

<High Voltage Insulated Gate Bipolar Transistor: HVIGBT >

# CM800DZ-34H

HIGH POWER SWITCHING USE  
INSULATED TYPE

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

## CM800DZ-34H



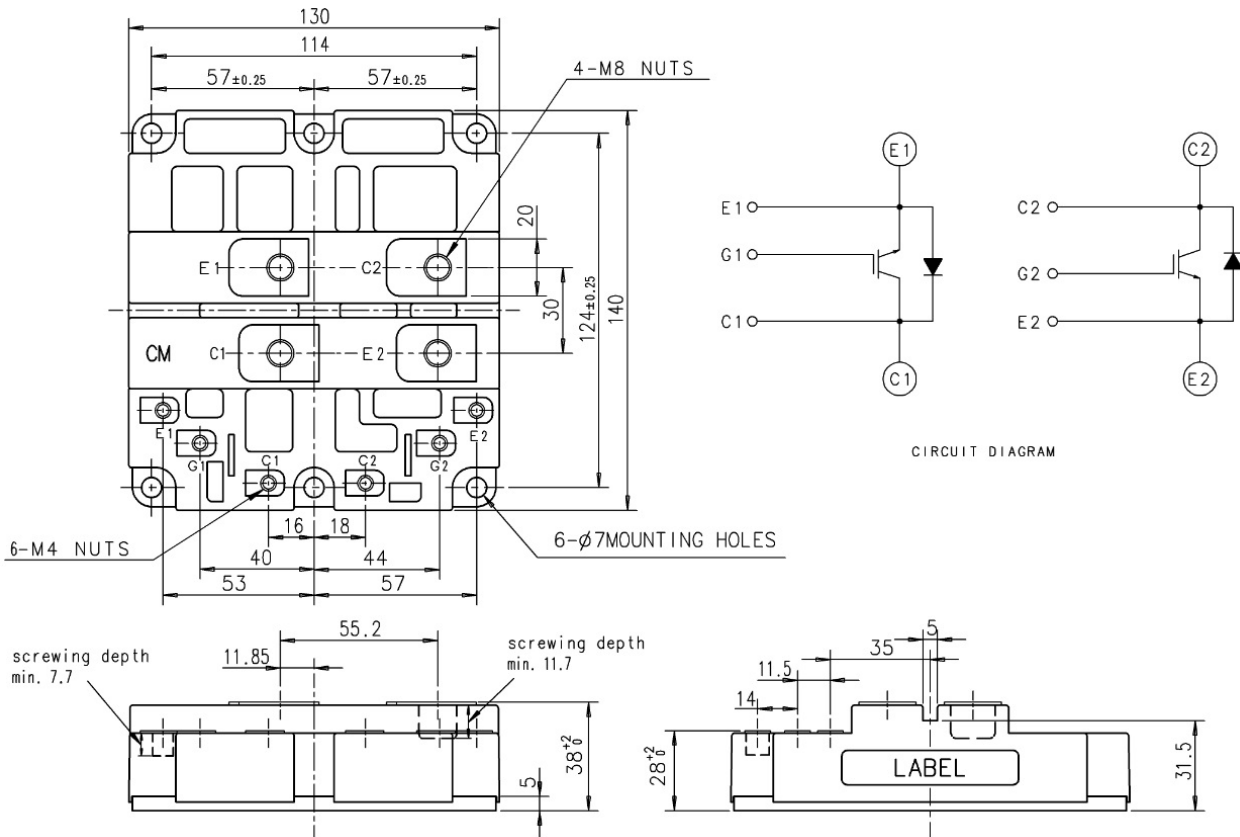
- $I_C$  ..... 800 A
- $V_{CES}$  ..... 1700 V
- 2-element in pack
- High Insulated type
- AlSiC baseplate

## 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	$V_{CE} = 0V, T_j = 25^\circ C$	$\pm 20$	V
$I_C$	Collector current	DC, $T_c = 80^\circ C$	800	A
$I_{CRM}$		Pulse (Note 1)	1600	A
$I_E$	Emitter current (Note 2)	DC	800	A
$I_{ERM}$		Pulse (Note 1)	1600	A
$P_{tot}$	Maximum power dissipation (Note 3)	$T_c = 25^\circ C$ , IGBT part	6200	W
$V_{iso}$	Isolation voltage	RMS, sinusoidal, $f = 60Hz, t = 1 \text{ min.}$	4000	V
$T_j$	Junction temperature		$-40 \sim +150$	$^\circ C$
$T_{jop}$	Operating junction temperature		$-40 \sim +125$	$^\circ C$
$T_{stg}$	Storage temperature		$-40 \sim +125$	$^\circ C$
$t_{psc}$	Short circuit pulse width	$V_{CC} = 1150V, V_{CE} \leq V_{CES}, V_{GE} = 15V, T_j = 125^\circ C$	10	$\mu s$

## ELECTRICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit	
			Min	Typ	Max		
$I_{CES}$	Collector cutoff current	$V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 25^\circ C$	—	—	12.0	mA	
$V_{GE(th)}$	Gate-emitter threshold voltage	$V_{CE} = 10V, I_C = 80 \text{ mA}, T_j = 25^\circ C$	4.5	5.5	6.5	V	
$I_{GES}$	Gate leakage current	$V_{GE} = V_{GES}, V_{CE} = 0V, T_j = 25^\circ C$	—	—	0.5	$\mu A$	
$C_{ies}$	Input capacitance	$V_{CE} = 10V, V_{GE} = 0V, f = 100 \text{ kHz}$ $T_j = 25^\circ C$	—	72.0	—	nF	
$C_{oes}$	Output capacitance		—	9.0	—	nF	
$C_{res}$	Reverse transfer capacitance		—	3.6	—	nF	
$Q_G$	Total gate charge	$V_{CC} = 850V, I_C = 800A, V_{GE} = 15V, T_j = 25^\circ C$	—	6.6	—	$\mu C$	
$V_{CEsat}$	Collector-emitter saturation voltage	$I_C = 800A$ (Note 4) $V_{GE} = 15V$	$T_j = 25^\circ C$	—	2.60	3.30	V
			$T_j = 125^\circ C$	—	3.10	—	
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 850V, I_C = 800A, V_{GE} = \pm 15V$ $R_{G(on)} = 3.3 \Omega, T_j = 125^\circ C, L_s = 150 \text{ nH}$	—	—	1.60	$\mu s$	
$t_r$	Turn-on rise time		—	—	1.30	$\mu s$	
$E_{on(10\%)}$	Turn-on switching energy (Note 5)		Inductive load	—	350	—	mJ
$t_{d(off)}$	Turn-off delay time	$V_{CC} = 850V, I_C = 800A, V_{GE} = \pm 15V$ $R_{G(off)} = 3.3 \Omega, T_j = 125^\circ C, L_s = 150 \text{ nH}$	—	—	2.70	$\mu s$	
$t_f$	Turn-off fall time		—	—	0.50	$\mu s$	
$E_{off(10\%)}$	Turn-off switching energy (Note 5)		Inductive load	—	260	—	mJ
$V_{EC}$	Emitter-collector voltage (Note 2)	$I_E = 800A$ (Note 4) $V_{GE} = 0V$	$T_j = 25^\circ C$	—	2.30	—	V
			$T_j = 125^\circ C$	—	2.00	—	
$t_{rr}$	Reverse recovery time (Note 2)	$V_{CC} = 850V, I_C = 800A, V_{GE} = \pm 15V$ $R_{G(on)} = 3.3 \Omega, T_j = 125^\circ C, L_s = 150 \text{ nH}$	—	—	2.70	$\mu s$	
$Q_{rr}$	Reverse recovery charge (Note 2)		—	300	—	$\mu C$	
$E_{rec(10\%)}$	Reverse recovery energy (Note 2), (Note 5)		Inductive load	—	120	—	mJ

