

<High Voltage Insulated Gate Bipolar Transistor: HVIGBT >

CM2400HCB-34N

HIGH POWER SWITCHING USE
INSULATED TYPE

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

CM2400HCB-34N



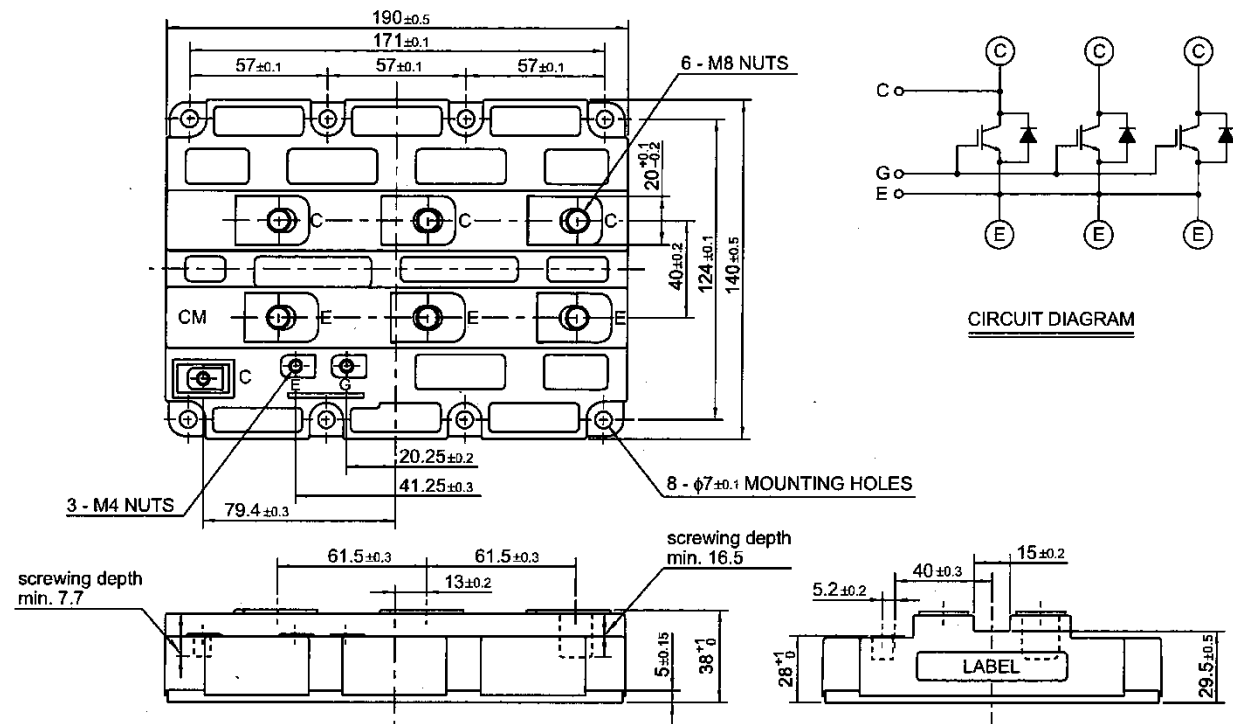
- I_C 2400 A
- V_{CES} 1700 V
- 1-element in pack
- Insulated type
- CSTBT™ / Soft recovery diode
- AISiC baseplate

APPLICATION

Traction drives, High Reliability Converters / Inverters, DC choppers

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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MAXIMUM RATINGS

