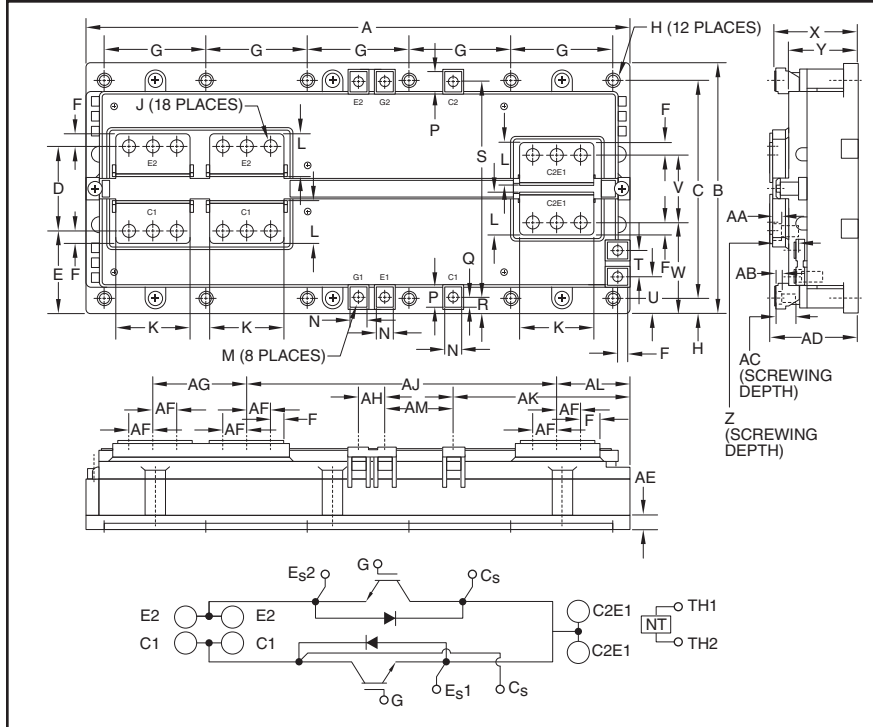


Dual Half-Bridge IGBTMOD™ HVIGBT Series Module 2500 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	12.2	310.0
B	5.6	142.5
C	4.96±0.01	126.0±0.25
D	1.89	48.0
E	1.85	46.9
F	0.28	7.0
G	2.28±0.01	58.0±0.25
H	0.315	8.0
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	0.71	18.0

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

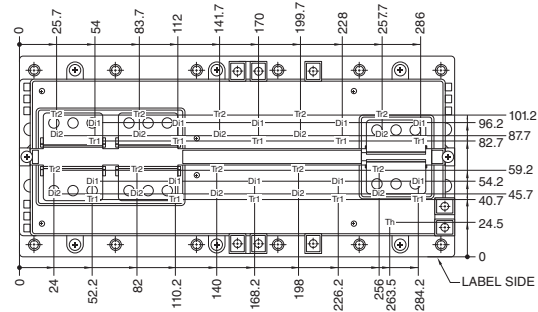
Inverter Part IGBT/FWDi

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, $T_C = 62^\circ\text{C}$) ²	I_C	2500	Amperes
Collector Current (Pulse) ³	I_{CRM}	5000	Amperes
Total Maximum Power Dissipation ($T_C = 25^\circ\text{C}$) ^{2,4}	P_{tot}	9350	Watts
Emitter Current, Free Wheeling Diode Forward Current ($T_C = 25^\circ\text{C}$) ^{2,4}	I_E^{*1}	2500	Amperes
Emitter Current, Free Wheeling Diode Forward Current (Pulse.) ³	I_{ERM}^{*1}	5000	Amperes

Module

Characteristics	Symbol	Rating	Units
Maximum Junction Temperature	$T_{j(max)}$	175	$^\circ\text{C}$
Operating Junction Temperature	$T_{j(op)}$	-40 to +150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to +125	$^\circ\text{C}$
Case Temperature ²	T_C	-40 to +125	$^\circ\text{C}$
Isolation Voltage (Terminals to Baseplate, $f = 60\text{Hz}$, AC 1 minute)	V_{ISO}	2500	V_{rms}

- *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. Refer to the figure to the right for chip location. 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.



