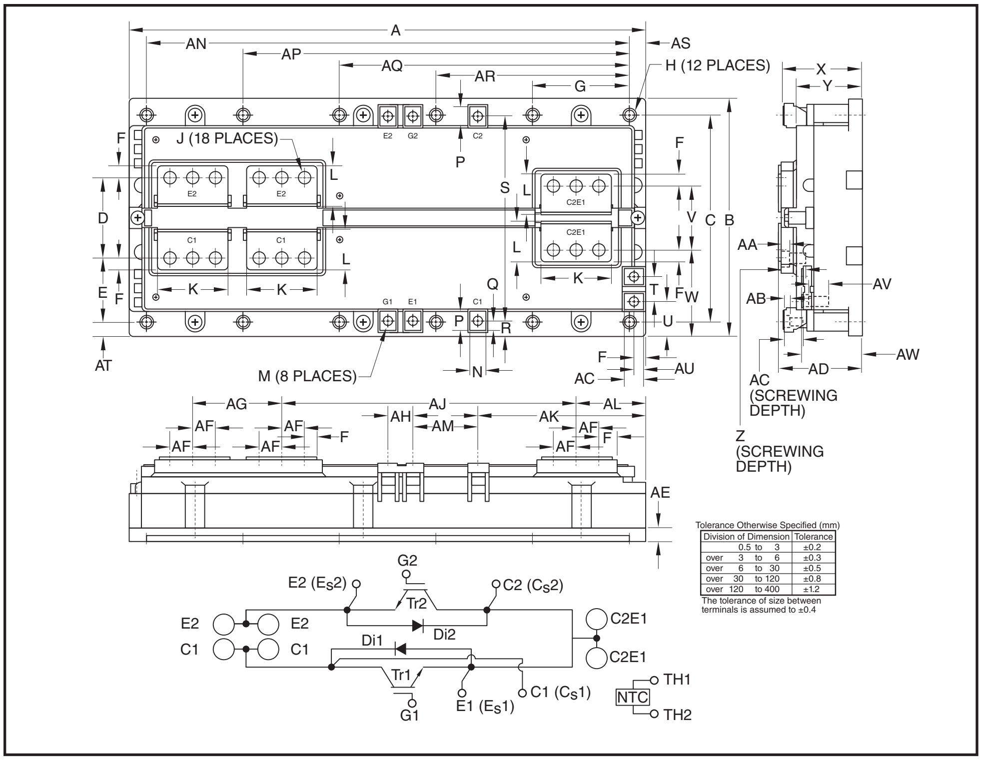
POWEREX

CM1800DY-34S

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

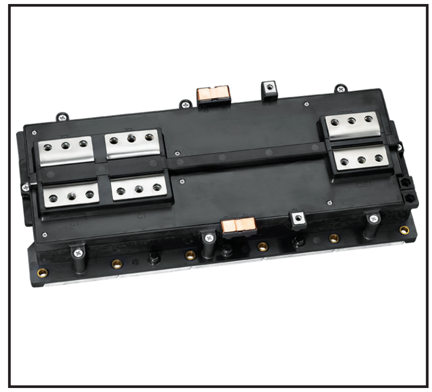
Dual Half-Bridge IGBT HVIGBT Series Module
1800 Amperes/1700 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	12.2	310.0
B	5.6	142.5
C	4.96	126.0
D	1.89	48.0
E	1.85	46.9
F	0.28	7.0
G	2.28	58.0
H	0.21±0.004 Dia.	5.5±0.1 Dia.
J	M6 Metric	M6
K	1.65	42.0
L	0.91	23.0
M	M4 Metric	M4
N	0.35	9.0
P	0.47	11.9
Q	0.21	5.4
R	0.33	8.5
S	4.92	125.0
T	0.6	15.0
U	0.83	21.0
V	1.5	38.0
W	2.04	51.9
X	1.85+0.04/-0.02	47.1+1.0/-0.5
Y	1.55	39.4

Dimensions	Inches	Millimeters
Z	0.63	16.0
AA	0.24	6.2
AB	0.16	4.0
AC	0.45	11.5
AD	2.01+0.04/-0.02	51.0+1.0/-0.5
AE	0.32	8.2
AF	0.55	14.0
AG	2.05	52.0
AH	0.59	15.0
AJ	7.01	178.0
AK	3.98	101.0
AL	1.63	41.5
AM	1.54	39.0
AN	11.42	290.0
AP	9.13	232.0
AQ	6.85	174.0
AR	4.56	116.0
AS	0.39	10.0
AT	0.03	8.0
AU	0.02	5.0
AV	0.16	4.0
AW	1.425+0.04/-0.02	36.2+1.0/-0.5