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

ELECTRICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit	
			Min	Typ	Max		
I_{CES}	Collector cutoff current	$V_{CE} = V_{CES}, V_{GE} = 0V$	$T_j = 25^\circ C$	—	—	9	mA
			$T_j = 125^\circ C$	—	7.0	18	
$V_{GE(th)}$	Gate-emitter threshold voltage	$V_{CE} = 10V, I_C = 240mA, T_j = 25^\circ C$	5.5	6.5	7.5	V	
I_{GES}	Gate leakage current	$V_{GE} = V_{GES}, V_{CE} = 0V, T_j = 25^\circ C$	-0.5	—	0.5	μA	
C_{ies}	Input capacitance	$V_{CE} = 10V, V_{GE} = 0V, f = 100kHz$ $T_j = 25^\circ C$	—	396	—	nF	
C_{oes}	Output capacitance		—	21.6	—	nF	
C_{res}	Reverse transfer capacitance		—	6.3	—	nF	
Q_G	Total gate charge	$V_{CC} = 900V, I_C = 2400A, V_{GE} = \pm 15V$	—	27.4	—	μC	
V_{CEsat}	Collector-emitter saturation voltage	$I_C = 2400A$ (Note 4) $V_{GE} = 15V$	$T_j = 25^\circ C$	—	2.10	2.70	V
			$T_j = 125^\circ C$	—	2.35	—	
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 900V, I_C = 2400A$ $V_{GE} = \pm 15V, R_{G(on)} = 0.8\Omega$ $T_j = 125^\circ C, L_s = 80nH$	—	0.90	—	μs	
t_r	Turn-on rise time		—	0.30	—	μs	
$E_{on(10\%)}$	Turn-on switching energy (Note 5)	Inductive load	—	0.83	—	J	
$t_{d(off)}$	Turn-off delay time	$V_{CC} = 900V, I_C = 2400A$ $V_{GE} = \pm 15V, R_{G(off)} = 1.1\Omega$ $T_j = 125^\circ C, L_s = 80nH$	—	1.60	—	μs	
t_f	Turn-off fall time		—	0.25	—	μs	
$E_{off(10\%)}$	Turn-off switching energy (Note 5)	Inductive load	—	0.70	—	J	
V_{EC}	Emitter-collector voltage (Note 2)	$I_E = 2400A$ (Note 4) $V_{GE} = 0V$	$T_j = 25^\circ C$	—	2.20	3.00	V
			$T_j = 125^\circ C$	—	1.85	—	
t_{rr}	Reverse recovery time (Note 2)	$V_{CC} = 900V, I_E = 2400A$ $V_{GE} = \pm 15V, R_{G(on)} = 0.8\Omega$ $T_j = 125^\circ C, L_s = 80nH$	—	0.90	—	μs	
Q_{rr}	Reverse recovery charge (Note 2)		—	750	—	μC	
$E_{rec(10\%)}$	Reverse recovery energy (Note 2) (Note 5)	Inductive load	—	0.42	—	J	

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
$R_{th(j-c)D}$		Junction to Case, FWDi part	—	—	12.0	K/kW
$R_{th(c-s)}$	Contact thermal resistance	Case to heat sink, $\lambda_{grease} = 1W/m^2k, D_{(c-s)} = 100\mu m$	—	6.0	—	K/kW

MECHANICAL CHARACTERISTICS

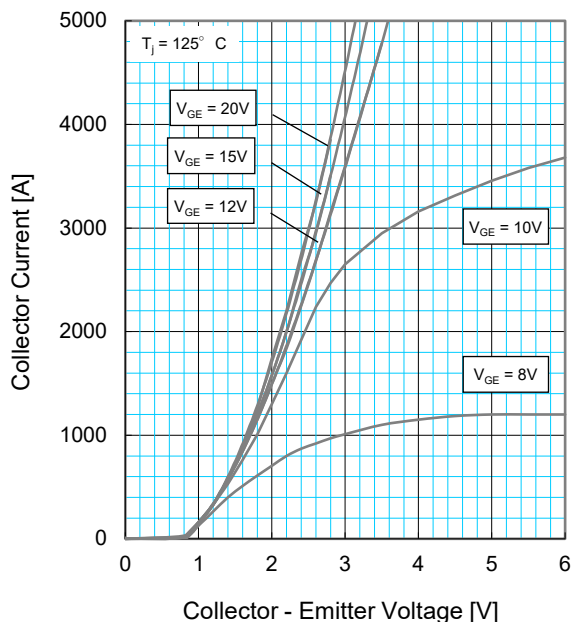
Symbol	Item	Conditions	Limits			Unit
			Min	Typ	Max	
M_t	Mounting torque	M8 : Main terminals screw	7.0	—	13.0	N·m
M_s		M6 : Mounting screw	3.0	—	6.0	N·m
M_t		M4 : Auxiliary terminals screw	1.0	—	2.0	N·m
m	Mass		—	1.5	—	kg
CTI	Comparative tracking index		600	—	—	—
d_a	Clearance		19.5	—	—	mm
d_s	Creepage distance		32.0	—	—	mm
$L_{P\ CE}$	Parasitic stray inductance		—	10.0	—	nH
$R_{CC+EE'}$	Internal lead resistance	$T_C = 25\ ^\circ\text{C}$	—	0.18	—	m Ω

Note1. Pulse width and repetition rate should be such that junction temperature (T_j) does not exceed $T_{j\text{ppmax}}$ rating.

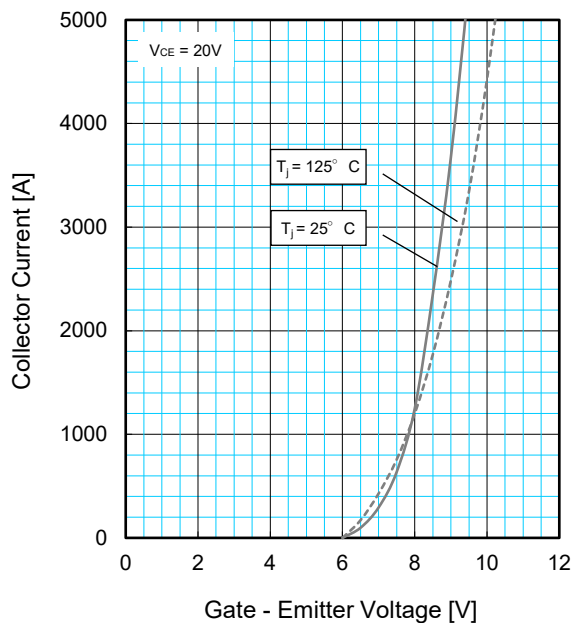
2. The symbols represent characteristics of the anti-parallel, emitter to collector free-wheel diode (FWD).
3. Junction temperature (T_j) should not exceed $T_{j\text{max}}$ rating (150°C).
4. Pulse width and repetition rate should be such as to cause negligible temperature rise.
5. $E_{\text{on}(10\%)}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

PERFORMANCE CURVES

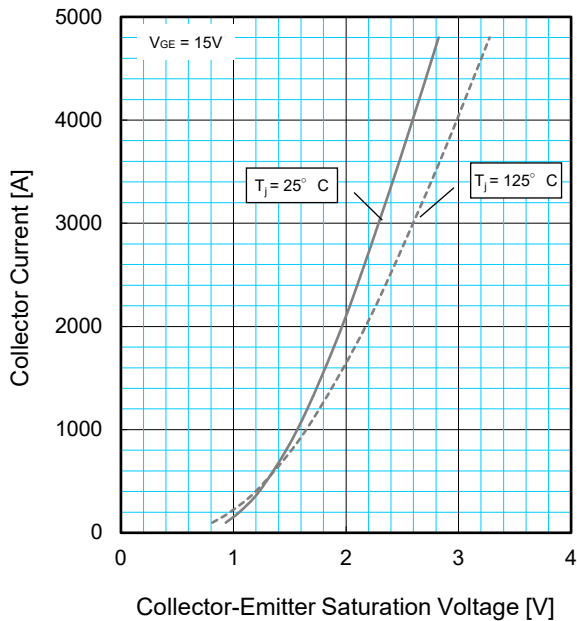
OUTPUT CHARACTERISTICS (TYPICAL)



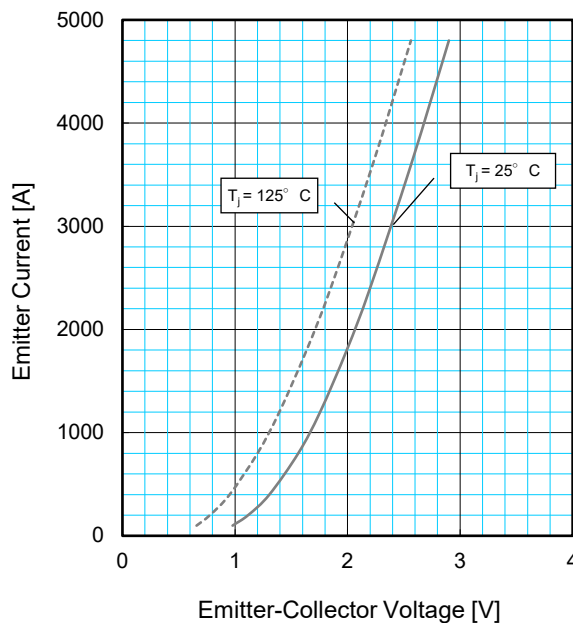
TRANSFER CHARACTERISTICS (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)

