

MITSUBISHI HVIGBT MODULES  
**CM900HC-90H**

3rd-Version HVIGBT (High Voltage Insulated Gate Bipolar Transistor) Modules

HIGH POWER SWITCHING USE  
 INSULATED TYPE

**CM900HC-90H**



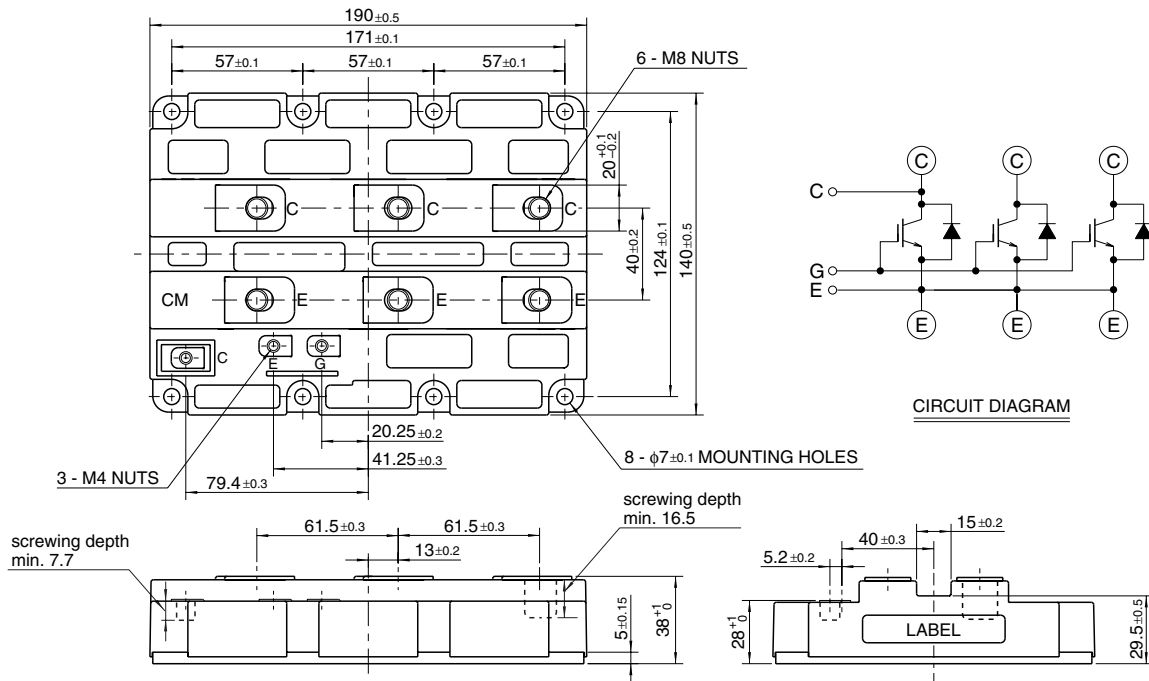
- IC ..... 900 A
- VCES ..... 4500 V
- Insulated Type
- 1-element in a Pack
- AISiC Baseplate

**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 <sub>CES</sub>	Collector-emitter voltage	V <sub>GE</sub> = 0V, T <sub>J</sub> = 25°C	4500	V
V <sub>GES</sub>	Gate-emitter voltage	V <sub>CE</sub> = 0V, T <sub>J</sub> = 25°C	± 20	V
I <sub>C</sub>	Collector current	DC, T <sub>c</sub> = 100°C	900	A
I <sub>CM</sub>		Pulse (Note 1)	1800	A
I <sub>E</sub>	Emitter current (Note 2)	DC	900	A
I <sub>EM</sub>		Pulse (Note 1)	1800	A
P <sub>c</sub>	Maximum power dissipation (Note 3)	T <sub>c</sub> = 25°C, IGBT part	11900	W
V <sub>iso</sub>	Isolation voltage	RMS, sinusoidal, f = 60Hz, t = 1 min.	6000	V
T <sub>J</sub>	Junction temperature		-40 ~ +150	°C
T <sub>op</sub>	Operating temperature		-40 ~ +125	°C
T <sub>stg</sub>	Storage temperature		-40 ~ +125	°C
t <sub>psc</sub>	Maximum short circuit pulse width	V <sub>CC</sub> = 3200V, V <sub>CE</sub> ≤ V <sub>CES</sub> , V <sub>GE</sub> = 15V, T <sub>J</sub> = 125°C	10	μs

