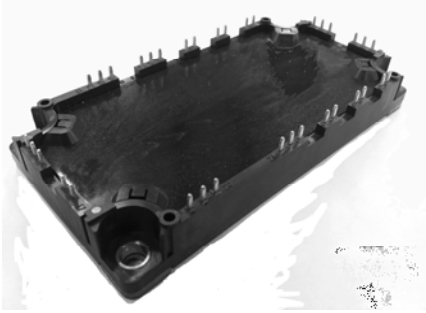
MITSUBISHI ELECTRIC

< IGBT MODULES >

CM75MXA-34SA

HIGH POWER SWITCHING USE
INSULATED TYPE



CIB (Converter+Inverter+Chopper Brake)

Collector current I_C ..... **75** A
Collector-emitter voltage V_{CES} ..... **1700** V
Maximum junction temperature T_{jmax} ..... **175** °C *
*: Converter part is permitted up to 150 °C.

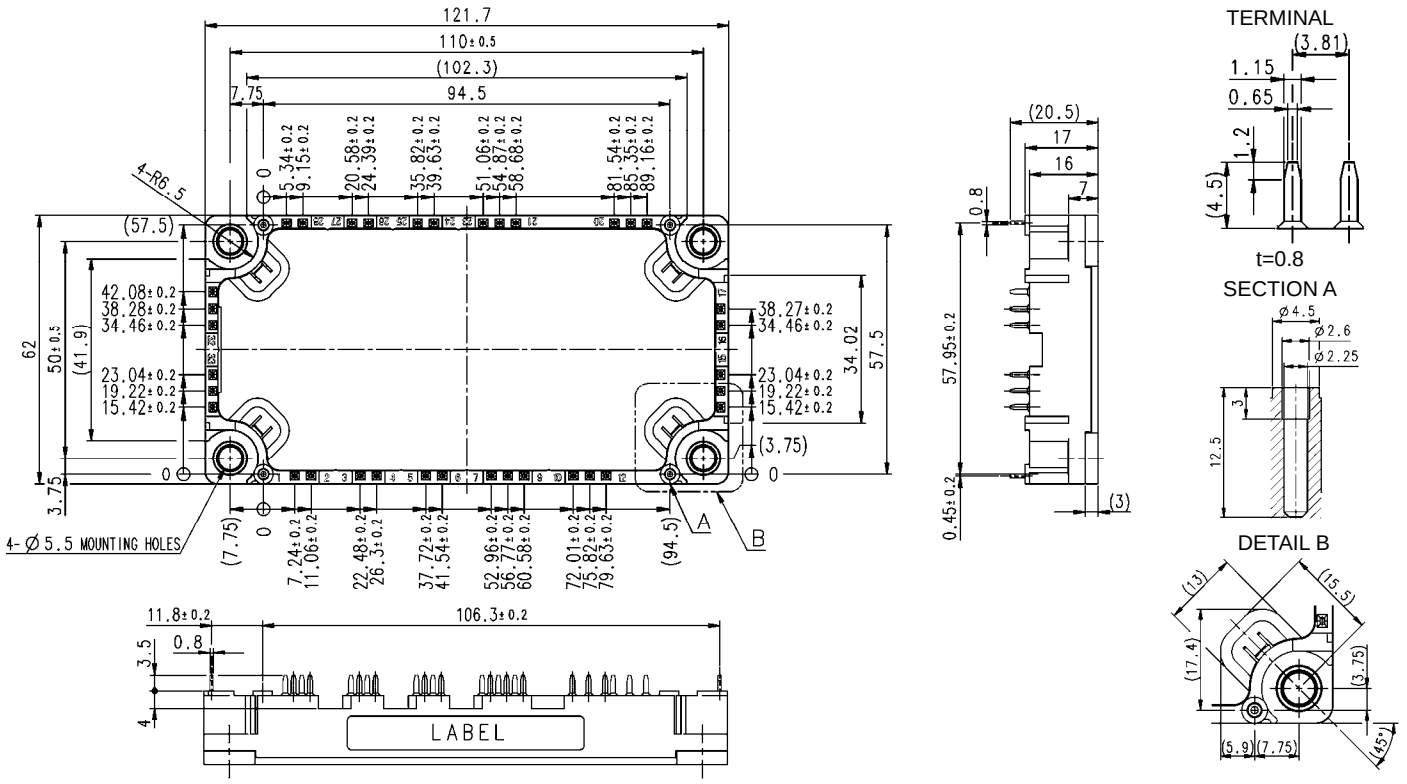
- ●Flat base Type
- ●Copper base plate (non-plating)
- ●Tin plating pin terminals
- ●RoHS Directive compliant
- ●Recognized under UL1557, File E323585

APPLICATION

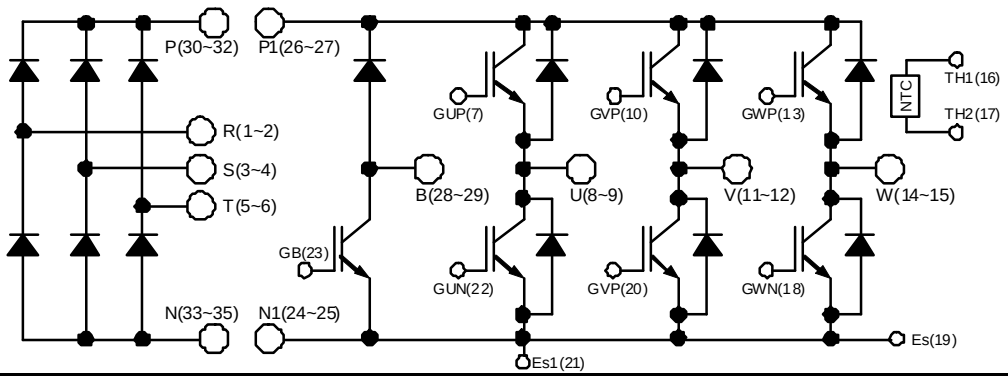
AC Motor Control, Motion/Servo Control, etc.

OUTLINE DRAWING & INTERNAL CONNECTION

Dimension in mm



INTERNAL CONNECTION



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

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

INVERTER PART IGBT/DIODE

Symbol	Item	Conditions	Rating	Unit
V_{CES}	Collector-emitter voltage	G-E short-circuited	1700	V
V_{GES}	Gate-emitter voltage	C-E short-circuited	± 20	V
I_C	Collector current	DC, T_C=125 °C (Note2, 4)	75	A
I_{CRM}		Pulse, Repetitive (Note3)	150	
P_{tot}	Total power dissipation	T_C=25 °C (Note2, 4)	830	W
I_E (Note1)	Emitter current	(Note2)	75	A
I_{ERM} (Note1)		Pulse, Repetitive (Note3)	150	
T_{jmax}	Maximum junction temperature	Instantaneous event (overload)	175	°C

BRAKE PART IGBT/DIODE

Symbol	Item	Conditions	Rating	Unit
V_{CES}	Collector-emitter voltage	G-E short-circuited	1700	V
V_{GES}	Gate-emitter voltage	C-E short-circuited	± 20	V
I_C	Collector current	DC, T_C=125 °C (Note2, 4)	50	A
I_{CRM}		Pulse, Repetitive (Note3)	100	
P_{tot}	Total power dissipation	T_C=25 °C (Note2, 4)	600	W
V_{RRM}	Repetitive peak reverse voltage	G-E short-circuited	1700	V
I_F	Forward current	(Note2)	50	A
I_{FRM}		Pulse, Repetitive (Note3)	100	
T_{jmax}	Maximum junction temperature	Instantaneous event (overload)	175	°C

CONVERTER PART DIODE

Symbol	Item	Conditions	Rating	Unit
V_{RRM}	Repetitive peak reverse voltage	-	1800	V
E_a	Recommended AC input voltage	RMS	575 / 690	V
I_O	DC output current	3-phase full wave rectifying, T_C=125 °C (Note4)	75	A
I_{FSM}	Surge forward current	The sine half wave 1 cycle peak value, f=60 Hz, non-repetitive	750	A
I^2t	Current square time	Value for one cycle of surge current	2340	A^2s
T_{jmax}	Maximum junction temperature	Instantaneous event (overload)	150	°C

MODULE

Symbol	Item	Conditions	Rating	Unit
V_{isol}	Isolation voltage	Terminals to base plate, RMS, f=60 Hz, AC 1 min	4000	V
T_{Cmax}	Maximum case temperature	(Note4)	125	°C
T_{jop}	Operating junction temperature	Continuous operation (under switching)	-40 ~ +150	°C
T_{stg}	Storage temperature	-	-40 ~ +125	

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

INVERTER PART IGBT/DIODE

Symbol	Item	Conditions		Limits			Unit
				Min.	Typ.	Max.	
I_{CES}	Collector-emitter cut-off current	V_{CE}=V_{CES}, G-E short-circuited		-	-	1.0	mA
I_{GES}	Gate-emitter leakage current	V_{GE}=V_{GES}, C-E short-circuited		-	-	0.5	µA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C=7.5 mA, V_{CE}=10 V		5.4	6.0	6.6	V
V_{CEsat}	Collector-emitter saturation voltage	I_C=75 A (Note5), V_{GE}=15 V, (Terminal)	T_j=25 °C	-	2.00	2.5	V
			T_j=125 °C	-	2.20	-	
			T_j=150 °C	-	2.25	-	
		I_C=75 A (Note5), V_{GE}=15 V, (Chip)	T_j=25 °C	-	1.90	2.4	V
			T_j=125 °C	-	2.10	-	
			T_j=150 °C	-	2.15	-	

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

INVERTER PART IGBT/DIODE

Symbol	Item	Conditions		Limits			Unit
				Min.	Typ.	Max.	
C_{ies}	Input capacitance	V_{CE}=10 V, G-E short-circuited		-	-	20	nF
C_{oes}	Output capacitance			-	-	1.6	
C_{res}	Reverse transfer capacitance			-	-	0.36	
Q_G	Gate charge	V_{CC}=1000 V, I_C=75 A, V_{GE}=15 V		-	414	-	nC
$t_{d(on)}$	Turn-on delay time	V_{CC}=1000 V, I_C=75 A, V_{GE}=±15 V, R_G=10 Ω, Inductive load		-	-	200	ns
t_r	Rise time			-	-	100	
$t_{d(off)}$	Turn-off delay time			-	-	700	
t_f	Fall time			-	-	600	
V_{EC} (Note1)	Emitter-collector voltage	I_E=75 A (Note5), G-E short-circuited, (Terminal)	T_j=25 °C	-	4.1	5.3	V
			T_j=125 °C	-	2.9	-	
			T_j=150 °C	-	2.7	-	
		I_E=75 A (Note5), G-E short-circuited, (Chip)	T_j=25 °C	-	4.0	5.2	V
			T_j=125 °C	-	2.8	-	
			T_j=150 °C	-	2.6	-	
t_{rr} (Note1)	Reverse recovery time	V_{CC}=1000 V, I_E=75 A, V_{GE}=±15 V, R_G=10 Ω, Inductive load		-	-	200	ns
Q_{rr} (Note1)	Reverse recovery charge			-	2.0	-	µC
E_{on}	Turn-on switching energy per pulse	V_{CC}=1000 V, I_C=I_E=75 A, V_{GE}=±15 V, R_G=10 Ω, T_j=150 °C, Inductive load		-	17.1	-	mJ
E_{off}	Turn-off switching energy per pulse			-	23	-	
E_{rr} (Note1)	Reverse recovery energy per pulse			-	15.9	-	mJ
$R_{CC'+EE'}$	Internal lead resistance	Main terminals-chip, per switch, T_C=25 °C (Note4)		-	-	3.7	mΩ
r_g	Internal gate resistance	Per switch		-	0	-	Ω

BRAKE PART IGBT/DIODE

Symbol	Item	Conditions		Limits			Unit
				Min.	Typ.	Max.	
I_{CES}	Collector-emitter cut-off current	V_{CE}=V_{CES}, G-E short-circuited		-	-	1.0	mA
I_{GES}	Gate-emitter leakage current	V_{GE}=V_{GES}, C-E short-circuited		-	-	0.5	µA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C=5 mA, V_{CE}=10 V		5.4	6.0	6.6	V
V_{CEsat}	Collector-emitter saturation voltage	I_C=50 A (Note5), V_{GE}=15 V, (Terminal)	T_j=25 °C	-	2.00	2.5	V
			T_j=125 °C	-	2.20	-	
			T_j=150 °C	-	2.25	-	
		I_C=50 A (Note5), V_{GE}=15 V, (Chip)	T_j=25 °C	-	1.90	2.4	V
			T_j=125 °C	-	2.10	-	
			T_j=150 °C	-	2.15	-	
C_{ies}	Input capacitance	V_{CE}=10 V, G-E short-circuited		-	-	13	nF
C_{oes}	Output capacitance			-	-	1.1	
C_{res}	Reverse transfer capacitance			-	-	0.24	
Q_G	Gate charge	V_{CC}=1000 V, I_C=50 A, V_{GE}=15 V		-	276	-	nC
$t_{d(on)}$	Turn-on delay time	V_{CC}=1000 V, I_C=50 A, V_{GE}=±15 V, R_G=13 Ω, Inductive load		-	-	200	ns
t_r	Rise time			-	-	100	
$t_{d(off)}$	Turn-off delay time			-	-	700	
t_f	Fall time			-	-	600	

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

BRAKE PART IGBT/DIODE

Symbol	Item	Conditions		Limits			Unit
				Min.	Typ.	Max.	
I_{RRM}	Reverse current	V_R=V_{RRM}, G-E short-circuited		-	-	1.0	mA
V_F	Forward voltage	I_F=50 A (Note5), (Terminal)	T_j=25 °C	-	4.1	5.3	V
			T_j=125 °C	-	2.9	-	
			T_j=150 °C	-	2.7	-	
		I_F=50 A (Note5), (Chip)	T_j=25 °C	-	4.0	5.2	V
			T_j=125 °C	-	2.8	-	
			T_j=150 °C	-	2.6	-	
t_{rr}	Reverse recovery time	V_{CC}=1000 V, I_F=50 A, V_{GE}=±15 V, R_G=13 Ω, Inductive load		-	-	200	ns
Q_{rr}	Reverse recovery charge			-	1.3	-	µC
E_{on}	Turn-on switching energy per pulse	V_{CC}=1000 V, I_C=I_F=50 A, V_{GE}=±15 V, R_G=13 Ω, T_j=150 °C, Inductive load		-	9.7	-	mJ
E_{off}	Turn-off switching energy per pulse			-	11.2	-	
E_{rr}	Reverse recovery energy per pulse			-	9.8	-	mJ
r_g	Internal gate resistance	-		-	0	-	Ω

CONVERTER PART DIODE

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
I_{RRM}	Reverse current	V_R=V_{RRM}, T_j=150 °C	-	-	20	mA
V_F (Terminal)	Forward voltage	I_F=75 A (Note5)	-	1.2	1.6	V

NTC THERMISTOR PART

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R_{25}	Zero-power resistance	T_C=25 °C (Note4)	4.85	5.00	5.15	kΩ
ΔR/R	Deviation of resistance	R_{100}=493 Ω, T_C=100 °C (Note4)	-7.3	-	+7.8	%
$B_{(25/50)}$	B-constant	Approximate by equation (Note6)	-	3375	-	K
P_{25}	Power dissipation	T_C=25 °C (Note4)	-	-	10	mW

THERMAL RESISTANCE CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
$R_{th(j-c)Q}$	Thermal resistance (Note4)	Junction to case, per Inverter IGBT	-	-	0.18	K/W
$R_{th(j-c)D}$		Junction to case, per Inverter DIODE	-	-	0.27	
$R_{th(j-c)Q}$		Junction to case, Brake IGBT	-	-	0.25	K/W
$R_{th(j-c)D}$		Junction to case, Brake DIODE	-	-	0.35	
$R_{th(j-c)D}$		Junction to case, per Converter DIODE	-	-	0.24	K/W
$R_{th(c-s)}$	Contact thermal resistance	Case to heat sink, per 1 module, Thermal grease applied (Note4, 7)	-	15	-	K/kW

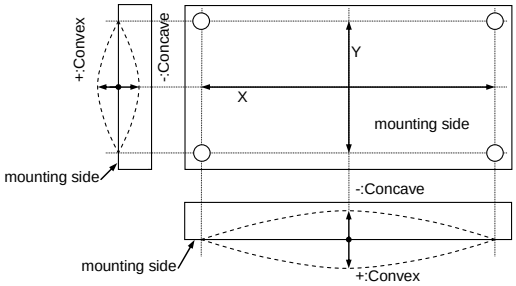
MECHANICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
M_s	Mounting torque	Mounting to heat sink M 5 screw	2.5	3.0	3.5	N·m
d_s	Creepage distance	Terminal to terminal	16.3	-	-	mm
		Terminal to base plate	16.8	-	-	
d_a	Clearance	Terminal to terminal	10.3	-	-	mm
		Terminal to base plate	9.53	-	-	
m	mass	-	-	330	-	g
e_c	Flatness of base plate	On the centerline X, Y (Note8)	±0	-	+100	µm

Note1. Represent ratings and characteristics of the anti-parallel, emitter-collector free wheeling diode (DIODE).

2. Junction temperature (T_j) should not increase beyond T_{jmax} rating.
3. Pulse width and repetition rate should be such that the device junction temperature (T_j) dose not exceed T_{jmax} rating.
4. Case temperature (T_C) and heat sink temperature (T_s) are defined on the each surface (mounting side) of base plate and heat sink just under the chips. Refer to the figure of chip location.
5. Pulse width and repetition rate should be such as to cause negligible temperature rise. Refer to the figure of test circuit.
6. $B_{(25/50)} = \ln(\frac{R_{25}}{R_{50}}) / (\frac{1}{T_{25}} - \frac{1}{T_{50}})$,

   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. The base plate (mounting side) flatness measurement points (X, Y) are as follows of the following figure.



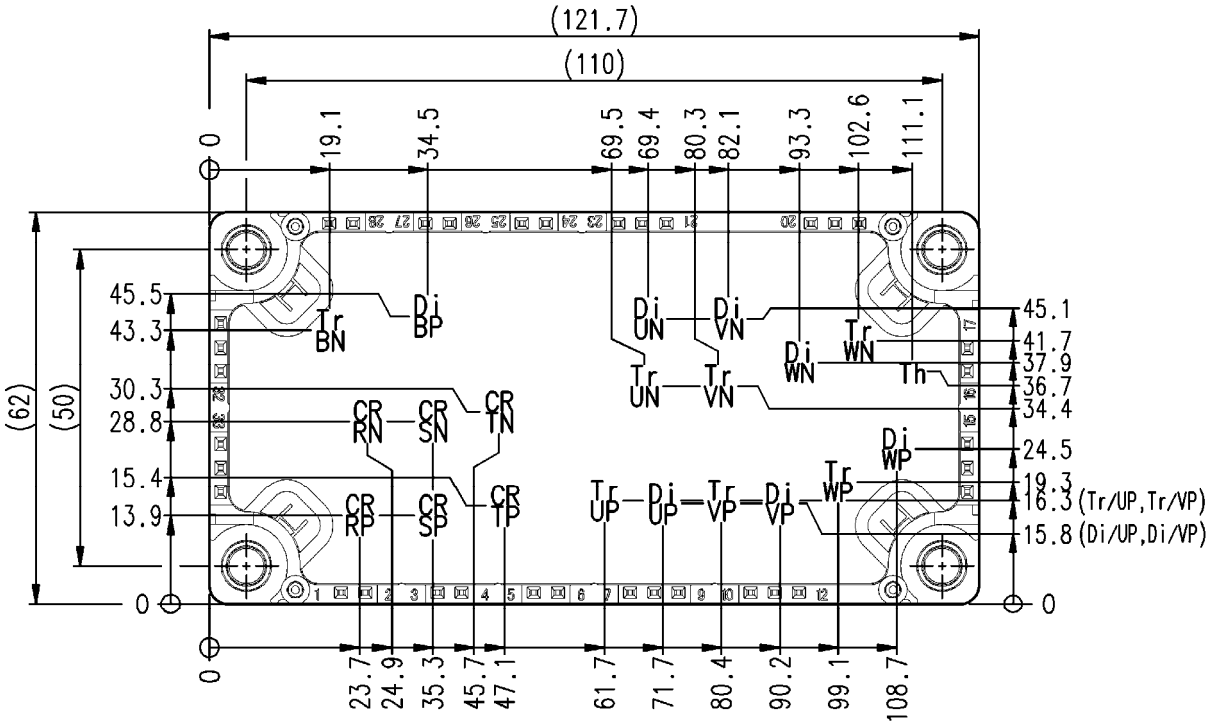
9. Use the following screws when mounting the printed circuit board (PCB) on the stand offs.
   φ2.6×10 or φ2.6×12 self tapping screw.
   The length of the screw depends on the thickness (t1.6~t2.0) of the PCB.

RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Conditions		Limits			Unit
				Min.	Typ.	Max.	
V_{CC}	(DC) Supply voltage	Applied across P1-N1/P-N terminals		-	1000	1200	V
V_{GEon}	Gate (-emitter drive) voltage	Applied across GB-Es/ G*P-*/G*N-Es(*=U, V, W) terminals		13.5	15.0	16.5	V
R_G	External gate resistance	Per switch	Inverter IGBT	10	-	100	Ω
			Brake IGBT	13	-	130	

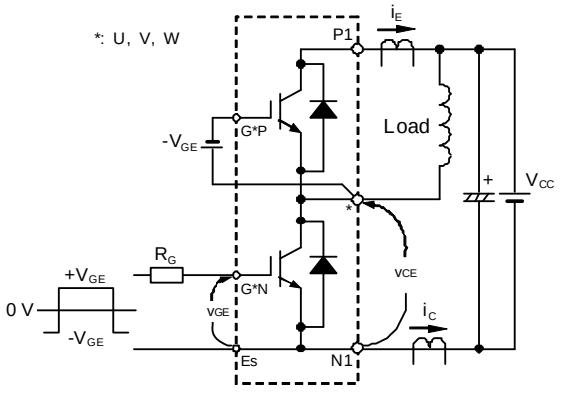
CHIP LOCATION (Top view)

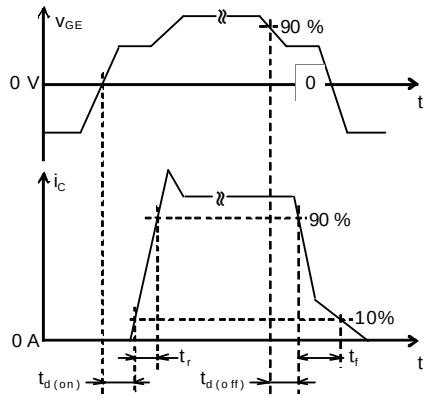
Dimension in mm, tolerance: ±1 mm



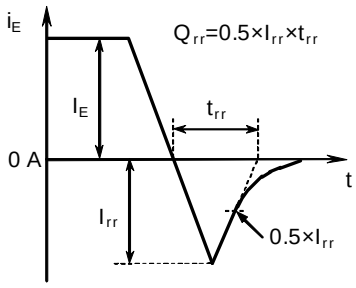
Tr*P/Tr*N/TrBN: IGBT, Di*P/Di*N: DIODE (*=U/V/W), DiBP: BRAKE DIODE, CR*P/CR*N: CONVETER DIODE (*=R/S/T), Th: NTC thermistor

TEST CIRCUIT AND WAVEFORMS

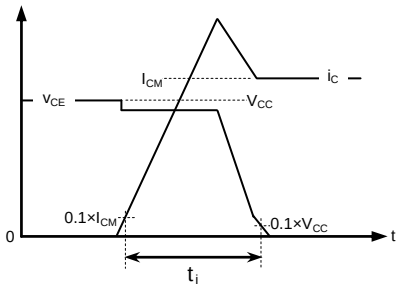




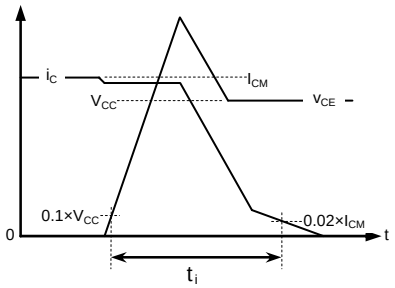
Switching characteristics test circuit and waveforms



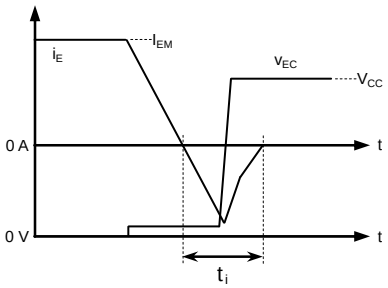
t_{rr}, Q_{rr} characteristics test waveform



IGBT Turn-on switching energy



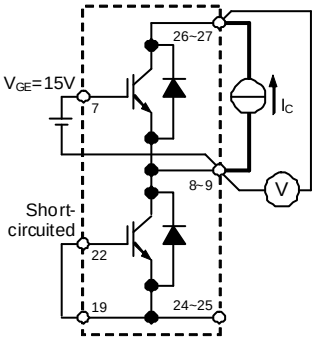
IGBT Turn-off switching energy

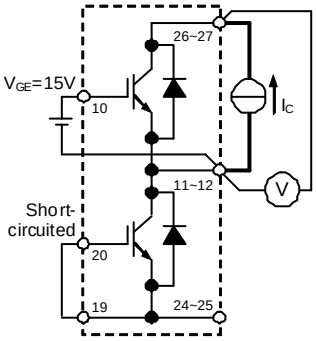


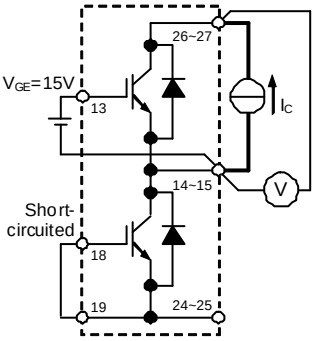
DIODE Reverse recovery energy

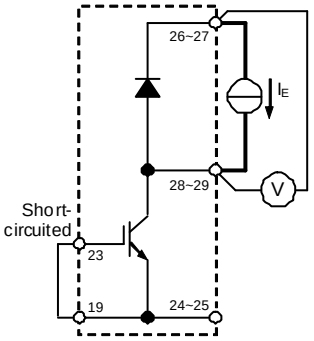
Turn-on / Turn-off switching energy and Reverse recovery energy test waveforms (Integral time instruction drawing)

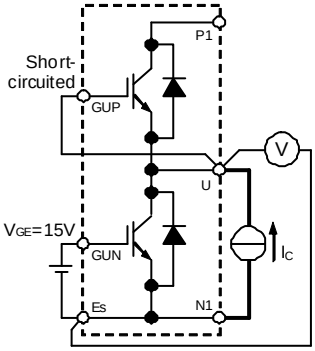
TEST CIRCUIT





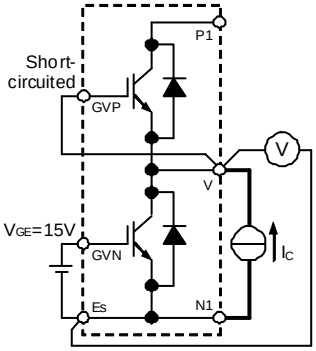






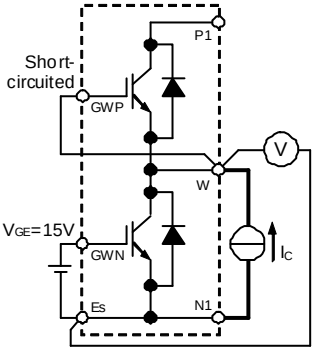
Gate-emitter short-circuited: GVP-V GVN-Es, GWP-W, GWN-Es, GB-Es

UP / UN IGBT



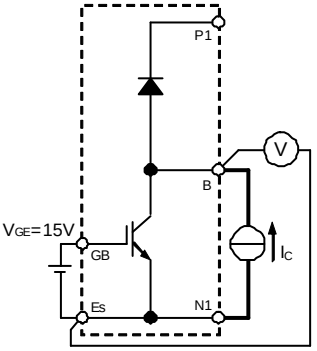
Gate-emitter short-circuited: GUP-U, GUN-Es, GWP-W, GWN-Es, GB-Es

VP / VN IGBT



Gate-emitter short-circuited: GUP-U GUN-Es, GVP-V, GVN-Es, GB-Es

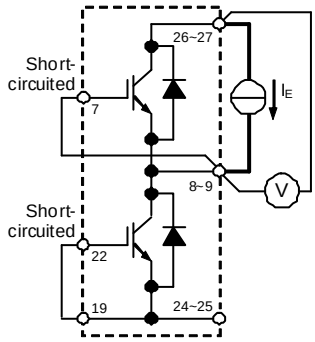
WP / WN IGBT

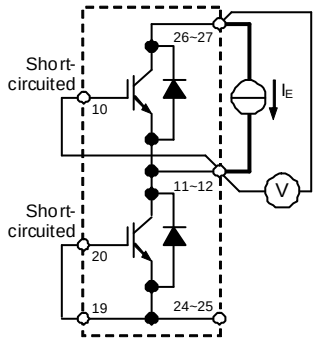


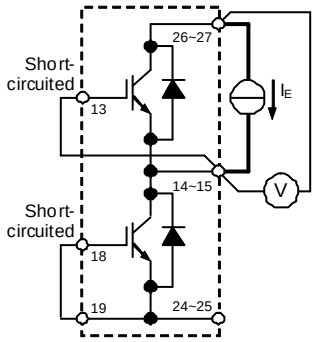
Gate-emitter short-circuited: GUP-U, GUN-Es, GVP-V, GVN-Es, GWP-W, GWN-Es

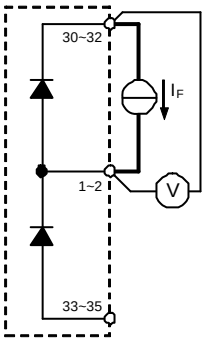
Brake IGBT/DIODE

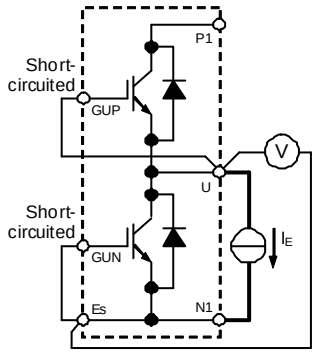
V_{CEsat} / Brake part V_F characteristics test circuit





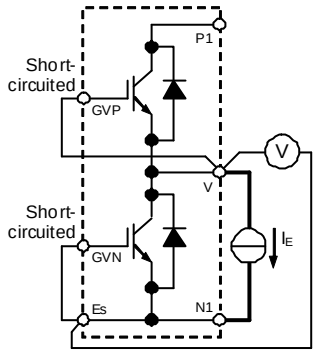






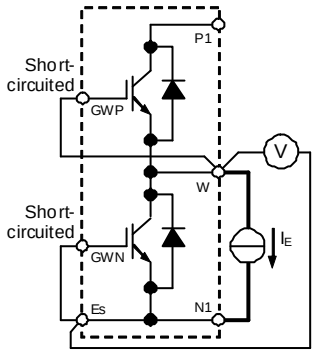
Gate-emitter short-circuited: GVP-V GVN-Es, GWP-W, GWN-Es, GB-Es

UP / UN DIODE



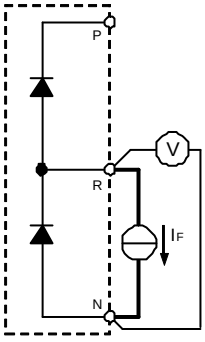
Gate-emitter short-circuited: GUP-U, GUN-Es, GWP-W, GWN-Es, GB-Es

VP / VN DIODE



Gate-emitter short-circuited: GUP-U GUN-Es, GVP-V, GVN-Es, GB-Es

WP / WN DIODE



CONVERTER DIODE (ex. Phase R)

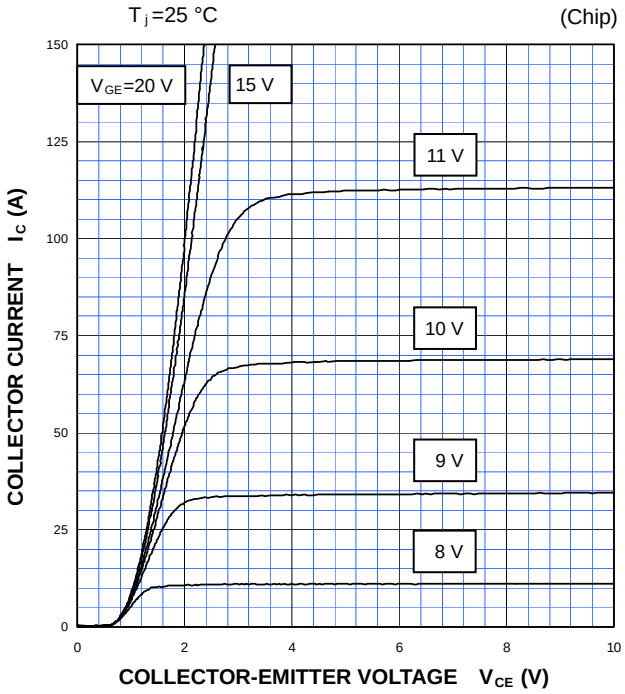
V_{EC} / Converter part V_F characteristics test circuit

Caution: Each (two or three) pin terminal of P/N/P1/N1/U/V/W/B/R/S/T is connected in the module, but should use all each three pins for the external wiring.

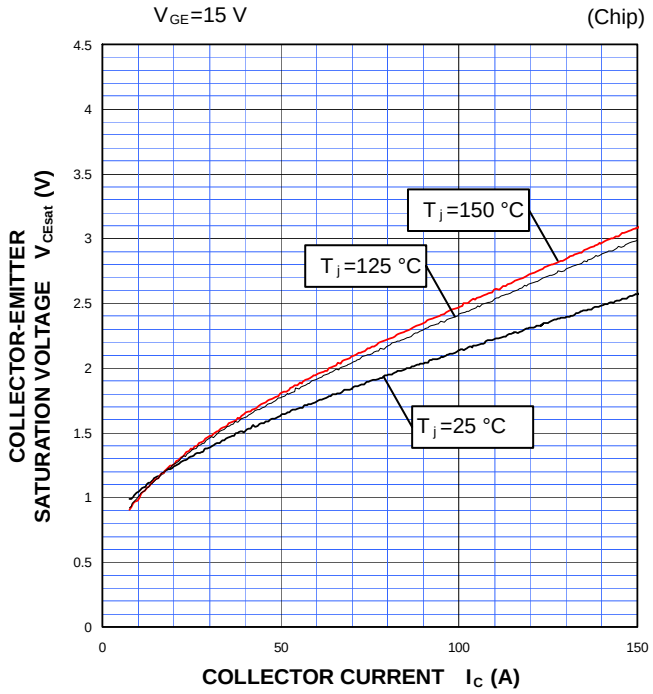
PERFORMANCE CURVES

INVERTER PART

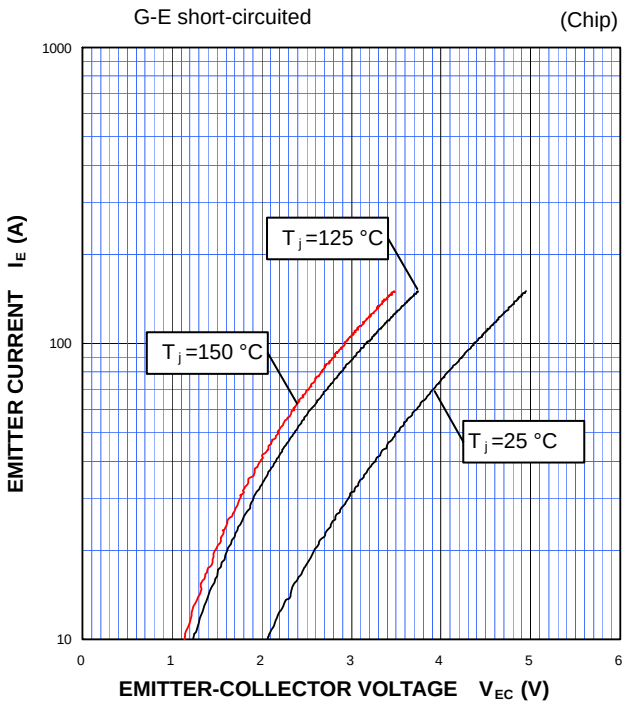
OUTPUT CHARACTERISTICS (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



FREE WHEELING DIODE FORWARD CHARACTERISTICS (TYPICAL)

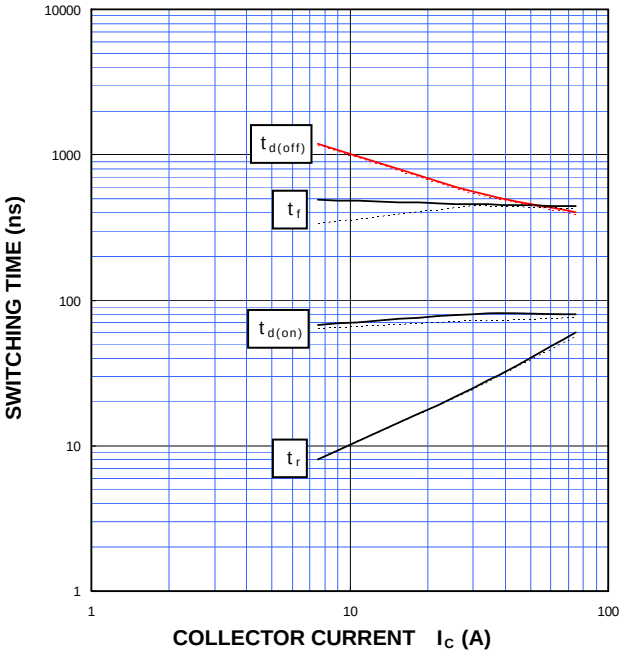


PERFORMANCE CURVES

INVERTER PART

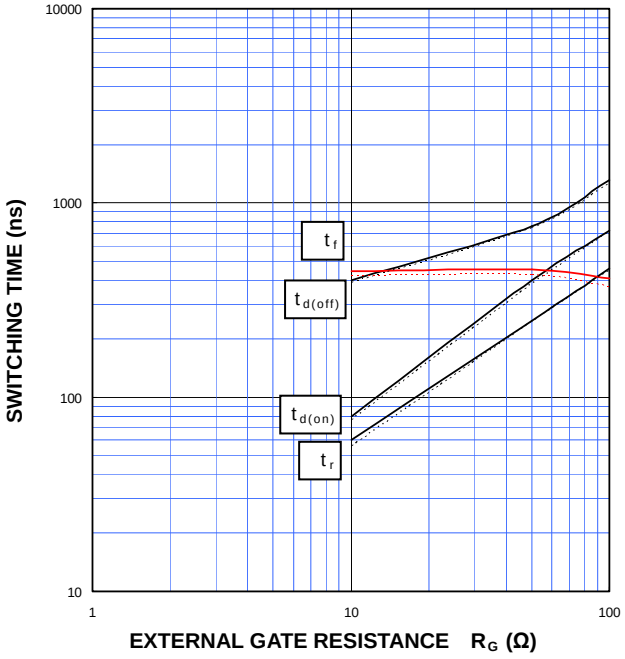
**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**

V_{CC}=1000 V, V_{GE}=±15 V, R_G=10 Ω, INDUCTIVE LOAD
———: T_j=150 °C, - - - - -: T_j=125 °C



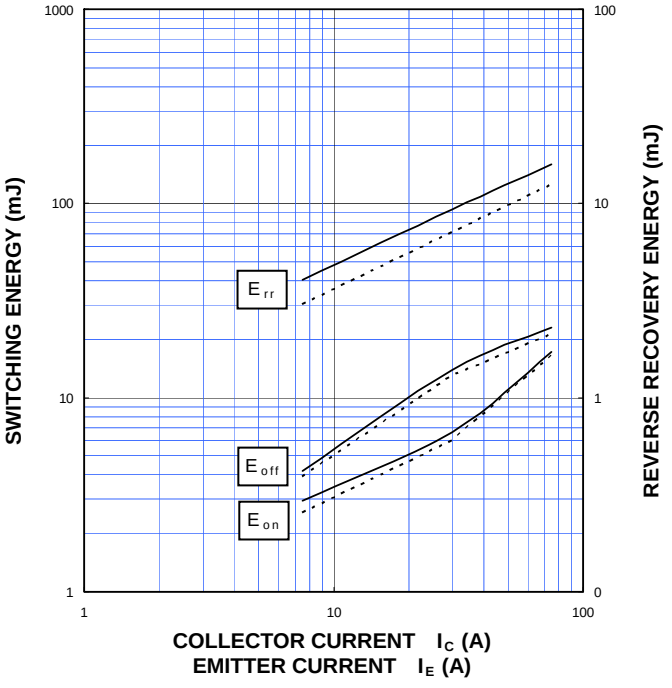
**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**

V_{CC}=1000 V, V_{GE}=±15 V, I_C=75 A, INDUCTIVE LOAD
———: T_j=150 °C, - - - - -: T_j=125 °C



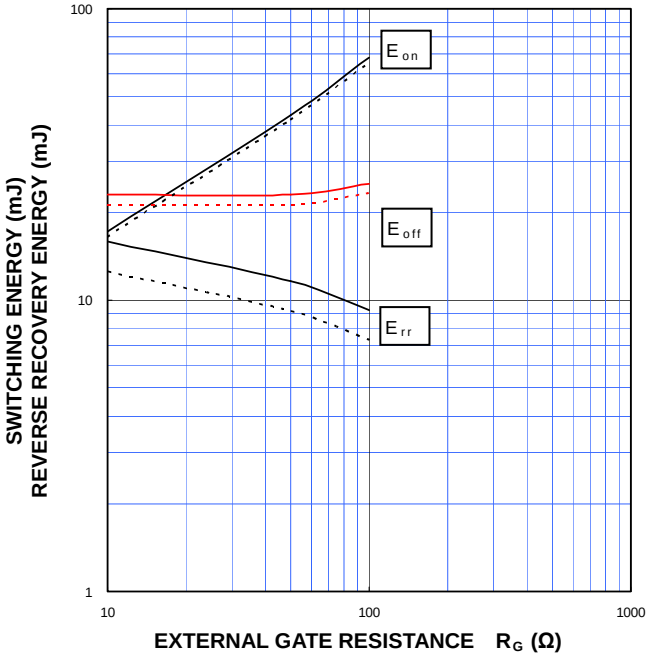
**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**

