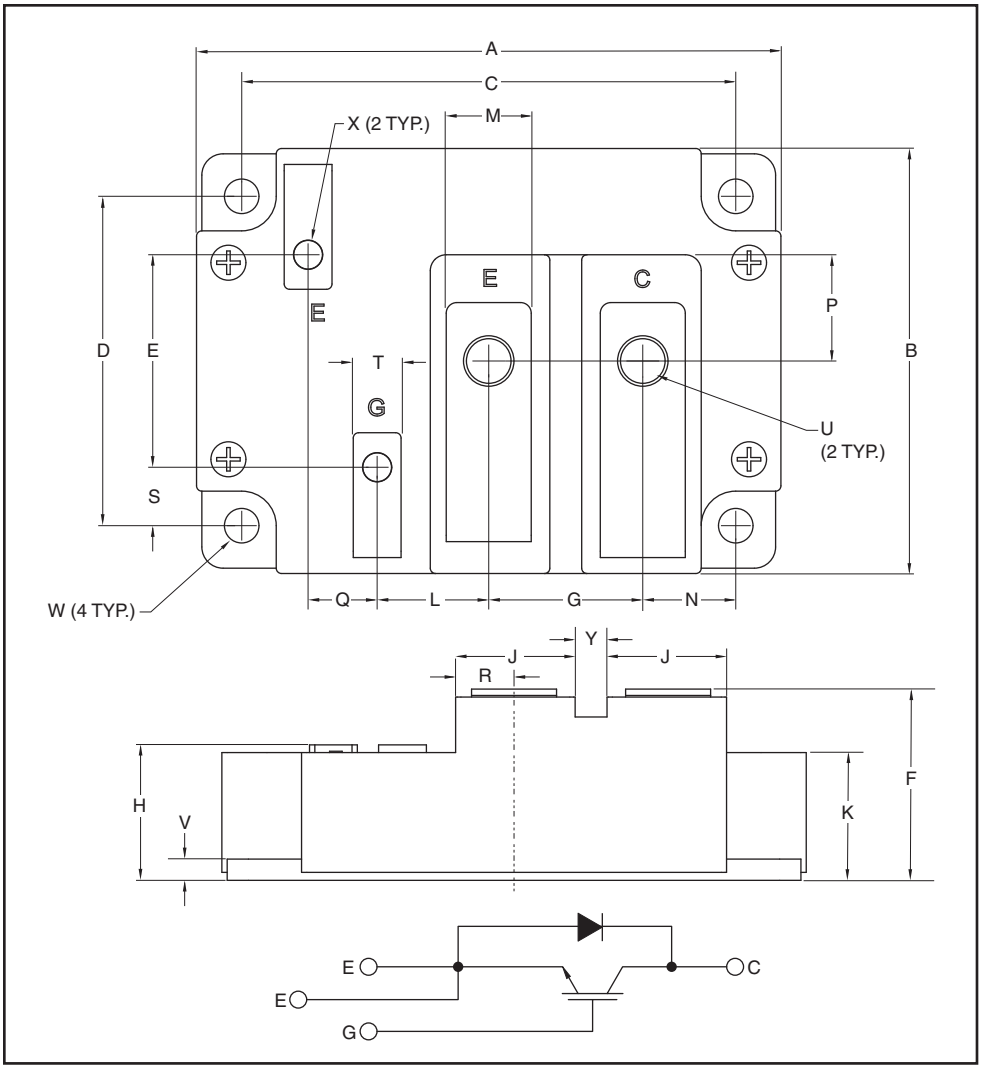
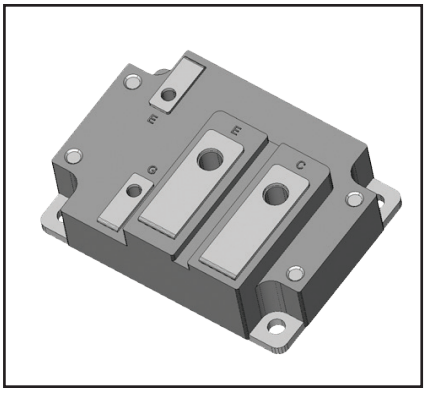
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
www.pwrx.com

Single IGBT Module
600 Amperes/1700 Volts

Note: All electrical characteristics scaled from 300A module CM300DX-34SA.





Description:
Powerex IGBT Modules are designed for use in switching applications. Each module consists of one IGBT Transistor in a single configuration with 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:
- ☐ Low Drive Power
- ☐ Low $V_{CE(sat)}$
- ☐ Discrete Super-Fast Recovery Free-Wheel Diode
- ☐ Isolated Baseplate for Easy Heat Sinking

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

Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.33	110.0
B	3.15	80.0
C	3.66±0.008	93.0±0.25
D	2.44±0.008	62.0±0.25
E	1.57	40.0
F	1.42 Max.	36.0 Max.
G	1.14	29.0
H	1.00 Max.	25.5 Max.
J	0.89	22.5
K	0.93	23.5
L	0.83	21.0
M	0.63	16.0

Dimensions	Inches	Millimeters
N	0.69	17.5
P	0.79	20.0
Q	0.51	13.0
R	0.43	11.0
S	0.43	11.0
T	0.35	9.0
U	M8 Metric	M8
V	0.16	4.0
W	0.256 Dia.	6.5 Dia.
X	M4 Metric	M4
Y	0.24	6.0

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

Characteristics	Symbol	Rating	Units
Collector-Emitter Voltage (V_{GE} = 0V)	V_{CES}	1700	Volts
Gate-Emitter Voltage (V_{CE} = 0V)	V_{GES}	±20	Volts
Collector Current (DC, T_C = TBD°C)*2,*4	I_C	600	Amperes
Collector Current (Pulse, Repetitive)*3	I_{CRM}	1200	Amperes
Total Power Dissipation (T_C = 25°C)*2,*4	P_{tot}	4660	Watts
Emitter Current (T_C = TBD°C)*2,*4	I_E*1	600	Amperes
Emitter Current (Pulse, Repetitive)*3	I_{ERM}*1	1200	Amperes
Maximum Junction Temperature	$T_{j(max)}$	175	°C
Maximum Case Temperature*2	$T_{C(max)}$	125	°C
Operating Junction Temperature	$T_{j(op)}$	-40 to +150	°C
Storage Temperature	T_{stg}	-40 to +125	°C
Isolation Voltage (Terminals to Baseplate, RMS, f = 60Hz, AC 1 minute)	V_{ISO}	3500	Volts

*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).
*2 Case temperature (T_C) and heatsink temperature (T_s) is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. The heatsink thermal resistance should be measured just under the chips.
*3 Pulse width and repetition rate should be such that device junction temperature (T_j) does not exceed $T_{j(max)}$ rating.
*4 Junction temperature (T_j) should not increase beyond maximum junction temperature ($T_{j(max)}$) rating.

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Electrical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Emitter Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V	—	—	2	mA
Gate-Emitter Leakage Current	I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	—	—	1.0	µA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 60mA, V_{CE} = 10V	5.4	6.0	6.6	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 600A, V_{GE} = 15V, T_j = 25°C*6	—	2.0	2.5	Volts
		I_C = 600A, V_{GE} = 15V, T_j = 125°C*6	—	2.2	—	Volts
		I_C = 600A, V_{GE} = 15V, T_j = 150°C*6	—	2.25	—	Volts
Input Capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V	—	—	104	nF
Output Capacitance	C_{oes}		—	—	4.4	nF
Reverse Transfer Capacitance	C_{res}		—	—	1.04	nF
Gate Charge	Q_G	V_{CC} = 1000V, I_C = 600A, V_{GE} = 15V	—	3312	—	nC
Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 1000V, I_C = 600A, V_{GE} = ±15V, R_G = 0Ω, Inductive Load	—	TBD	—	ns
Rise Time	t_r		—	TBD	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	TBD	—	ns
Fall Time	t_f		—	TBD	—	ns
Emitter-Collector Voltage	V_{EC}*1	I_E = 600A, V_{GE} = 0V, T_j = 25°C*6	—	4.1	5.3	Volts
		I_E = 600A, V_{GE} = 0V, T_j = 125°C*6	—	2.9	—	Volts
		I_E = 600A, V_{GE} = 0V, T_j = 150°C*6	—	2.7	—	Volts
Reverse Recovery Time	t_{rr}*1	V_{CC} = 1000V, I_E = 600A, V_{GE} = ±15V, R_G = 0Ω, Inductive Load	—	—	300	ns
Reverse Recovery Charge	Q_{rr}*1		—	28	—	µC
Turn-on Switching Energy per Pulse	E_{on}	V_{CC} = 1000V, I_C = I_E = 600A, V_{GE} = ±15V, R_G = 0Ω, T_j = 150°C, Inductive Load	—	76	—	mJ
Turn-off Switching Energy per Pulse	E_{off}		—	160	—	mJ
Reverse Recovery Energy per Pulse	E_{rr}*1		—	138	—	mJ
Internal Lead Resistance	$R_{CC' + EE'}$	Main Terminals-Chip, T_C = 25°C*2	—	—	TBD	mΩ
Internal Gate Resistance	r_g		—	0.85	—	Ω

*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).
*2 Case temperature (T_C) and heatsink temperature (T_S) is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. The heatsink thermal resistance should be measured just under the chips.
*6 Pulse width and repetition rate should be such as to cause negligible temperature rise.

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Electrical Characteristics, T_j = 25°C unless otherwise specified (continued)

Thermal Resistance Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case*2	$R_{th(j-c)}Q$	Per Inverter IGBT	—	26.8	—	K/kW
Thermal Resistance, Junction to Case*2	$R_{th(j-c)}D$	Per Inverter FWDi	—	37.9	—	K/kW
Contact Thermal Resistance, Case to Heatsink*2	$R_{th(c-f)}$	Thermal Grease Applied	—	15	—	K/kW

Mechanical Characteristics

Mounting Torque		Mounting to Terminal, M8 Screw	—	—	95	in-lb
		Mounting to Terminal, M4 Screw	—	—	15	in-lb
		Mounting to Heatsink, M6 Screw	—	—	40	in-lb
Creepage Distance	d_s	Terminal to Terminal	18	—	—	mm
		Terminal to Baseplate	20	—	—	mm
Clearance	d_a	Terminal to Terminal	13	—	—	mm
		Terminal to Baseplate	20	—	—	mm
Weight	m		—	600	—	Grams
Flatness of Baseplate	e_c	On Centerline X, Y	-100	—	+100	µm

Recommended Operating Conditons, T_a = 25°C

(DC) Supply Voltage	V_{CC}	Applied Across C-E	—	1000	1200	Volts
Gate (-Emitter Drive) Voltage	$V_{GE(on)}$	Applied Across G-E	13.5	15.0	16.5	Volts
External Gate Resistance	R_G	Per Switch	0	—	13.5	Ω

*2 Case temperature (T_C) and heatsink temperature (T_s) is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. The heatsink thermal resistance should be measured just under the chips.

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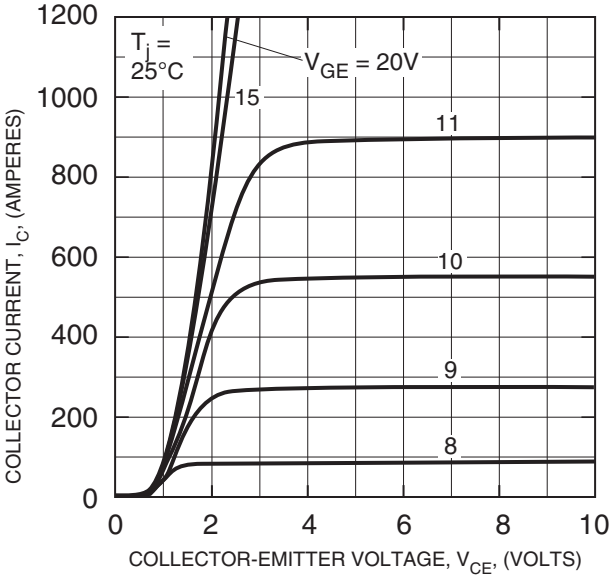
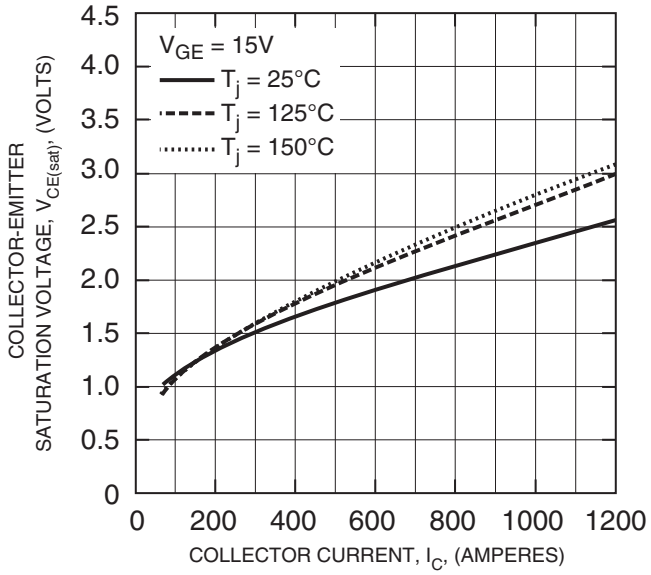
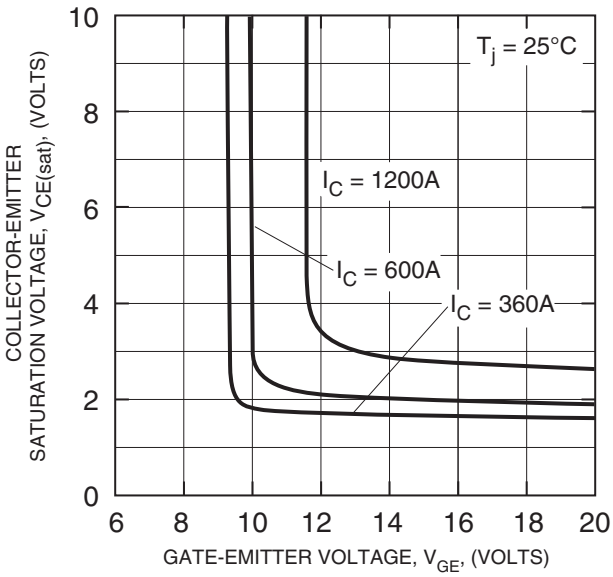
OUTPUT CHARACTERISTICS (CHIP - TYPICAL)



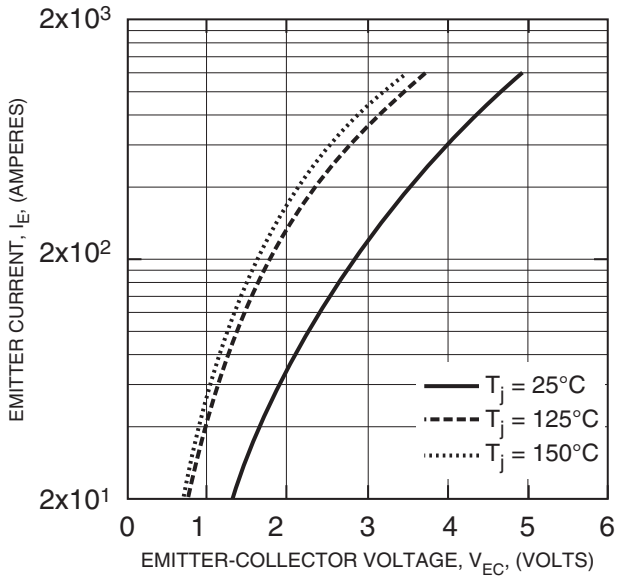
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (CHIP - TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (CHIP - TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (CHIP - TYPICAL)