**ELECTRICAL CHARACTERISTICS**

Symbol	Item	Conditions	Limits			Unit	
			Min	Typ	Max		
I <sub>CES</sub>	Collector cutoff current	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V	T <sub>J</sub> = 25°C	—	—	5	mA
			T <sub>J</sub> = 125°C	—	12	50	
V <sub>GE(th)</sub>	Gate-emitter threshold voltage	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 90 mA, T <sub>J</sub> = 25°C	5.0	6.0	7.0	V	
I <sub>GES</sub>	Gate leakage current	V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V, T <sub>J</sub> = 25°C	—	—	0.5	μA	
C <sub>ies</sub>	Input capacitance	V <sub>CE</sub> = 10 V, V <sub>GE</sub> = 0 V, f = 100 kHz, T <sub>J</sub> = 25°C	—	162	—	nF	
C <sub>oes</sub>	Output capacitance		—	12.0	—	nF	
C <sub>res</sub>	Reverse transfer capacitance		—	3.6	—	nF	
Q <sub>g</sub>	Total gate charge	V <sub>CC</sub> = 2250 V, I <sub>C</sub> = 900 A, V <sub>GE</sub> = ±15 V, T <sub>J</sub> = 25°C	—	15	—	μC	
V <sub>CE(sat)</sub>	Collector-emitter saturation voltage	I <sub>C</sub> = 900 A (Note 4) V <sub>GE</sub> = 15 V	T <sub>J</sub> = 25°C	—	3.45	—	V
			T <sub>J</sub> = 125°C	—	3.70	—	
t <sub>d(on)</sub>	Turn-on delay time	V <sub>CC</sub> = 2250 V, I <sub>C</sub> = 900 A, V <sub>GE</sub> = ±15 V R <sub>G</sub> = 10 Ω, T <sub>J</sub> = 125°C, L <sub>S</sub> = 100 nH	—	—	2.40	μs	
t <sub>r</sub>	Turn-on rise time		—	—	1.20	μs	
E <sub>on(10%)</sub>	Turn-on switching energy (Note 5)	Inductive load	—	4.20	—	J/P	
t <sub>d(off)</sub>	Turn-off delay time	V <sub>CC</sub> = 2250 V, I <sub>C</sub> = 900 A, V <sub>GE</sub> = ±15 V R <sub>G</sub> = 10 Ω, T <sub>J</sub> = 125°C, L <sub>S</sub> = 100 nH	—	—	6.00	μs	
t <sub>f</sub>	Turn-off fall time		—	—	1.20	μs	
E <sub>off(10%)</sub>	Turn-off switching energy (Note 5)	Inductive load	—	2.50	—	J/P	
V <sub>EC</sub>	Emitter-collector voltage (Note 2)	I <sub>E</sub> = 900 A (Note 4) V <sub>GE</sub> = 0 V	T <sub>J</sub> = 25°C	—	4.80	—	V
			T <sub>J</sub> = 125°C	—	4.15	—	
t <sub>rr</sub>	Reverse recovery time (Note 2)	V <sub>CC</sub> = 2250 V, I <sub>E</sub> = 900 A, V <sub>GE</sub> = ±15 V R <sub>G</sub> = 10 Ω, T <sub>J</sub> = 125°C, L <sub>S</sub> = 100 nH	—	—	1.80	μs	
Q <sub>rr</sub>	Reverse recovery charge (Note 2)		—	920	—	μC	
E <sub>rec(10%)</sub>	Reverse recovery energy (Note 2, 5)	Inductive load	—	1.00	—	J/P	

- Note 1. Pulse width and repetition rate should be such that junction temperature (T<sub>J</sub>) does not exceed T<sub>opmax</sub> rating (125°C).
- The symbols represent characteristics of the anti-parallel, emitter to collector free-wheel diode (FWDi).
- Junction temperature (T<sub>J</sub>) should not exceed T<sub>Jmax</sub> rating (150°C).
- Pulse width and repetition rate should be such as to cause negligible temperature rise.
- E<sub>on(10%)</sub> / E<sub>off(10%)</sub> / E<sub>rec(10%)</sub> are the integral of 0.1V<sub>CE</sub> x 0.1I<sub>C</sub> x dt.

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**THERMAL CHARACTERISTICS**

Symbol	Item	Conditions	Limits			Unit
			Min	Typ	Max	
$R_{th(j-c)Q}$	Thermal resistance	Junction to Case, IGBT part	—	—	10.5	K/kW
$R_{th(j-c)R}$	Thermal resistance	Junction to Case, FWDi part	—	—	21.0	K/kW
$R_{th(c-f)}$	Contact thermal resistance	Case to Fin, $\lambda_{grease} = 1W/m-K$ , $D_{(c-f)} = 100 \mu m$	—	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
$L_{PCE}$	Parasitic stray inductance		—	10	—	nH
$R_{CC+EE}$	Internal lead resistance	$T_c = 25^\circ C$	—	0.16	—	mΩ

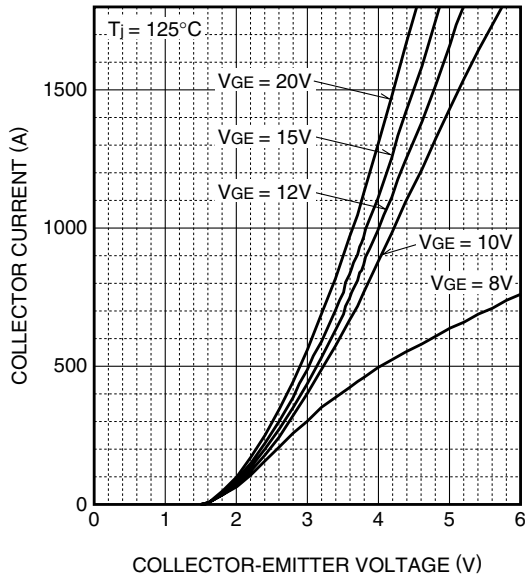
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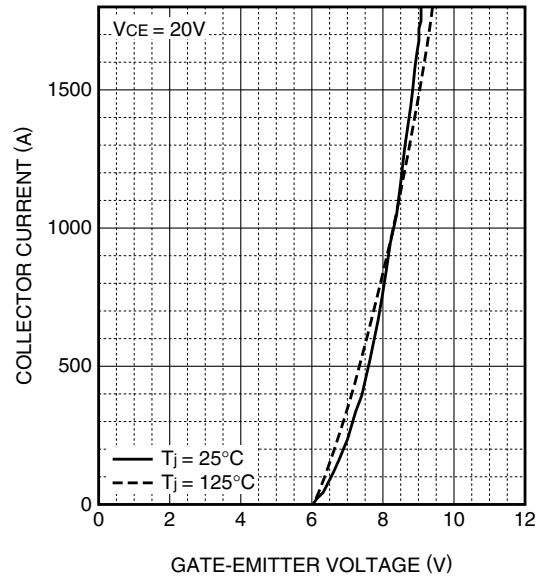
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**PERFORMANCE CURVES**

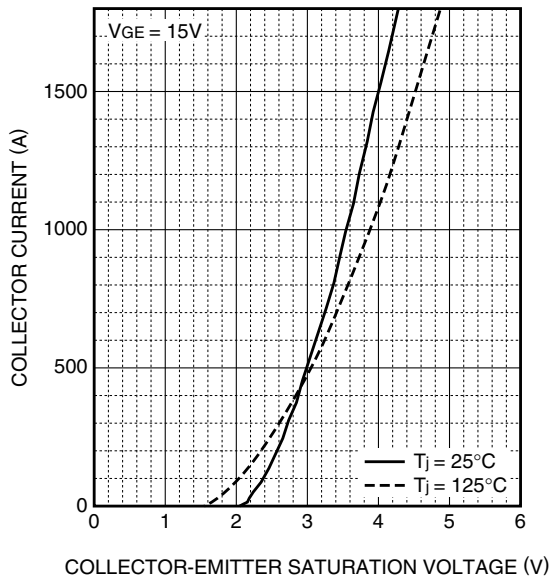
**OUTPUT CHARACTERISTICS  
(TYPICAL)**



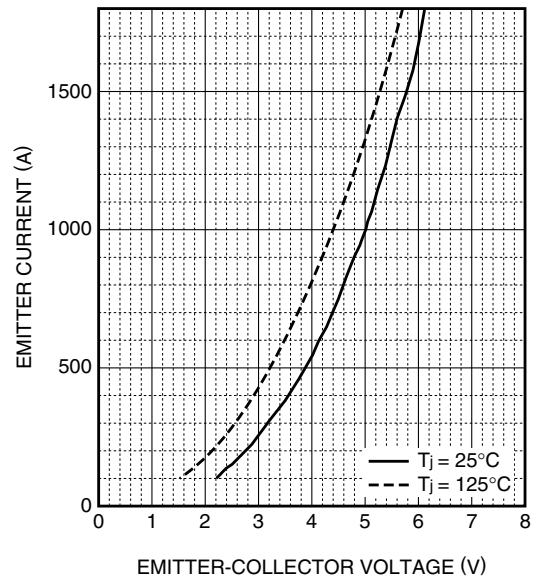
**TRANSFER CHARACTERISTICS  
(TYPICAL)**