Description:
Powerex IGBT 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:
- ☐ Low Drive Power
- ☐ Low $V_{CE(sat)}$
- ☐ Discrete Super-Fast Recovery Free-Wheel Diode
- ☐ Isolated Baseplate for Easy Heat Sinking
- ☐ NTC Thermistor

Applications:
- ☐ AC Motor Control
- ☐ Motion/Servo Control
- ☐ Photovoltaic/Wind
- ☐ UPS Inverter

Ordering Information:
Example: Select the complete module number you desire from the table below -i.e. CM1800DY-34S is a 1700V (V_{CES}), 1800 Ampere Dual Half-Bridge IGBT HVIGBT Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	1800	34

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

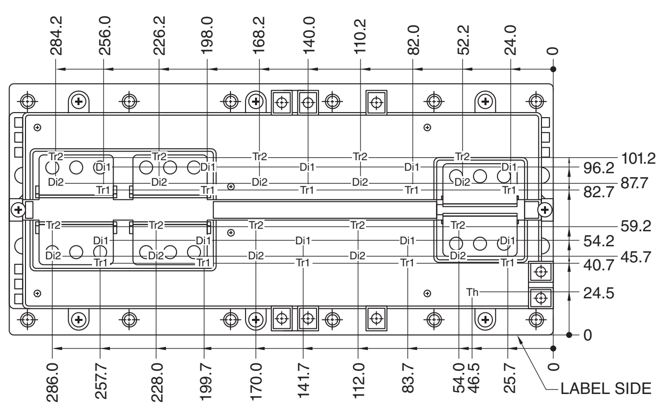
Inverter Part IGBT/FWDi

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 = 105°C)*2,*4	I_C	1800	Amperes
Collector Current (Pulse, Repetitive)*3	I_{CRM}	3600	Amperes
Total Maximum Power Dissipation (T_C = 25°C)*2,*4	P_{tot}	11535	Watts
Emitter Current (DC)*2	I_E*1	1800	Amperes
Emitter Current (Pulse, Repetitive)*3	I_{ERM}*1	3600	Amperes

Module

Characteristics	Symbol	Rating	Units
Isolation Voltage (Terminals to Baseplate, RMS, f = 60Hz, AC 1 minute)	V_{ISO}	4000	V
Maximum Junction Temperature, Instantaneous Event (Overload)	$T_{j(max)}$	175	°C
Maximum Case Temperature*4	$T_{C(max)}$	125	°C
Operating Junction Temperature, Continuous Operation (Under Switching)	$T_{j(opr)}$	-40 ~ 150	°C
Storage Temperature	T_{stg}	-40 ~ 125	°C

*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).
*2 Junction temperature (T_j) should not increase beyond maximum junction temperature ($T_{j(max)}$) rating.
*3 Pulse width and repetition rate should be such that device junction temperature (T_j) does not exceed $T_{j(max)}$ rating.
*4 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. Refer to the figure to the right for chip location. The heatsink thermal resistance should be measured just under the chips.



Each mark points to the center position of each chip.

Tr1 / Tr2: IGBT Di1 / Di2: FWDi Th: NTC Thermistor

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Electrical Characteristics, T_j = 25°C unless otherwise specified

