

<High Voltage Insulated Gate Bipolar Transistor : HVIGBT >

# CM1800HCB-34N

HIGH POWER SWITCHING USE  
INSULATED TYPE

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

## CM2400HCB-34N



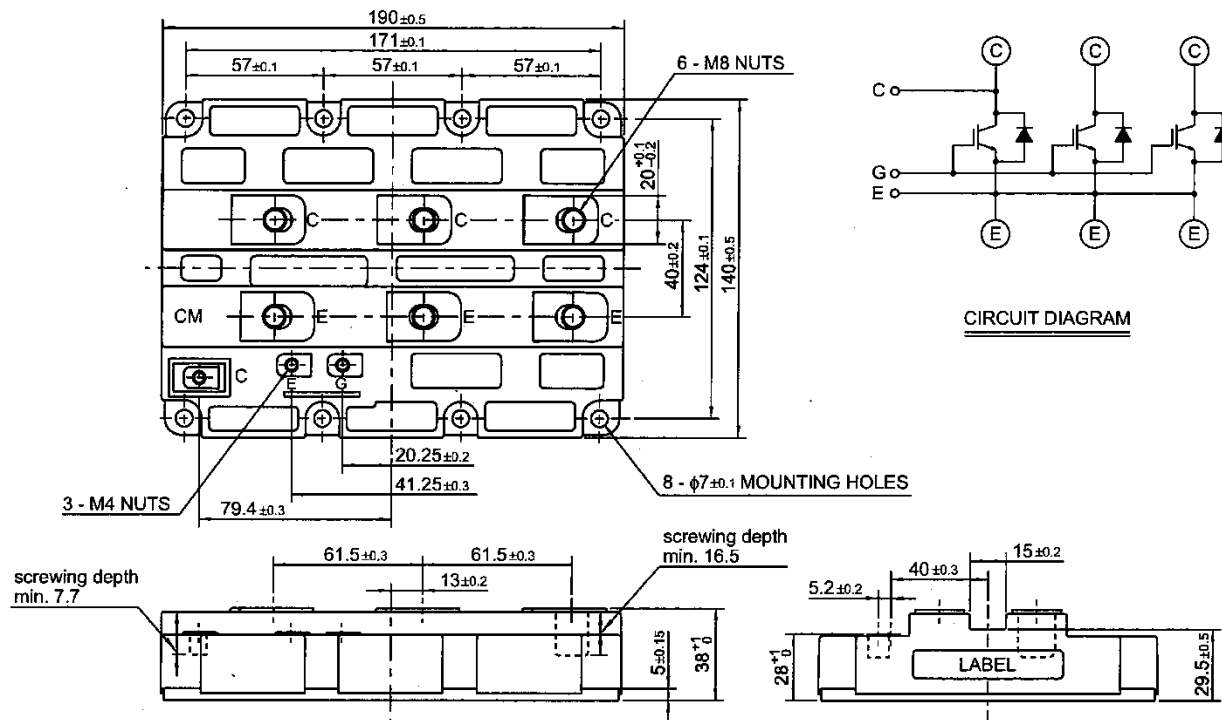
- $I_C$  ..... 1800 A
- $V_{CES}$  ..... 1700 V
- 1-element in pack
- Insulated type
- CSTBT™ / Soft recovery diode
- AISiC baseplate

## APPLICATION

Traction drives, High Reliability Converters / Inverters, DC choppers

## OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



**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	$V_{CE} = 0V, T_j = 25^\circ C$	$\pm 20$	V
$I_C$	Collector current	DC, $T_c = 80^\circ C$	1800	A
$I_{CRM}$		Pulse (Note 1)	3600	A
$I_E$	Emitter current (Note 2)	DC	1800	A
$I_{ERM}$		Pulse (Note 1)	3600	A
$P_{tot}$	Maximum power dissipation (Note 3)	$T_c = 25^\circ C$ , IGBT part	13800	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	$\mu s$

