

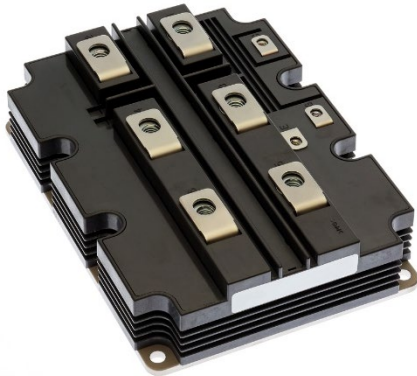
< High Voltage Insulated Gate Bipolar Transistor : HVIGBT >

CM900HG-130X

HIGH POWER SWITCHING USE
INSULATED TYPE

5th-Version HVIGBT (High Voltage Insulated Gate Bipolar Transistor) Modules

CM900HG-130X



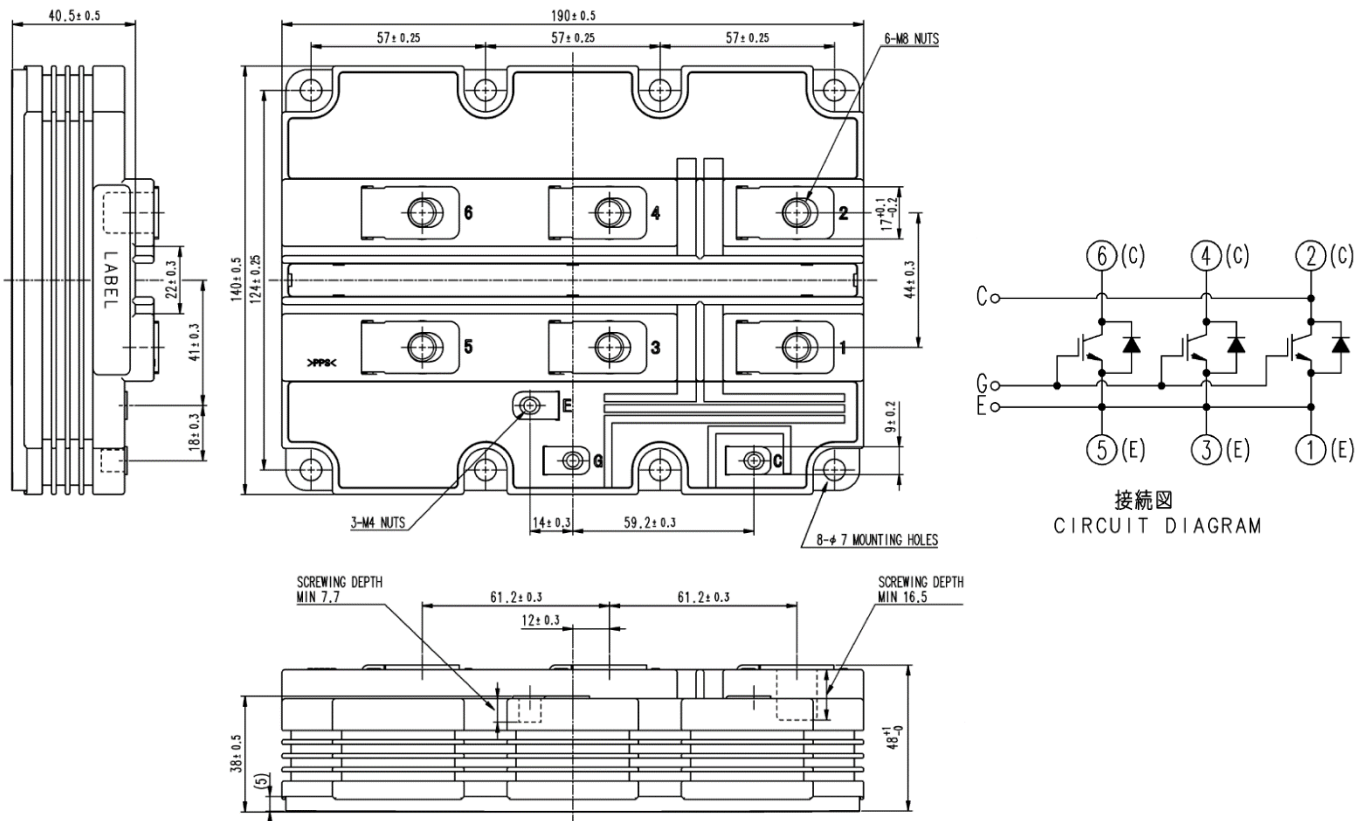
- I_C900A
- V_{CES}6500V
- 1-element in a Pack
- High Insulated Type
- CSTBT™(III) / RFC Diode
- AISiC Baseplate
- UL recognized under UL1557

