CM200RX-12A

HIGH POWER SWITCHING USE

CM200RX-12A

- I_C 200A
- V_{CES} 600V
- 7pack (3-phase Inverter + Brake)

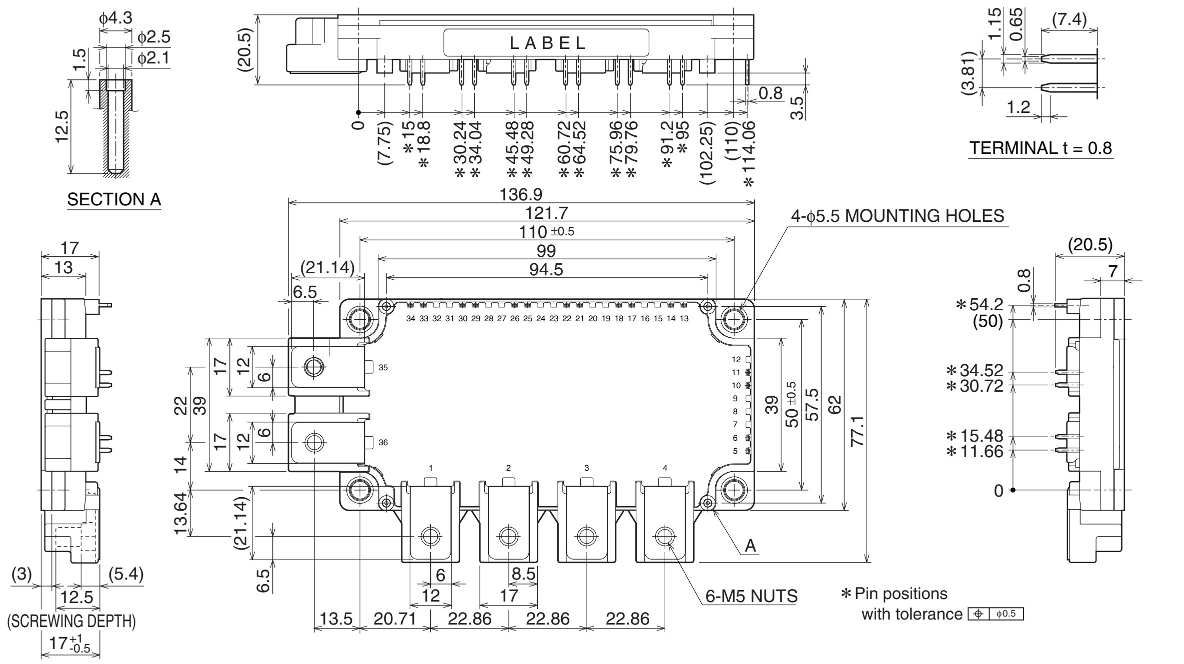
- Flatbase Type / Insulated Package / Copper (non-plating) base plate
- RoHS Directive compliant

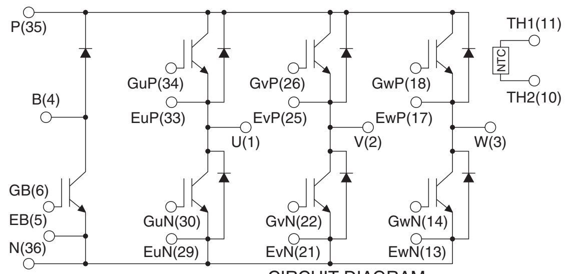
APPLICATION

General purpose Inverters, Servo Amplifiers

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm





CIRCUIT DIAGRAM

Tolerance otherwise specified

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

Jan. 2009

MITSUBISHI ELECTRIC

ABSOLUTE MAXIMUM RATINGS (T_j = 25°C, unless otherwise specified)

INVERTER PART

Symbol	Parameter	Conditions	Rating	Unit
V_{CES}	Collector-emitter voltage	G-E Short	600	V
V_{GES}	Gate-emitter voltage	C-E Short	±20	V
I_C	Collector current	DC, T_C = 68°C (Note. 1)	200	A
I_{CRM}	Collector current	Pulse (Note. 4)	400	A
P_C	Maximum collector dissipation	T_C = 25°C (Note. 1, 5)	735	W
I_E (Note.3)	Emitter current	T_C = 25°C (Note. 1)	200	A
I_{ERM}(Note.3)	(Free wheeling diode forward current)	Pulse (Note. 4)	400	A

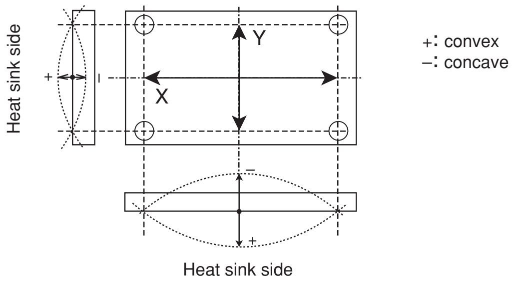
BRAKE PART

Symbol	Parameter	Conditions	Rating	Unit
V_{CES}	Collector-emitter voltage	G-E Short	600	V
V_{GES}	Gate-emitter voltage	C-E Short	±20	V
I_C	Collector current	DC, T_C = 75°C (Note. 1)	100	A
I_{CRM}	Collector current	Pulse (Note. 4)	200	A
P_C	Maximum collector dissipation	T_C = 25°C (Note. 1, 5)	400	W
V_{RRM}(Note.3)	Repetitive peak reverse voltage		600	V
I_F (Note.3)	Forward current	T_C = 25°C (Note. 1)	100	A
I_{FRM}(Note.3)	Forward current	Pulse (Note. 4)	200	A

MODULE

Symbol	Parameter	Conditions	Rating	Unit
T_j	Junction temperature		–40 ~ +150	°C
T_{stg}	Storage temperature		–40 ~ +125	°C
V_{iso}	Isolation voltage	Terminals to base plate, f = 60Hz, AC 1 minute	2500	Vrms
—	Base plate flatness	On the centerline X, Y (Note. 8)	±0 ~ +100	µm
—	Torque strength	Main terminals M5 screw	2.5 ~ 3.5	N·m
—	Torque strength	Mounting M5 screw	2.5 ~ 3.5	N·m
—	Weight	(Typical)	330	g

Note. 8: The base plate flatness measurement points are in the following figure.



ELECTRICAL CHARACTERISTICS (T_j = 25°C, unless otherwise specified)

INVERTER PART

Symbol	Parameter	Conditions		Limits			Unit
				Min.	Typ.	Max.	
I_{CES}	Collector cutoff current	V_{CE} = V_{CES}, V_{GE} = 0V		—	—	1	mA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C = 20mA, V_{CE} = 10V		5	6	7	V
I_{GES}	Gate leakage current	±V_{GE} = V_{GES}, V_{CE} = 0V		—	—	0.5	μA
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = 200A, V_{GE} = 15V (Note. 6)	T_j = 25°C	—	1.7	2.1	V
			T_j = 125°C	—	1.9	—	
		I_C = 200A, V_{GE} = 15V	Chip	—	1.6	—	
C_{ies}	Input capacitance	V_{CE} = 10V, V_{GE} = 0V (Note. 6)		—	—	27	nF
C_{oes}	Output capacitance			—	—	2.7	
C_{res}	Reverse transfer capacitance			—	—	0.8	
Q_G	Total gate charge	V_{CC} = 300V, I_C = 200A, V_{GE} = 15V		—	530	—	nC
$t_{d(on)}$	Turn-on delay time	V_{CC} = 300V, I_C = 200A, V_{GE} = ±15V, R_G = 5.1Ω, Inductive load		—	—	120	ns
t_r	Turn-on rise time			—	—	150	
$t_{d(off)}$	Turn-off delay time			—	—	350	
t_f	Turn-off fall time			—	—	600	
t_{rr} (Note.3)	Reverse recovery time	(I_E = 200A)		—	—	200	
Q_{rr} (Note.3)	Reverse recovery charge			—	5	—	μC
V_{EC}(Note.3)	Emitter-collector voltage	I_E = 200A, V_{GE} = 0V (Note. 6)	T_j = 25°C	—	2.0	2.8	V
			T_j = 125°C	—	1.95	—	
		I_E = 200A, V_{GE} = 0V	Chip	—	1.9	—	
$R_{th(j-c)Q}$	Thermal resistance (Junction to case) (Note. 1)	per IGBT		—	—	0.17	K/W
$R_{th(j-c)R}$		per free wheeling diode		—	—	0.33	
R_{Gint}	Internal gate resistance	T_C = 25°C, per switch		—	0	—	Ω
R_G	External gate resistance			3.0	—	31	

BRAKE PART

Symbol	Parameter	Conditions		Limits			Unit
				Min.	Typ.	Max.	
I_{CES}	Collector cutoff current	V_{CE} = V_{CES}, V_{GE} = 0V		—	—	1	mA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C = 10mA, V_{CE} = 10V		5	6	7	V
I_{GES}	Gate leakage current	±V_{GE} = V_{GES}, V_{CE} = 0V		—	—	0.5	μA
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = 100A, V_{GE} = 15V (Note. 6)	T_j = 25°C	—	1.7	2.1	V
			T_j = 125°C	—	1.9	—	
		I_C = 100A, V_{GE} = 15V	Chip	—	1.6	—	
C_{ies}	Input capacitance	V_{CE} = 10V, V_{GE} = 0V (Note. 6)		—	—	13.3	nF
C_{oes}	Output capacitance			—	—	1.4	
C_{res}	Reverse transfer capacitance			—	—	0.45	
Q_G	Total gate charge	V_{CC} = 300V, I_C = 100A, V_{GE} = 15V		—	270	—	nC
I_{RRM}(Note.3)	Repetitive peak reverse current	V_R = V_{RRM}		—	—	1	mA
V_{FM}(Note.3)	Forward voltage drop	I_F = 100A (Note. 6)	T_j = 25°C	—	2.0	2.8	V
			T_j = 125°C	—	1.95	—	
		I_F = 100A	Chip	—	1.9	—	
$R_{th(j-c)Q}$	Thermal resistance (Junction to case) (Note. 1)	per IGBT		—	—	0.31	K/W
$R_{th(j-c)R}$		per Clamp diode		—	—	0.59	
R_{Gint}	Internal gate resistance	T_C = 25°C		—	0	—	Ω
R_G	External gate resistance			6.0	—	62	

NTC THERMISTOR PART

Symbol	Parameter	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R	Zero power resistance	T_C = 25°C	4.85	5.00	5.15	kΩ
ΔR/R	Deviation of resistance	T_C = 100°C, R_{100} = 493Ω	–7.3	—	+7.8	%
$B_{(25/50)}$	B constant	Approximate by equation (Note. 7)	—	3375	—	K
P_{25}	Power dissipation	T_C = 25°C	—	—	10	mW

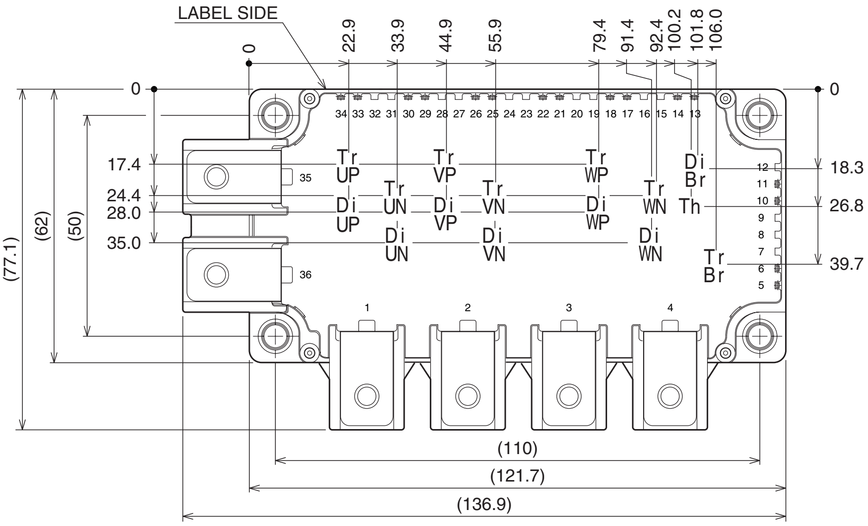
MODULE

Symbol	Parameter	Conditions	Limits			Unit
			Min.	Typ.	Max.	
$R_{th(c-f)}$	Contact thermal resistance (Case to fin) (Note. 1)	Thermal grease applied per 1 module (Note. 2)	—	0.015	—	K/W

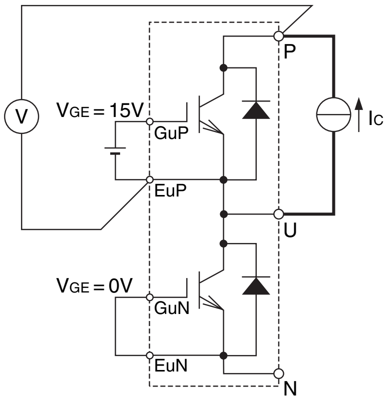
Note. 1: Case temperature (T_C), heat sink temperature (T_f) measured point is just under the chips. (Refer to the figure of the chip location.)
2: Typical value is measured by using thermally conductive grease of λ = 0.9W/(m·K).
3: I_E, I_{ERM}, V_{EC}, t_{rr} and Q_{rr} represent ratings and characteristics of the anti-parallel, emitter-collector free wheeling diode (FWDi).
I_F, I_{FRM}, V_F, V_{RRM} and I_{RRM} represent ratings and characteristics of the Clamp diode of Brake part.
4: Pulse width and repetition rate should be such that the device junction temperature (T_j) dose not exceed Tjmax rating.
5: Junction temperature (T_j) should not increase beyond 150°C.
6: Pulse width and repetition rate should be such as to cause negligible temperature rise.
(Refer to the figure of the test circuit for $V_{CE(sat)}$ and V_{EC})
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]

Chip Location (Top view)

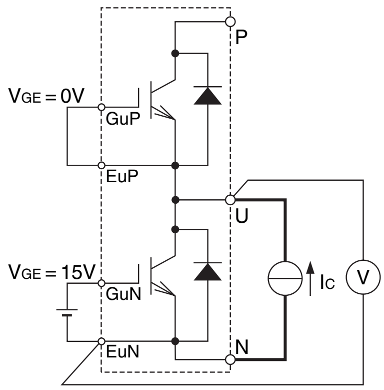
Dimensions in mm (tolerance: ±1mm)



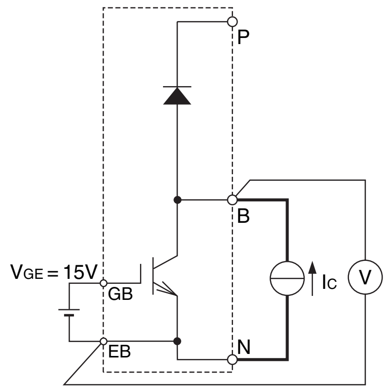
Each mark points the center position of each chip. Tr**: IGBT, Di**: FWDi (DiBr: Clamp diode), Th: NTC thermistor



P side Inverter part Tr
(example of U arm)
VGE = 0V(GvP-EvP, GwP-EwP, GvN-EvN,
GwN-EwN, GB-EB)

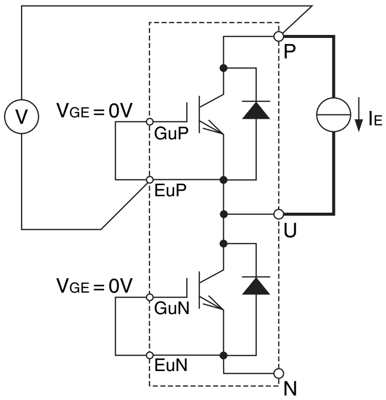


N side Inverter part Tr
(example of U arm)
VGE = 0V(GvP-EvP, GwP-EwP, GvN-EvN,
GwN-EwN, GB-EB)

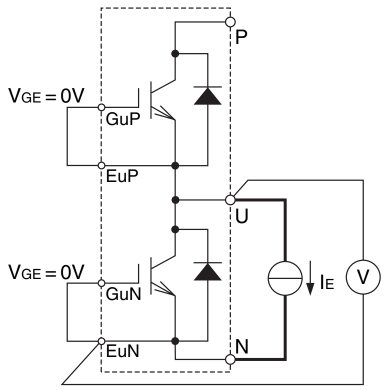


Br Tr
VGE = 0V(GuP-EuP, GvP-EvP, GwP-EwP,
GuN-EuN, GvN-EvN, GwN-EwN)

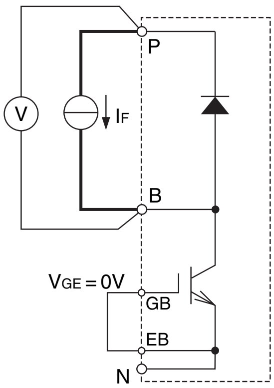
VCE(sat) test circuit



P side Inverter part Di
(example of U arm)
VGE = 0V(GvP-EvP, GwP-EwP, GvN-EvN,
GwN-EwN, GB-EB)

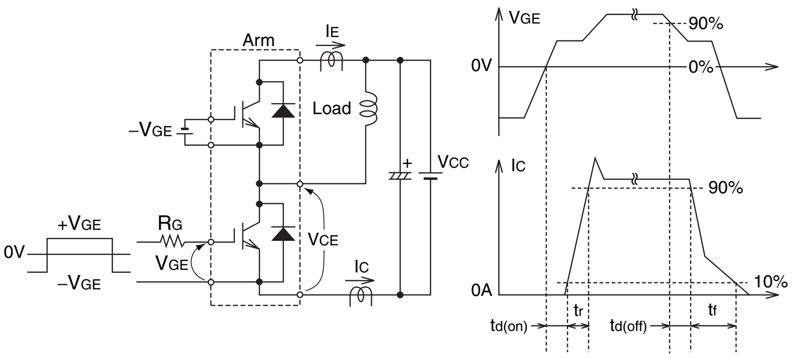


N side Inverter part Di
(example of U arm)
VGE = 0V(GvP-EvP, GwP-EwP, GvN-EvN,
GwN-EwN, GB-EB)

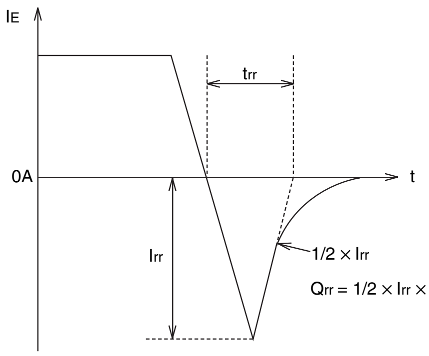


Br Di
VGE = 0V(GuP-EuP, GvP-EvP, GwP-EwP,
GuN-EuN, GvN-EvN, GwN-EwN)

VEC/VFM test circuit



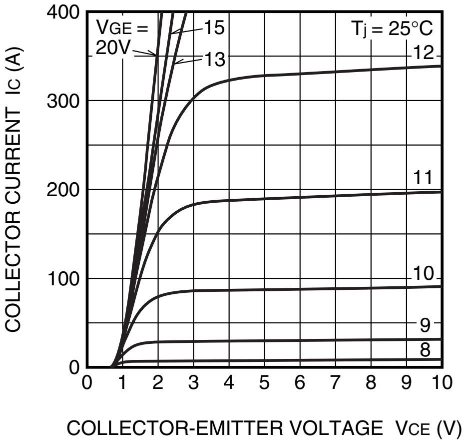
Switching time test circuit and waveforms



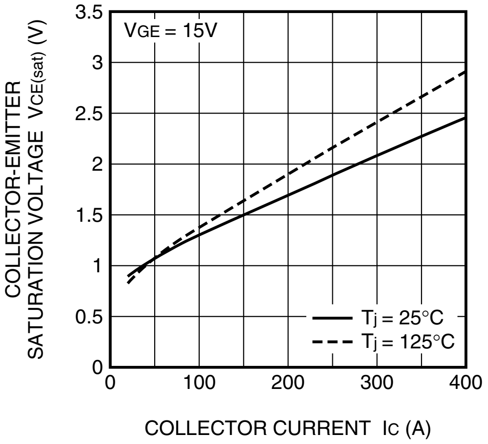
t_{rr}, Q_{rr} test waveform

PERFORMANCE CURVES

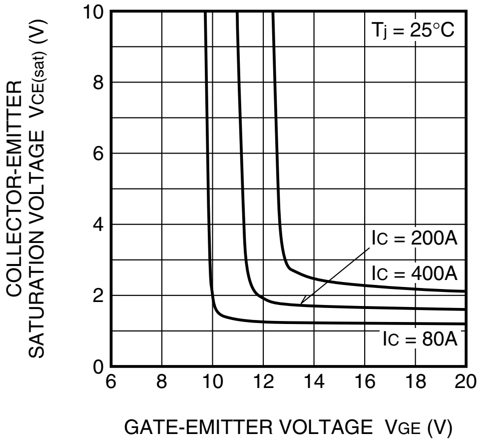
OUTPUT CHARACTERISTICS (TYPICAL) Inverter part



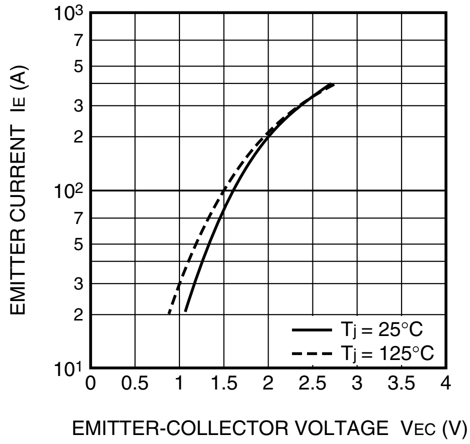
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL) Inverter part



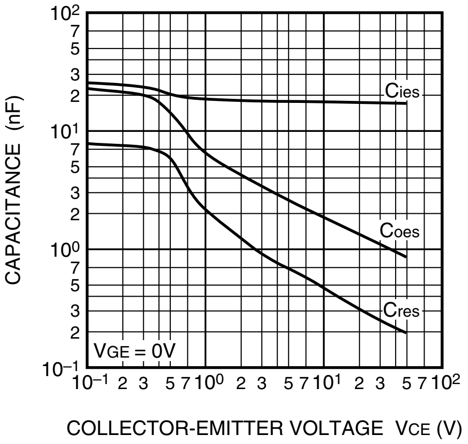
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL) Inverter part



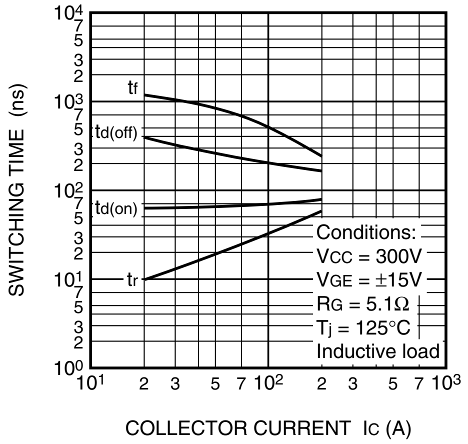
FREE WHEELING DIODE FORWARD CHARACTERISTICS (TYPICAL) Inverter part



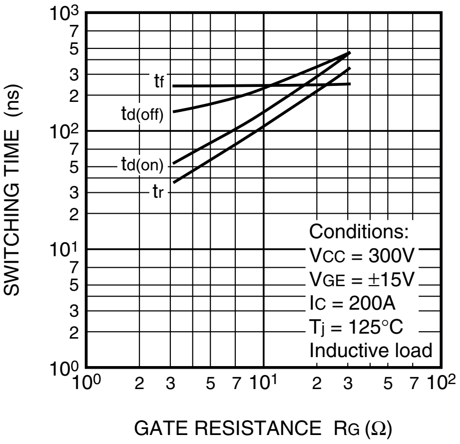
CAPACITANCE CHARACTERISTICS (TYPICAL) Inverter part



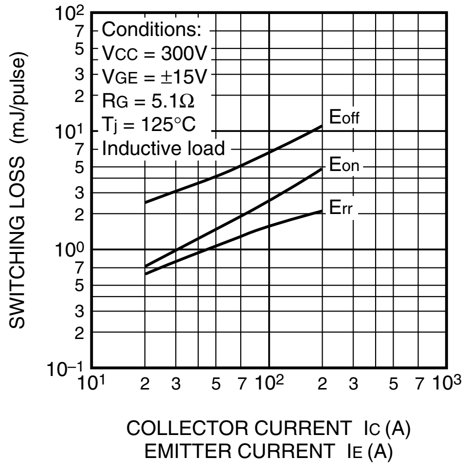
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL) Inverter part



