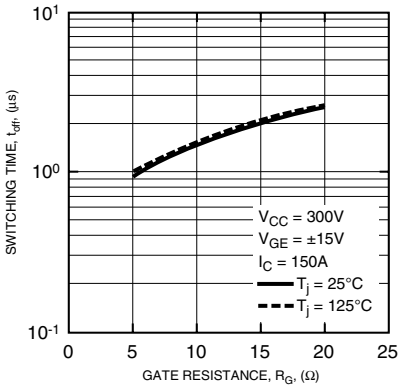
FALL TIME VS. COLLECTOR CURRENT (TYPICAL)



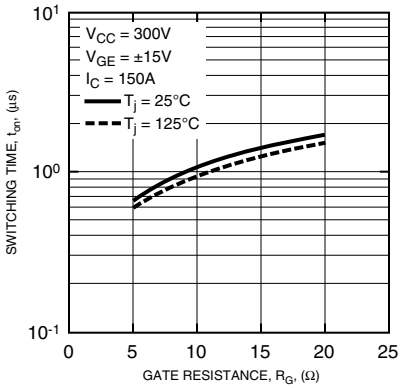
RISE TIME VS. COLLECTOR CURRENT (TYPICAL)



TURN-OFF TIME VS. GATE RESISTANCE (TYPICAL)



TURN-ON TIME VS. GATE RESISTANCE (TYPICAL)



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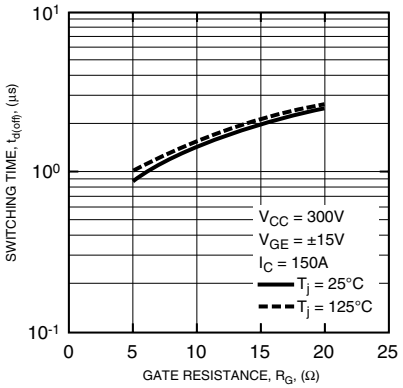
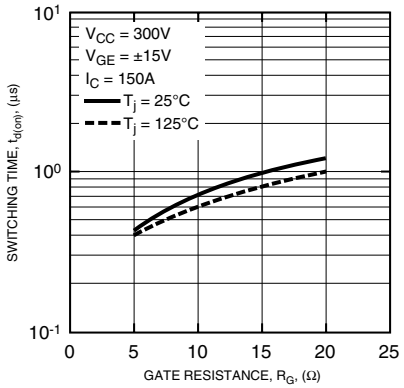
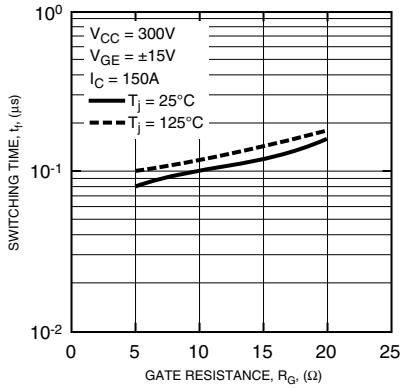
TURN-OFF DELAY TIME VS. GATE RESISTANCE (TYPICAL)



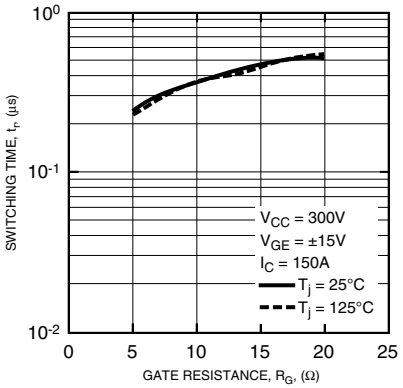
TURN-ON DELAY TIME VS. GATE RESISTANCE (TYPICAL)



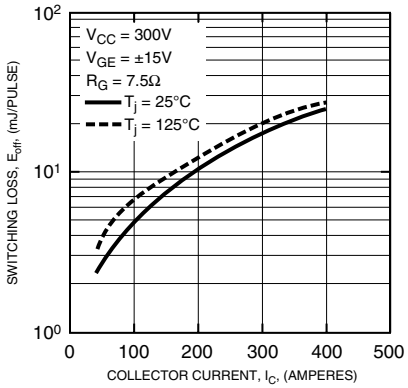
FALL TIME VS. GATE RESISTANCE (TYPICAL)



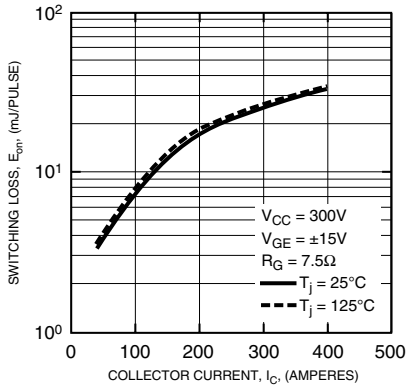
RISE TIME VS. GATE RESISTANCE (TYPICAL)



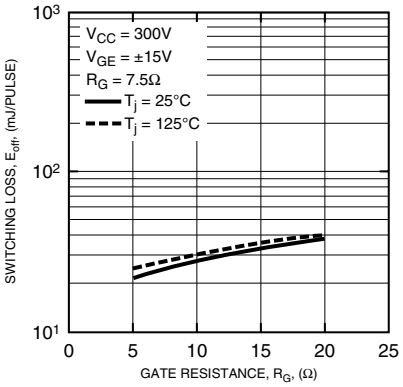
SWITCHING LOSS (OFF) VS. COLLECTOR CURRENT (TYPICAL)