V_{CC}=1000 V, V_{GE}=±15 V, R_G=10 Ω,
INDUCTIVE LOAD, PER PULSE
———: T_j=150 °C, - - - - -: T_j=125 °C



**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**

V_{CC}=1000 V, V_{GE}=±15 V, I_C/I_E=75 A,
INDUCTIVE LOAD, PER PULSE
———: T_j=150 °C, - - - - -: T_j=125 °C

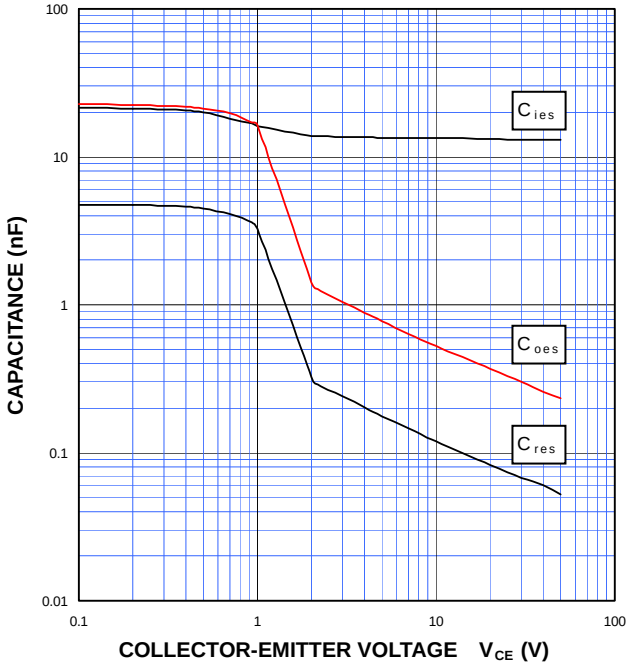


PERFORMANCE CURVES

INVERTER PART

CAPACITANCE CHARACTERISTICS (TYPICAL)

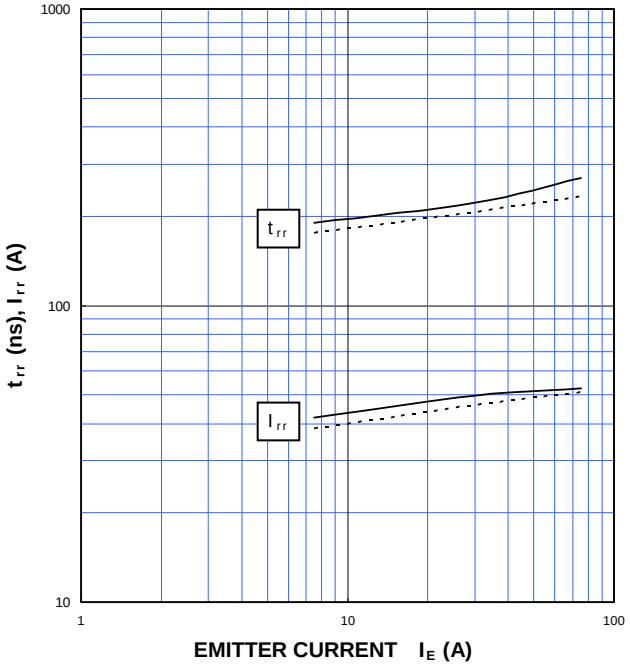
G-E short-circuited, T_j=25 °C



FREE WHEELING DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)

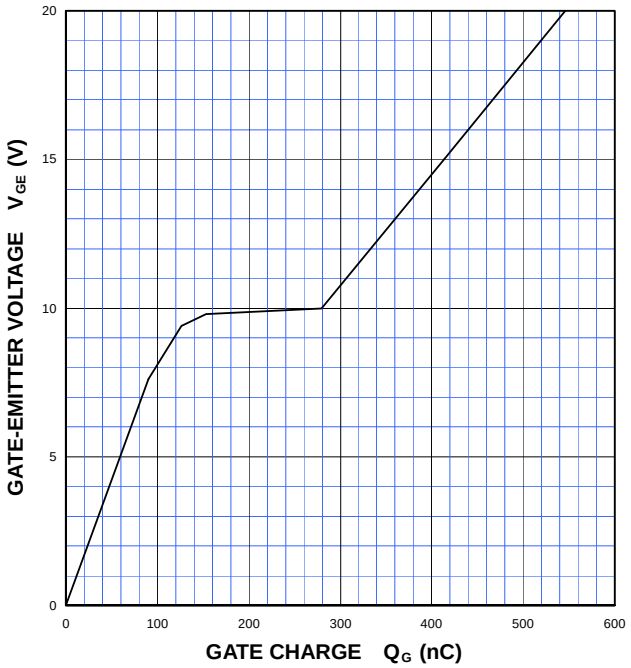
V_{CC}=1000 V, V_{GE}=±15 V, R_G=10 Ω, INDUCTIVE LOAD

———: T_j=150 °C, - - - - -: T_j=125 °C



GATE CHARGE CHARACTERISTICS (TYPICAL)

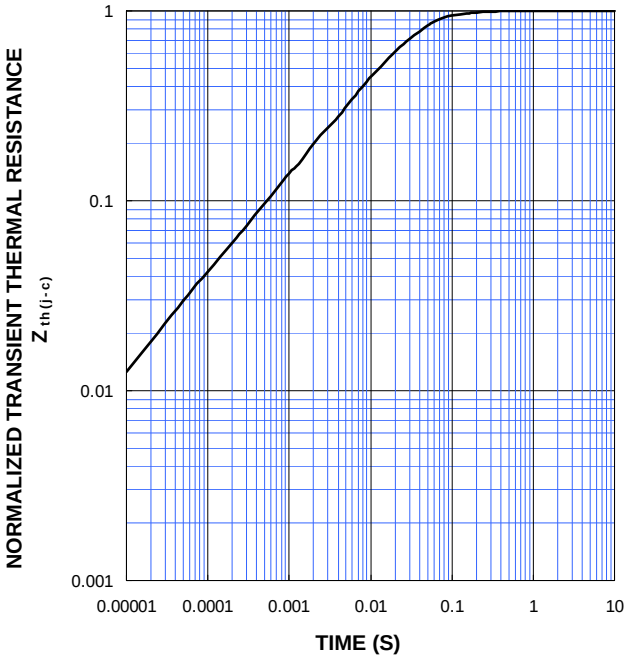
V_{CC}=1000 V, I_C=75 A, T_j=25 °C



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)

Single pulse, T_C=25 °C

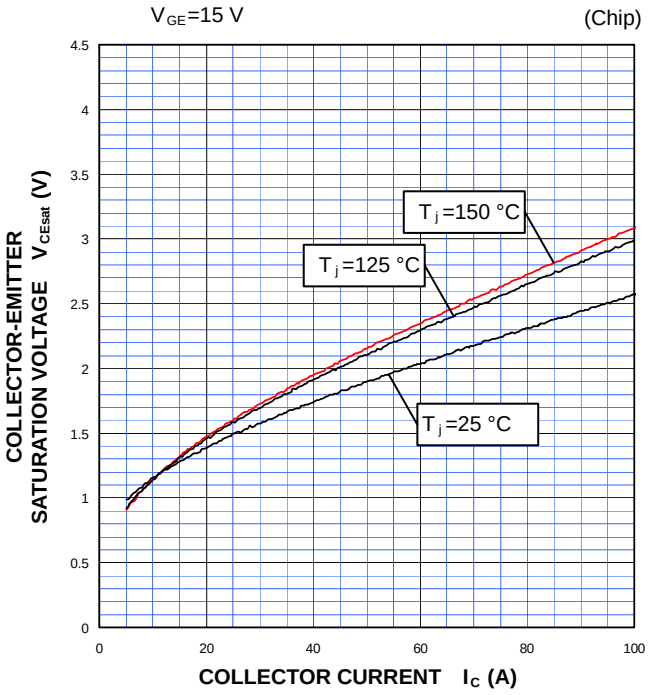
$R_{th(j-c)Q}$=0.18 K/W, $R_{th(j-c)D}$=0.27 K/W



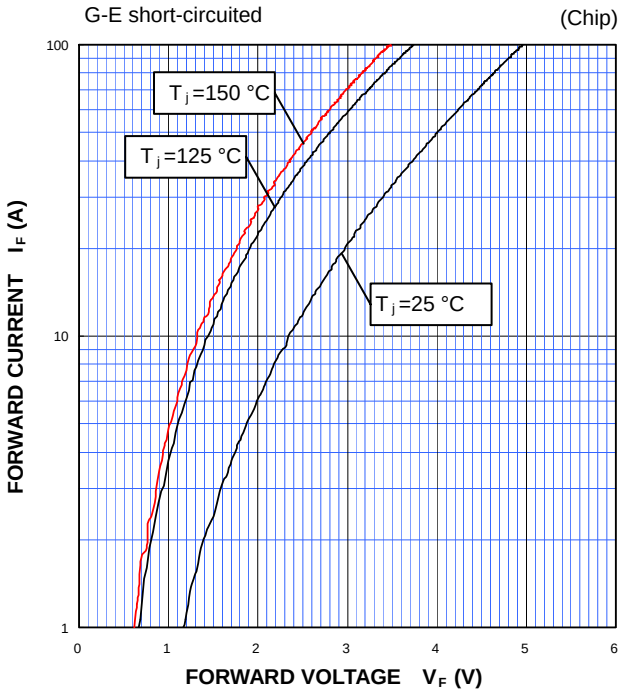
PERFORMANCE CURVES

BRAKE PART

COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)

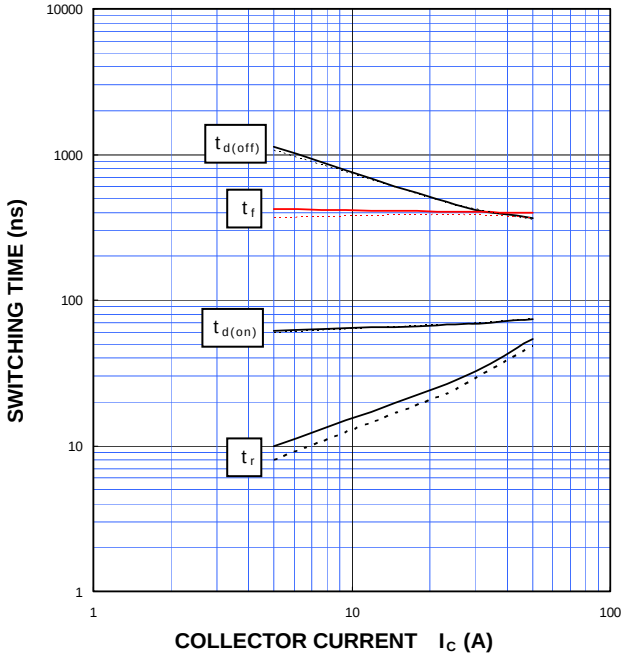


DIODE FORWARD CHARACTERISTICS (TYPICAL)



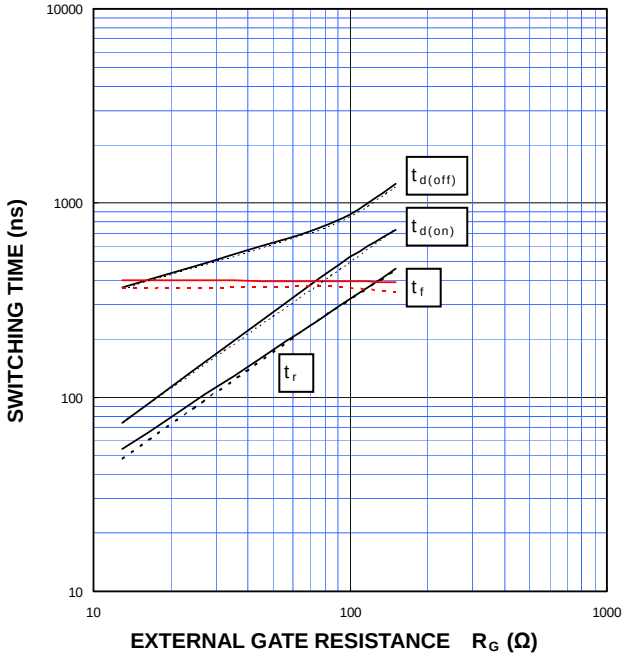
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

V_{CC}=1000 V, V_{GE}=±15 V, R_G=13 Ω, INDUCTIVE LOAD
———: T_j=150 °C, - - - - -: T_j=125 °C



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

V_{CC}=1000 V, I_C=50 A, V_{GE}=±15 V, INDUCTIVE LOAD
———: T_j=150 °C, - - - - -: T_j=125 °C

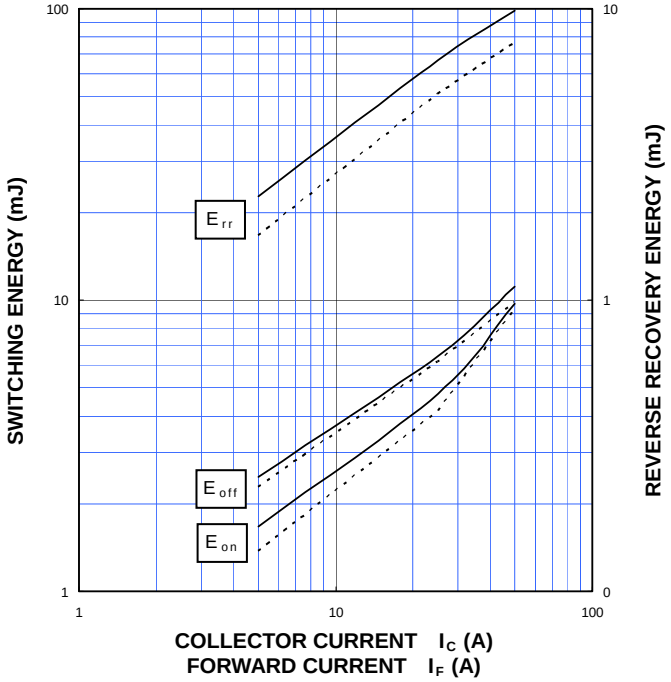


PERFORMANCE CURVES

BRAKE PART

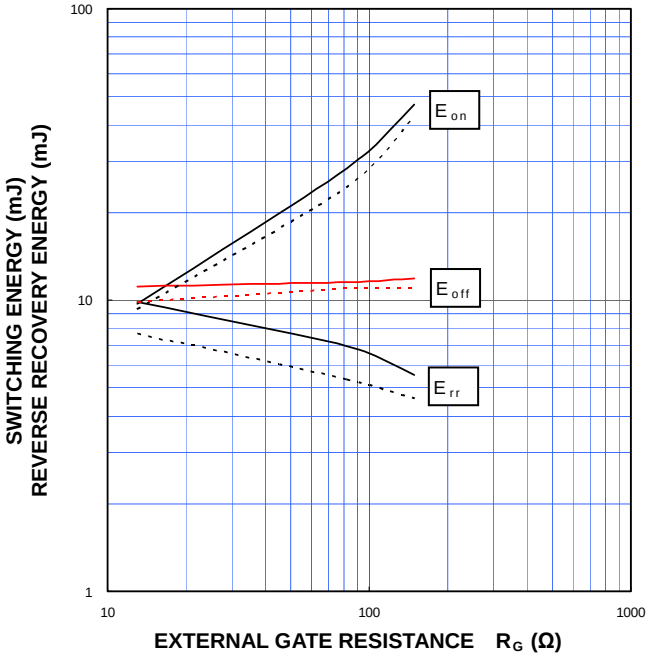
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

