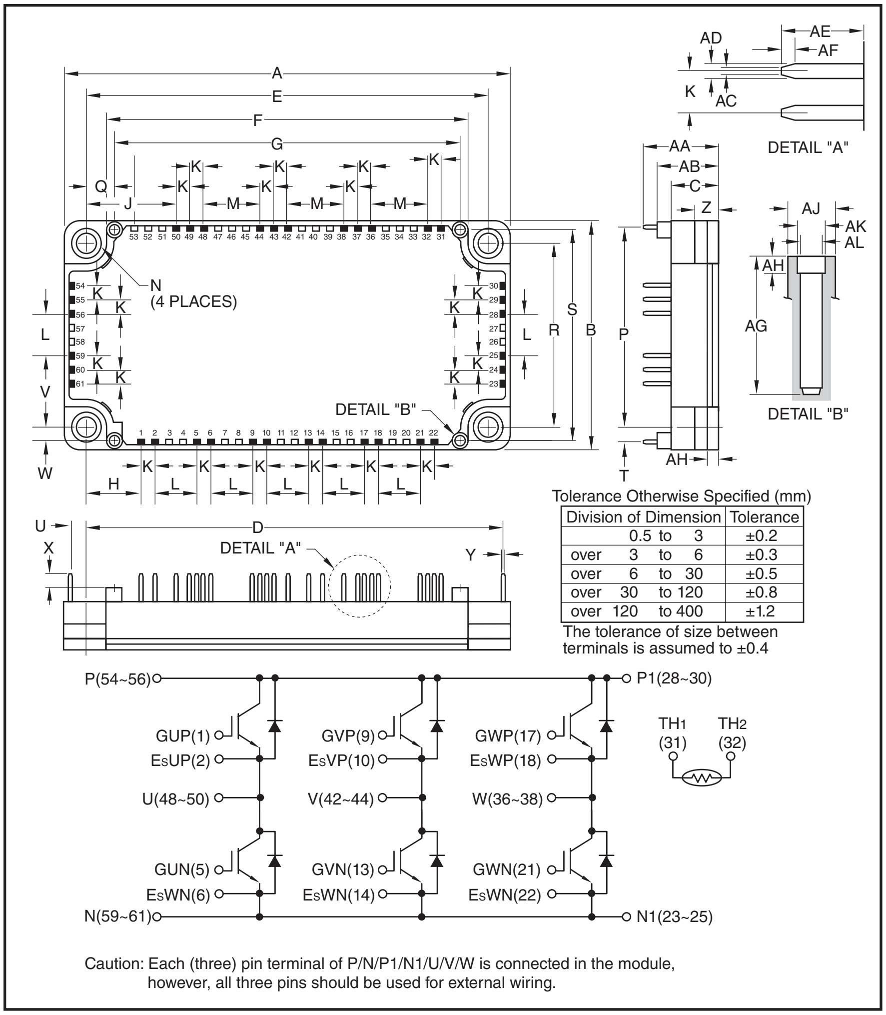
POWEREX

CM100TX-24S

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

Six IGBTMOD™ NX-S Series Module
100 Amperes/1200 Volts



Tolerance Otherwise Specified (mm)

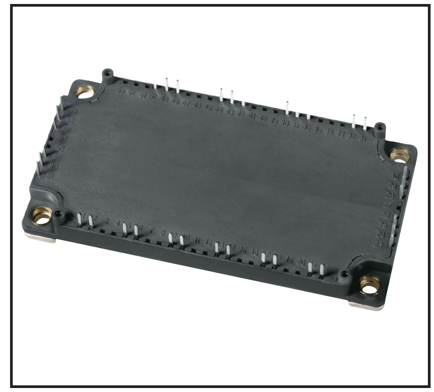
Division of Dimension	Tolerance
0.5 to 3	±0.2
over 3 to 6	±0.3
over 6 to 30	±0.5
over 30 to 120	±0.8
over 120 to 400	±1.2

The tolerance of size between terminals is assumed to ±0.4

Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.79	121.7
B	2.44	62.0
C	0.51	13.0
D	4.49	114.05
E	4.33±0.02	110.0±0.5
F	3.9	99.0
G	3.72	94.5
H	0.59	15.0
J	0.96	24.52
K	0.15	3.81
L	0.45	11.43
M	0.6	15.24
N	0.22 Dia.	5.5 Dia.
P	2.13	54.2
Q	0.30	7.75
R	1.97±0.02	50.0±0.5
S	2.26	57.5
T	0.165	4.2

Dimensions	Inches	Millimeters
U	0.16	4.06
V	0.46	11.66
W	0.14	3.75
X	0.14	3.5
Y	0.03	0.8
Z	0.28	7.0
AA	0.81	20.5
AB	0.67	17.0
AC	0.03	0.65
AD	0.05	1.15
AE	0.29	7.4
AF	0.047	1.2
AG	0.49	12.5
AH	0.12	3.0
AJ	0.17 Dia.	4.3 Dia.
AK	0.102 Dia.	2.6 Dia.
AL	0.088 Dia.	2.25 Dia.