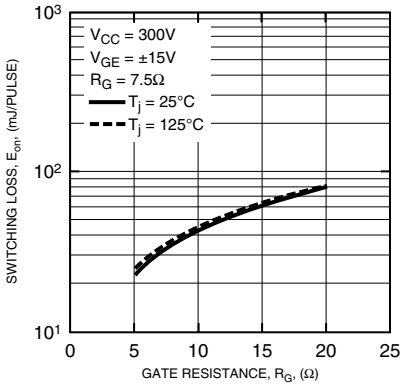
SWITCHING LOSS (ON) VS. COLLECTOR CURRENT (TYPICAL)



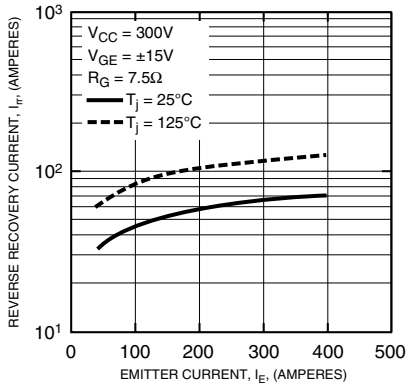
SWITCHING LOSS (OFF) VS. GATE RESISTANCE (TYPICAL)



SWITCHING LOSS (ON) VS. GATE RESISTANCE (TYPICAL)



REVERSE RECOVERY CURRENT (TYPICAL)



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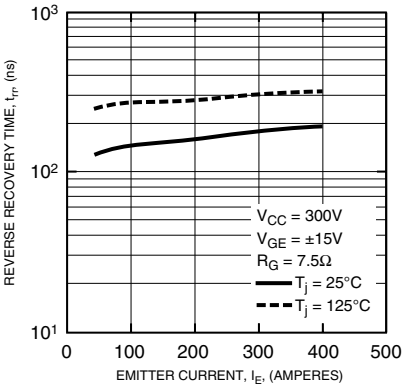
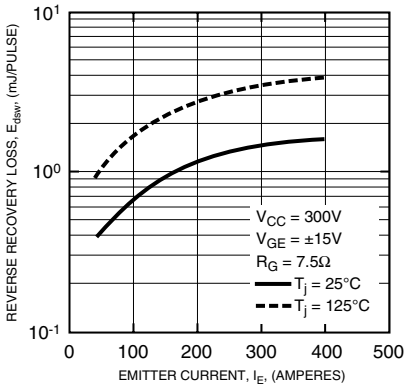
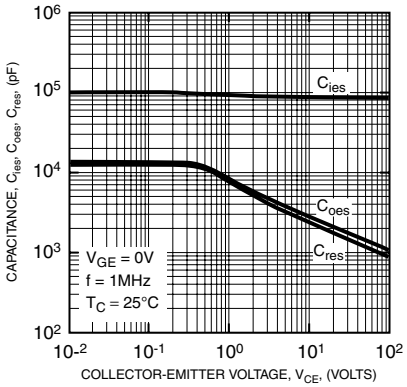
REVERSE RECOVERY TIME (TYPICAL)



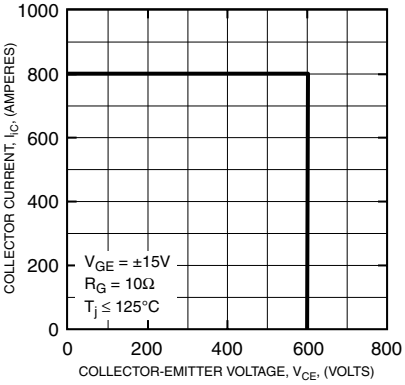
REVERSE RECOVERY LOSS VS. FORWARD CURRENT (TYPICAL)



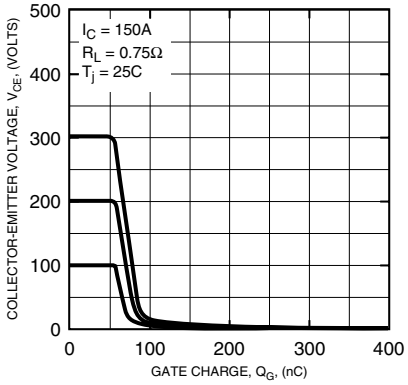
CAPACITANCE VS. COLLECTOR-EMITTER VOLTAGE (TYPICAL)



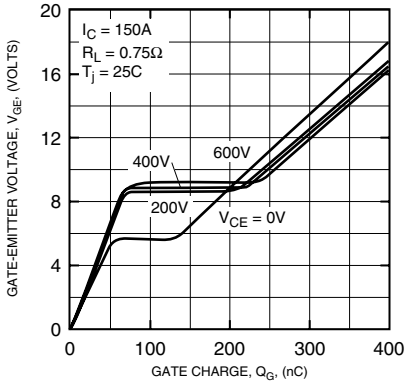
REVERSE BIAS SAFE OPERATION AREA (TYPICAL)



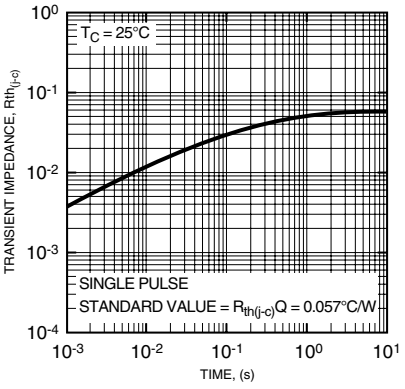
COLLECTOR-EMITTER VOLTAGE VS. GATE CHARGE (TYPICAL)



GATE-EMITTER VOLTAGE VS. GATE CHARGE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi)