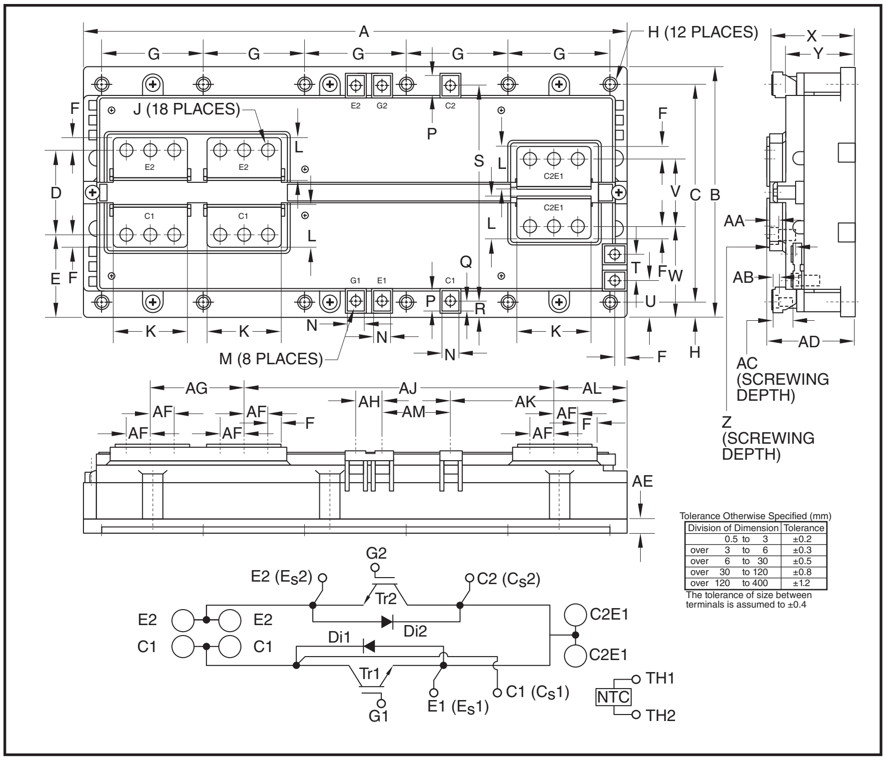
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
www.pwrx.com

Dual Half-Bridge IGBTMOD™ HVIGBT Series Module

2500 Amperes/1200 Volts



Tolerance Otherwise Specified (mm)

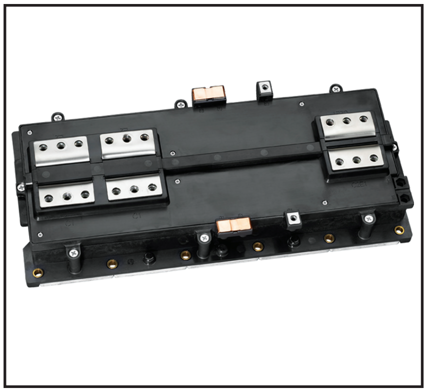
Division of Dimension	Tolerance
0.5 to 3	±0.2
over 3 to 6	±0.3
over 6 to 30	±0.5
over 30 to 120	±0.8
over 120 to 400	±1.2

The tolerance of size between terminals is assumed to ±0.4

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	M6
K	1.65	42.0
L	0.91	23.0
M	M4	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

Dimensions	Inches	Millimeters
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
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



Description:

Powerex IGBTMOD™ 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 IGBTMOD™ HVIGBT Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	2500	24

CM2500DY-24S
Dual Half-Bridge IGBTMOD™ HVIGBT Module
2500 Amperes/1200 Volts

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}	1200	Volts
Gate-Emitter Voltage (V_{CE} = 0V)	V_{GES}	±20	Volts
Collector Current (DC, T_C = 83°C)[*2,*4]	I_C	2500	Amperes
Collector Current (Pulse, Repetitive)[*3]	I_{CRM}	5000	Amperes
Total Maximum Power Dissipation (T_C = 25°C)[*2,*4]	P_{tot}	11535	Watts
Emitter Current, Free Wheeling Diode Forward Current (T_C = 25°C)[*2]	I_E[*1]	2500	Amperes
Emitter Current, Free Wheeling Diode Forward Current (Pulse, repetitive)[*3]	I_{ERM}[*1]	5000	Amperes