Description:
Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of six IGBT Transistors in a three phase 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

Applications:
- ☐ AC Motor Control
- ☐ Motion/Servo Control
- ☐ Photovoltaic/Fuel Cell

Ordering Information:
Example: Select the complete module number you desire from the table below -i.e. CM100TX-24S is a 1200V (V_{CES}), 100 Ampere Six IGBTMOD™ Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	100	24

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

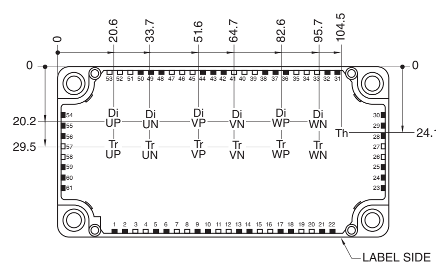
Inverter Part IGBT/FWDi

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 = 119°C)*2	I_C	100	Amperes
Collector Current (Pulse)*3	I_{CRM}	200	Amperes
Total Power Dissipation (T_C = 25°C)*2,*4	P_{tot}	750	Watts
Emitter Current (T_C = 25°C)*2,*4	I_E*1	100	Amperes
Emitter Current (Pulse)*3	I_{ERM}*1	200	Amperes

Module

Characteristics	Symbol	Rating	Units
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, f = 60Hz, AC 1 minute)	V_{ISO}	2500	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. 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.

Tr*P / Tr*N: IGBT   Di*P / Di*N: FWDi   Th: NTC Thermistor

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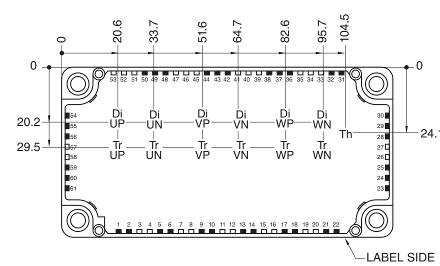
Electrical Characteristics, T_j = 25°C unless otherwise specified

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	mA
Gate-Emitter Leakage Current	I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	—	—	0.5	µA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 10mA, V_{CE} = 10V	5.4	6.0	6.6	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 100A, V_{GE} = 15V, T_j = 25°C*5	—	1.80	2.25	Volts
	(Terminal)	I_C = 100A, V_{GE} = 15V, T_j = 125°C*5	—	2.00	—	Volts
		I_C = 100A, V_{GE} = 15V, T_j = 150°C*5	—	2.05	—	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 100A, V_{GE} = 15V, T_j = 25°C*5	—	1.70	2.15	Volts
	(Chip)	I_C = 100A, V_{GE} = 15V, T_j = 125°C*5	—	1.90	—	Volts
		I_C = 100A, V_{GE} = 15V, T_j = 150°C*5	—	1.95	—	Volts
Input Capacitance	C_{ies}		—	—	10	nF
Output Capacitance	C_{oes}	V_{CE} = 10V, V_{GE} = 0V	—	—	2.0	nF
Reverse Transfer Capacitance	C_{res}		—	—	0.17	nF
Gate Charge	Q_G	V_{CC} = 600V, I_C = 100A, V_{GE} = 15V	—	233	—	nC
Turn-on Delay Time	$t_{d(on)}$		—	—	300	ns
Rise Time	t_r	V_{CC} = 600V, I_C = 100A, V_{GE} = ±15V,	—	—	200	ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 6.2Ω, Inductive Load	—	—	600	ns
Fall Time	t_f		—	—	300	ns
Emitter-Collector Voltage	V_{EC}*1	I_E = 100A, V_{GE} = 0V, T_j = 25°C*5	—	1.80	2.25	Volts
	(Terminal)	I_E = 100A, V_{GE} = 0V, T_j = 125°C*5	—	1.80	—	Volts
		I_E = 100A, V_{GE} = 0V, T_j = 150°C*5	—	1.80	—	Volts
Emitter-Collector Voltage	V_{EC}*1	I_E = 100A, V_{GE} = 0V, T_j = 25°C*5	—	1.70	2.15	Volts
	(Chip)	I_E = 100A, V_{GE} = 0V, T_j = 125°C*5	—	1.70	—	Volts
		I_E = 100A, V_{GE} = 0V, T_j = 150°C*5	—	1.70	—	Volts
Reverse Recovery Time	t_{rr}*1	V_{CC} = 600V, I_E = 100A, V_{GE} = ±15V	—	—	300	ns
Reverse Recovery Charge	Q_{rr}*1	R_G = 6.2Ω, Inductive Load	—	5.3	—	µC
Turn-on switching Energy per Pulse	E_{on}	V_{CC} = 600V, $I_C = I_E$ = 100A, V_{GE} = ±15V	—	8.6	—	mJ
Turn-off switching Energy per Pulse	E_{off}	R_G = 6.2Ω, T_j = 150°C	—	10.7	—	mJ
Reverse Recovery Energy per Pulse	E_{rr}*1	Inductive Load	—	10.2	—	mJ
Internal Lead Resistance	$R_{CC' + EE'}$	Main Terminals-Chip, Per Switch, T_C = 25°C*2	—	—	2.2	mΩ
Internal Gate Resistance	r_g	Per Switch	—	0	—	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 figure to the right 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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Tr*P / Tr*N: IGBT Di*P / Di*N: FWDi Th: NTC Thermistor