Each mark points to the center position of each chip.

Tr1P / Tr2: IGBT D1 / D2: FWDi

CM2500DY-24S

Dual Half-Bridge IGBTMOD™ HVIGBT Module

2500 Amperes/1200 Volts

Electrical Characteristics, $T_j = 25^\circ\text{C}$ 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 Current	I_{GES}	$\pm V_{GE} = V_{GES}, V_{CE} = 0V$	—	—	0.5	μA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 250\text{mA}, V_{CE} = 10V$	5.4	6.0	6.6	Volts
Collector-Emitter Saturation Voltage (Terminal)	$V_{CE(sat)}$	$I_C = 2500\text{A}, V_{GE} = 15V, T_j = 25^\circ\text{C}^{*6}$	—	2.00	2.45	Volts
		$I_C = 2500\text{A}, V_{GE} = 15V, T_j = 125^\circ\text{C}^{*6}$	—	2.20	—	Volts
		$I_C = 2500\text{A}, V_{GE} = 15V, T_j = 150^\circ\text{C}^{*6}$	—	2.25	—	Volts
Collector-Emitter Saturation Voltage (Chip)	$V_{CE(sat)}$	$I_C = 2500\text{A}, V_{GE} = 15V, T_j = 25^\circ\text{C}^{*6}$	—	1.70	2.15	Volts
		$I_C = 2500\text{A}, V_{GE} = 15V, T_j = 125^\circ\text{C}^{*6}$	—	1.90	—	Volts
		$I_C = 2500\text{A}, V_{GE} = 15V, T_j = 150^\circ\text{C}^{*6}$	—	1.95	—	Volts
Input Capacitance	C_{ies}		—	—	250	nF
Output Capacitance	C_{oes}	$V_{CE} = 10V, V_{GE} = 0V$	—	—	50	nF
Reverse Transfer Capacitance	C_{res}		—	—	4.2	nF
Total Gate Charge	Q_G	$V_{CC} = 600V, I_C = 2500\text{A}, V_{GE} = 15V$	—	5800	—	nC
Turn-on Delay Time	$t_{d(on)}$		—	—	800	ns
Rise Time	t_r	$V_{CC} = 600V, I_C = 2500\text{A}, V_{GE} = \pm 15V,$	—	—	200	ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 0\Omega, \text{ Inductive Load}$	—	—	700	ns
Fall Time	t_f		—	—	300	ns
Reverse Recovery Time	t_{rr}^{*1}	$V_{CC} = 600V, I_E = 2500\text{A}, V_{GE} = \pm 15V$	—	—	300	ns
Reverse Recovery Charge	Q_{rr}^{*1}	$R_G = 0\Omega, \text{ Inductive Load}$	—	70	—	μC
Turn-on Switching Energy per Pulse	E_{on}	$V_{CC} = 600V, I_C = I_E = 2500\text{A},$	—	214	—	mJ
Turn-off Switching Energy per Pulse	E_{off}	$V_{GE} = \pm 15V, R_G = 0\Omega,$	—	304	—	mJ
Reverse Recovery Energy per Pulse	E_{rr}^{*1}	$T_j = 150^\circ\text{C}, \text{ Inductive Load}$	—	210	—	mJ
Emitter-Collector Voltage (Terminal)	V_{EC}^{*1}	$I_E = 2500\text{A}, V_{GE} = 0V, T_j = 25^\circ\text{C}^{*6}$	—	2.0	2.45	Volts
		$I_E = 2500\text{A}, V_{GE} = 0V, T_j = 125^\circ\text{C}^{*6}$	—	2.0	—	Volts
		$I_E = 2500\text{A}, V_{GE} = 0V, T_j = 150^\circ\text{C}^{*6}$	—	2.0	—	Volts
Emitter-Collector Voltage (Chip)	V_{EC}^{*1}	$I_E = 2500\text{A}, V_{GE} = 0V, T_j = 25^\circ\text{C}^{*6}$	—	1.7	2.25	Volts
		$I_E = 2500\text{A}, V_{GE} = 0V, T_j = 125^\circ\text{C}^{*6}$	—	1.7	—	Volts
		$I_E = 2500\text{A}, V_{GE} = 0V, T_j = 150^\circ\text{C}^{*6}$	—	1.7	—	Volts
Internal Lead Resistance	$R_{CC}^{*1} + EE'$	Main Terminals-Chip, Per Switch, $T_C = 25^\circ\text{C}^{*2}$	—	0.11	—	m Ω
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).

