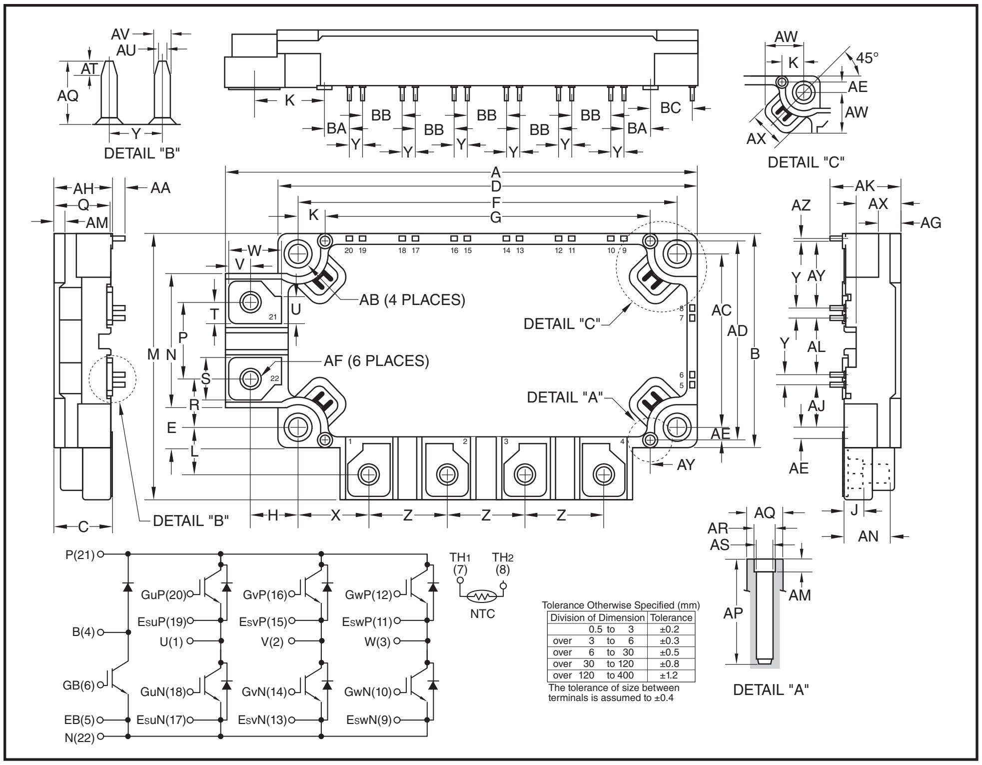
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
www.pwrx.com

CM75RX-34SA

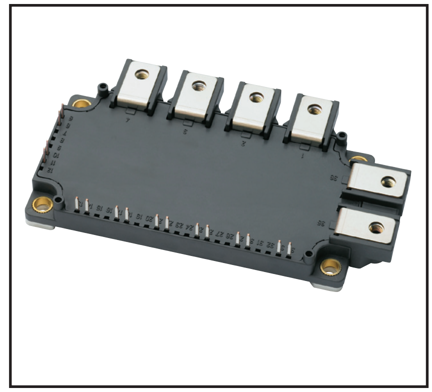
Six IGBT + Brake NX-Series Module
75 Amperes/1700 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.39	136.9
B	2.44	62.0
C	0.67+0.04/-0.02	17.0+1.0/-0.5
D	4.79	121.7
E	0.45	11.5
F	4.33±0.02	110.0±0.5
G	3.72	94.5
H	0.53	13.5
J	0.23	5.9
K	0.30	7.75
L	0.53	13.64
M	3.02	77.0
N	1.53	39.0
P	0.87	22.0
Q	0.65	16.5
R	0.55	14.0
S	0.47	12.0
T	0.24	6.0
U	0.31	8.0
V	0.37	6.5
W	0.61	15.64
X	0.81	20.71
Y	0.15±0.008	3.81±0.2
Z	0.9	22.86
AA	0.14	3.5
AB	0.22 Dia.	5.5 Dia.

Dimensions	Inches	Millimeters
AC	1.97±0.02	50.0±0.5
AD	2.26	57.5
AE	0.14	3.75
AF	M5	M5
AG	0.27	7.0
AH	0.67	17.0
AJ	0.44±0.008	11.67±0.2
AK	0.81	20.5
AL	0.60±0.008	15.24±0.2
AM	0.12	3.0
AN	0.53	13.4
AP	0.49	12.5
AQ	Dia.	4.5 Dia.
AR	0.102 Dia.	2.6 Dia.
AS	0.088 Dia.	2.25 Dia.
AT	0.05	1.2
AU	0.02	0.65
AV	0.04	1.15
AW	0.54	13.7
AX	0.51	13.0
AY	0.75	19.12
AZ	0.021±0.008	0.55±0.2
BA	0.28±0.008	7.24±0.2
BB	0.43±0.008	11.42±0.2
BC	0.46±0.008	11.8±0.2



Description:
Powerex IGBT Modules are designed for use in switching applications. Each module consists of six IGBT Transistors in a three phase bridge configuration and a seventh IGBT with free-wheel diode for dynamic braking. 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. CM75RX-34SA is a 1700V (V_{CES}), 75 Ampere Six-IGBT + Brake Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	75	34

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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}	1700	Volts
Gate-Emitter Voltage (V_{CE} = 0V)	V_{GES}	±20	Volts
Collector Current (DC, T_C = 125°C)*2,*4	I_C	75	Amperes
Collector Current (Pulse, Repetitive)*3	I_{CRM}	150	Amperes
Total Power Dissipation (T_C = 25°C)*2,*4	P_{tot}	830	Watts
Emitter Current*2,*4	I_E*1	75	Amperes
Emitter Current (Pulse, Repetitive)*3	I_{ERM}*1	150	Amperes
Maximum Junction Temperature	$T_{j(max)}$	175	°C

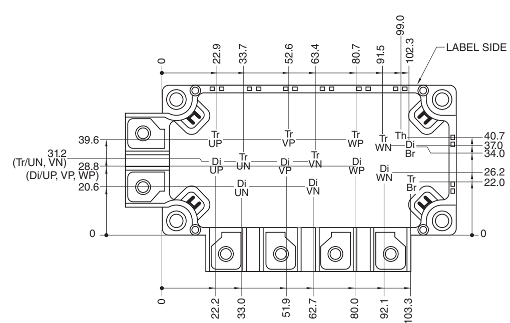
Brake Part IGBT/ClampDi

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 = 125°C)*2,*4	I_C	50	Amperes
Collector Current (Pulse, Repetitive)*3	I_{CRM}	100	Amperes
Total Power Dissipation (T_C = 25°C)*2,*4	P_{tot}	600	Watts
Repetitive Peak Reverse Voltage (V_{GE} = 0V)	V_{RRM}	1700	Volts
Forward Current*2,*4	I_F*1	50	Amperes
Forward Current (Pulse, Repetitive)*3	I_{FRM}*1	100	Amperes
Maximum Junction Temperature	$T_{j(max)}$	175	°C