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**THERMAL CHARACTERISTICS**

Symbol	Item	Conditions	Limits			Unit
			Min	Typ	Max	
$R_{th(i-c)Q}$	Thermal resistance	Junction to Case, IGBT part, 1/2 module	—	—	20.0	K/kW
$R_{th(i-c)D}$		Junction to Case, FWDi part, 1/2 module	—	—	34.0	K/kW
$R_{th(c-s)}$	Contact thermal resistance	Case to heat sink, $\lambda_{grease} = 1W/m^2 \cdot k$ , $D_{(c-s)} = 100\mu m$ 1/2 module	—	16.0	—	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		—	1.0	—	kg
CTI	Comparative tracking index		250	—	—	—
$d_a$	Clearance		10.0	—	—	mm
$d_s$	Creepage distance		15.0	—	—	mm
$L_{P_{CE}}$	Parasitic stray inductance	IGBT part, 1/2 module	—	18	—	nH
$R_{CC+EE}$	Internal lead resistance	IGBT part, 1/2 module, $T_C = 25^\circ C$	—	0.16	—	mΩ

Note 1. Pulse width and repetition rate should be such that junction temperature ( $T_j$ ) does not exceed  $T_{jopmax}$  rating.

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

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

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

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

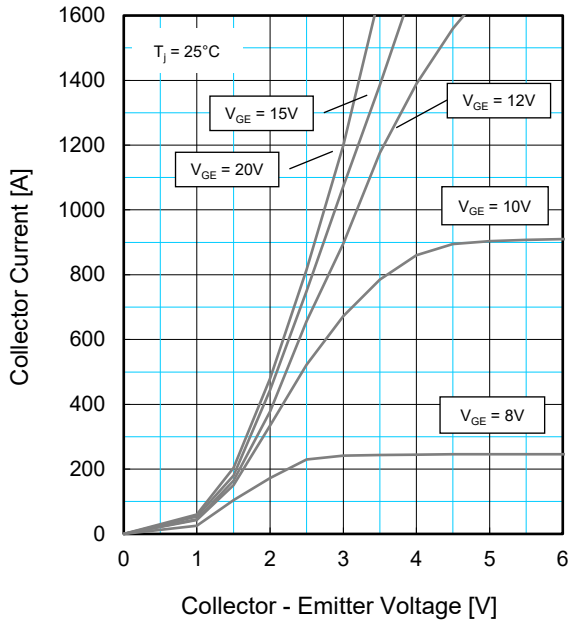
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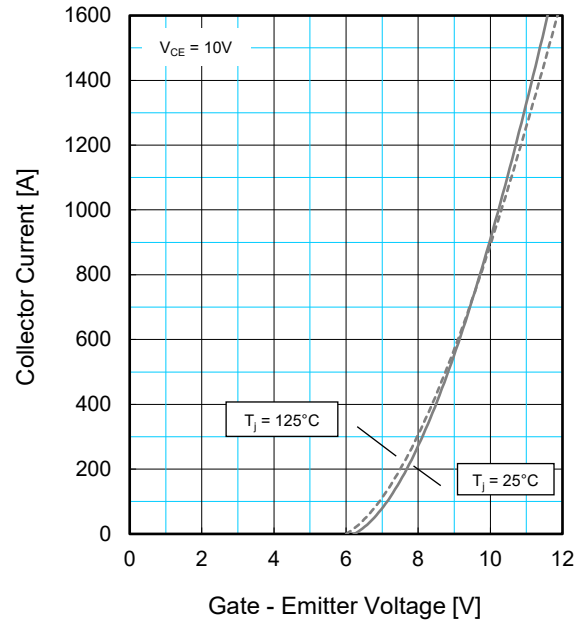
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## PERFORMANCE CURVES