**ELECTRICAL CHARACTERISTICS**

Symbol	Item	Conditions	Limits			Unit
			Min	Typ	Max	
$I_{CES}$	Collector cutoff current	$V_{CE} = V_{CES}, V_{GE} = 0V$ $T_j = 25^\circ C$ $T_j = 125^\circ C$	—	—	8	mA
$V_{GE(th)}$	Gate-emitter threshold voltage	$V_{CE} = 10V, I_C = 180mA, T_j = 25^\circ C$	5.5	6.5	7.5	
$I_{GES}$	Gate leakage current	$V_{GE} = V_{GES}, V_{CE} = 0V, T_j = 25^\circ C$	-0.5	—	0.5	$\mu A$
$C_{ies}$	Input capacitance	$V_{CE} = 10V, V_{GE} = 0V, f = 100kHz$ $T_j = 25^\circ C$	—	352	—	nF
$C_{oes}$	Output capacitance		—	19.2	—	nF
$C_{res}$	Reverse transfer capacitance		—	5.6	—	nF
$Q_G$	Total gate charge	$V_{CC} = 900V, I_C = 1800A, V_{GE} = \pm 15V$	—	24.4	—	$\mu C$
$V_{CESat}$	Collector-emitter saturation voltage	$I_C = 1800A$ (Note 4) $V_{GE} = 15V$ $T_j = 25^\circ C$ $T_j = 125^\circ C$	—	2.00	2.60	V
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 900V, I_C = 1800A$ $V_{GE} = \pm 15V, R_{G(on)} = 0.9\Omega$ $T_j = 125^\circ C, L_s = 80nH$	—	—	1.50	
$t_r$	Turn-on rise time		—	—	0.60	$\mu s$
$E_{on(10\%)}$	Turn-on switching energy (Note 5)		Inductive load	—	0.56	—
$t_{d(off)}$	Turn-off delay time	$V_{CC} = 900V, I_C = 1800A$ $V_{GE} = \pm 15V, R_{G(off)} = 1.3\Omega$ $T_j = 125^\circ C, L_s = 80nH$	—	—	3.00	$\mu s$
$t_f$	Turn-off fall time		—	—	0.60	$\mu s$
$E_{off(10\%)}$	Turn-off switching energy (Note 5)		Inductive load	—	0.50	—
$V_{EC}$	Emitter-collector voltage (Note 2)	$I_E = 1800A$ (Note 4) $V_{GE} = 0V$ $T_j = 25^\circ C$ $T_j = 125^\circ C$	—	2.10	2.90	V
$t_{rr}$	Reverse recovery time (Note 2)	$V_{CC} = 900V, I_E = 1800A$ $V_{GE} = \pm 15V, R_{G(on)} = 0.9\Omega$ $T_j = 125^\circ C, L_s = 80nH$	—	—	1.50	
$Q_{rr}$	Reverse recovery charge (Note 2)		—	700	—	$\mu C$
$E_{rec(10\%)}$	Reverse recovery energy (Note 2) (Note 5)		Inductive load	—	0.44	—

**THERMAL CHARACTERISTICS**

Symbol	Item	Conditions	Limits			Unit
			Min	Typ	Max	
$R_{th(j-c)Q}$	Thermal resistance	Junction to Case, IGBT part	—	—	9.0	K/kW
$R_{th(j-c)D}$		Junction to Case, FWDi part	—	—	13.0	
$R_{th(c-s)}$	Contact thermal resistance	Case to heat sink, $\lambda_{grease} = 1W/m \cdot k, D_{(c-s)} = 100\mu m$	—	7.0	—	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	$T_C = 25\text{ }^\circ\text{C}$	—	0.18	—	m $\Omega$

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

2. The symbols represent characteristics of the anti-parallel, emitter to collector free-wheel diode (FWD).

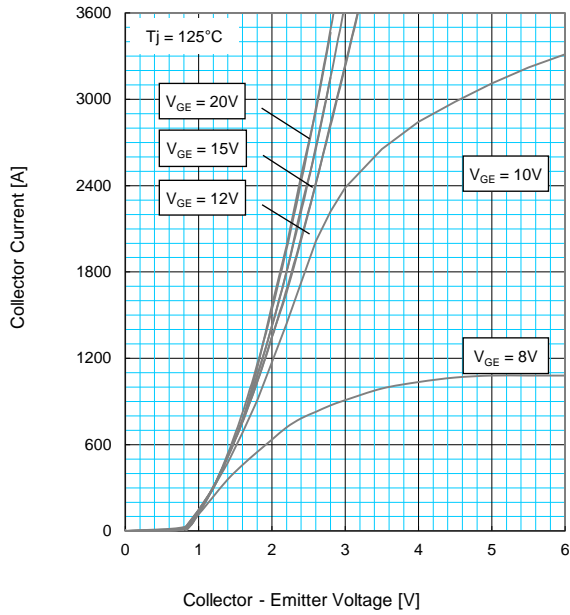
3. Junction temperature ( $T_j$ ) should not exceed  $T_{jmax}$  rating (150°C).