Inverter Part IGBT/FWDi

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Emitter Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V	—	—	1.0	mA
Gate-Emitter Leakage Current	I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	—	—	5.0	µA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 180mA, V_{CE} = 10V	5.4	6.0	6.6	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 1800A, V_{GE} = 15V, T_j = 25°C*5	—	2.20	2.70	Volts
	(Terminal)	I_C = 1800A, V_{GE} = 15V, T_j = 125°C*5	—	2.40	—	Volts
		I_C = 1800A, V_{GE} = 15V, T_j = 150°C*5	—	2.45	—	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 1800A, V_{GE} = 15V, T_j = 25°C*5	—	2.10	2.60	Volts
	(Chip)	I_C = 1800A, V_{GE} = 15V, T_j = 125°C*5	—	2.30	—	Volts
		I_C = 1800A, V_{GE} = 15V, T_j = 150°C*5	—	2.35	—	Volts
Input Capacitance	C_{ies}		—	—	460	nF
Output Capacitance	C_{oes}	V_{CE} = 10V, V_{GE} = 0V	—	—	48	nF
Reverse Transfer Capacitance	C_{res}		—	—	8.0	nF
Gate Charge	Q_G	V_{CC} = 1000V, I_C = 1800A, V_{GE} = 15V	—	8400	—	nC
Turn-on Delay Time	$t_{d(on)}$		—	—	1100	ns
Rise Time	t_r	V_{CC} = 1000V, I_C = 1800A, V_{GE} = ±15V,	—	—	200	ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 0Ω, Inductive Load	—	—	950	ns
Fall Time	t_f		—	—	500	ns
Emitter-Collector Voltage	V_{EC}*1	I_E = 1800A, V_{GE} = 0V, T_j = 25°C*5	—	2.00	2.50	Volts
	(Terminal)	I_E = 1800A, V_{GE} = 0V, T_j = 125°C*5	—	2.10	—	Volts
		I_E = 1800A, V_{GE} = 0V, T_j = 150°C*5	—	2.05	—	Volts
Emitter-Collector Voltage	V_{EC}*1	I_E = 1800A, V_{GE} = 0V, T_j = 25°C*5	—	1.90	2.40	Volts
	(Chip)	I_E = 1800A, V_{GE} = 0V, T_j = 125°C*5	—	2.00	—	Volts
		I_E = 1800A, V_{GE} = 0V, T_j = 150°C*5	—	1.95	—	Volts
Reverse Recovery Time	t_{rr}*1	V_{CC} = 1000V, I_E = 1800A, V_{GE} = ±15V	—	—	350	ns
Reverse Recovery Charge	Q_{rr}*1	R_G = 0Ω, Inductive Load	—	80	—	µC
Turn-on Switching Energy per Pulse	E_{on}	V_{CC} = 1000V, $I_C = I_E$ = 1800A,	—	722.8	—	mJ
Turn-off Switching Energy per Pulse	E_{off}	V_{GE} = ±15V, R_G = 0Ω,	—	509.5	—	mJ
Reverse Recovery Energy per Pulse	E_{rr}*1	T_j = 150°C, Inductive Load	—	509.2	—	mJ
Internal Lead Resistance	$R_{CC' + EE'}$	Main Terminals-Chip, Per Switch, T_C = 25°C*4	—	0.11	—	mΩ
Internal Gate Resistance	r_g	Per Switch	—	1.1	—	Ω

*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).
*4 Case temperature (T_C) and heatsink temperature (T_s) are measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips.
Refer to the figure on page 1 for chip location.
The heatsink thermal resistance should be measured just under the chips.
*5 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)

NTC Thermistor Part

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Zero Power Resistance	R_{25}	T_C = 25°C*4	4.85	5.00	5.15	kΩ
Deviation of Resistance	ΔR/R	T_C = 100°C, R_{100} = 493Ω*4	-7.3	—	+7.8	%
B Constant	$B_{(25/50)}$	Approximate by Equation*6	—	3375	—	K
Power Dissipation	P_{25}	T_C = 25°C*4	—	—	10	mW

Thermal Resistance Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case*4	$R_{th(j-c)}Q$	Per IGBT	—	—	13	K/kW
Thermal Resistance, Junction to Case*4	$R_{th(j-c)}D$	Per FWDi	—	—	22	K/kW
Contact Thermal Resistance, Case to Heatsink*4	$R_{th(c-f)}$	Thermal Grease Applied (Per 1 Module)*7	—	3.1	—	K/kW

Mechanical Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Mounting Torque	M_t	Main Terminals, M6 Screw	31	35	40	in-lb
		Auxiliary Terminals, M4 Screw	12	13	15	in-lb
	M_s	Mounting, M5 Screw	22	27	31	in-lb
Creepage Distance	d_s	Terminal to Terminal	16	—	—	mm
		Terminal to Baseplate	25	—	—	mm
Clearance	d_a	Terminal to Terminal	16	—	—	mm
		Terminal to Baseplate	24	—	—	mm
Weight	m		—	2	—	kg
Flatness of Baseplate	e_c	On Centerline X, Y*8	-50	—	+100	μm

Recommended Operating Conditions, T_a = 25°C

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
DC Supply Voltage	V_{CC}	Applied Across C1-E2	—	1000	1200	Volts
Gate-Emitter Drive Voltage	$V_{GE(on)}$	Applied Across G1-Es1 / G2-Es2	13.5	15.0	16.5	Volts
External Gate Resistance	R_G	Per Switch	0	—	2	Ω