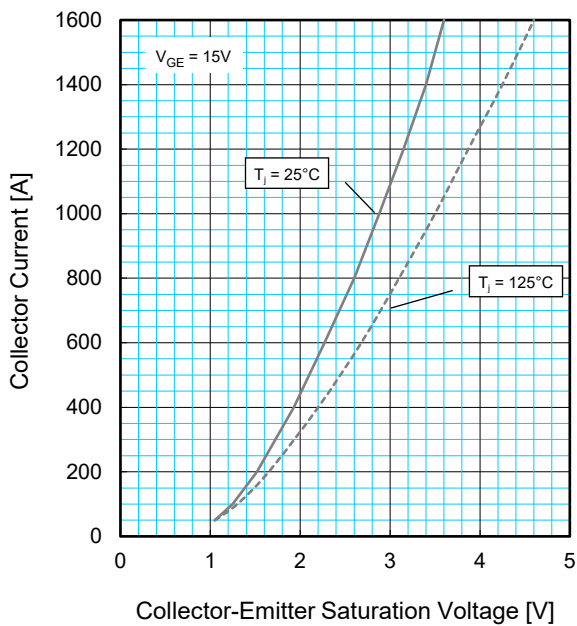
**OUTPUT CHARACTERISTICS (TYPICAL)**



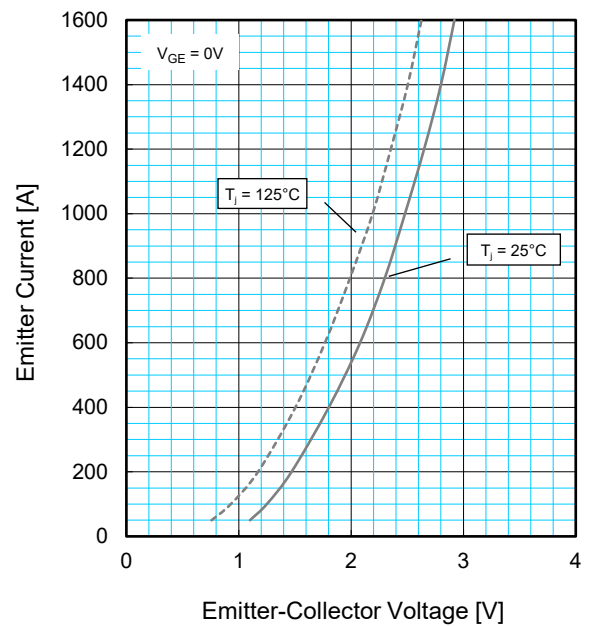
**TRANSFER CHARACTERISTICS (TYPICAL)**



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



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



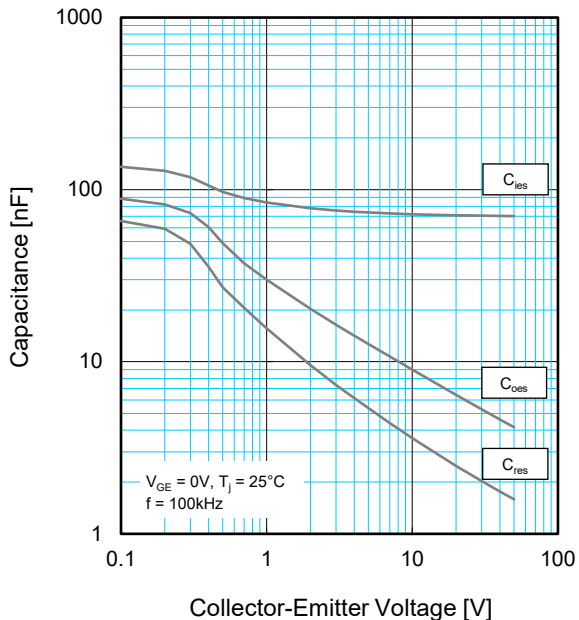