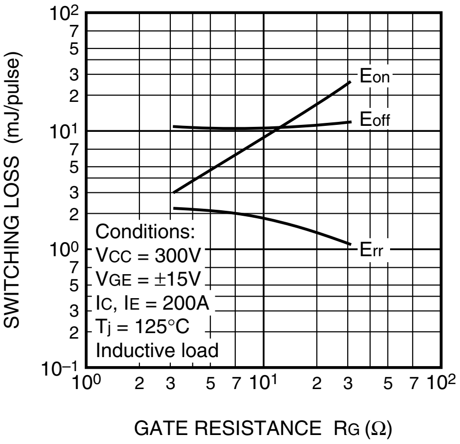
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL) Inverter part



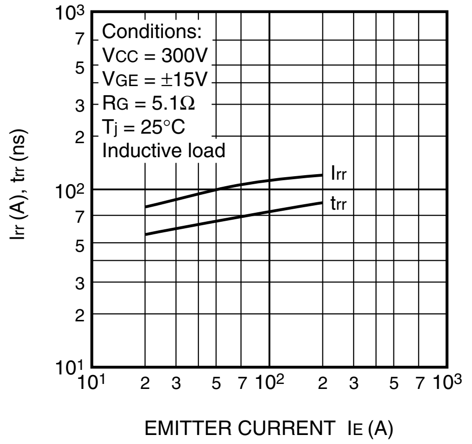
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL) Inverter part



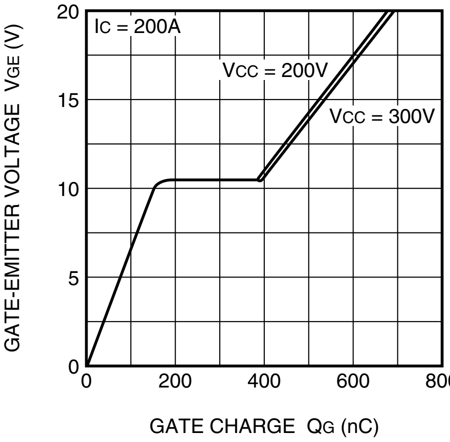
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL) Inverter part



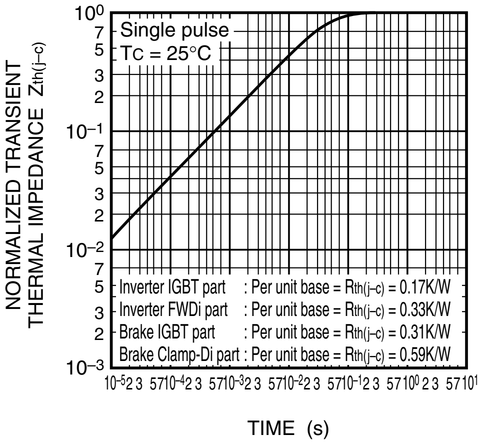
REVERSE RECOVERY CHARACTERISTICS OF FREE WHEELING DIODE (TYPICAL) Inverter part



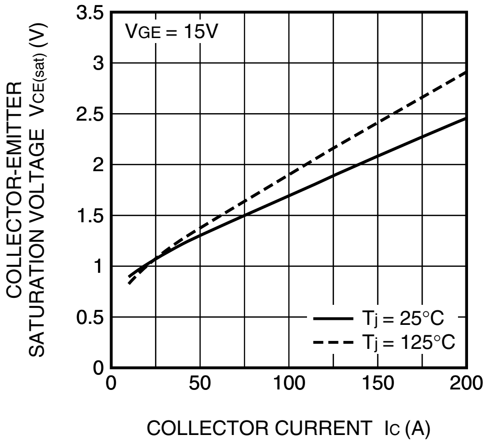
GATE CHARGE CHARACTERISTICS (TYPICAL) Inverter part



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL) Brake part



CLAMP DIODE FORWARD CHARACTERISTICS (TYPICAL) Brake part