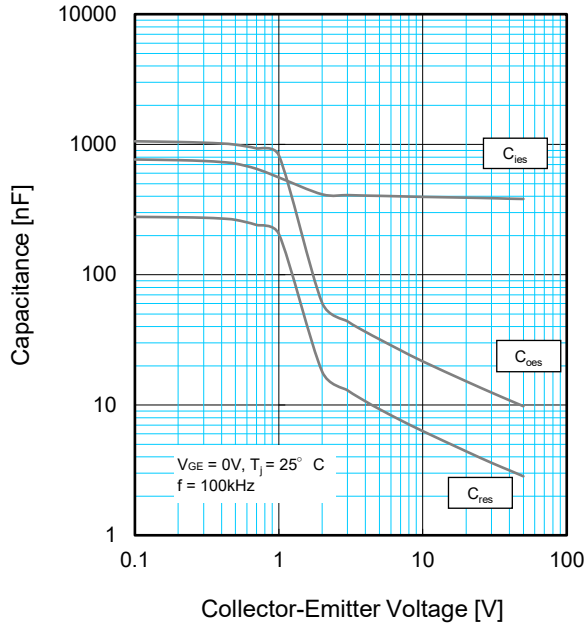


FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)

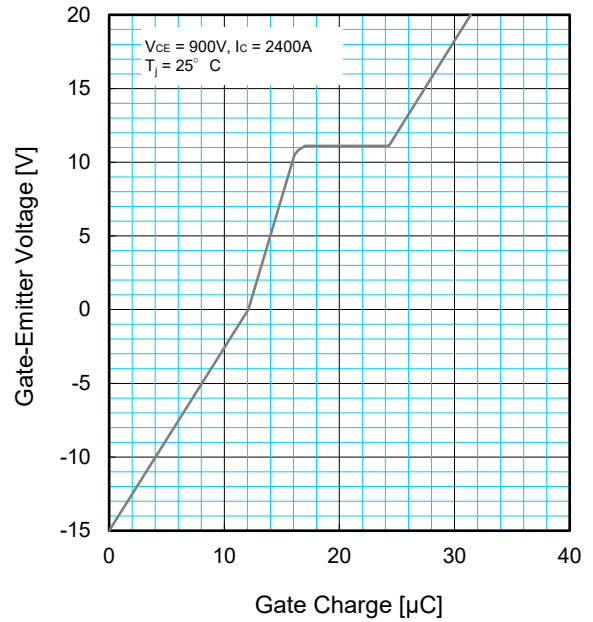


PERFORMANCE CURVES

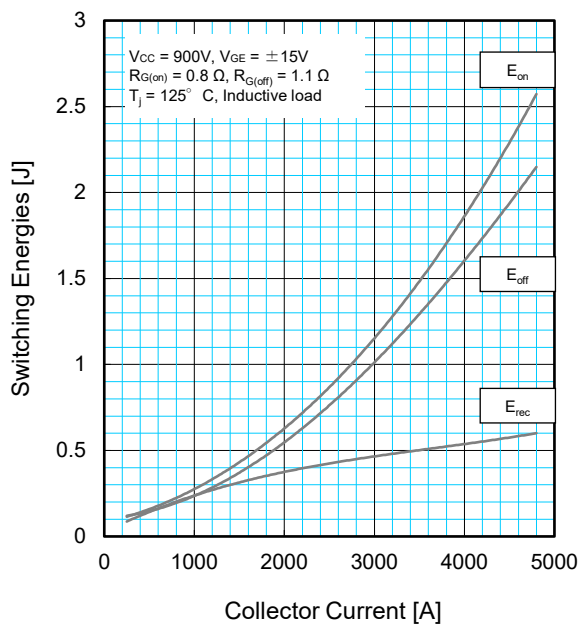
CAPACITANCE CHARACTERISTICS (TYPICAL)