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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*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*6	—	3375	—	K
Power Dissipation	P_{25}	T_C = 25°C*2	—	—	10	mW

Thermal Resistance Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case*2	$R_{th(j-c)}Q$	IGBT Part, Per 1/6 Module	—	—	0.20	K/W
Thermal Resistance, Junction to Case*2	$R_{th(j-c)}D$	FWDi Part, Per 1/6 Module	—	—	0.29	K/W
Contact Thermal Resistance, Case to Heatsink*2	$R_{th(c-f)}$	Thermal Grease Applied, Per 1 Module*7	—	0.015	—	K/W

Mechanical Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Mounting Torque	M_s	Mounting to Heatsink, M5 Screw	22	27	31	in-lb
Creepage Distance	d_s	Terminal to Terminal	10.28	—	—	mm
		Terminal to Baseplate	14.27	—	—	mm
Clearance	d_a	Terminal to Terminal	10.28	—	—	mm
		Terminal to Baseplate	12.33	—	—	mm
Weight	m		—	300	—	Grams
Flatness of Baseplate	e_c	On Centerline X, Y*8	±0	—	±100	μm

Recommended Operating Conditons, T_a = 25°C

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
DC Supply Voltage	V_{CC}	Applied Across P-N/P1-N1 Terminals	—	600	850	Volts
Gate-Emitter Drive Voltage	$V_{GE(on)}$	Applied Across G*P-Es*P/G*N-Es*N Terminals	13.5	15.0	16.5	Volts
External Gate Resistance	R_G	Per Switch	6.2	—	62	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.

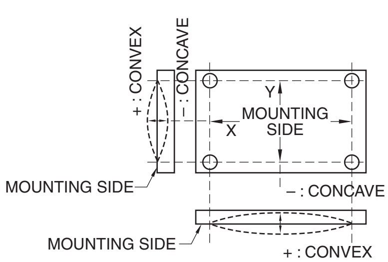
*6 $B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) / \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$

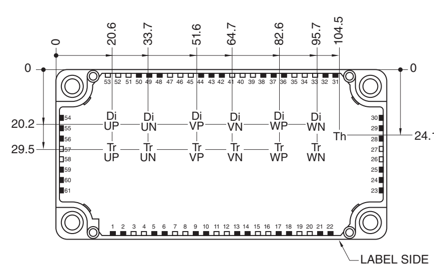
R_{25}; Resistance at Absolute Temperature T_{25} [K]; T_{25} = 25 [°C] + 273.15 = 298.15 [K]

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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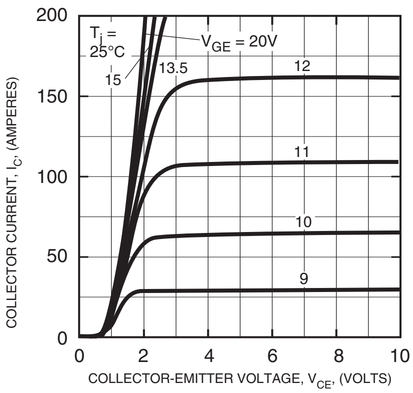
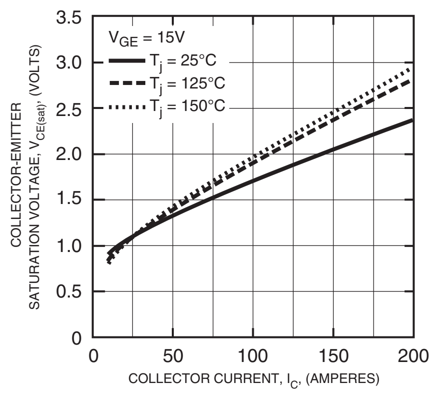
OUTPUT CHARACTERISTICS (CHIP - TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (CHIP - TYPICAL)