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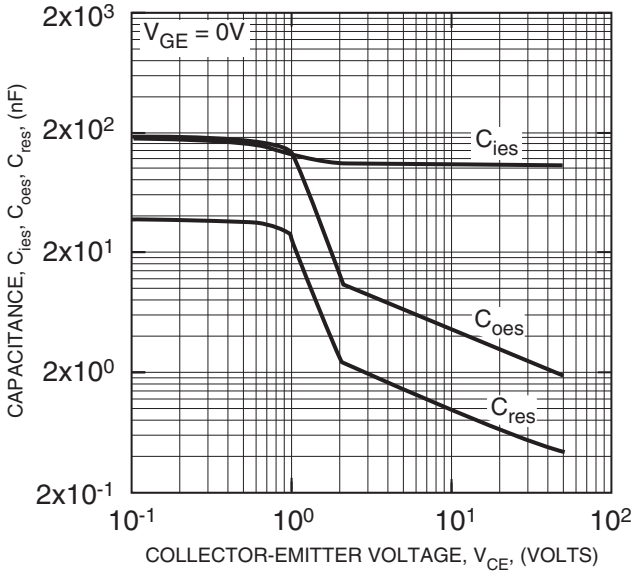
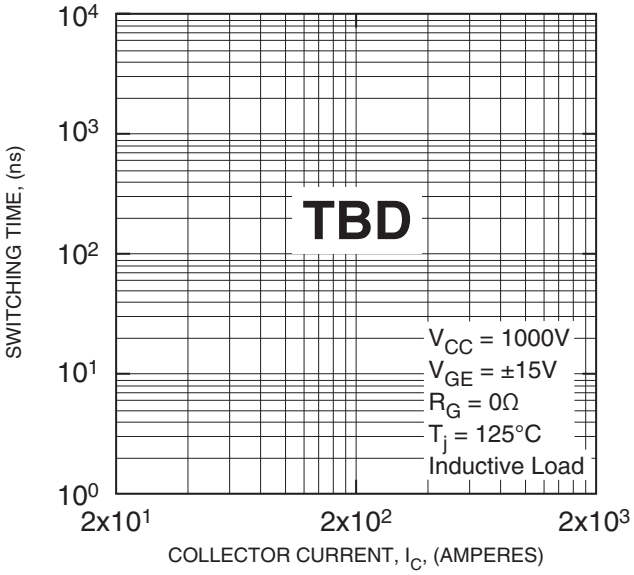
CAPACITANCE VS. V_{CE} (TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



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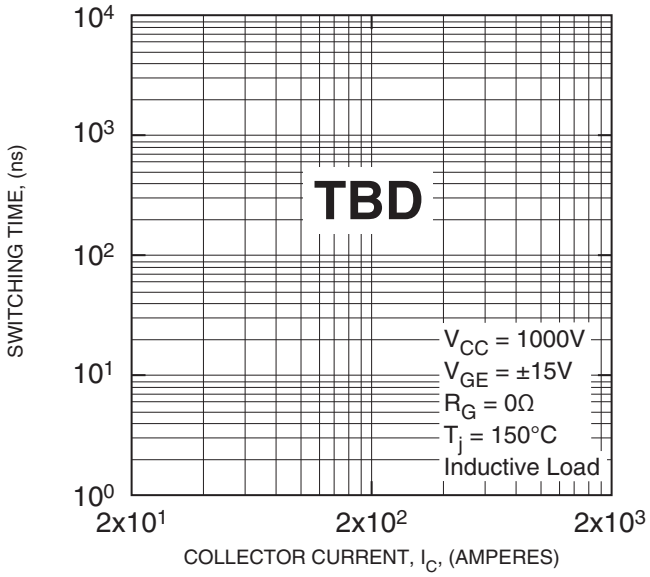
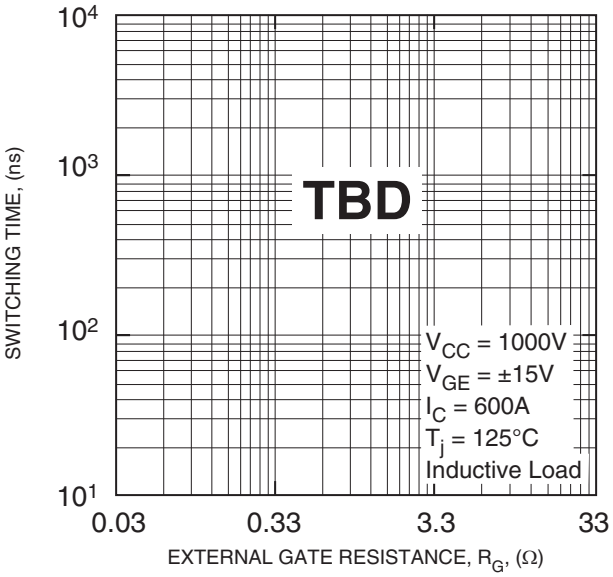