4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

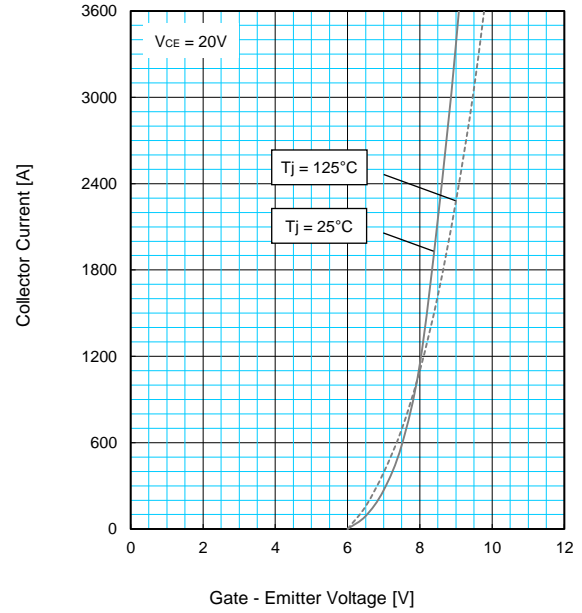
5.  $E_{on(10\%)} / E_{off(10\%)} / E_{rec(10\%)}$  are the integral of  $0.1V_{CE} \times 0.1I_C \times dt$ .

**PERFORMANCE CURVES**

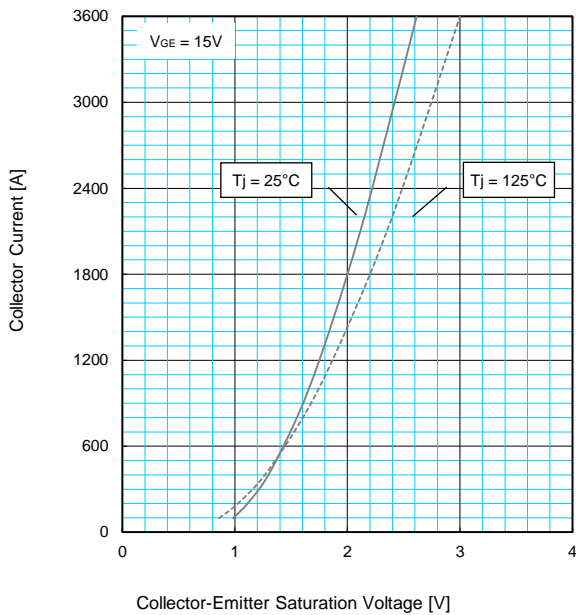
**OUTPUT CHARACTERISTICS  
(TYPICAL)**



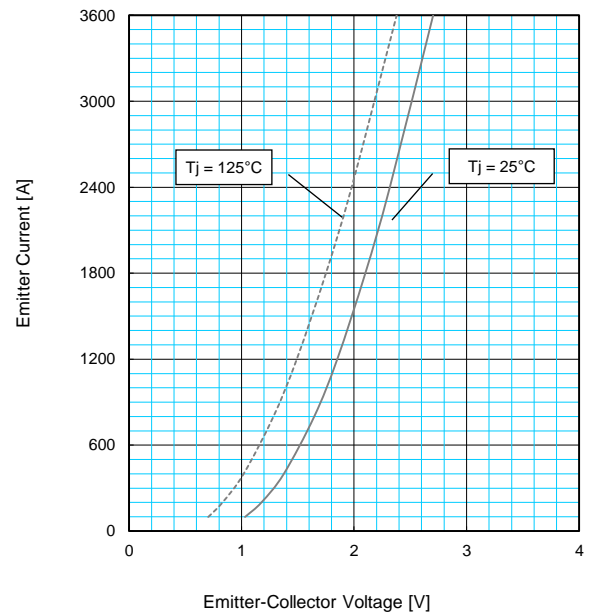
**TRANSFER CHARACTERISTICS  
(TYPICAL)**