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 = 150°C	6500	V
		V _{GE} = 0V, T _J = 25°C	6300	
		V _{GE} = 0V, T _J = -50°C	5700	
V _{GES}	Gate-emitter voltage	V _{CE} = 0V, T _J = 25°C	± 20	V
I _C	Collector current	DC, T _c = 115°C	900	A
I _{CRM}		Pulse (Note 1)	1800	A
I _E	Emitter current (Note 2)	DC, T _c = 95°C	900	A
I _{ERM}		Pulse (Note 1)	1800	A
P _{tot}	Maximum power dissipation (Note 3)	T _c = 25°C, IGBT part	12500	W
V _{iso}	Isolation voltage	RMS, sinusoidal, f = 60Hz, t = 1 min.	10200	V
Q _{PD}	Partial discharge	V1 = 6900 Vrms, V2 = 5100 Vrms, 60 Hz	10	pC
T _J	Junction temperature		-50 ~ +150	°C
T _{top}	Operating junction temperature		-50 ~ +150	°C
T _{stg}	Storage temperature		-55 ~ +150	°C
t _{psc}	Short circuit pulse width	V _{CC} = 4500V, V _{CE} ≤ V _{CES} , V _{GE} = 15V, T _J = 150°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	—	—	6.0	mA
			T _J = 125°C	—	5.0	—	
			T _J = 150°C	—	—	150.0	
V _{GE(th)}	Gate-emitter threshold voltage	V _{CE} = 10V, I _C = 90mA, T _J = 25°C	6.5	7.0	7.5	V	
I _{GES}	Gate leakage current	V _{GE} = V _{GES} , V _{CE} = 0V, T _J = 25°C	-0.5	—	0.5	μA	
C _{ies}	Input capacitance	V _{CE} = 10V, V _{GE} = 0V, f = 100kHz T _J = 25°C	—	151	—	nF	
C _{oes}	Output capacitance		—	6.3	—	nF	
C _{res}	Reverse transfer capacitance		—	0.8	—	nF	
Q _G	Total gate charge	V _{CC} = 3600V, I _C = 900A, V _{GE} = ±15V	—	9.9	—	μC	
V _{CEsat}	Collector-emitter saturation voltage	I _C = 900A (Note 4) V _{GE} = 15V	T _J = 25°C	—	2.50	—	V
			T _J = 125°C	—	3.20	—	
			T _J = 150°C	—	3.30	3.80	
t _{d(on)}	Turn-on delay time	V _{CC} = 3600V I _C = 900A V _{GE} = ±15V R _{G(on)} = 4.3Ω	T _J = 150°C	—	—	1.45	μs
t _r	Rise time		T _J = 150°C	—	—	0.50	
E _{on(10%)}	Turn-on switching energy (per pulse) (Note 5)		L _s = 150nH Inductive load	T _J = 25°C	—	6.10	
		T _J = 125°C		—	6.60	—	
		T _J = 150°C		—	7.50	—	
E _{on}	Turn-on switching energy (per pulse) (Note 6)	Inductive load	T _J = 25°C	—	6.30	—	J
			T _J = 125°C	—	7.00	—	
			T _J = 150°C	—	7.90	—	
t _{d(off)}	Turn-off delay time	V _{CC} = 3600V I _C = 900A V _{GE} = ±15V	T _J = 25°C	—	5.90	—	μs
			T _J = 125°C	—	7.00	—	
			T _J = 150°C	—	7.00	10.5	
t _f	Fall time	R _{G(off)} = 30Ω L _s = 150nH Inductive load	T _J = 25°C	—	0.50	—	μs
			T _J = 125°C	—	1.00	—	
			T _J = 150°C	—	1.00	1.50	
E _{off(10%)}	Turn-off switching energy (per pulse) (Note 5)	Inductive load	T _J = 25°C	—	3.60	—	J
			T _J = 125°C	—	5.80	—	
			T _J = 150°C	—	6.00	—	
E _{off}	Turn-off switching energy (per pulse) (Note 6)	Inductive load	T _J = 25°C	—	3.70	—	J
			T _J = 125°C	—	6.00	—	
			T _J = 150°C	—	6.20	—	

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ELECTRICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit	
			Min	Typ	Max		
V_{EC}	Emitter-collector voltage (Note 2)	$I_E = 900A$ (Note 4) $V_{GE} = 0V$	$T_J = 25^\circ C$	—	2.50	—	V
			$T_J = 125^\circ C$	—	3.20	—	
			$T_J = 150^\circ C$	—	3.30	3.80	
t_{rr}	Reverse recovery time (Note 2)		$T_J = 25^\circ C$	—	2.00	—	μs
			$T_J = 125^\circ C$	—	2.40	—	
			$T_J = 150^\circ C$	—	2.50	—	
I_{rr}	Reverse recovery current (Note 2)		$T_J = 25^\circ C$	—	1250	—	A
			$T_J = 125^\circ C$	—	1200	—	
			$T_J = 150^\circ C$	—	1200	—	
$Q_{rr(10\%)}$	Reverse recovery charge (Note 2, 7)	$V_{CC} = 3600V$ $I_C = 900A$ $V_{GE} = \pm 15V$	$T_J = 25^\circ C$	—	1800	—	μC
			$T_J = 125^\circ C$	—	2300	—	
			$T_J = 150^\circ C$	—	2400	—	
Q_{rr}	Reverse recovery charge (Note 2, 6)	$R_{G(on)} = 4.3\Omega$ $L_s = 150nH$ Inductive load	$T_J = 25^\circ C$	—	1850	—	μC
			$T_J = 125^\circ C$	—	2350	—	
			$T_J = 150^\circ C$	—	2500	—	
$E_{rec(10\%)}$	Reverse recovery energy (per pulse) (Note 2, 5)		$T_J = 25^\circ C$	—	2.90	—	J
			$T_J = 125^\circ C$	—	4.20	—	
			$T_J = 150^\circ C$	—	4.50	—	
E_{rec}	Reverse recovery energy (per pulse) (Note 2, 6)		$T_J = 25^\circ C$	—	3.00	—	J
			$T_J = 125^\circ C$	—	4.30	—	
			$T_J = 150^\circ C$	—	4.80	—	

THERMAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min	Typ	Max	
$R_{th(l-c)Q}$	Thermal resistance	Junction to Case, IGBT part	—	—	10.0	K/kW
$R_{th(l-c)D}$		Junction to Case, FWDi part	—	—	16.0	K/kW
$R_{th(c-s)}$	Contact thermal resistance	Case to heat sink, $\lambda_{grease} = 1W/m^2K$, $D_{(c-s)} = 80\mu m$	—	5.0	—	K/kW

MECHANICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min	Typ	Max	
M_t	Mounting torque	M8 : Main terminals screw	7.0	—	19.0	N·m
M_s		M6 : Mounting screw	3.0	—	6.0	N·m
M_t		M4 : Auxiliary terminals screw	1.0	—	3.0	N·m
m	Mass		—	1.5	—	kg
CTI	Comparative tracking index		600	—	—	—
d_a	Clearance		26.0	—	—	mm
d_s	Creepage distance		56.0	—	—	mm
L_{PCE}	Parasitic stray inductance		—	13.5	—	nH
R_{CC+EE}	Internal lead resistance	$T_C = 25^\circ C$	—	0.12	—	m Ω

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

Note2. The symbols represent characteristics of the anti-parallel, emitter to collector free-wheel diode (FWD).

Note3. Junction temperature (T_J) should not exceed T_{Jmax} rating ($150^\circ C$).

Note4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

Note5. The integration range of switching energies is from $10\%V_{CE}$ to $10\%I_C(10\%I_E)$.

Note6. Definition of all items is according to IEC 60747, unless otherwise specified.

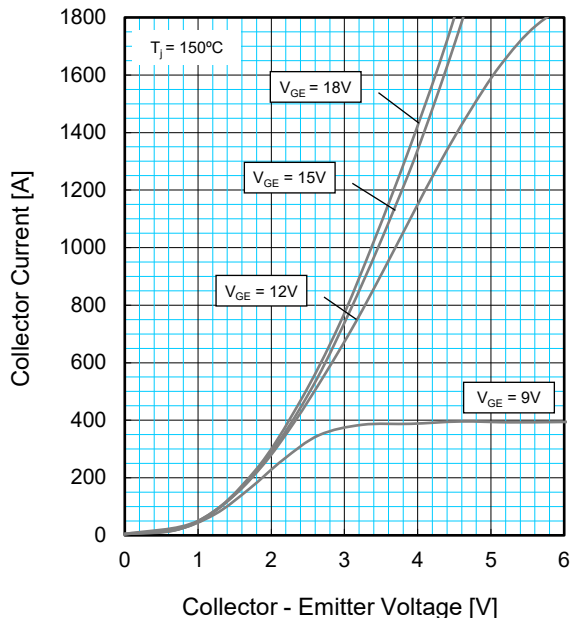
Note7. The integration range of reverse recovery charge is from $I_E = 0A$ to $10\%I_E$.

