CM2400HCB-34N

HIGH POWER SWITCHING USE
INSULATED TYPE

4th-Version HVIGBT (High Voltage Insulated Gate Bipolar Transistor) Modules

CM2400HCB-34N

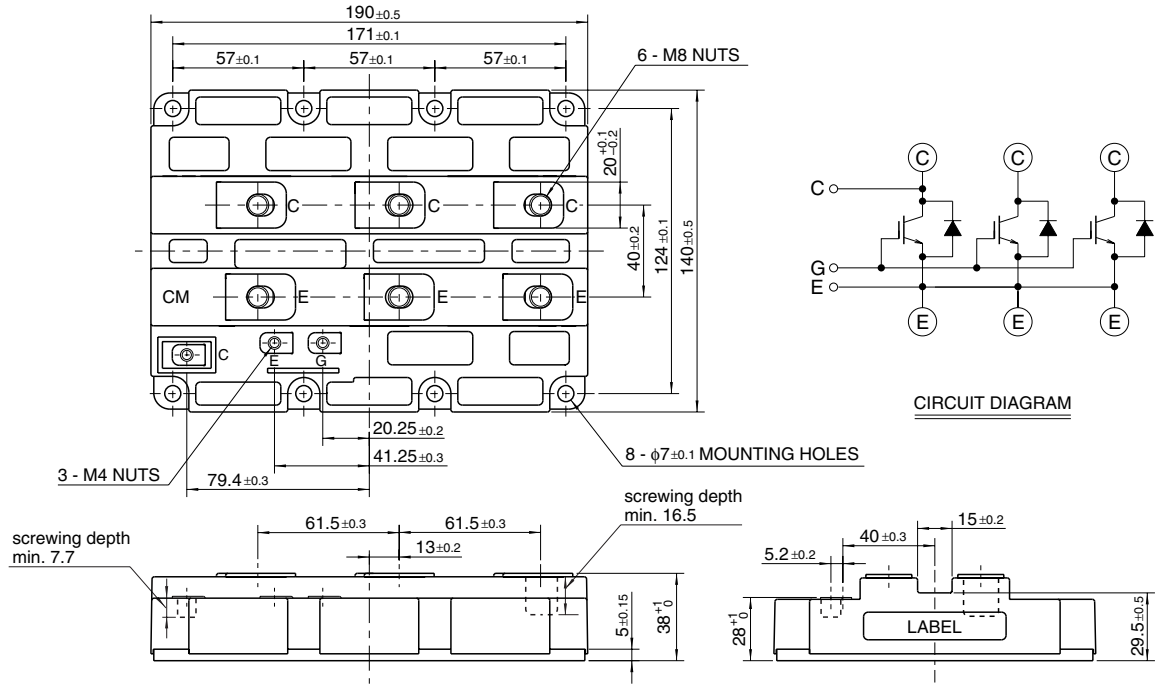
- I_C ..... 2400 A
- V_{CES} ..... 1700 V
- Insulated Type
- 1-element in a Pack
- AlSiC Baseplate
- Trench Gate IGBT : CSTBT™
- Soft Reverse Recovery Diode

APPLICATION

Traction drives, High Reliability Converters / Inverters, DC choppers

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



MITSUBISHI ELECTRIC

MAXIMUM RATINGS

Symbol	Item	Conditions	Ratings	Unit
V_{CES}	Collector-emitter voltage	V_{GE} = 0V, T_j = 25°C	1700	V
V_{GES}	Gate-emitter voltage	V_{CE} = 0V, T_j = 25°C	± 20	V
I_C	Collector current	DC, T_c = 80°C	2400	A
I_{CM}		Pulse (Note 1)	4800	A
I_E	Emitter current (Note 2)	DC	2400	A
I_{EM}		Pulse (Note 1)	4800	A
P_c	Maximum power dissipation (Note 3)	T_c = 25°C, IGBT part	15600	W
V_{iso}	Isolation voltage	RMS, sinusoidal, f = 60Hz, t = 1 min.	4000	V
T_j	Junction temperature		–40 ~ +150	°C
T_{op}	Operating temperature		–40 ~ +125	°C
T_{stg}	Storage temperature		–40 ~ +125	°C
t_{psc}	Maximum short circuit pulse width	V_{CC} = 1000V, $V_{CE} \leq V_{CES}$, V_{GE} = 15V, T_j = 125°C	10	µs