**COLLECTOR-EMITTER SATURATION  
VOLTAGE CHARACTERISTICS (TYPICAL)**

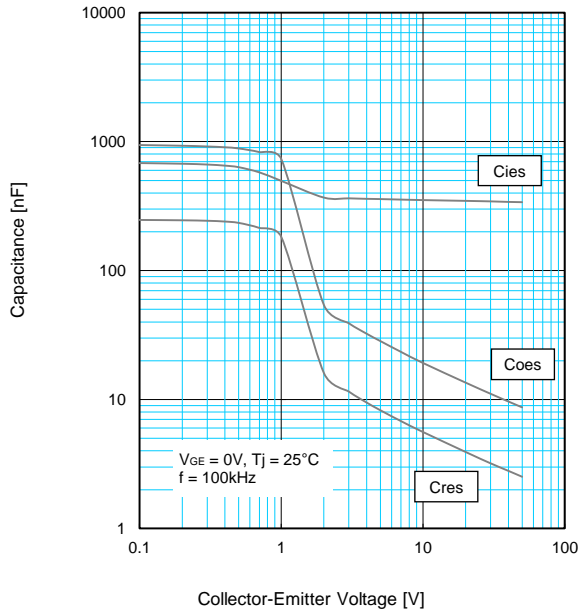


**FREE-WHEEL DIODE FORWARD  
CHARACTERISTICS (TYPICAL)**

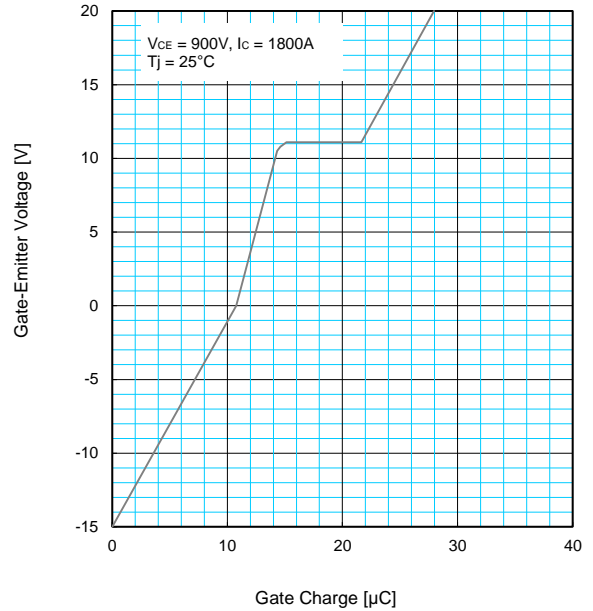


**PERFORMANCE CURVES**

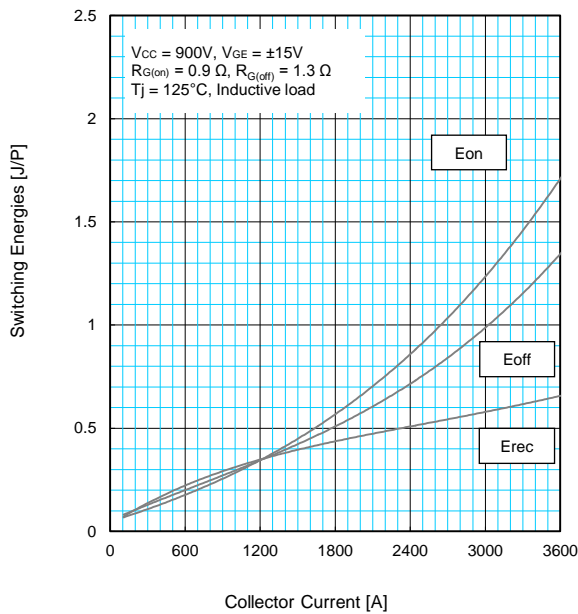
**CAPACITANCE CHARACTERISTICS  
(TYPICAL)**