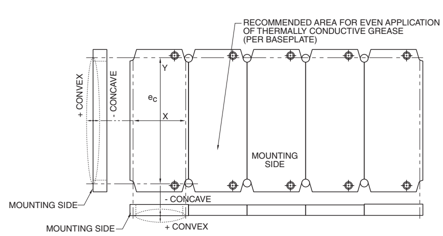
*4 Case temperature (T_C) and heatsink temperature (T_s) is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. Refer to the figure to the right for chip location. The heatsink thermal resistance should be measured just under the chips.

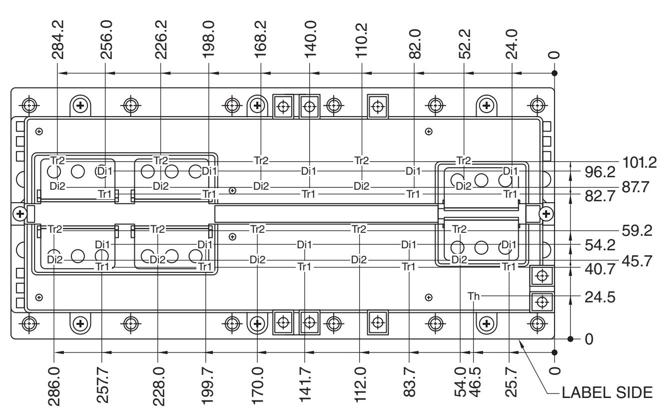
*6 $B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) / \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$

R_{25}; Resistance at Absolute Temperature T_{25} [K]; T_{25} = 25 [°C] + 273.15 = 298.15 [K]
R_{50}; Resistance at Absolute Temperature T_{50} [K]; T_{50} = 50 [°C] + 273.15 = 323.15 [K]

*7 Typical value is measured by using thermally conductive grease of λ = 0.9 [W/(m • K)].

*8 Baseplate (mounting side) flatness measurement points (X, Y) are shown in the figure below.





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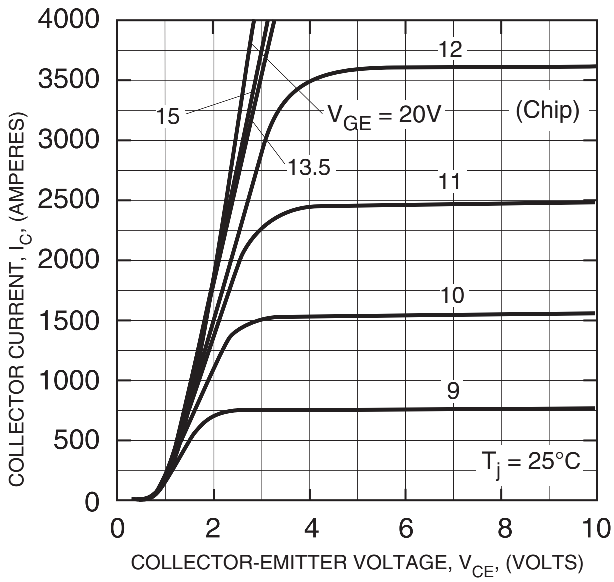
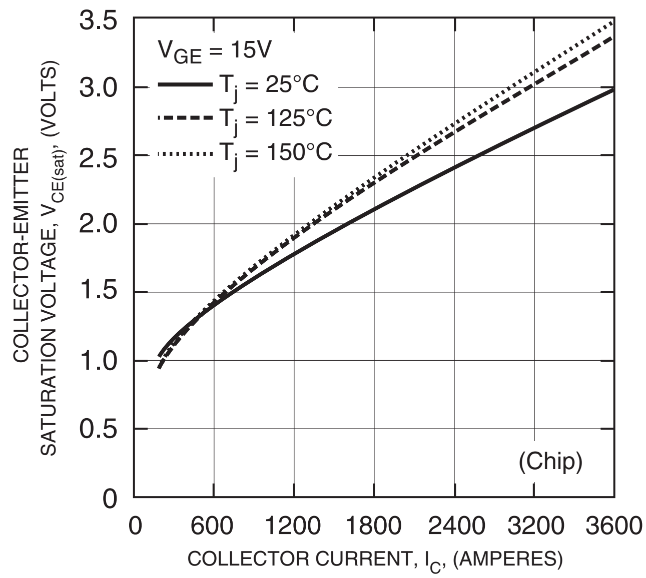
OUTPUT CHARACTERISTICS (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