V_{CC}=1000 V, V_{GE}=±15 V, R_G=13 Ω,
INDUCTIVE LOAD, PER PULSE
———: T_j=150 °C, - - - - -: T_j=125 °C



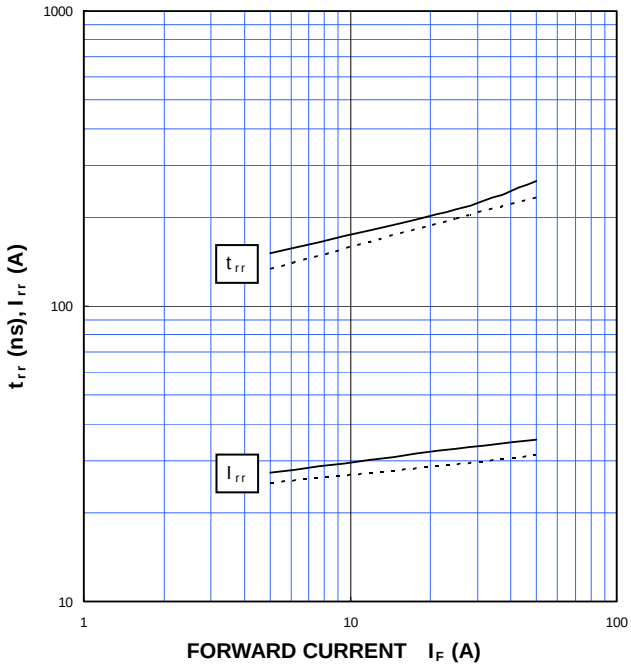
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

V_{CC}=1000 V, I_C/I_F=50 A, V_{GE}=±15 V,
INDUCTIVE LOAD, PER PULSE
———: T_j=150 °C, - - - - -: T_j=125 °C



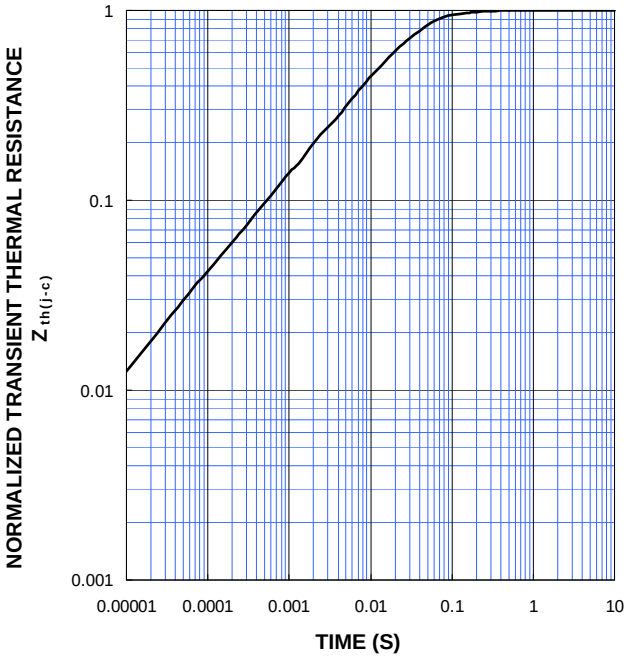
CLAMP DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)

V_{CC}=1000 V, V_{GE}=±15 V, R_G=13 Ω, INDUCTIVE LOAD
———: T_j=150 °C, - - - - -: T_j=125 °C



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)

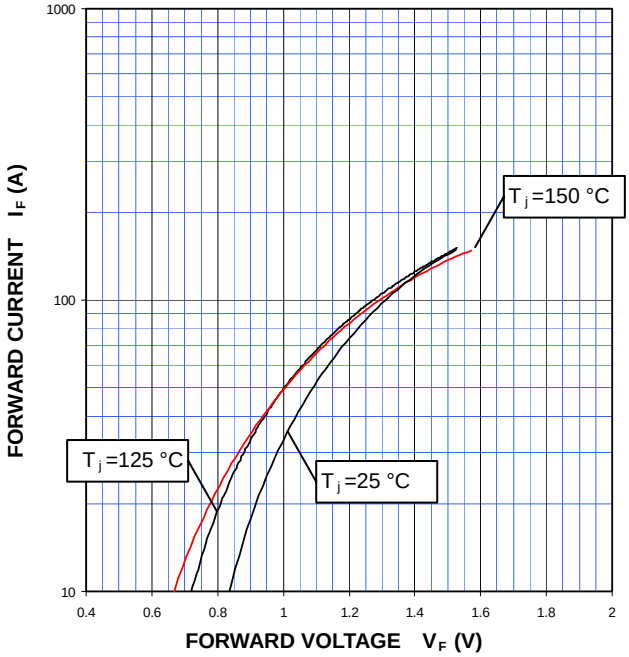
Single pulse, T_C=25 °C
$R_{th(j-c)Q}$=0.25 K/W, $R_{th(j-c)D}$=0.35 K/W



PERFORMANCE CURVES

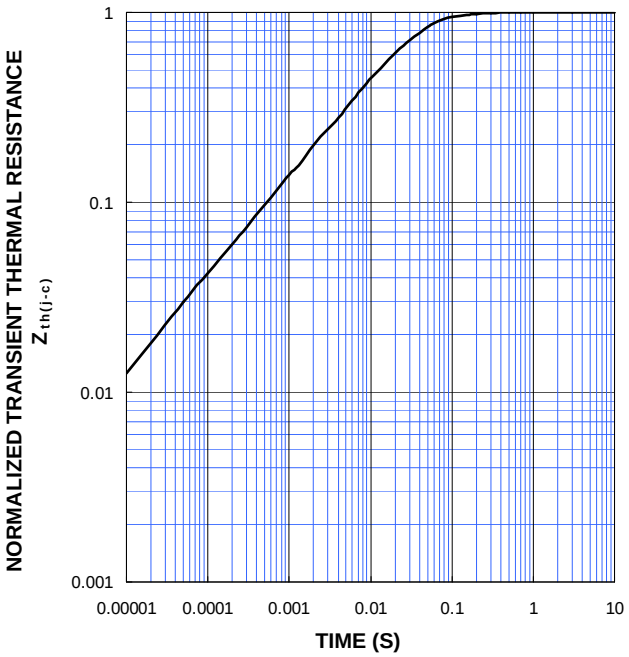
CONVERTER PART

DIODE FORWARD CHARACTERISTICS (TYPICAL)



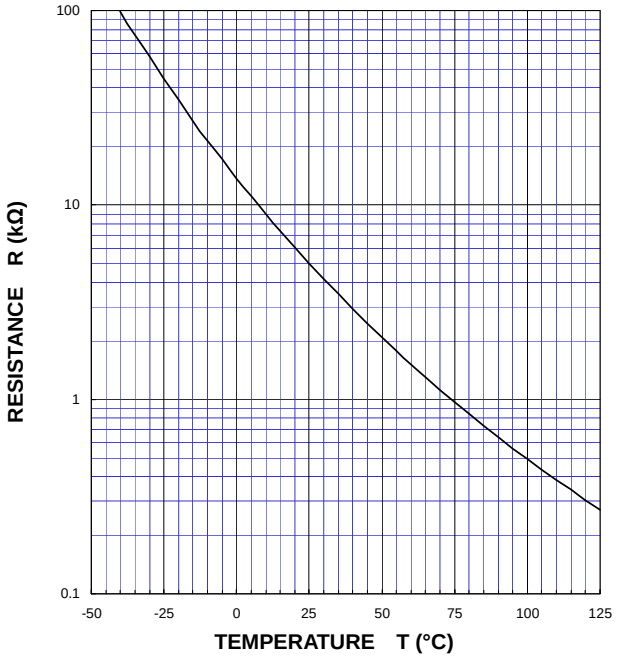
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)

Single pulse, T_C=25 °C
$R_{th(j-c)D}$=0.24 K/W



NTC THERMISTOR PART

TEMPERATURE CHARACTERISTICS (TYPICAL)



Keep safety first in your circuit designs!

Mitsubishi Electric Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of non-flammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

- These materials are intended as a reference to assist our customers in the selection of the Mitsubishi semiconductor product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Mitsubishi Electric Corporation or a third party.
- Mitsubishi Electric Corporation assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
- All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Mitsubishi Electric Corporation without notice due to product improvements or other reasons. It is therefore recommended that customers contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor for the latest product information before purchasing a product listed herein.
  The information described here may contain technical inaccuracies or typographical errors. Mitsubishi Electric Corporation assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors.
  Please also pay attention to information published by Mitsubishi Electric Corporation by various means, including the Mitsubishi Semiconductor home page (www.MitsubishiElectric.com/semiconductors/).
- When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Mitsubishi Electric Corporation assumes no responsibility for any damage, liability or other loss resulting from the information containedherein.
- Mitsubishi Electric Corporation semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
- The prior written approval of Mitsubishi Electric Corporation is necessary to reprint or reproduce in whole or in part these materials.
- If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.
  Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
- Please contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor for further details on these materials or the products contained therein.