ELECTRICAL CHARACTERISTICS

Symbol	Item	Conditions		Limits			Unit
				Min	Typ	Max	
I_{CES}	Collector cutoff current	V_{CE} = V_{CES}, V_{GE} = 0V	T_j = 25°C	—	—	9	mA
			T_j = 125°C	—	7.0	18	
$V_{GE(th)}$	Gate-emitter threshold voltage	V_{CE} = 10 V, I_C = 240 mA, T_j = 25°C		5.5	6.5	7.5	V
I_{GES}	Gate leakage current	V_{GE} = V_{GES}, V_{CE} = 0V, T_j = 25°C		—	—	0.5	µA
C_{ies}	Input capacitance	V_{CE} = 10 V, V_{GE} = 0 V, f = 100 kHz, T_j = 25°C		—	396	—	nF
C_{oes}	Output capacitance			—	21.6	—	nF
C_{res}	Reverse transfer capacitance			—	6.3	—	nF
Q_g	Total gate charge	V_{CC} = 900 V, I_C = 2400 A, V_{GE} = ±15 V, T_j = 25°C		—	27.4	—	µC
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = 2400 A (Note 4), V_{GE} = 15 V	T_j = 25°C	—	2.10	2.70	V
			T_j = 125°C	—	2.35	—	
$t_{d(on)}$	Turn-on delay time	V_{CC} = 900 V, I_C = 2400 A, V_{GE} = ±15 V, $R_{G(on)}$ = 0.8 Ω, T_j = 125°C, L_s = 80 nH, Inductive load		—	—	1.50	µs
t_r	Turn-on rise time			—	—	0.60	µs
$E_{on(10\%)}$	Turn-on switching energy (Note 5)			—	0.65	—	J/P
$t_{d(off)}$	Turn-off delay time	V_{CC} = 900 V, I_C = 2400 A, V_{GE} = ±15 V, $R_{G(off)}$ = 1.1 Ω, T_j = 125°C, L_s = 80 nH, Inductive load		—	—	3.00	µs
t_f	Turn-off fall time			—	—	0.60	µs
$E_{off(10\%)}$	Turn-off switching energy (Note 5)			—	0.70	—	J/P
V_{EC}	Emitter-collector voltage (Note 2)	I_E = 2400 A (Note 4), V_{GE} = 0 V	T_j = 25°C	—	2.20	3.00	V
			T_j = 125°C	—	1.85	—	
t_{rr}	Reverse recovery time (Note 2)	V_{CC} = 900 V, I_E = 2400 A, V_{GE} = ±15 V, $R_{G(on)}$ = 0.8 Ω, T_j = 125°C, L_s = 80 nH, Inductive load		—	—	1.50	µs
Q_{rr}	Reverse recovery charge (Note 2)			—	750	—	µC
$E_{rec(10\%)}$	Reverse recovery energy (Note 2), (Note 5)			—	0.50	—	J/P

THERMAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min	Typ	Max	
$R_{th(j-c)Q}$	Thermal resistance	Junction to Case, IGBT part	—	—	8.0	K/kW
$R_{th(j-c)R}$	Thermal resistance	Junction to Case, FWDi part	—	—	12.0	K/kW
$R_{th(c-f)}$	Contact thermal resistance	Case to Fin, λ_{grease} = 1W/m·K, $D_{(c-f)}$ = 100 μm	—	6.0	—	K/kW