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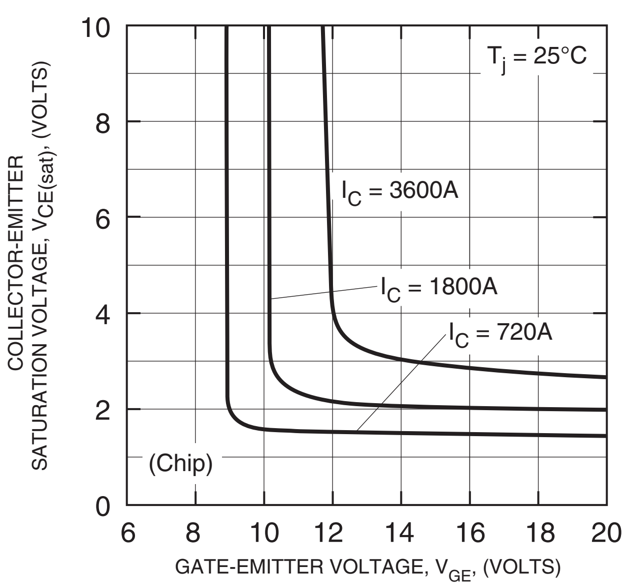
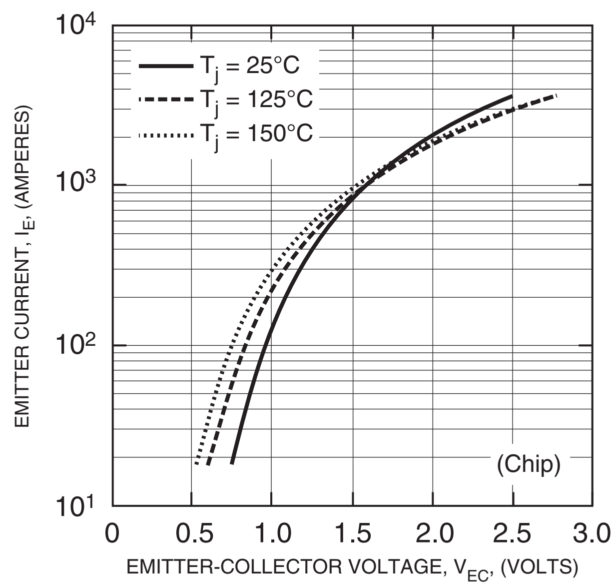


FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



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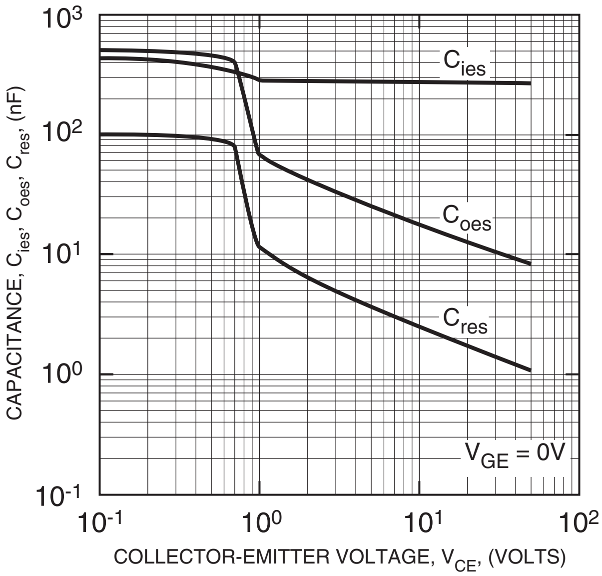
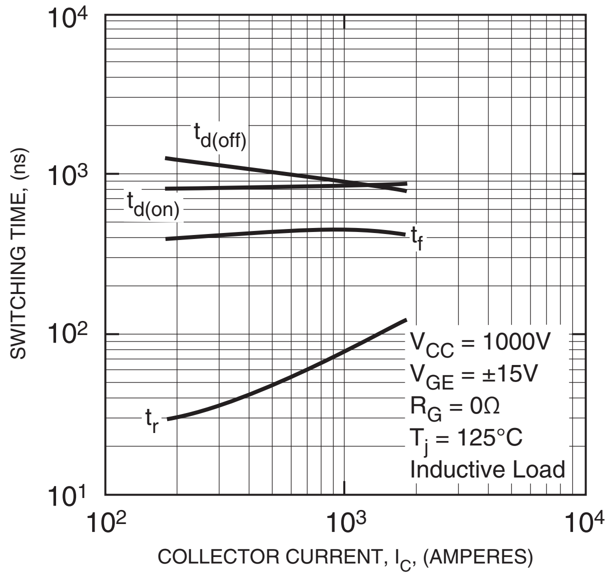
CAPACITANCE VS. V_{CE}
(TYPICAL)



HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)



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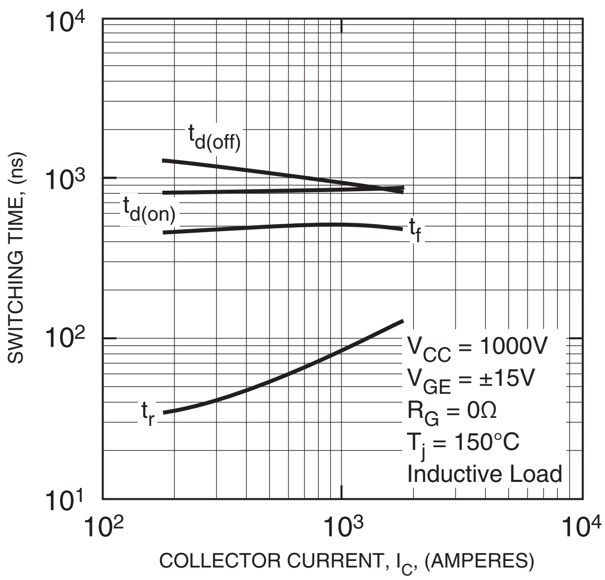
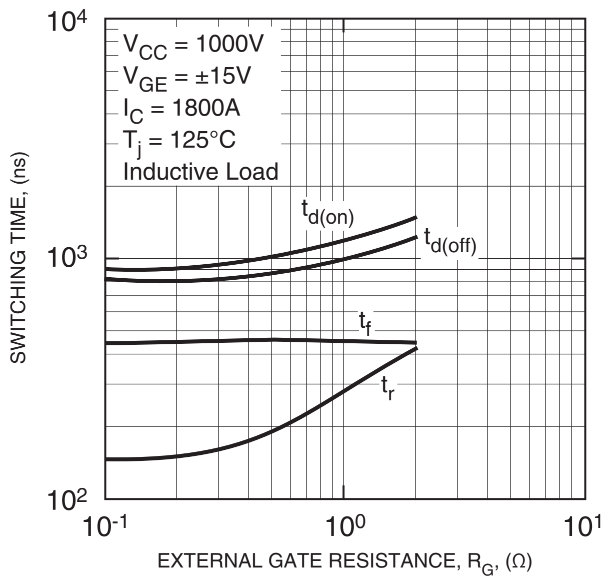


SWITCHING TIME VS.
GATE RESISTANCE
(TYPICAL)



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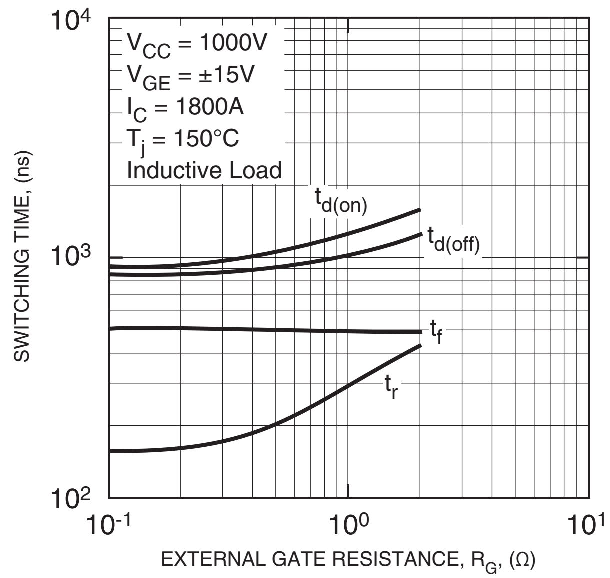
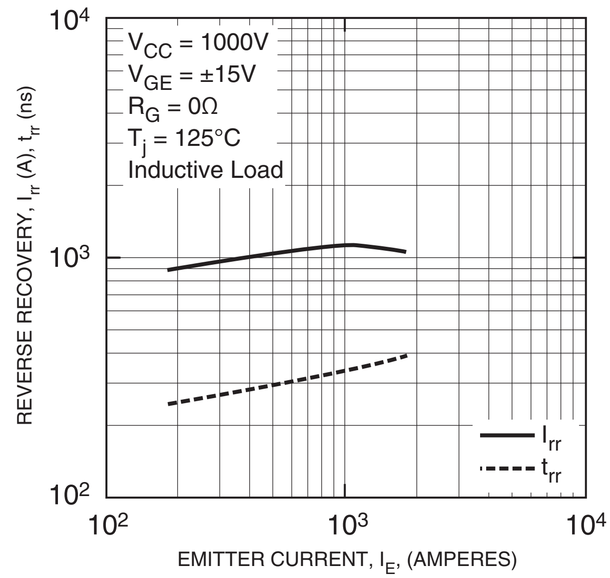
SWITCHING TIME VS. GATE RESISTANCE (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