*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. Refer to the chip location on page 1, Note 2. 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.

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

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*2	4.85	5.00	5.15	kΩ
Deviation of Resistance	ΔR/R	T _C = 100°C, R ₁₀₀ = 493Ω	-7.3	—	+7.8	%
B Constant	B _(25/50)	Approximate by Equation*7	—	3375	—	K
Power Dissipation	P ₂₅	T _C = 25°C*2	—	—	10	mW

Thermal Resistance Characteristics

Thermal Resistance, Junction to Case*2	R _{th(j-c)Q}	Per Inverter IGBT	—	—	16	K/kW
Thermal Resistance, Junction to Case*2	R _{th(j-c)D}	Per Inverter FWDi	—	—	27	K/kW
Contact Thermal Resistance, Case to Heatsink*2, *9	R _{th(c-f)}	Thermal Grease Applied (Per 1 Module)*8	—	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
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*5	-50	—	+100	μm

Recommended Operating Conditions, 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

*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. Refer to the figure to the right for chip location.

The heatsink thermal resistance should be measured just under the chips.

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

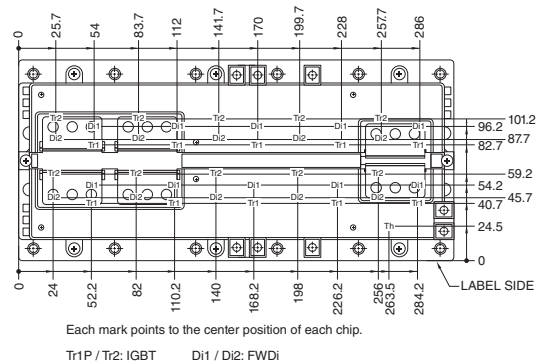
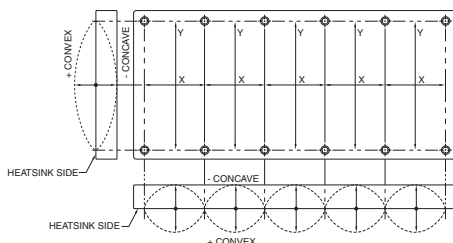
$$*7 B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$$

R₂₅: Resistance at Absolute Temperature T₂₅ [K]; T₂₅ = 25 [°C] + 273.15 = 298.15 [K]