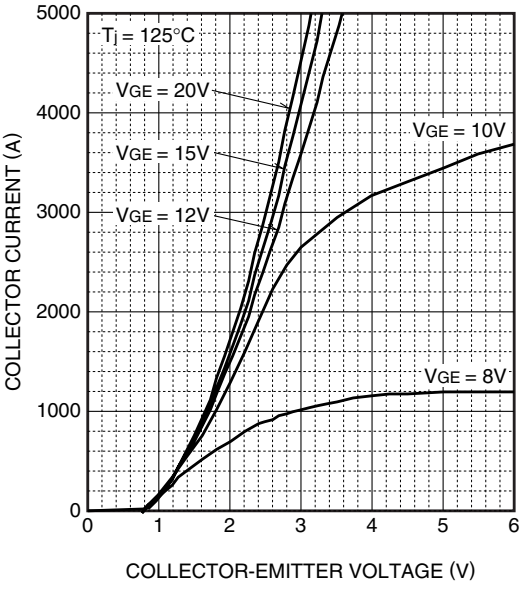
MECHANICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min	Typ	Max	
M_t	Mounting torque	M8: Main terminals screw	7.0	—	13.0	N·m
M_s		M6: Mounting screw	3.0	—	6.0	N·m
M_t		M4: Auxiliary terminals screw	1.0	—	2.0	N·m
m	Mass		—	1.5	—	kg
CTI	Comparative tracking index		600	—	—	—
d_a	Clearance		19.5	—	—	mm
d_s	Creepage distance		32.0	—	—	mm
$L_{P\ CE}$	Parasitic stray inductance		—	10	—	nH
$R_{CC'+EE'}$	Internal lead resistance	T_c = 25°C	—	0.18	—	mΩ

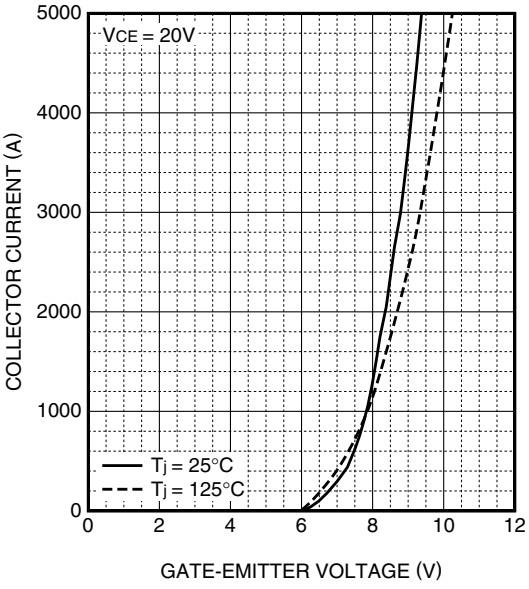
Note 1. Pulse width and repetition rate should be such that junction temperature (T_j) does not exceed T_{opmax} rating (125°C).
2. The symbols represent characteristics of the anti-parallel, emitter to collector free-wheel diode (FWDi).
3. Junction temperature (T_j) should not exceed T_{jmax} rating (150°C).
4. Pulse width and repetition rate should be such as to cause negligible temperature rise.
5. $E_{on(10\%)}$ / $E_{off(10\%)}$ / $E_{rec(10\%)}$ are the integral of $0.1V_{CE} \times 0.1I_C\ dt$.

PERFORMANCE CURVES

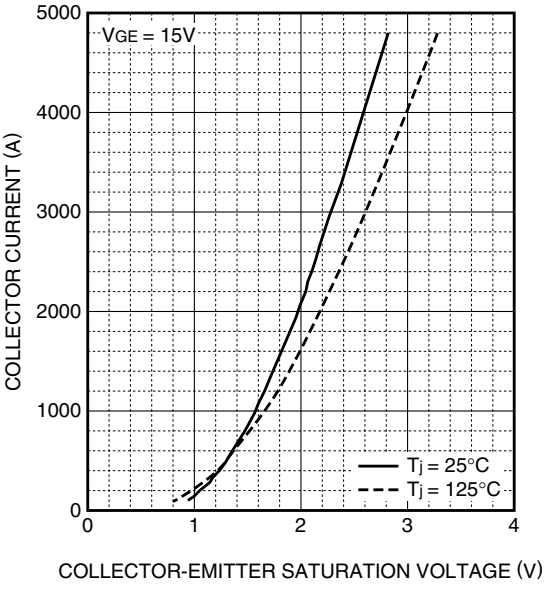
OUTPUT CHARACTERISTICS (TYPICAL)



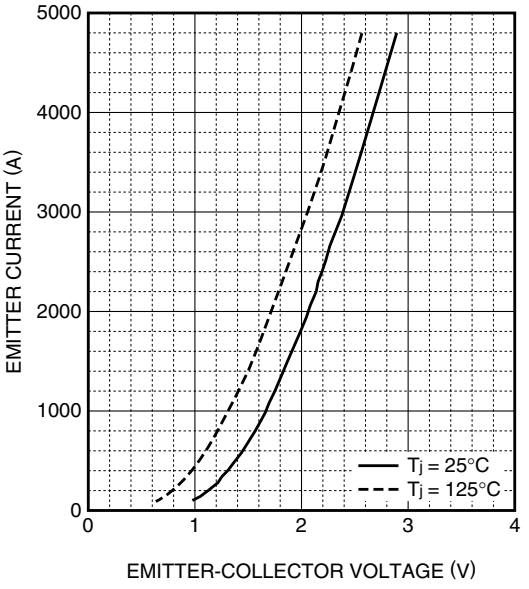
TRANSFER CHARACTERISTICS (TYPICAL)



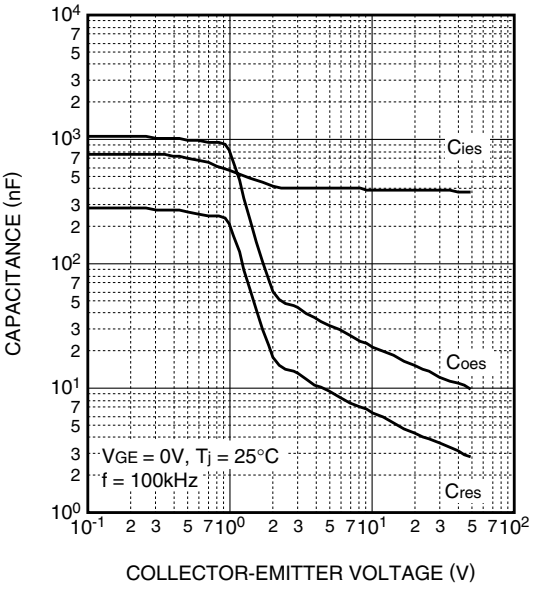
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



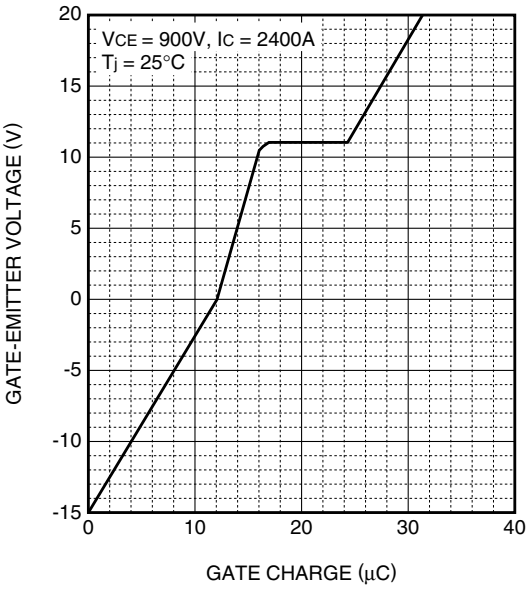
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



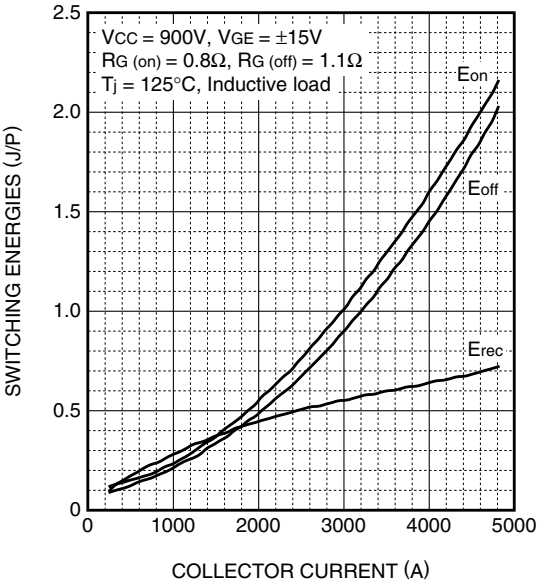
CAPACITANCE CHARACTERISTICS (TYPICAL)