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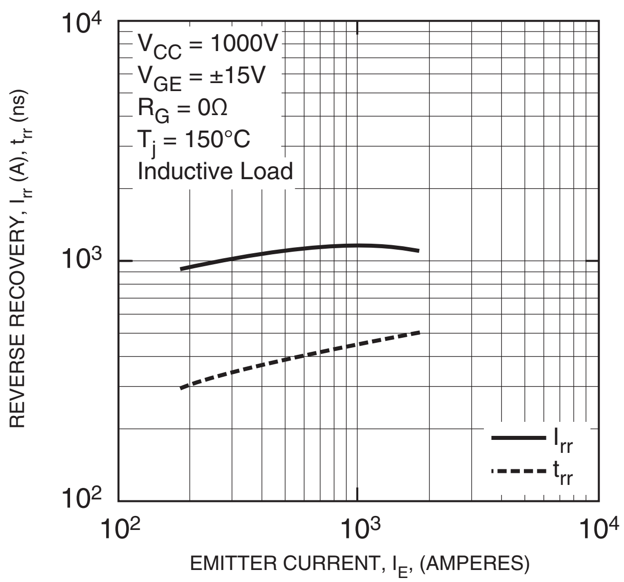
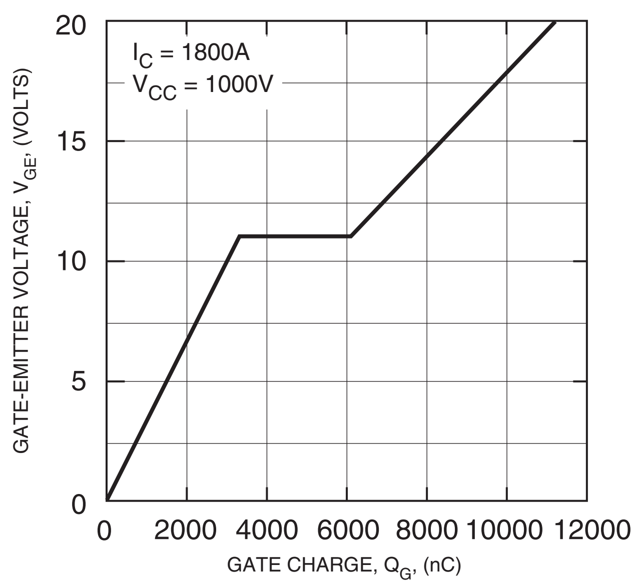