Module

Characteristics	Symbol	Rating	Units
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}	4000	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 / TrBr (* = U/V/W): IGBT
DiBr: ClampDi
Di*P / Di*N (* = U/V/W): FWDi
Th: NTC Thermistor

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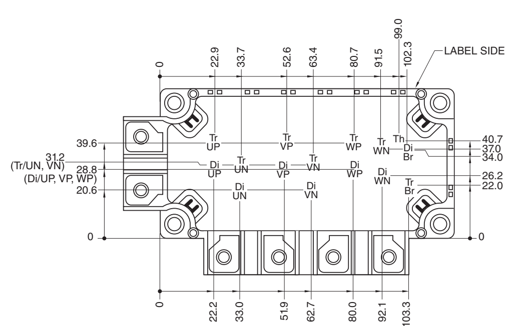
75 Amperes/1700 Volts

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	—	—	0.5	µA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 7.5mA, V_{CE} = 10V	5.4	6.0	6.6	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 75A, V_{GE} = 15V, T_j = 25°C[*6]	—	2.0	2.5	Volts
	(Terminal)	I_C = 75A, V_{GE} = 15V, T_j = 125°C[*6]	—	2.2	—	Volts
		I_C = 75A, V_{GE} = 15V, T_j = 150°C[*6]	—	2.25	—	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 75A, V_{GE} = 15V, T_j = 25°C[*6]	—	1.9	2.4	Volts
	(Chip)	I_C = 75A, V_{GE} = 15V, T_j = 125°C[*6]	—	2.1	—	Volts
		I_C = 75A, V_{GE} = 15V, T_j = 150°C[*6]	—	2.15	—	Volts
Input Capacitance	C_{ies}		—	—	13	nF
Output Capacitance	C_{oes}	V_{CE} = 10V, V_{GE} = 0V	—	—	0.53	nF
Reverse Transfer Capacitance	C_{res}		—	—	0.13	nF
Gate Charge	Q_G	V_{CC} = 1000V, I_C = 75A, V_{GE} = 15V	—	414	—	nC
Turn-on Delay Time	$t_{d(on)}$		—	—	200	ns
Rise Time	t_r	V_{CC} = 1000V, I_C = 75A, V_{GE} = ±15V,	—	—	100	ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10Ω, Inductive Load	—	—	700	ns
Fall Time	t_f		—	—	600	ns
Emitter-Collector Voltage	V_{EC}[*1]	I_E = 75A, V_{GE} = 0V, T_j = 25°C[*6]	—	4.1	5.3	Volts
	(Terminal)	I_E = 75A, V_{GE} = 0V, T_j = 125°C[*6]	—	2.9	—	Volts
		I_E = 75A, V_{GE} = 0V, T_j = 150°C[*6]	—	2.7	—	Volts
Emitter-Collector Voltage	V_{EC}[*1]	I_E = 75A, V_{GE} = 0V, T_j = 25°C[*6]	—	4.0	5.2	Volts
	(Chip)	I_E = 75A, V_{GE} = 0V, T_j = 125°C[*6]	—	2.8	—	Volts
		I_E = 75A, V_{GE} = 0V, T_j = 150°C[*6]	—	2.6	—	Volts
Reverse Recovery Time	t_{rr}[*1]	V_{CC} = 1000V, I_E = 75A, V_{GE} = ±15V	—	—	200	ns
Reverse Recovery Charge	Q_{rr}[*1]	R_G = 10Ω, Inductive Load	—	2.0	—	µC
Turn-on Switching Energy per Pulse	E_{on}	V_{CC} = 1000V, $I_C = I_E$ = 75A,	—	17.1	—	mJ
Turn-off Switching Energy per Pulse	E_{off}	V_{GE} = ±15V, R_G = 10Ω,	—	17.4	—	mJ
Reverse Recovery Energy per Pulse	E_{rr}[*1]	T_j = 150°C, Inductive Load	—	15.9	—	mJ
Internal Lead Resistance	$R_{CC' + EE'}$	Main Terminals-Chip, Per Switch, T_C = 25°C[*2]	—	—	4.0	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.
*6 Pulse width and repetition rate should be such as to cause negligible temperature rise.



Each mark points to the center position of each chip.

Tr*P / Tr*N / TrBr (* = U/V/W): IGBT
DiBr: ClampDi
Di*P / Di*N (* = U/V/W): FWDi
Th: NTC Thermistor

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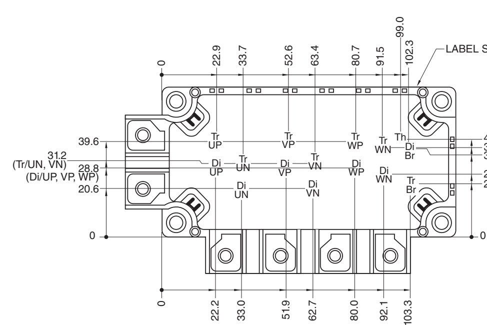
Electrical Characteristics, T_j = 25°C unless otherwise specified

Brake Part IGBT/ClampDi

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	—	—	0.5	µA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 5mA, V_{CE} = 10V	5.4	6.0	6.6	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 50A, V_{GE} = 15V, T_j = 25°C*6	—	2.0	2.5	Volts
	(Terminal)	I_C = 50A, V_{GE} = 15V, T_j = 125°C*6	—	2.2	—	Volts
		I_C = 50A, V_{GE} = 15V, T_j = 150°C*6	—	2.25	—	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 50A, V_{GE} = 15V, T_j = 25°C*6	—	1.9	2.4	Volts
	(Chip)	I_C = 50A, V_{GE} = 15V, T_j = 125°C*6	—	2.1	—	Volts
		I_C = 50A, V_{GE} = 15V, T_j = 150°C*6	—	2.15	—	Volts
Input Capacitance	C_{ies}		—	—	8.8	nF
Output Capacitance	C_{oes}	V_{CE} = 10V, V_{GE} = 0V	—	—	0.35	nF
Reverse Transfer Capacitance	C_{res}		—	—	0.09	nF
Gate Charge	Q_G	V_{CC} = 1000V, I_C = 50A, V_{GE} = 15V	—	276	—	nC
Turn-on Delay Time	$t_{d(on)}$		—	—	200	ns
Rise Time	t_r	V_{CC} = 1000V, I_C = 50A, V_{GE} = ±15V,	—	—	100	ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 13Ω, Inductive Load	—	—	700	ns
Fall Time	t_f		—	—	600	ns
Repetitive Peak Reverse Current	I_{RRM}	$V_R = V_{RRM}$, V_{GE} = 0V	—	—	1	mA
Forward Voltage	V_F	I_F = 50A, V_{GE} = 0V, T_j = 25°C*6	—	4.1	5.3	Volts
	(Terminal)	I_F = 50A, V_{GE} = 0V, T_j = 125°C*6	—	2.9	—	Volts
		I_F = 50A, V_{GE} = 0V, T_j = 150°C*6	—	2.7	—	Volts
Forward Voltage	V_F	I_F = 50A, V_{GE} = 0V, T_j = 25°C*6	—	4.0	5.2	Volts
	(Chip)	I_F = 50A, V_{GE} = 0V, T_j = 125°C*6	—	2.8	—	Volts
		I_F = 50A, V_{GE} = 0V, T_j = 150°C*6	—	2.6	—	Volts
Reverse Recovery Time	t_{rr}*1	V_{CC} = 1000V, I_F = 50A, V_{GE} = ±15V	—	—	200	ns
Reverse Recovery Charge	Q_{rr}*1	R_G = 13Ω, Inductive Load	—	1.3	—	µC
Turn-on Switching Energy per Pulse	E_{on}	V_{CC} = 1000V, $I_C = I_F$ = 50A,	—	9.7	—	mJ
Turn-off Switching Energy per Pulse	E_{off}	V_{GE} = ±15V, R_G = 13Ω,	—	11.2	—	mJ
Reverse Recovery Energy per Pulse	E_{rr}*1	T_j = 150°C, Inductive Load	—	9.8	—	mJ
Internal Gate Resistance	r_g		—	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.
*6 Pulse width and repetition rate should be such as to cause negligible temperature rise.



Each mark points to the center position of each chip.

Tr*P / Tr*N / TrBr (* = U/V/W): IGBT
DiBr: ClampDi
Di*P / Di*N (* = U/V/W): FWDi
Th: NTC Thermistor

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75 Amperes/1700 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	—	—	0.18	K/W
Thermal Resistance, Junction to Case*2	$R_{th(j-c)}D$	Per Inverter FWDi	—	—	0.27	K/W
Thermal Resistance, Junction to Case*2	$R_{th(j-c)}Q$	Per Brake IGBT	—	—	0.25	K/W
Thermal Resistance, Junction to Case*2	$R_{th(j-c)}D$	Per Brake ClampDi	—	—	0.35	K/W
Contact Thermal Resistance, Case to Heatsink*2	$R_{th(c-f)}$	Thermal Grease Applied, Per 1 Module*8	—	15	—	K/kW

Mechanical Characteristics

Mounting Torque	M_t	Main Terminal, M5 Screw	22	27	31	in-lb
Mounting Torque	M_s	Mounting to Heatsink, M5 Screw	22	27	31	in-lb
Creepage Distance	d_s	Terminal to Terminal	16.3	—	—	mm
		Terminal to Baseplate	16.8	—	—	mm
Clearance	d_a	Terminal to Terminal	10.0	—	—	mm
		Terminal to Baseplate	10.0	—	—	mm
Weight	m			370		g
Flatness of Baseplate	e_c	On Centerline X, Y*5	±0	—	+100	µm

Recommended Operating Conditons, T_a = 25°C

DC Supply Voltage	V_{CC}	Applied Across P-N/P1-N1 Terminals	—	1000	1200	Volts
Gate-Emitter Drive Voltage	$V_{GE(on)}$	Applied Across GB-Es1/ G*P-*/G*N-Es (* = U, V, W) Terminals	13.5	15.0	16.5	Volts
External Gate Resistance	R_G	Per Switch Inverter IGBT	10	—	100	Ω
		Per Switch Brake IGBT	13	—	130	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.

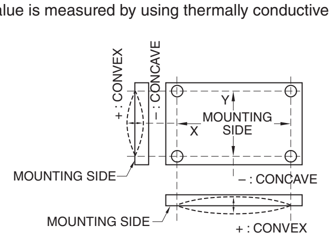
*5 Baseplate (mounting side) flatness measurement points (X, Y) are shown in the figure below.

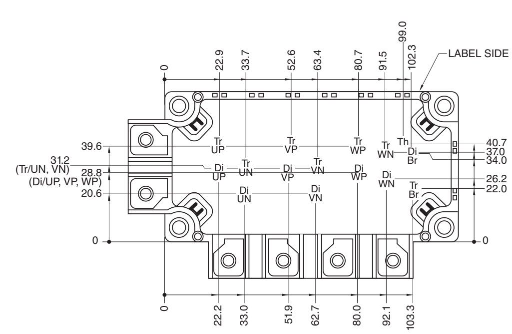
*7 $B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right)/\left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$

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]

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





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DiBr: ClampDi Th: NTC Thermistor

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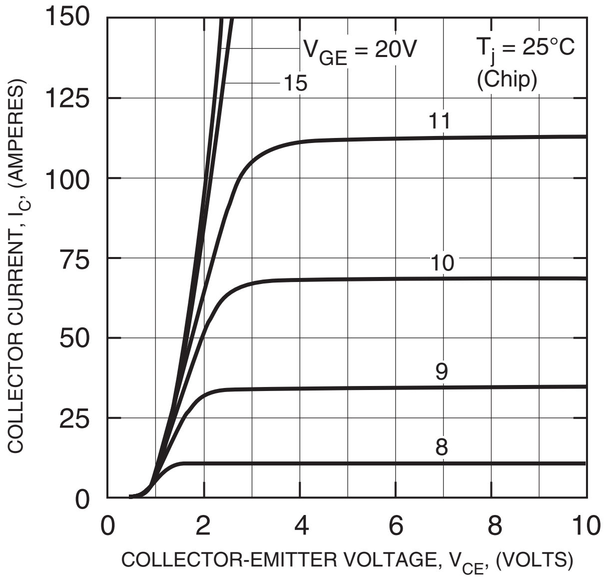
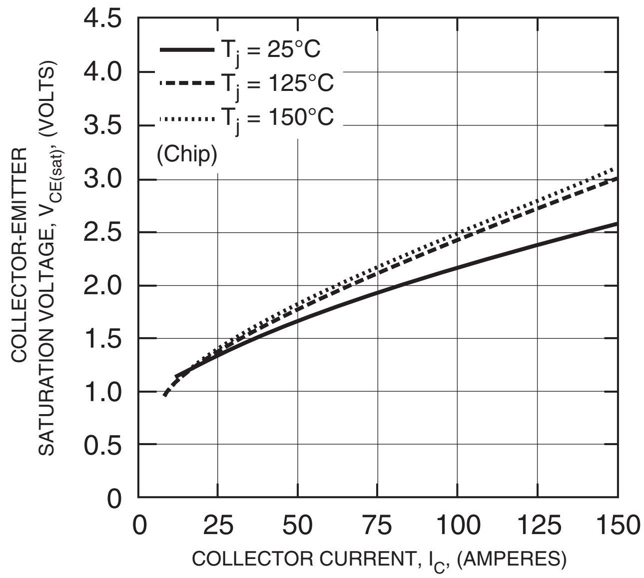
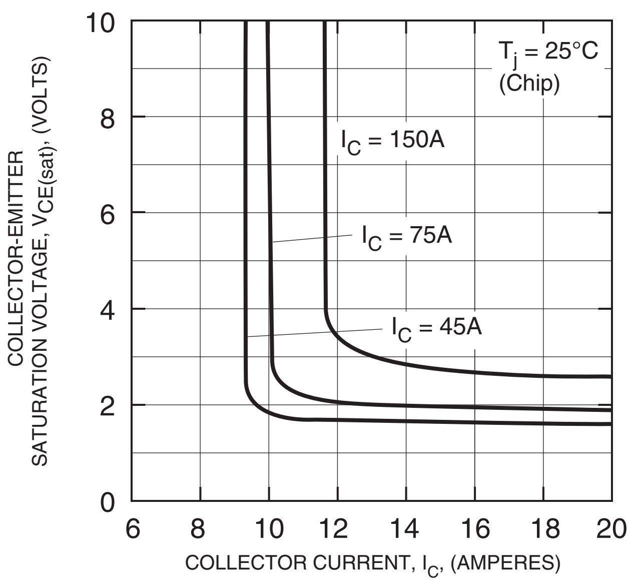
OUTPUT CHARACTERISTICS (INVERTER PART - TYPICAL)