Module

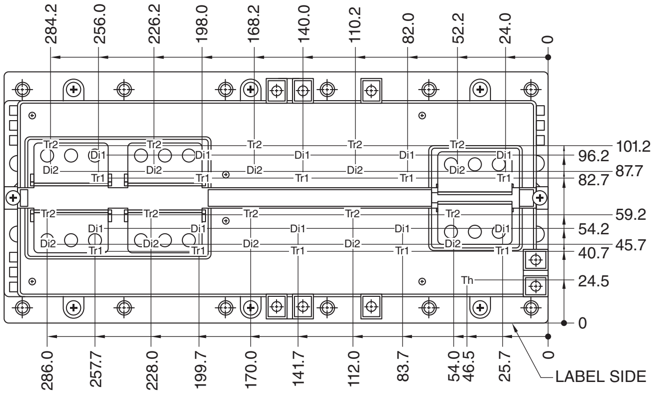
Characteristics	Symbol	Rating	Units
Isolation Voltage (Terminals to Baseplate, f = 60Hz, AC 1 minute)	V_{ISO}	4000	V
Maximum Junction Temperature	$T_{j(max)}$	175	°C
Maximum Case Temperature[*4]	$T_{C(max)}$	125	°C
Operating Junction Temperature	$T_{j(opr)}$	-40 to +150	°C
Storage Temperature	T_{stg}	-40 to +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

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	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 = 45mA, V_{CE} = 10V	5.4	6.0	6.6	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 2500A, V_{GE} = 15V, T_j = 25°C*5	—	1.80	2.25	Volts
	(Terminal)	I_C = 2500A, V_{GE} = 15V, T_j = 125°C*5	—	2.00	—	Volts
		I_C = 2500A, V_{GE} = 15V, T_j = 150°C*5	—	2.05	—	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 2500A, V_{GE} = 15V, T_j = 25°C*5	—	1.70	2.15	Volts
	(Chip)	I_C = 2500A, V_{GE} = 15V, T_j = 125°C*5	—	1.90	—	Volts
		I_C = 2500A, V_{GE} = 15V, T_j = 150°C*5	—	1.95	—	Volts
Input Capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V	—	—	250	nF
Output Capacitance	C_{oes}		—	—	50	nF
Reverse Transfer Capacitance	C_{res}		—	—	4.2	nF
Gate Charge	Q_G	V_{CC} = 600V, I_C = 2500A, V_{GE} = 15V	—	5800	—	nC
Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 600V, I_C = 2500A, V_{GE} = ±15V, R_G = 0Ω, Inductive Load	—	—	800	ns
Rise Time	t_r		—	—	200	ns
Turn-off Delay Time	$t_{d(off)}$		—	—	700	ns
Fall Time	t_f		—	—	300	ns
Emitter-Collector Voltage	V_{EC}*1	I_E = 2500A, V_{GE} = 0V, T_j = 25°C*5	—	1.80	2.25	Volts
	(Terminal)	I_E = 2500A, V_{GE} = 0V, T_j = 125°C*5	—	1.80	—	Volts
		I_E = 2500A, V_{GE} = 0V, T_j = 150°C*5	—	1.80	—	Volts
Emitter-Collector Voltage	V_{EC}*1	I_E = 2500A, V_{GE} = 0V, T_j = 25°C*5	—	1.70	2.15	Volts
	(Chip)	I_E = 2500A, V_{GE} = 0V, T_j = 125°C*5	—	1.70	—	Volts
		I_E = 2500A, V_{GE} = 0V, T_j = 150°C*5	—	1.70	—	Volts
Reverse Recovery Time	t_{rr}*1	V_{CC} = 600V, I_E = 2500A, V_{GE} = ±15V R_G = 0Ω, Inductive Load	—	—	300	ns
Reverse Recovery Charge	Q_{rr}*1		—	70	—	μC
Turn-on Switching Energy per Pulse	E_{on}	V_{CC} = 600V, I_C = I_E = 2500A, V_{GE} = ±15V, R_G = 0Ω, T_j = 150°C, Inductive Load	—	(TBD)	—	mJ
Turn-off Switching Energy per Pulse	E_{off}		—	(TBD)	—	mJ
Reverse Recovery Energy per Pulse	E_{rr}*1		—	(TBD)	—	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.