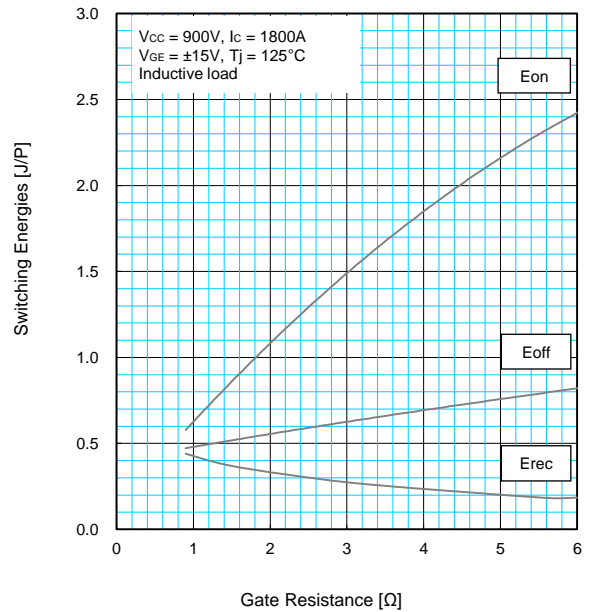
**GATE CHARGE CHARACTERISTICS  
(TYPICAL)**



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

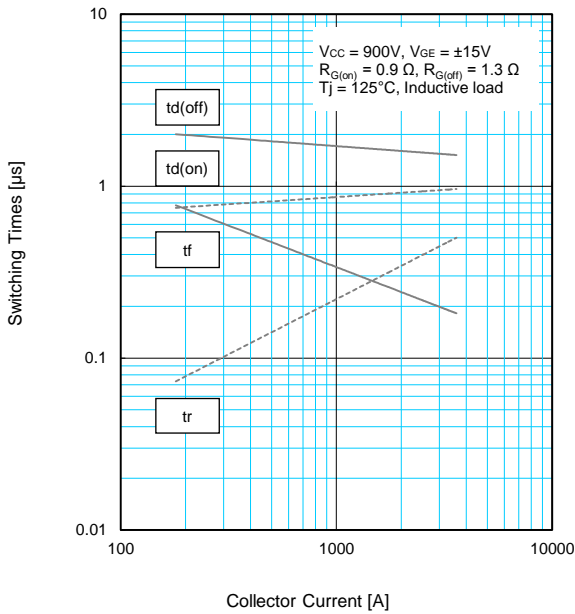


**HALF-BRIDGE SWITCHING ENERGY  
CHARACTERISTICS (TYPICAL)**

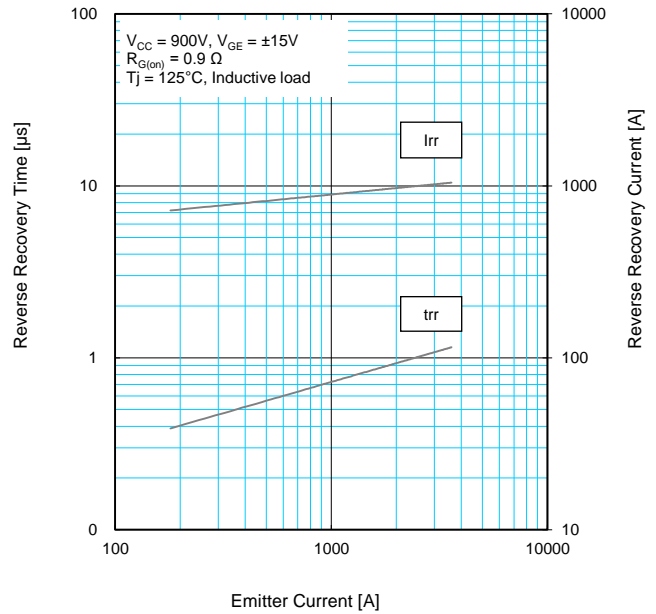


**PERFORMANCE CURVES**

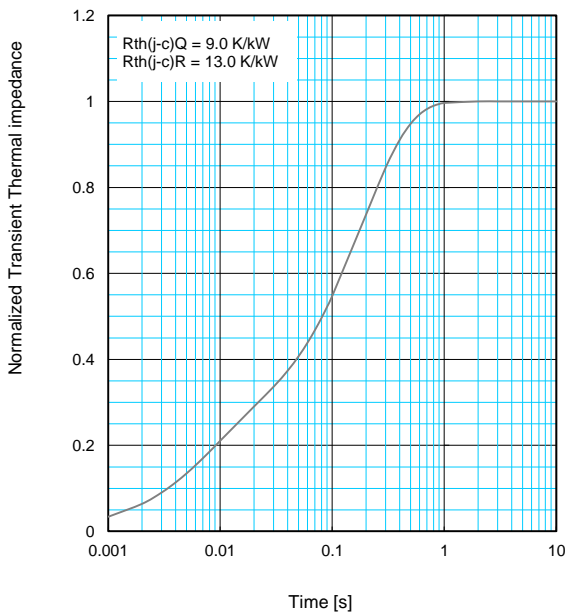
**HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)**