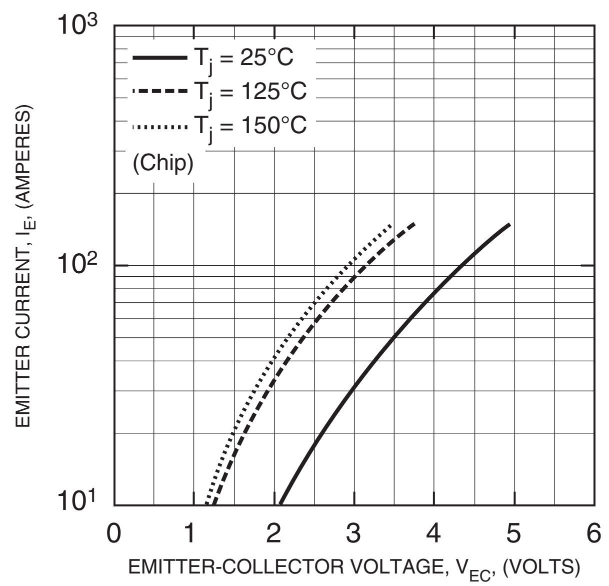
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (INVERTER PART - TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (INVERTER PART - TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (INVERTER PART - TYPICAL)



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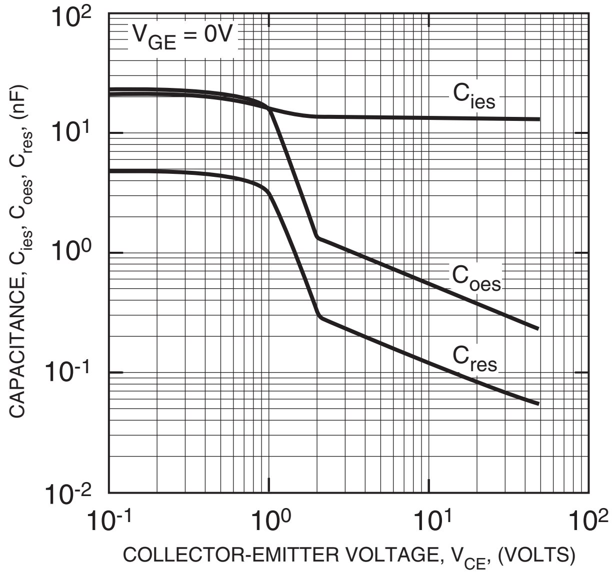
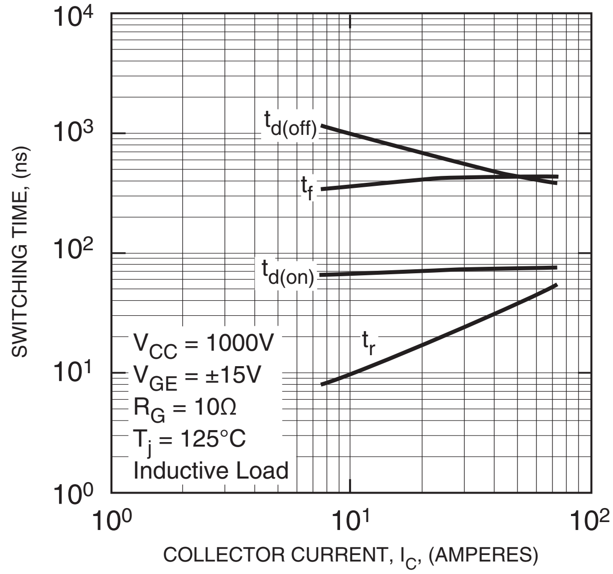
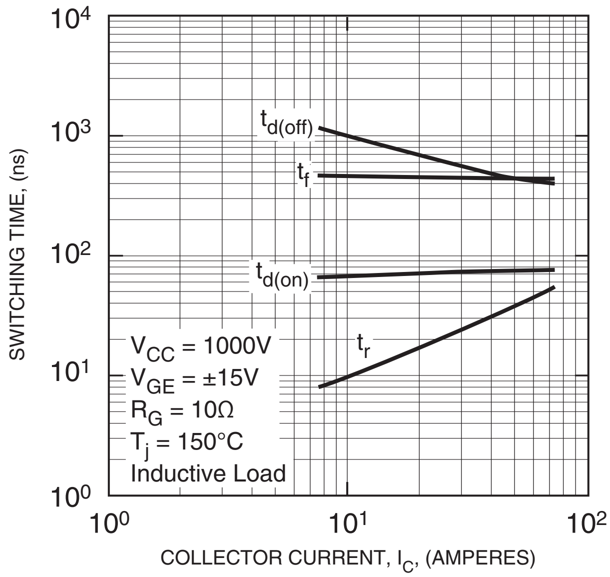
CAPACITANCE VS. V_{CE} (INVERTER PART - TYPICAL)



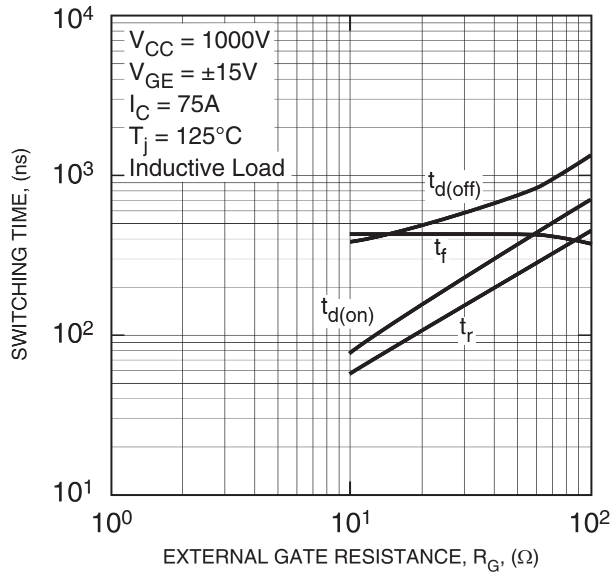
HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)



SWITCHING TIME VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



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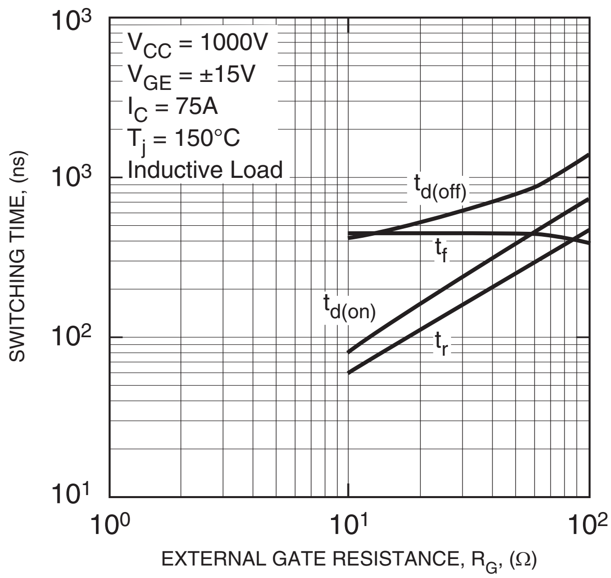
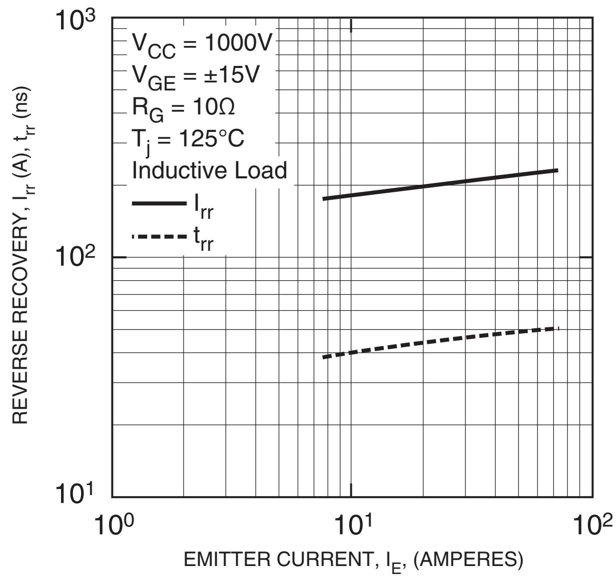
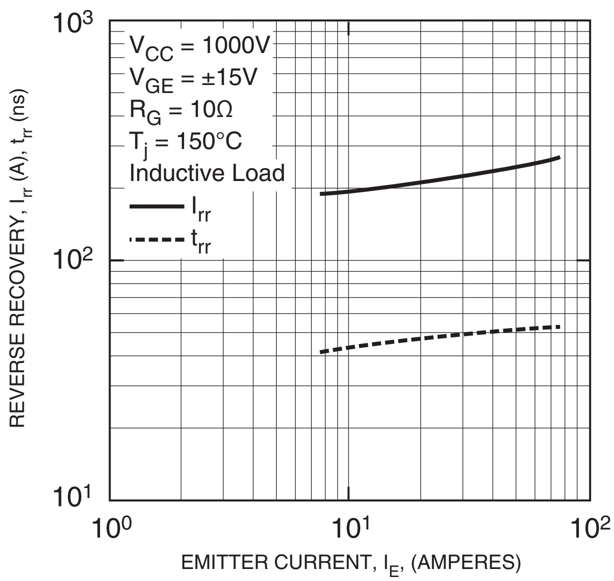
SWITCHING TIME VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



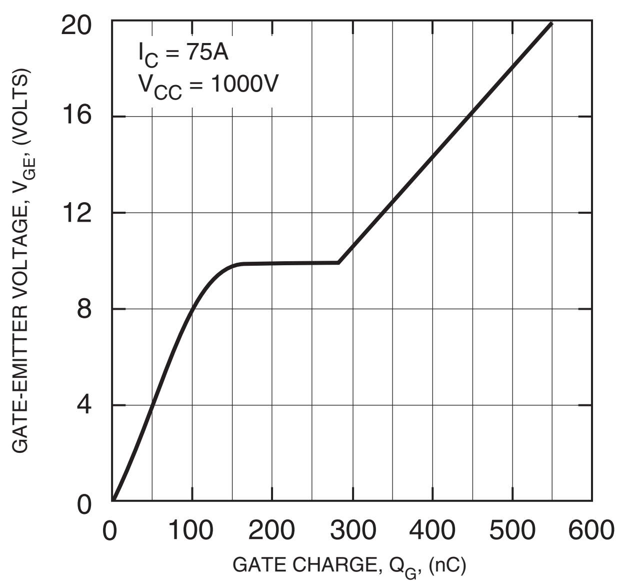
REVERSE RECOVERY CHARACTERISTICS (INVERTER PART - TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (INVERTER PART - TYPICAL)



GATE CHARGE VS. V_{GE} (INVERTER PART)



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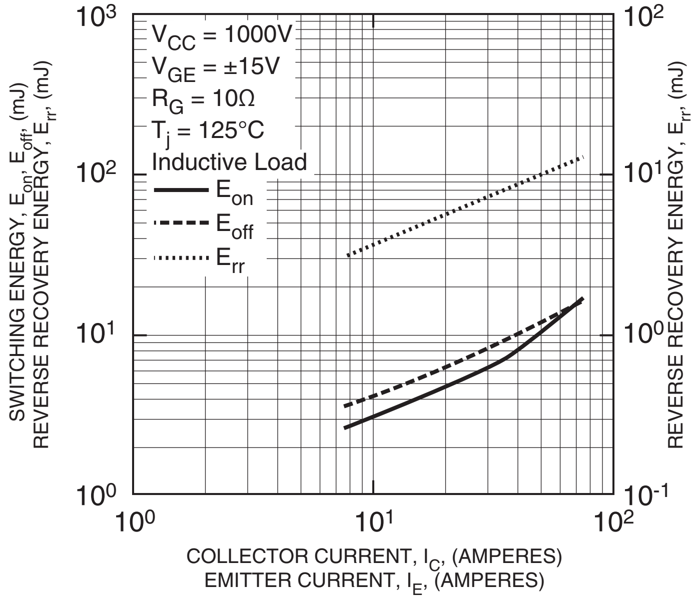
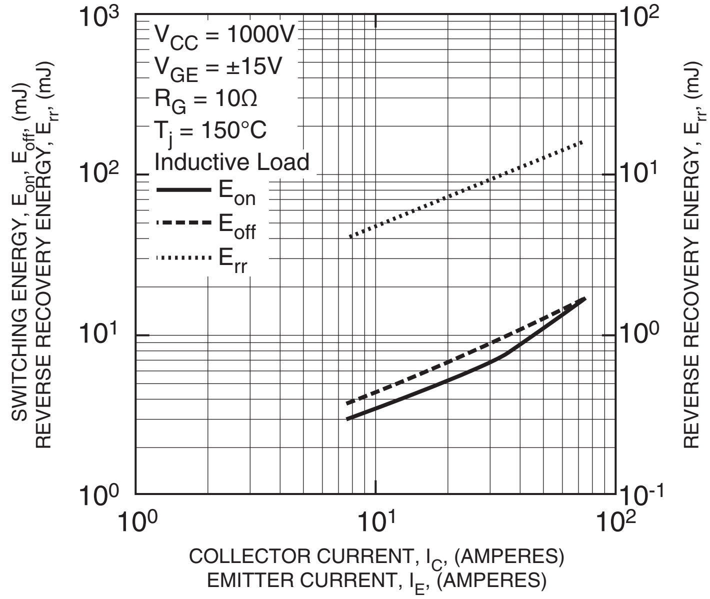
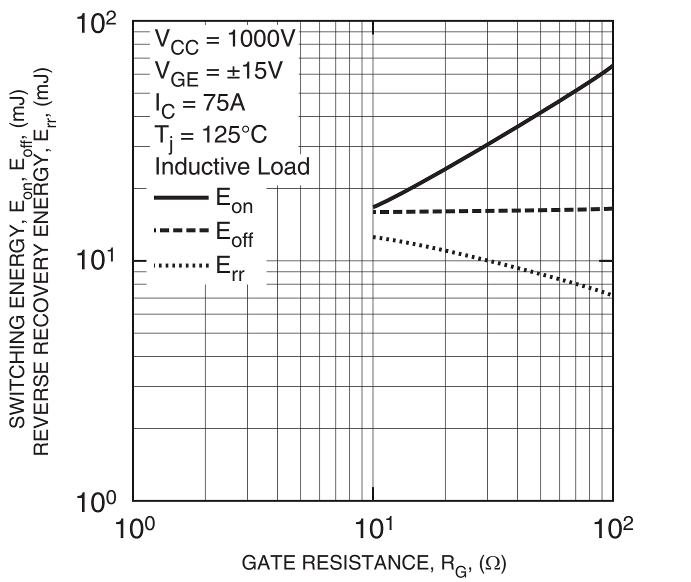
HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)



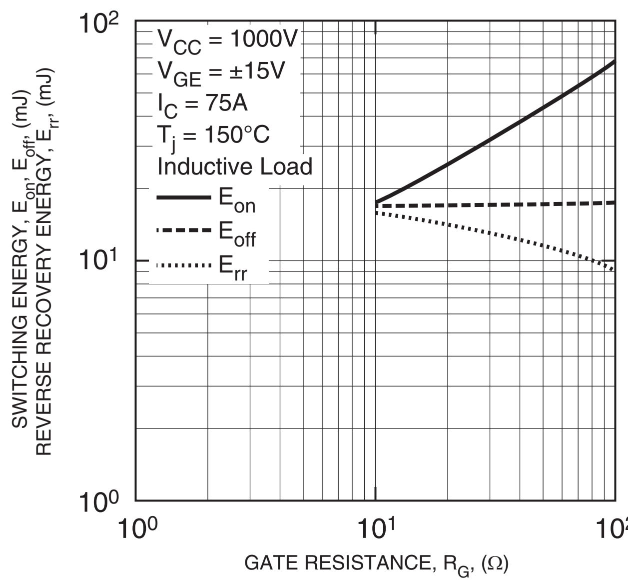
HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)



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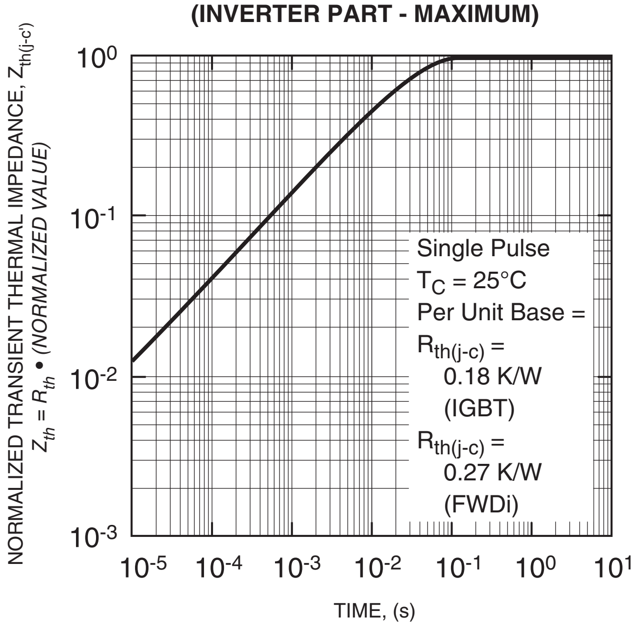
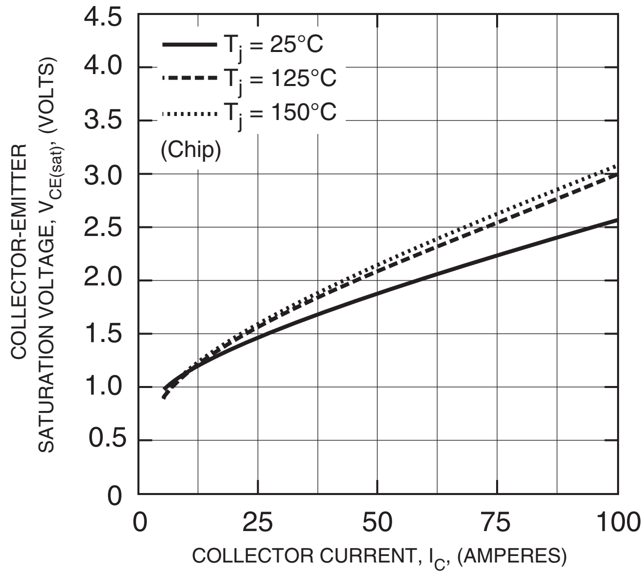
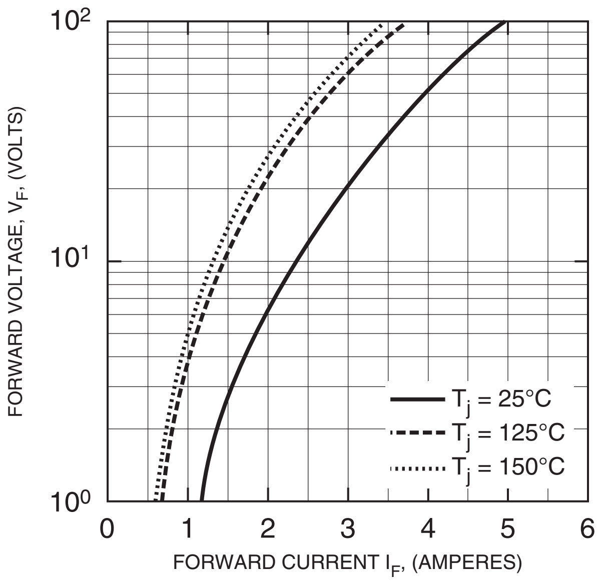
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (INVERTER PART - MAXIMUM)



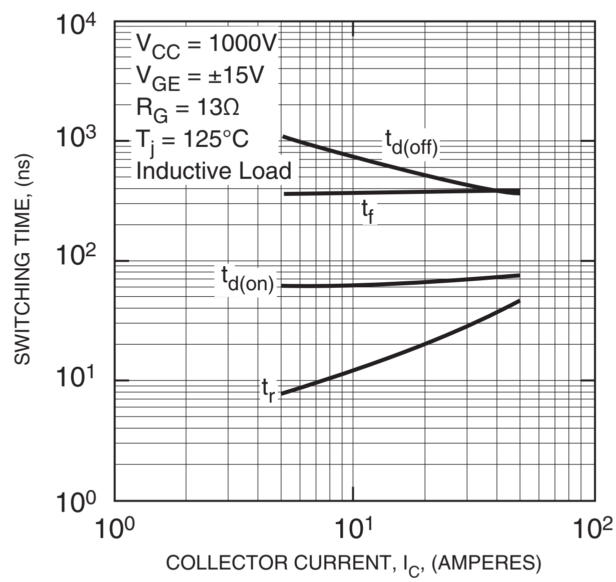
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (BRAKE PART - TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (BRAKE PART - TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (BRAKE PART - TYPICAL)



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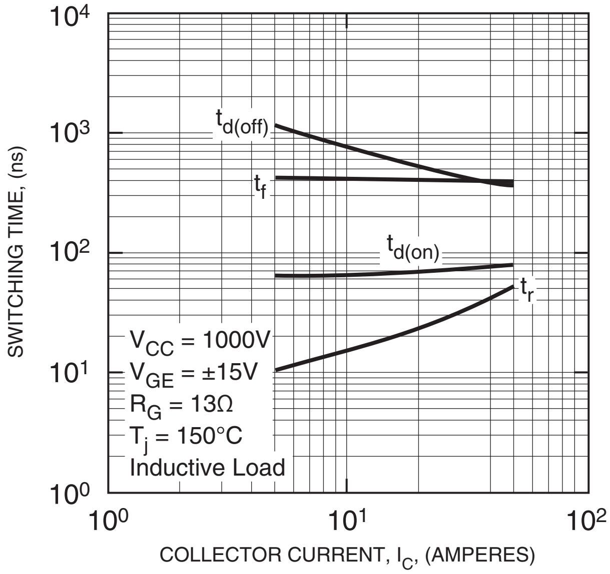
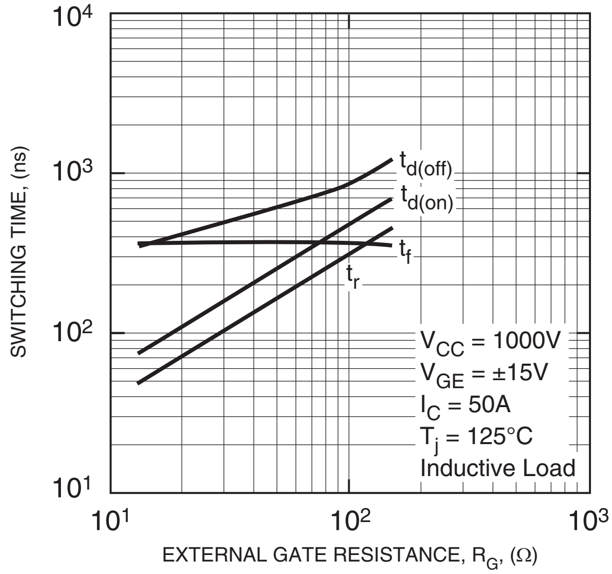
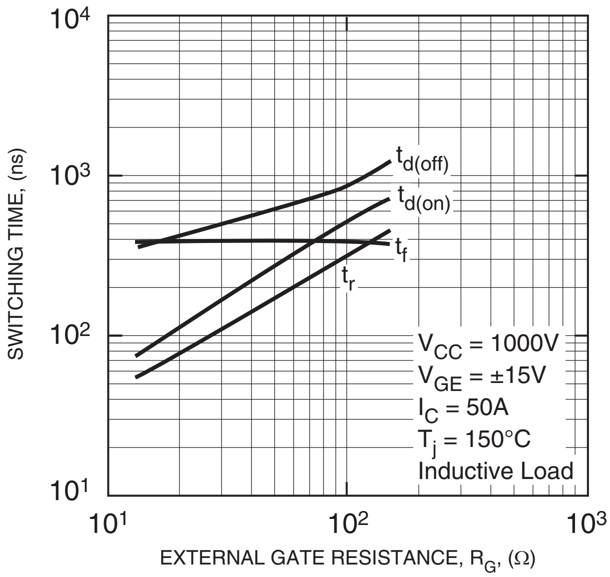
HALF-BRIDGE SWITCHING CHARACTERISTICS (BRAKE PART - TYPICAL)



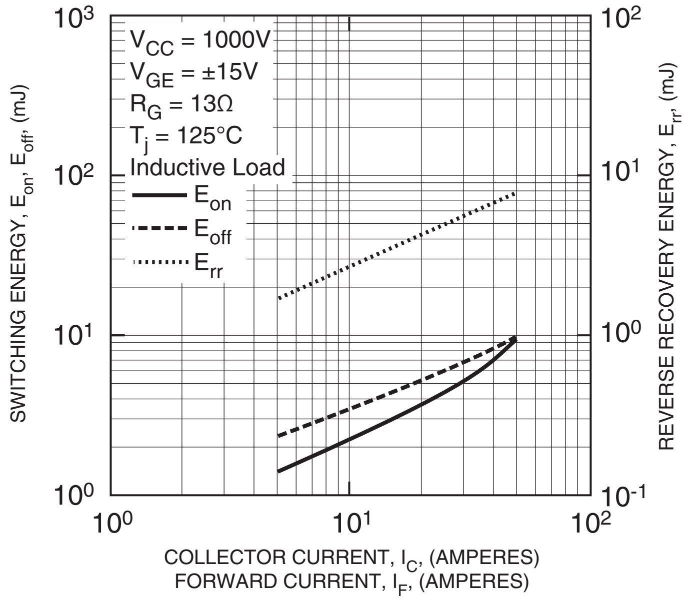
SWITCHING TIME VS. GATE RESISTANCE (BRAKE - TYPICAL)