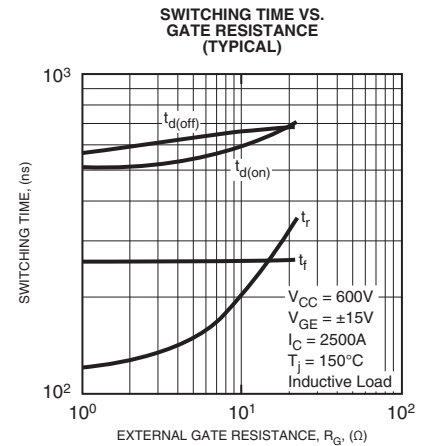
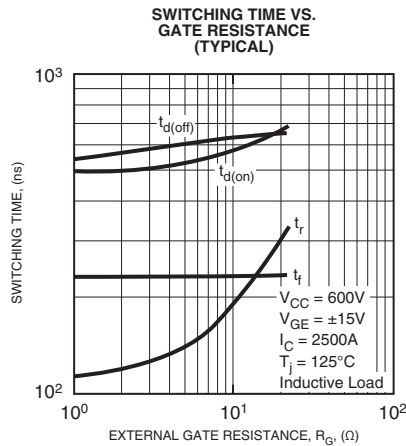
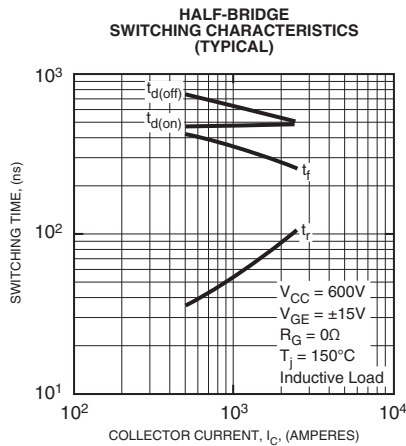
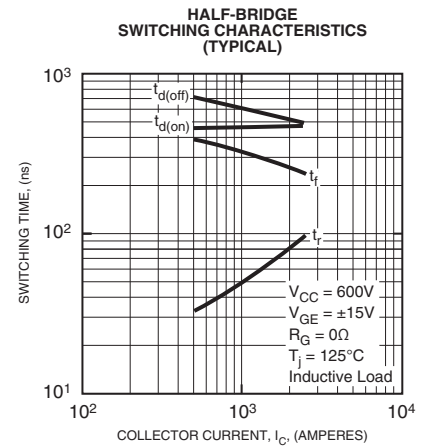
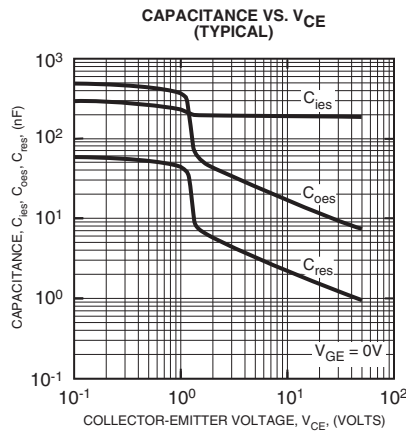
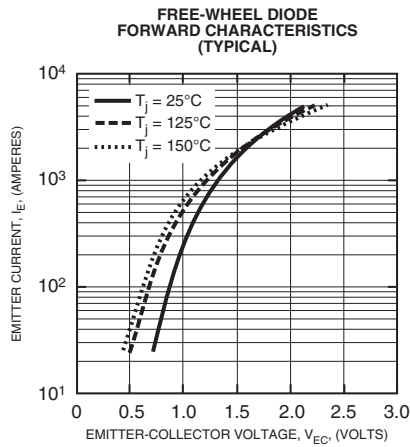
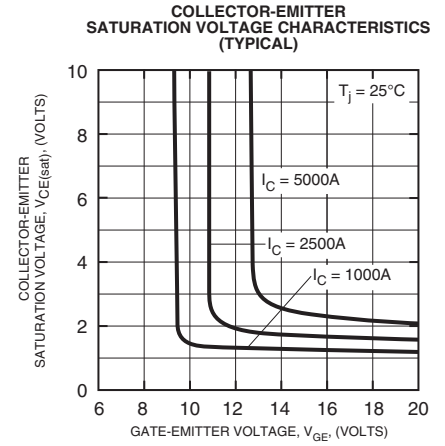
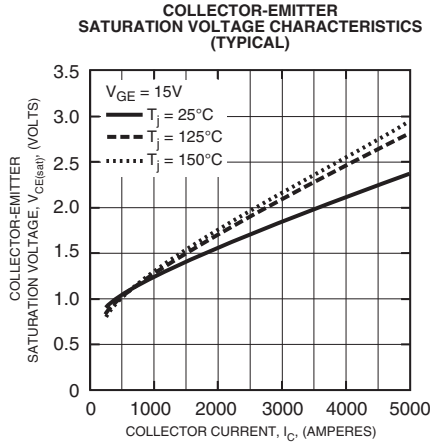
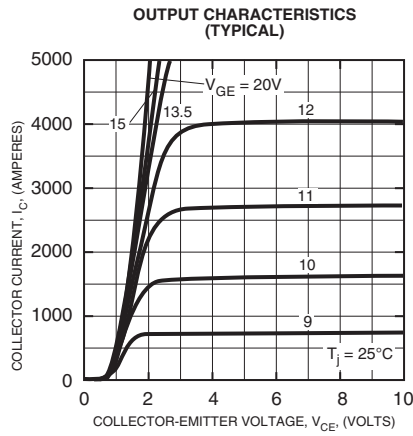
R₅₀: Resistance at Absolute Temperature T₅₀ [K]; T₅₀ = 50 [°C] + 273.15 = 323.15 [K]

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

*9 When using liquid cooling, actual R_{th(c-s)} should be used by measurement on each heatsink.