GATE CHARGE VS. V_{GE}



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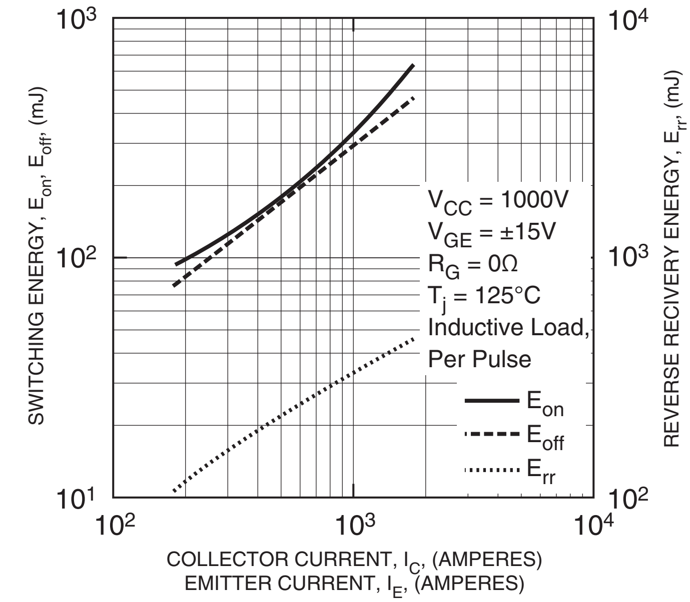
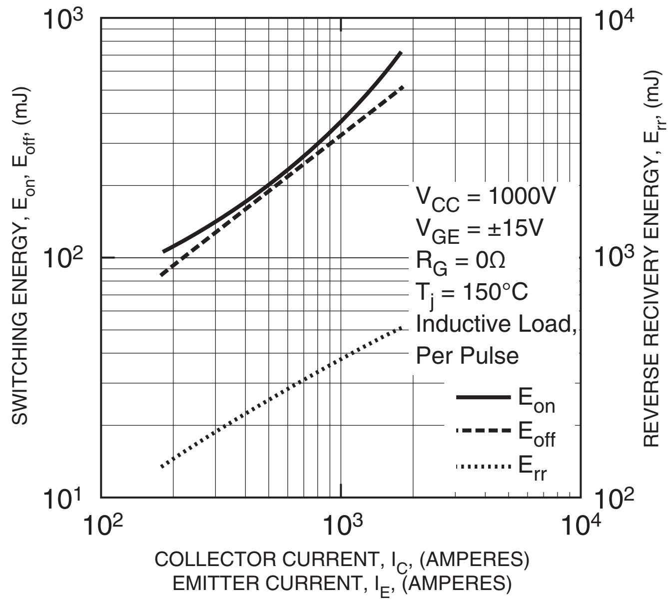
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



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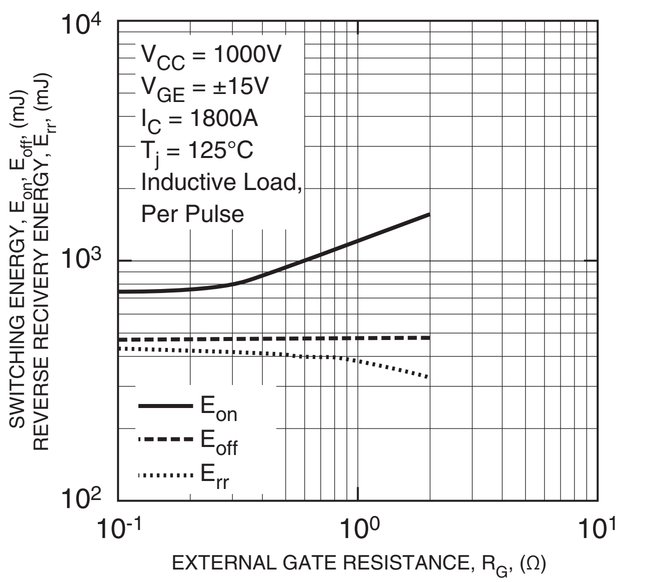

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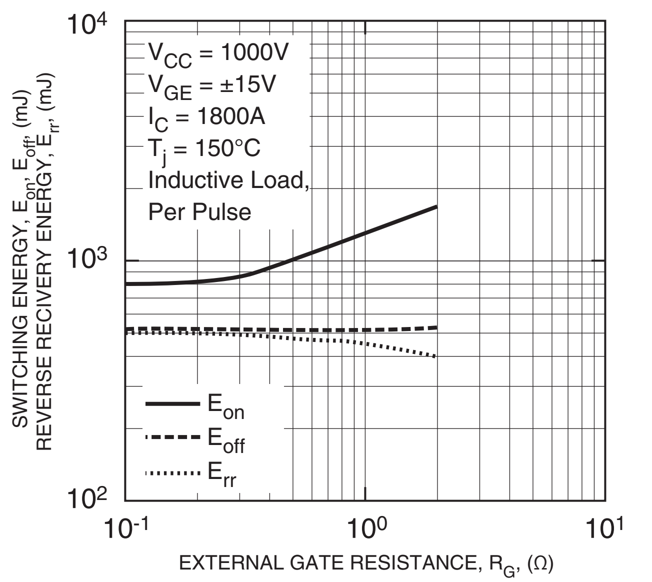

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