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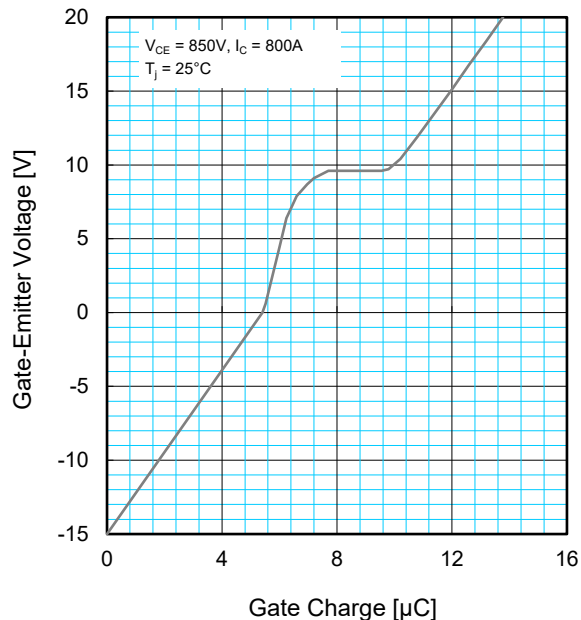
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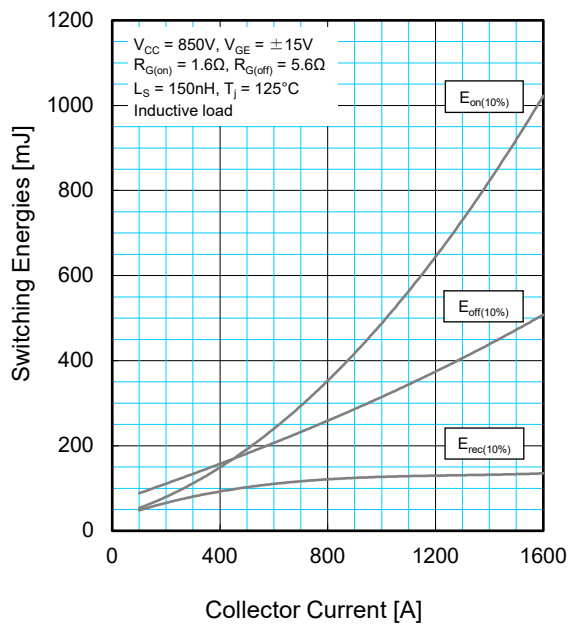
**CAPACITANCE CHARACTERISTICS (TYPICAL)**



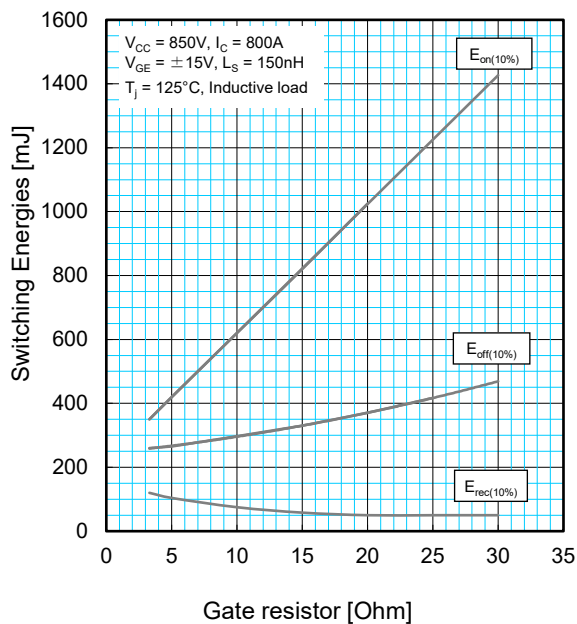
**GATE CHARGE CHARACTERISTICS (TYPICAL)**