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

Thermal Resistance, Junction to Case^{*4}	$R_{th(j\text{-}c)}Q$	Per IGBT	—	—	13	K/kW
Thermal Resistance, Junction to Case^{*4}	$R_{th(j\text{-}c)}D$	Per FWDi	—	—	22	K/kW
Contact Thermal Resistance, Case to Heatsink^{*4}	$R_{th(c\text{-}f)}$	Thermal Grease Applied (Per 1/2 Module)^{*7}	—	3.1	—	K/kW

Mechanical Characteristics

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		—	2000	—	Grams
Flatness of Baseplate	e_c	On Centerline X, Y^{*8}	-50	—	+100	µm

Recommended Operating Conditons, T_a = 25°C

DC Supply Voltage	V_{CC}	Applied Across P-N Terminals	—	600	850	Volts
Gate-Emitter Drive Voltage	$V_{GE(on)}$	Applied Across G-E Terminals	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.

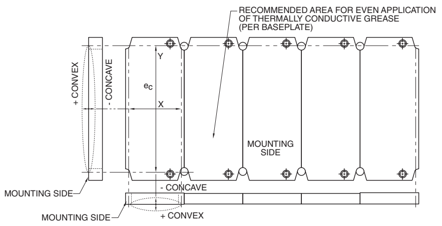
*6 $B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right)/\left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$

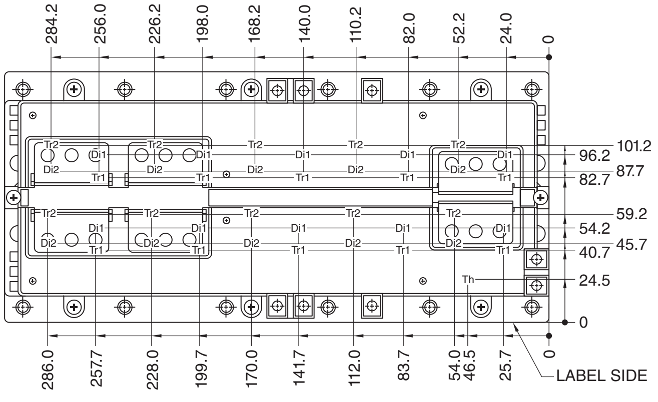
R_{25}; Resistance at Absolute Temperature T_{25} [K]; T_{25} = 25 [°C] + 273.15 = 298.15 [K]

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

CM2500DY-24S
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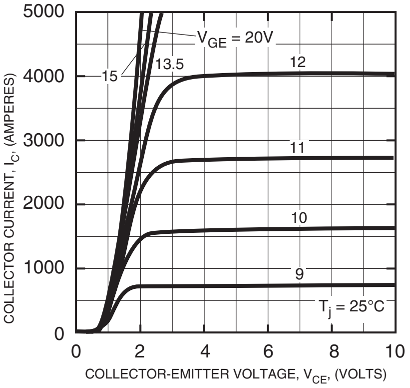
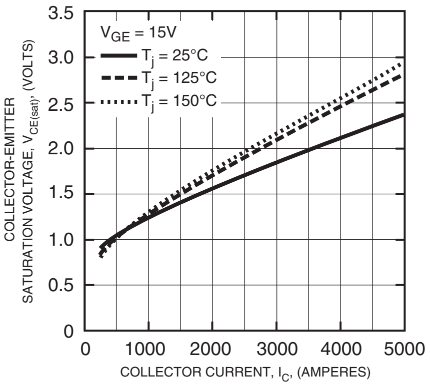
2500 Amperes/1200 Volts

OUTPUT CHARACTERISTICS
(TYPICAL)