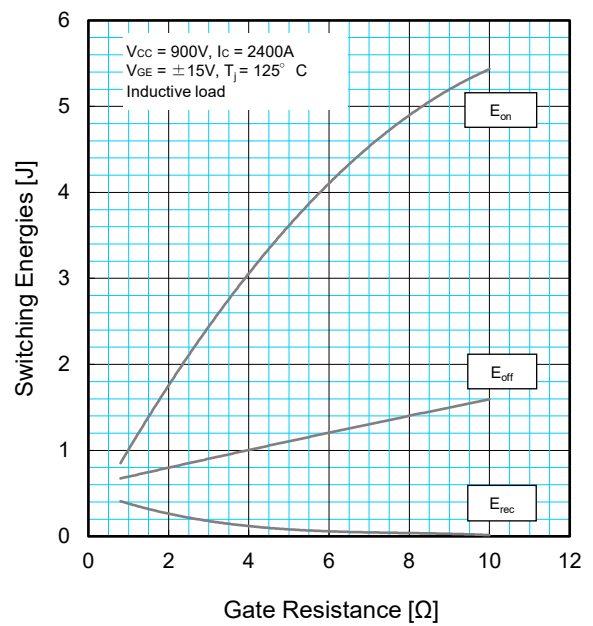
GATE CHARGE CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)

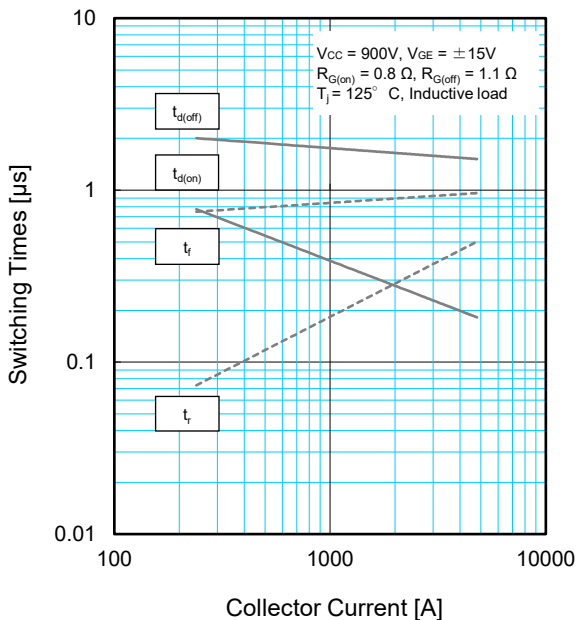


HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)

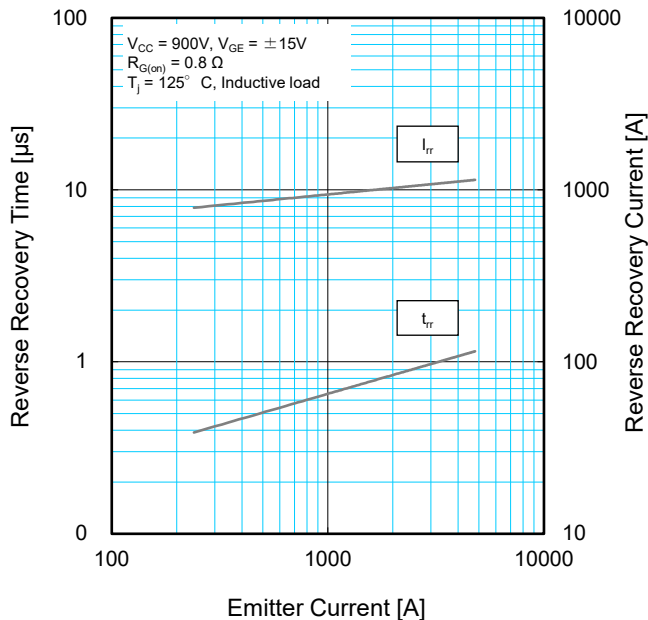


PERFORMANCE CURVES

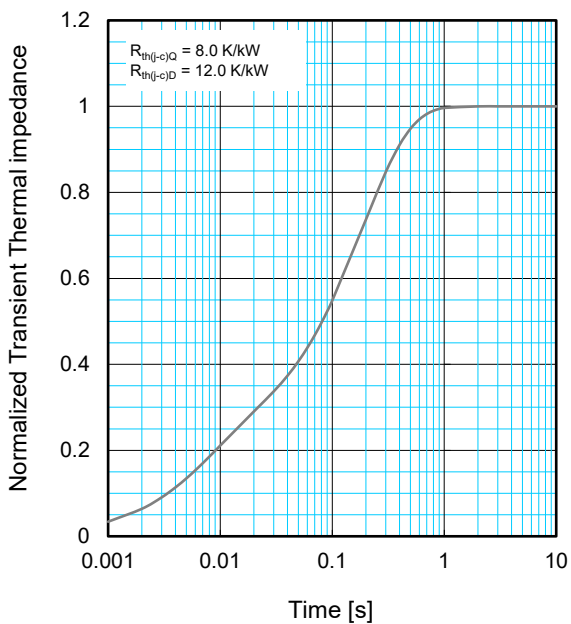
HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)