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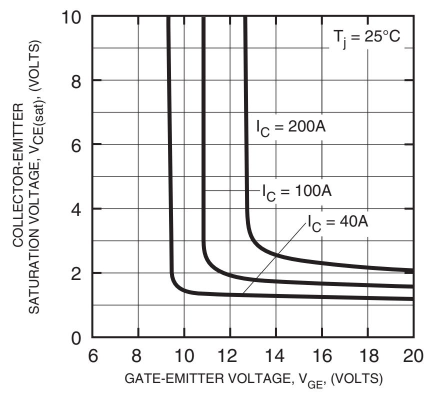
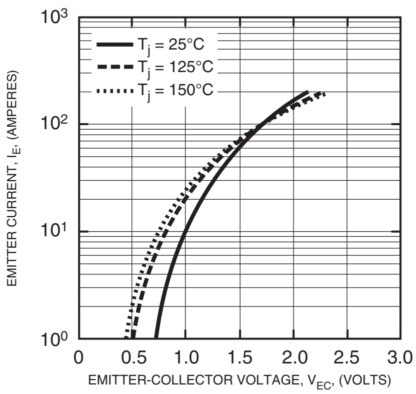
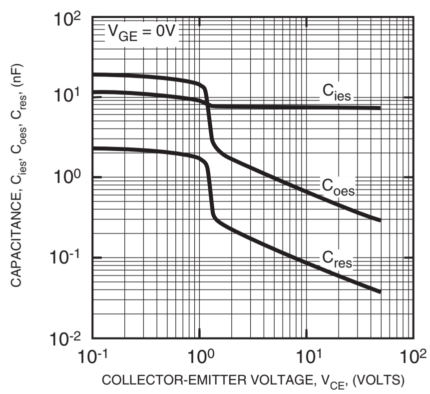


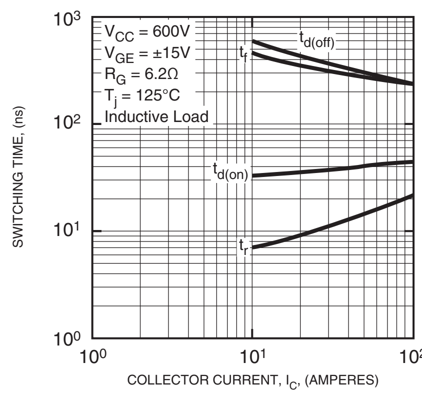
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (CHIP - TYPICAL)



CAPACITANCE VS. V_{CE} (TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



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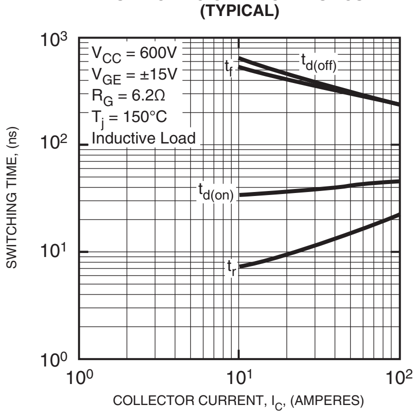
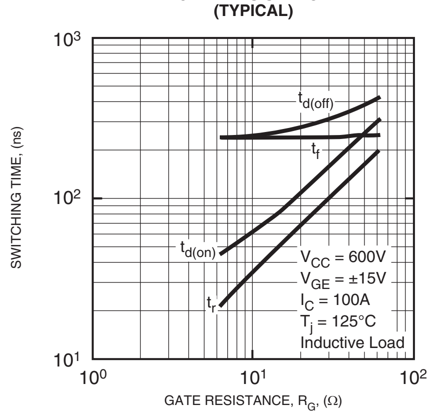


SWITCHING TIME VS. GATE RESISTANCE (TYPICAL)