COLLECTOR-EMITTER
SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL)



COLLECTOR-EMITTER
SATURATION VOLTAGE CHARACTERISTICS
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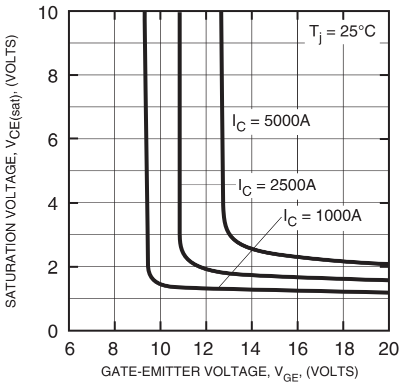
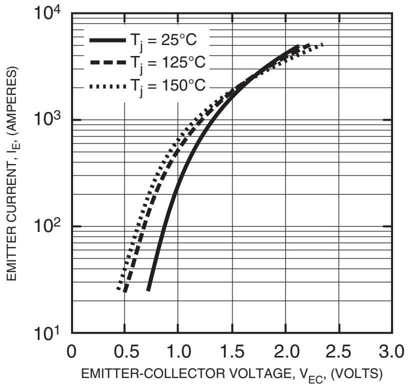
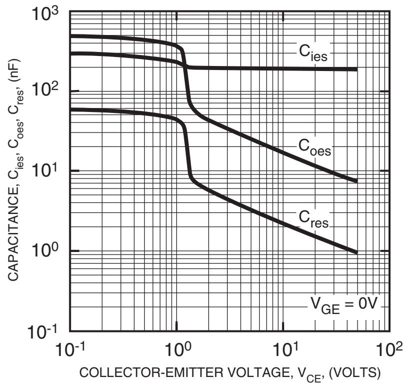


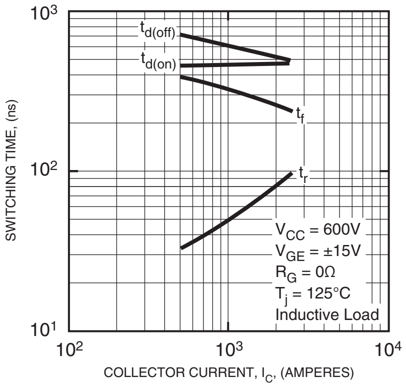
FREE-WHEEL DIODE
FORWARD CHARACTERISTICS
(TYPICAL)



CAPACITANCE VS. V_{CE}
(TYPICAL)



HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)



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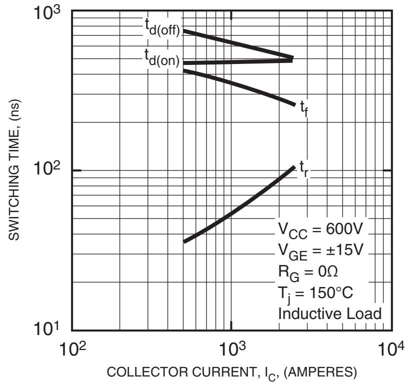
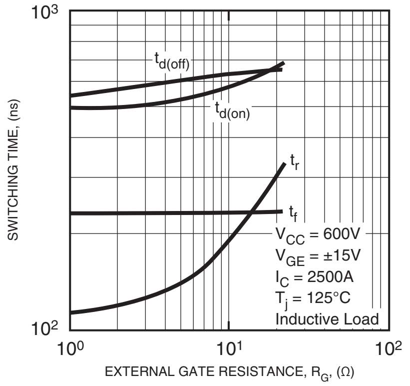


SWITCHING TIME VS.
GATE RESISTANCE
(TYPICAL)