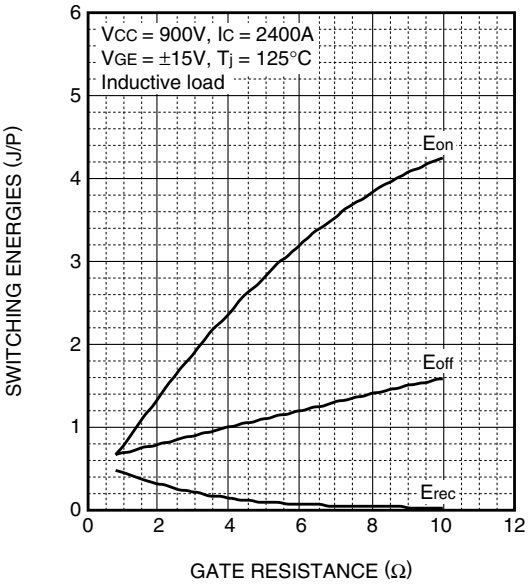
GATE CHARGE CHARACTERISTICS (TYPICAL)



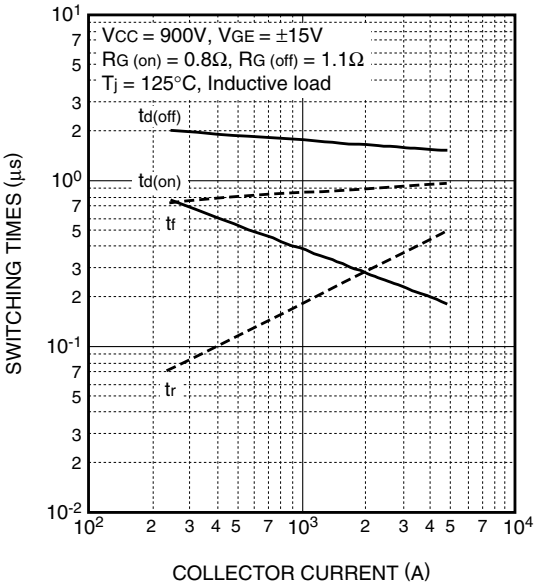
HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)



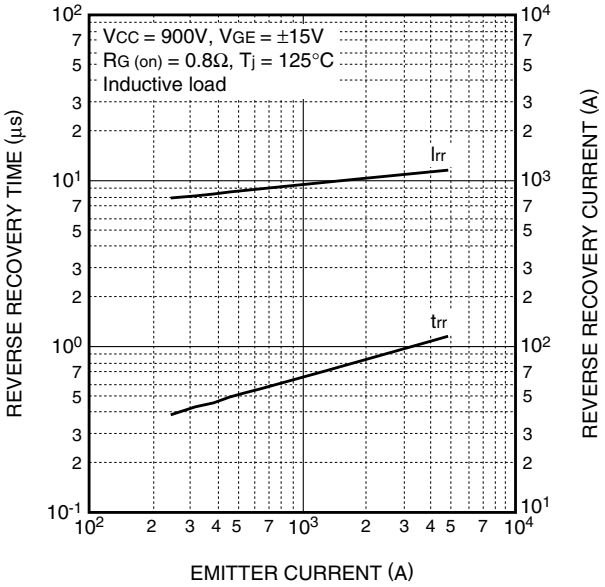
HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)