**FREE-WHEEL DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**



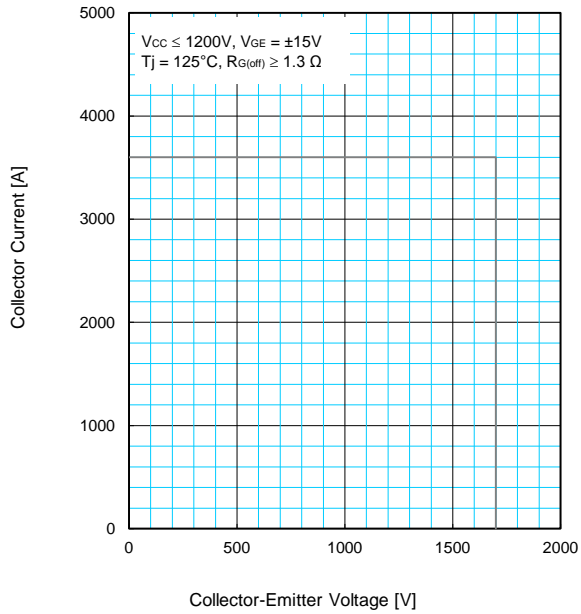
**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS**



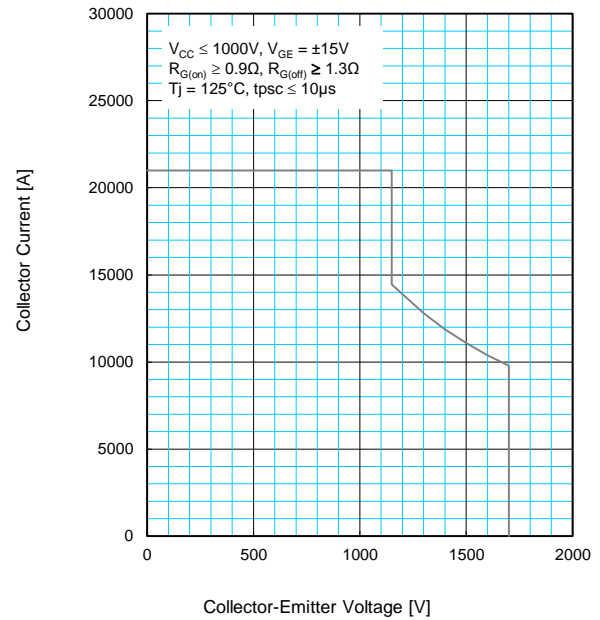
$$Z_{th(j-c)}(t) = \sum_{i=1}^n R_i \left\{ 1 - \exp\left(-\frac{t}{\tau_i}\right) \right\}$$

**PERFORMANCE CURVES**

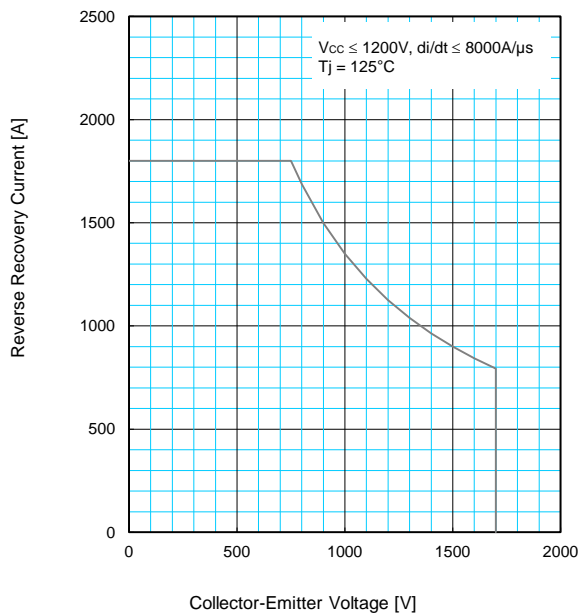
**REVERSE BIAS SAFE OPERATING AREA (RBSOA)**



**SHORT CIRCUIT SAFE OPERATING AREA (SCSOA)**



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



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