FREE-WHEEL DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



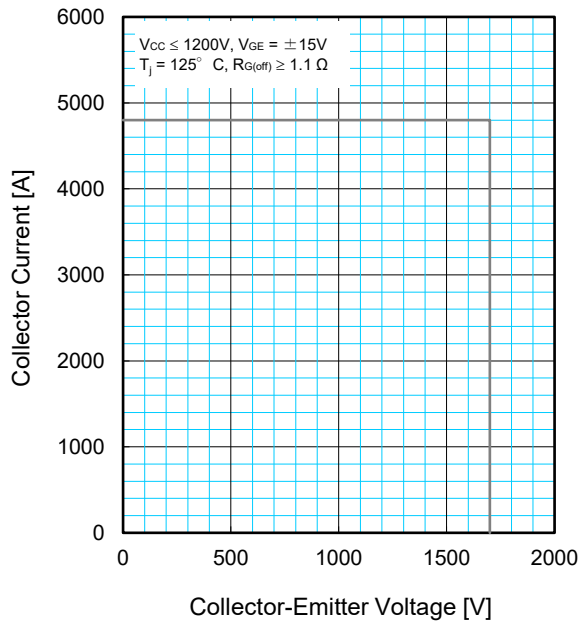
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS



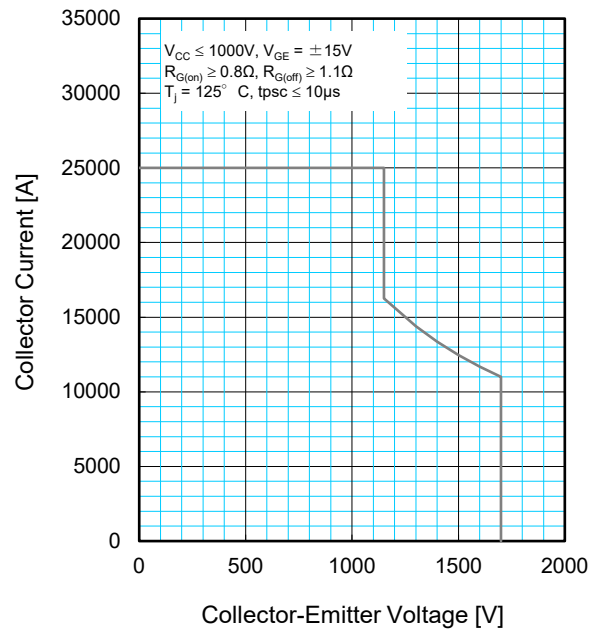
$$Z_{th(j-c)}(t) = \sum_{i=1}^n R_i \left\{ 1 - \exp\left(-\frac{t}{\tau_i}\right) \right\}$$

PERFORMANCE CURVES

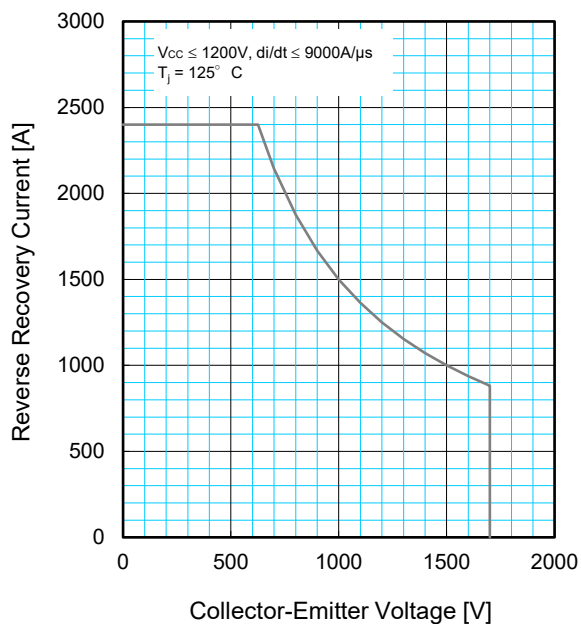
REVERSE BIAS SAFE OPERATING AREA (RBSOA)



SHORT CIRCUIT SAFE OPERATING AREA (SCSOA)



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



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