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



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



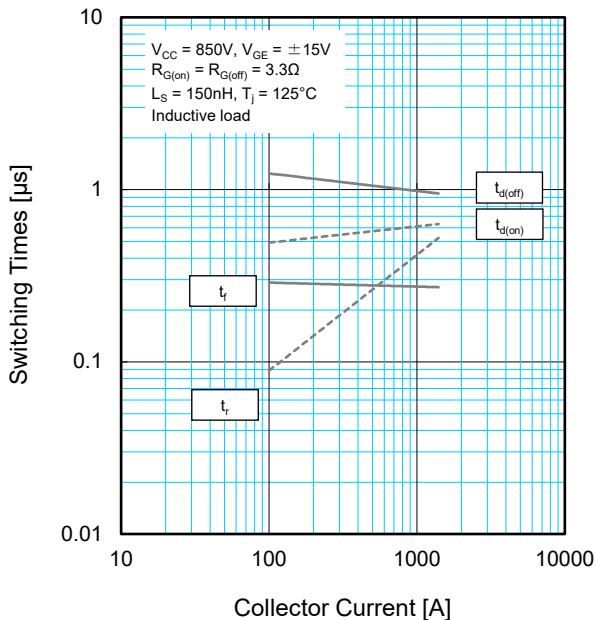
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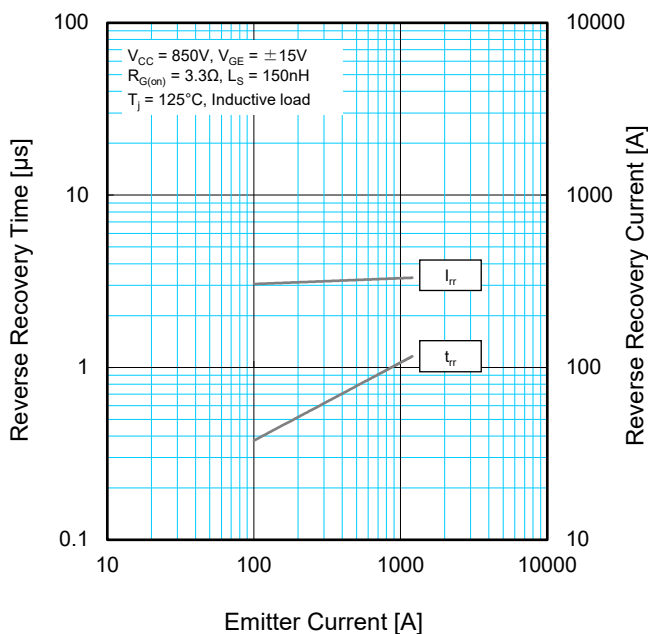
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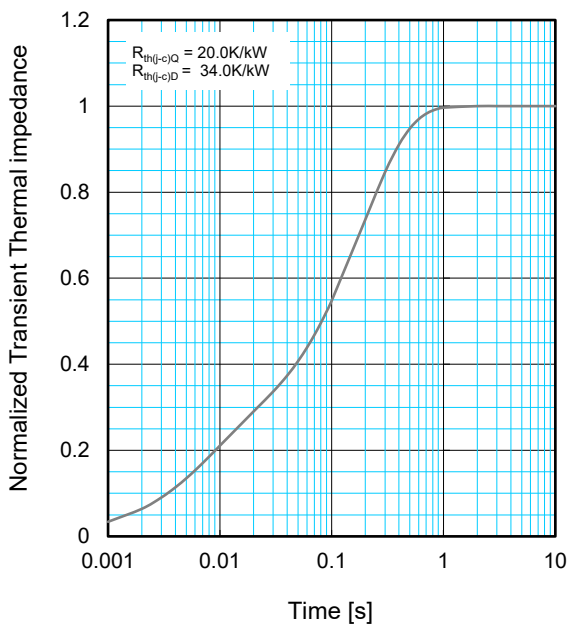
### HALF-BRIDGE SWITCHING TIME CHARACTERISTICS (TYPICAL)