SWITCHING TIME VS. GATE RESISTANCE (TYPICAL)



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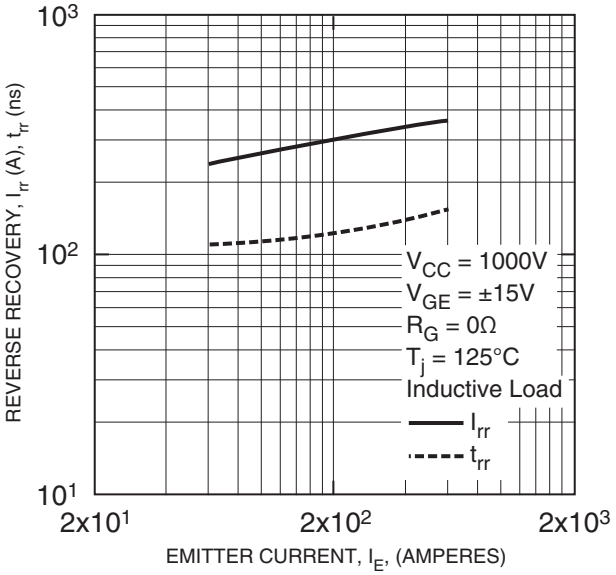
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



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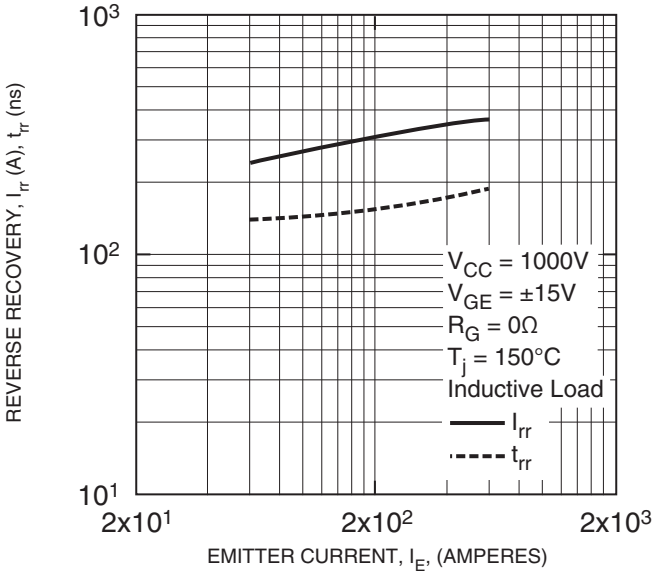