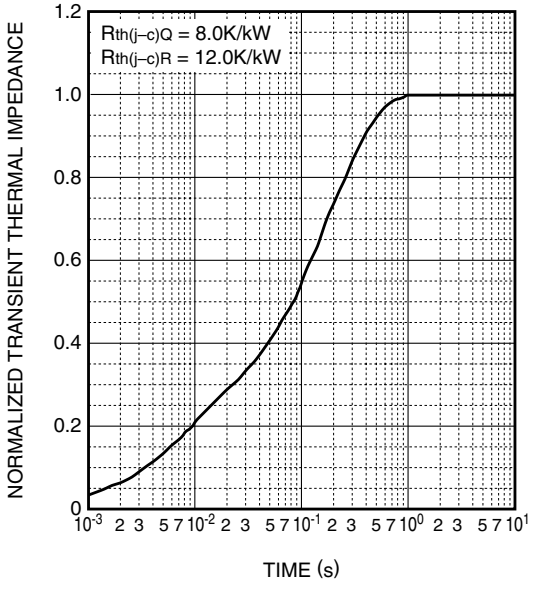
HALF-BRIDGE SWITCHING TIME CHARACTERISTICS (TYPICAL)



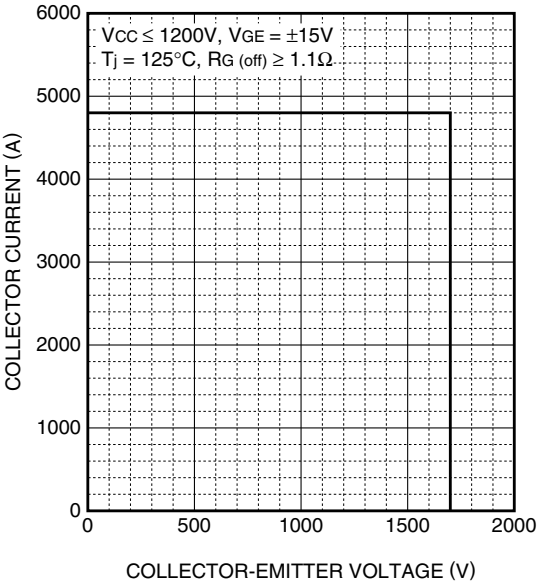
FREE-WHEEL DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



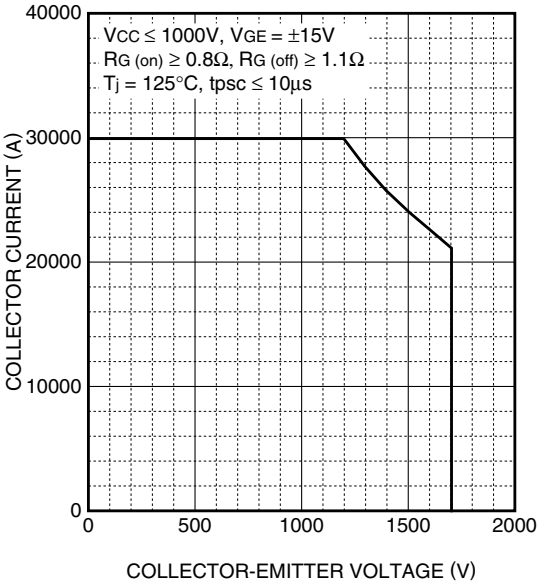
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS



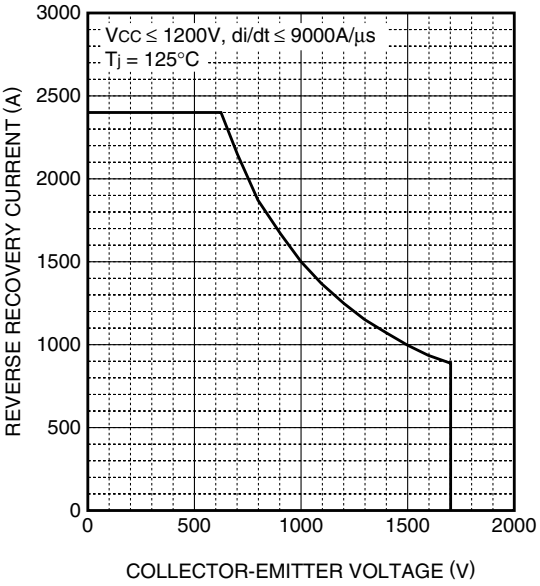
REVERSE BIAS SAFE OPERATING AREA (RBSOA)



SHORT CIRCUIT SAFE OPERATING AREA (SCSOA)



FREE-WHEEL DIODE REVERSE RECOVERY SAFE OPERATING AREA (RRSOA)



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