SWITCHING TIME VS. GATE RESISTANCE (BRAKE - TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (BRAKE PART - TYPICAL)



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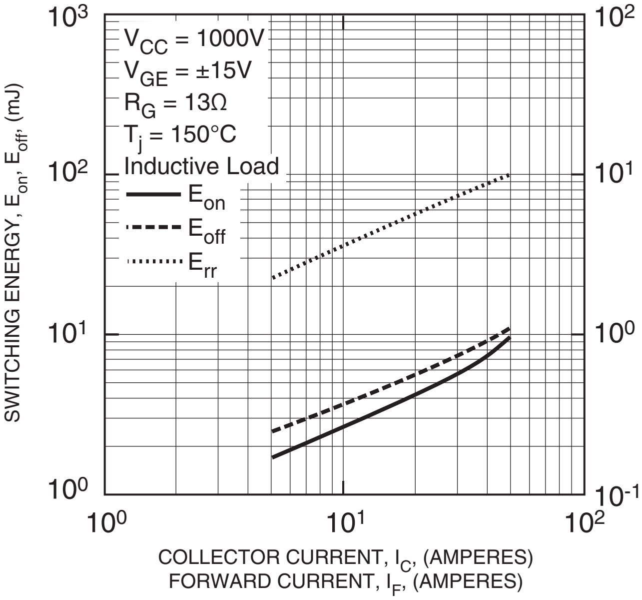
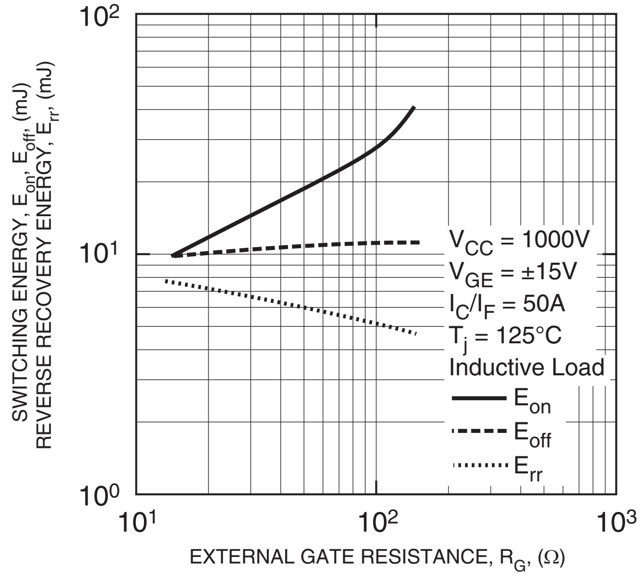
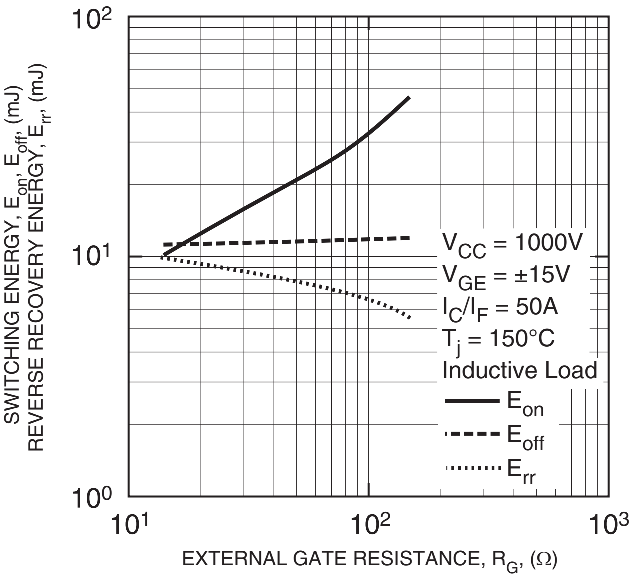
HALF-BRIDGE SWITCHING CHARACTERISTICS (BRAKE PART - TYPICAL)



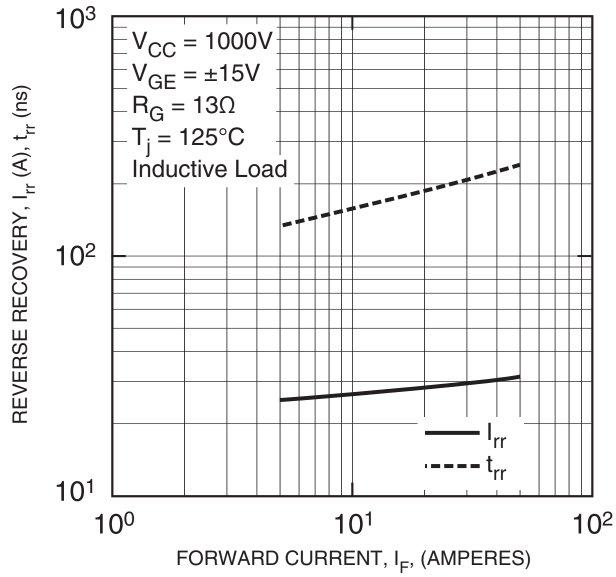
HALF-BRIDGE SWITCHING CHARACTERISTICS (BRAKE PART - TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (BRAKE PART - TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (BRAKE PART - TYPICAL)



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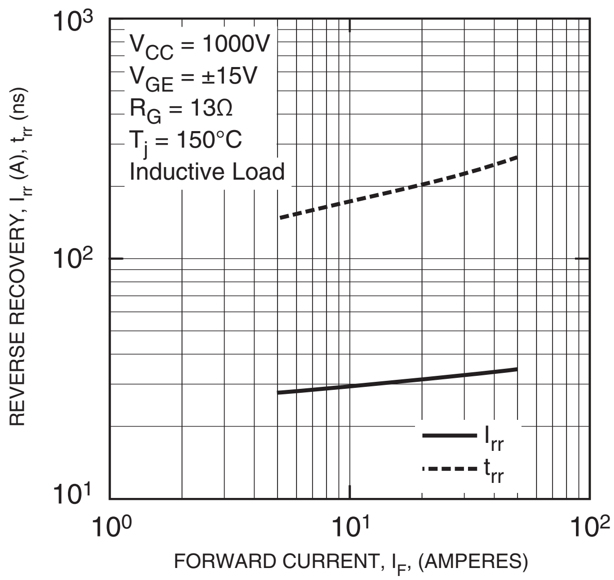
REVERSE RECOVERY CHARACTERISTICS (BRAKE PART - TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (BRAKE PART - MAXIMUM)