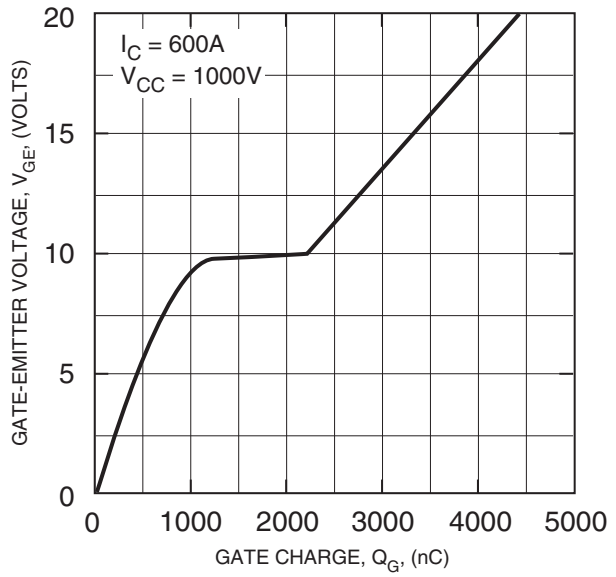
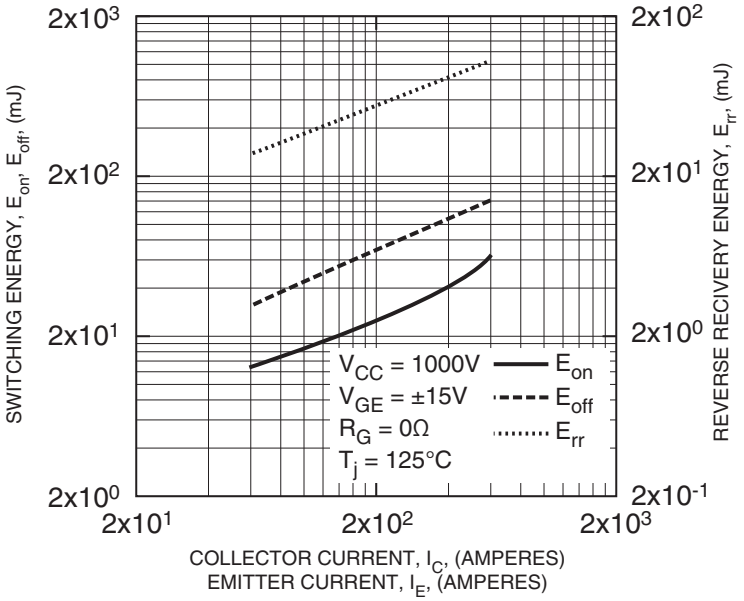


GATE CHARGE VS. V_{GE} (TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



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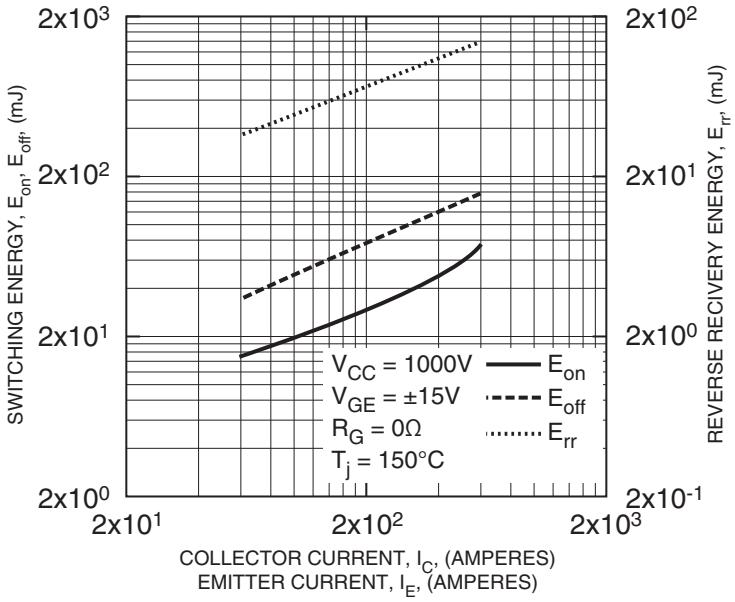

TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (TYPICAL)