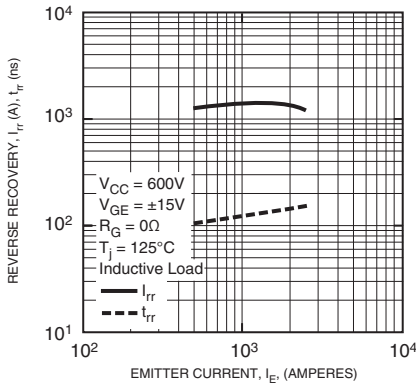


CM2500DY-24S
Dual Half-Bridge IGBTMOD™ HVIGBT Module
 2500 Amperes/1200 Volts

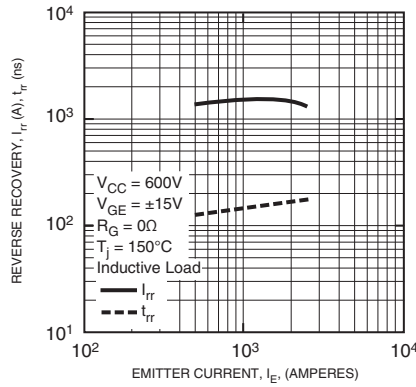


CM2500DY-24S
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 2500 Amperes/1200 Volts

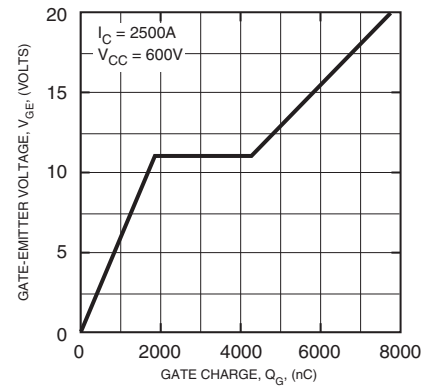
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



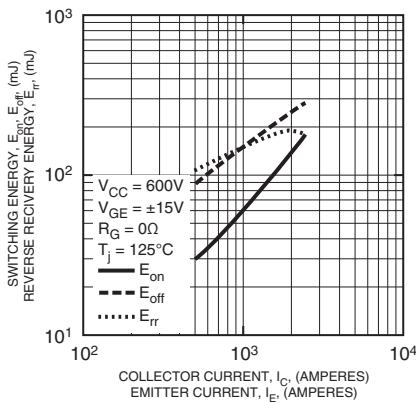
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



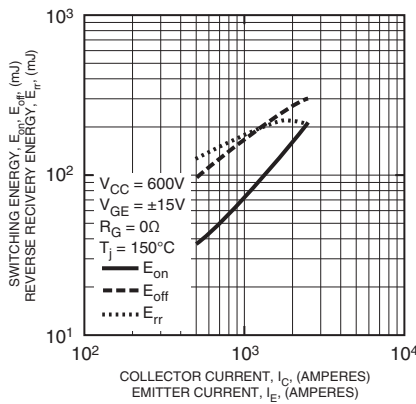
GATE CHARGE VS. V_GE



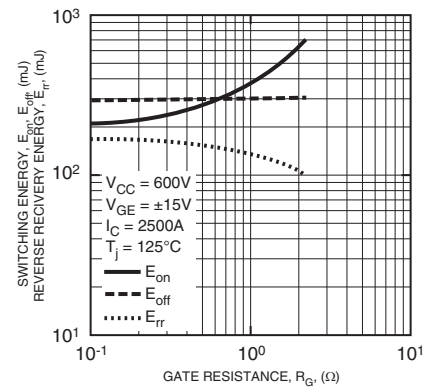
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



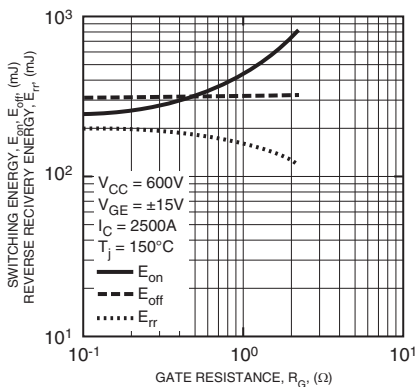
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)