SWITCHING TIME VS.
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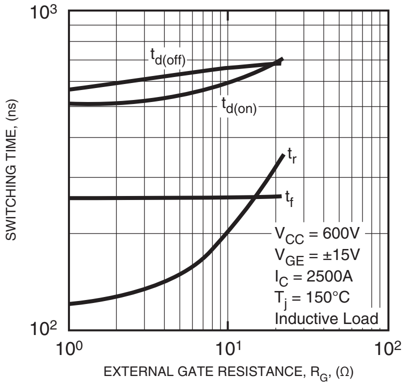
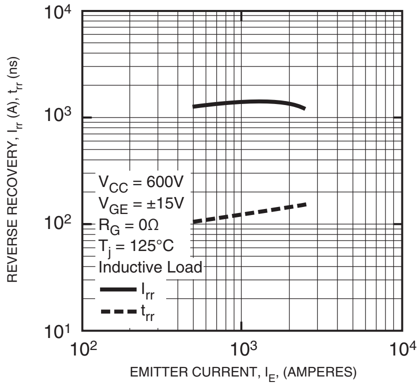


CM2500DY-24S
Dual Half-Bridge IGBTMOD™ HVIGBT Module
2500 Amperes/1200 Volts

REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



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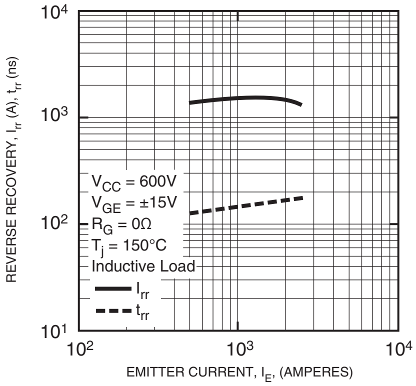
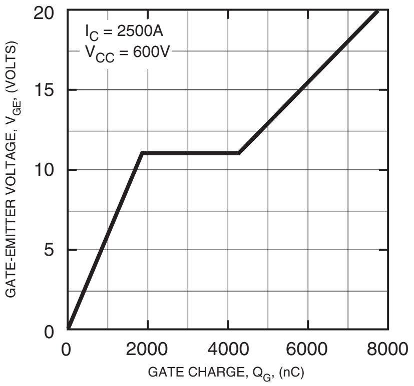
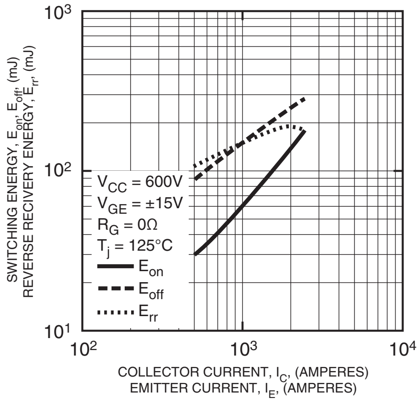


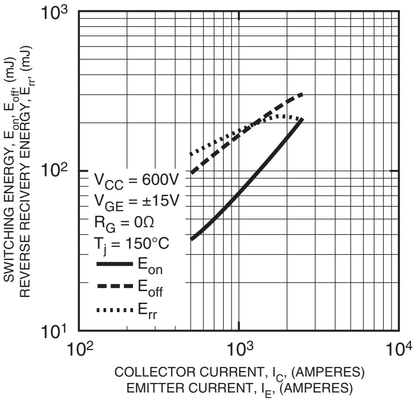
GATE CHARGE VS. V_{GE}



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



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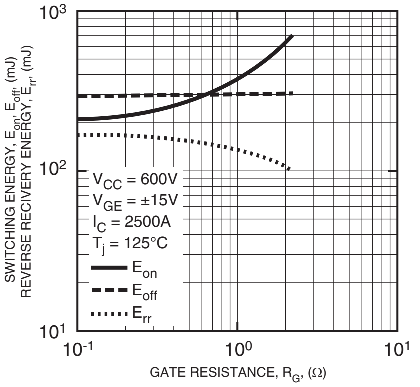

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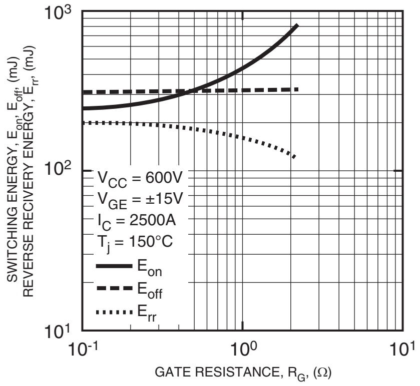

TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)