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



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

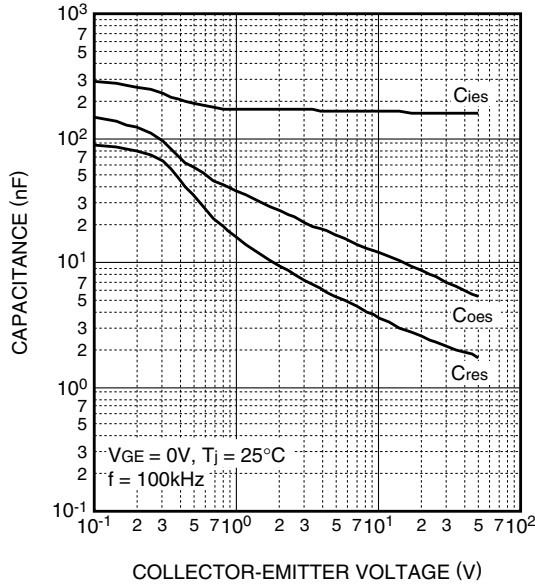


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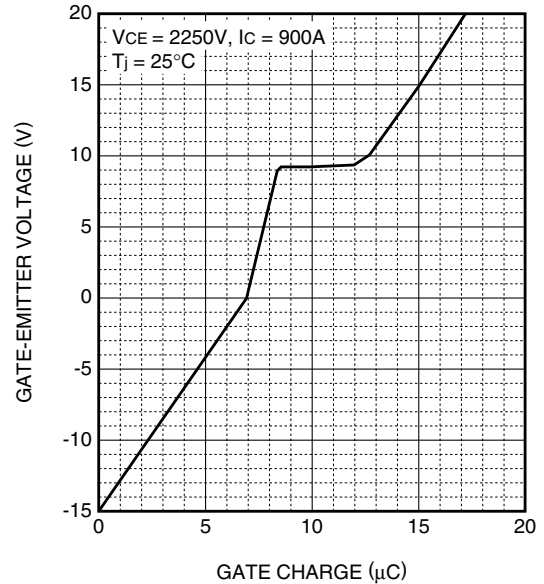
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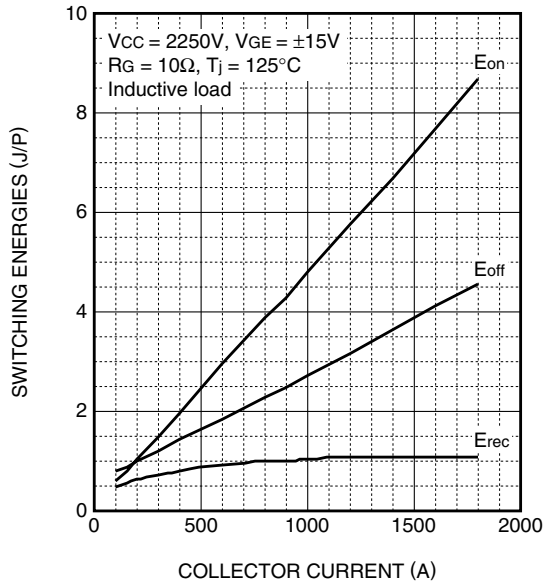
**CAPACITANCE CHARACTERISTICS  
(TYPICAL)**



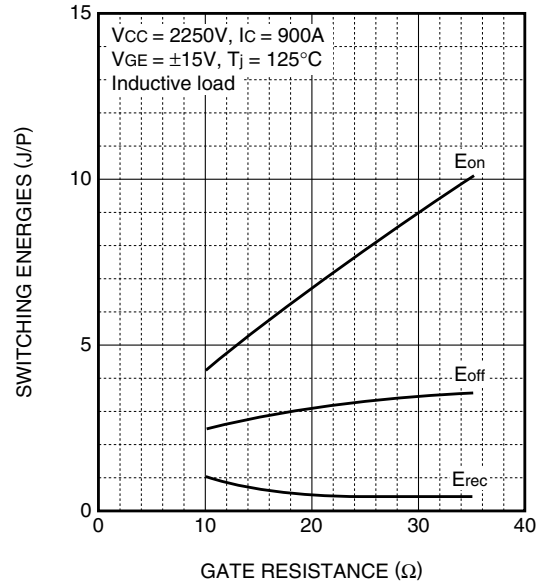
**GATE CHARGE CHARACTERISTICS  
(TYPICAL)**



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



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

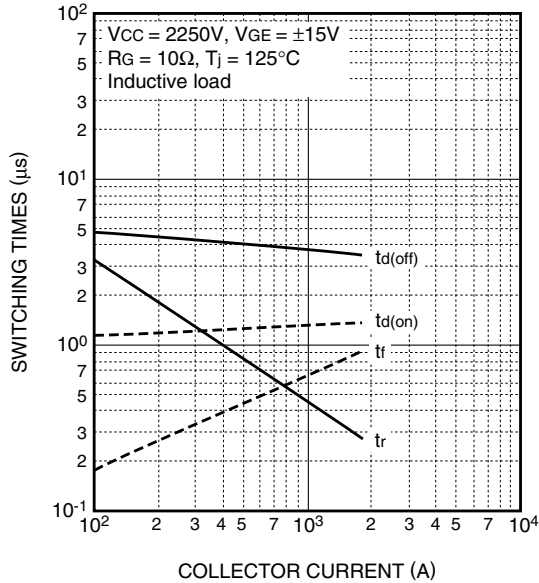


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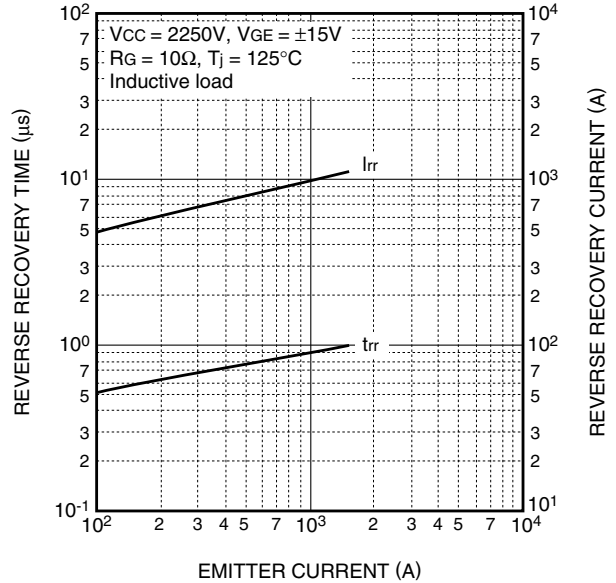
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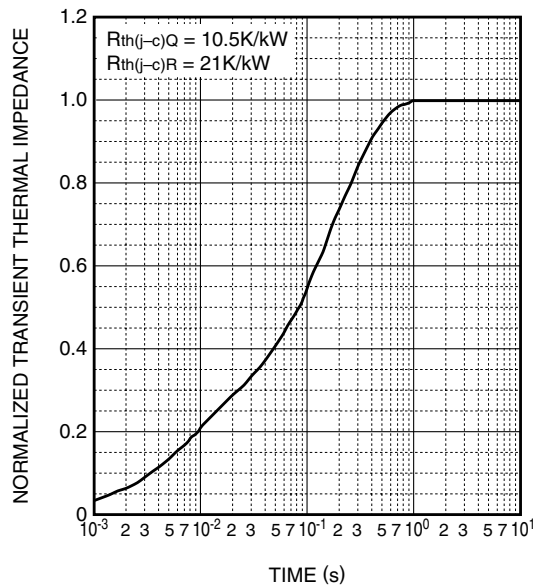
**HALF-BRIDGE SWITCHING TIME CHARACTERISTICS (TYPICAL)**



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



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS**

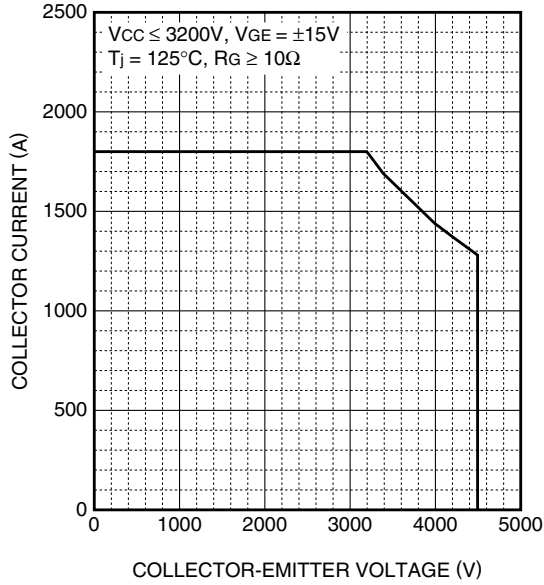


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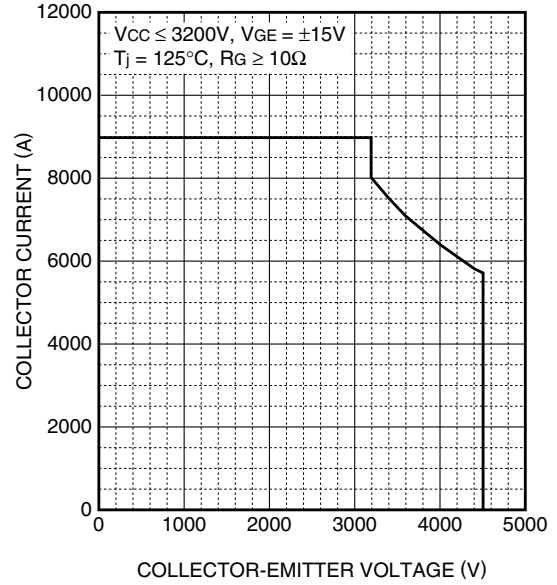
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**REVERSE BIAS SAFE OPERATING AREA (RBSOA)**



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



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