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



### TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS



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

	1	2	3	4
$R_i$ [K/kW]	0.07	0.11	0.45	0.37
$\tau_i$ [sec]	0.001	0.01	0.077	0.432

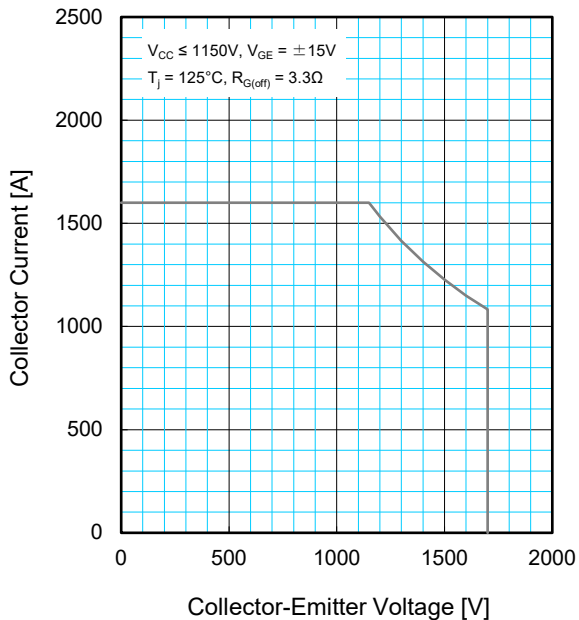
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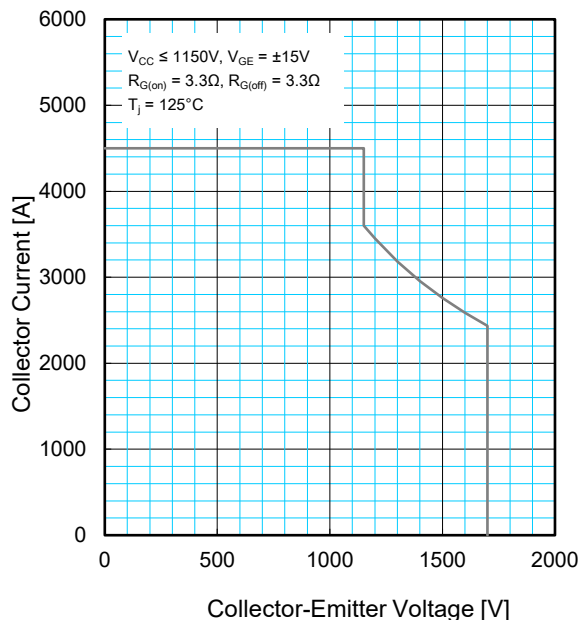
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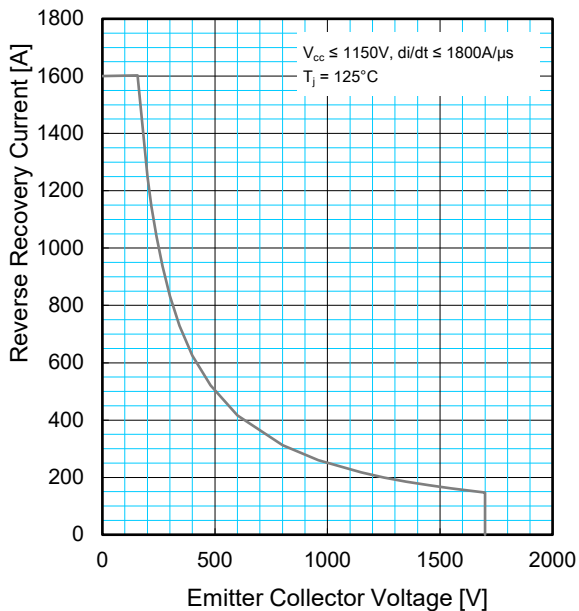
**REVERSE BIAS SAFE OPERATING AREA (RBSOA)**



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



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



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