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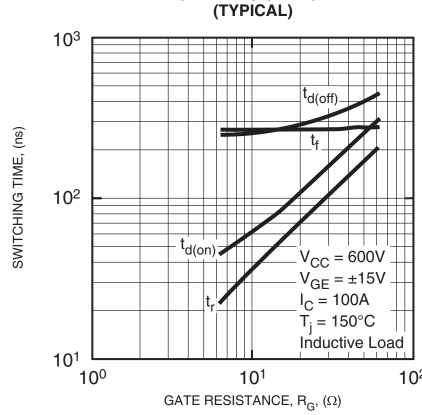

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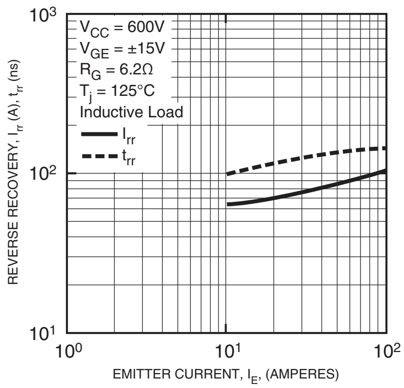
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



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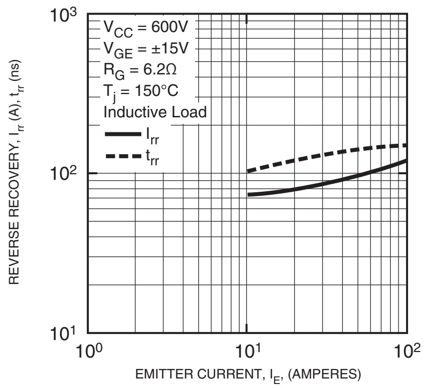
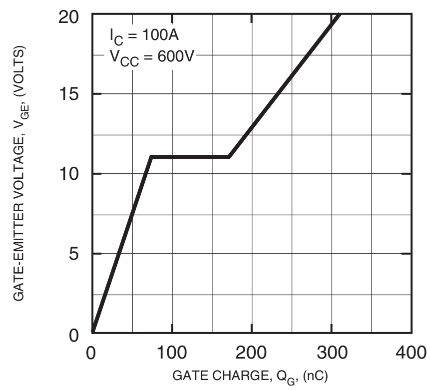
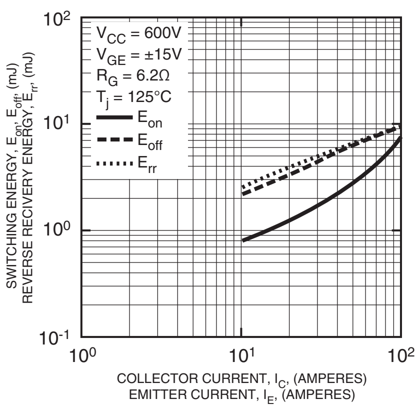


GATE CHARGE VS. V_{GE}



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



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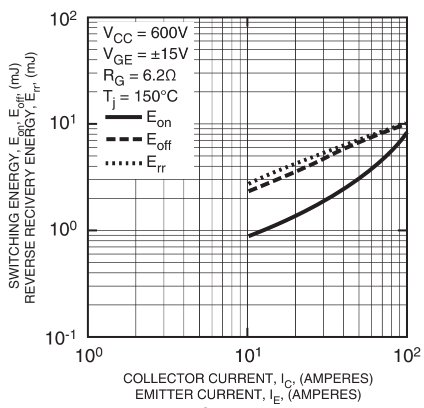

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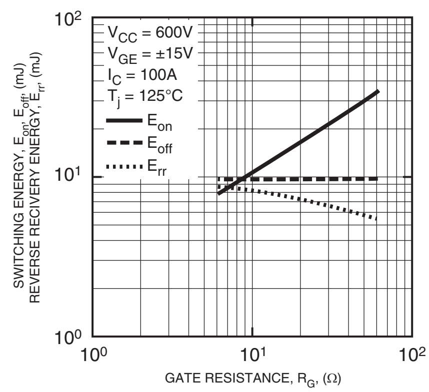

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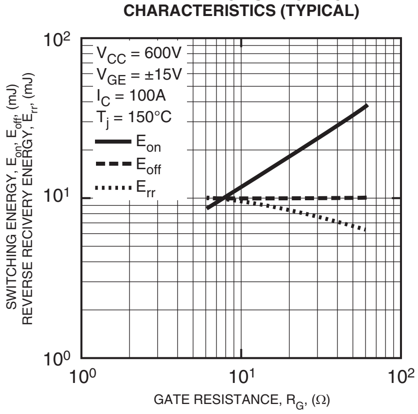

TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)