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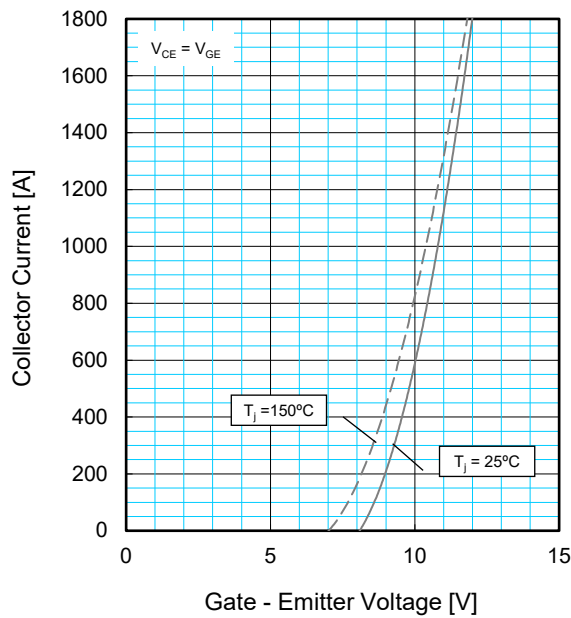
HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

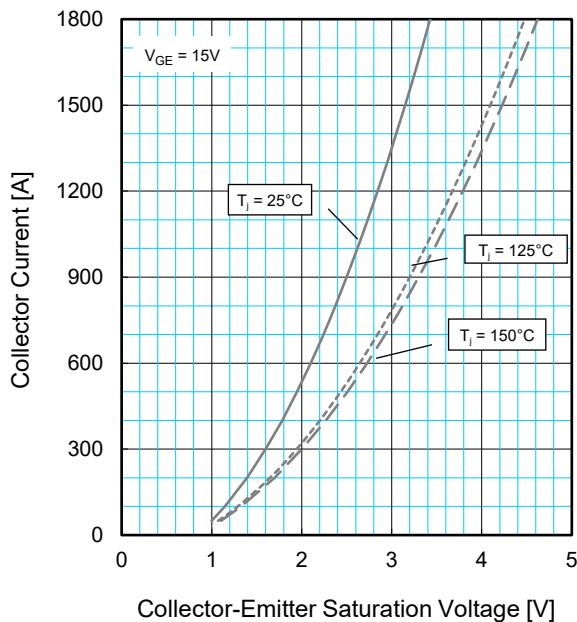
OUTPUT CHARACTERISTICS (TYPICAL)



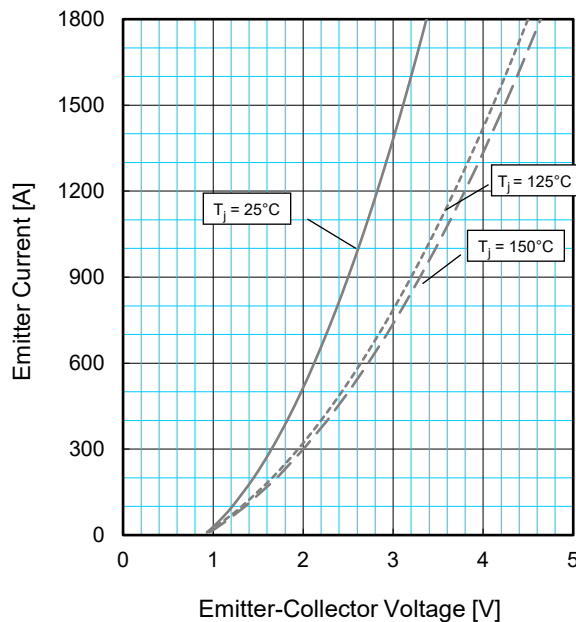
TRANSFER CHARACTERISTICS (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



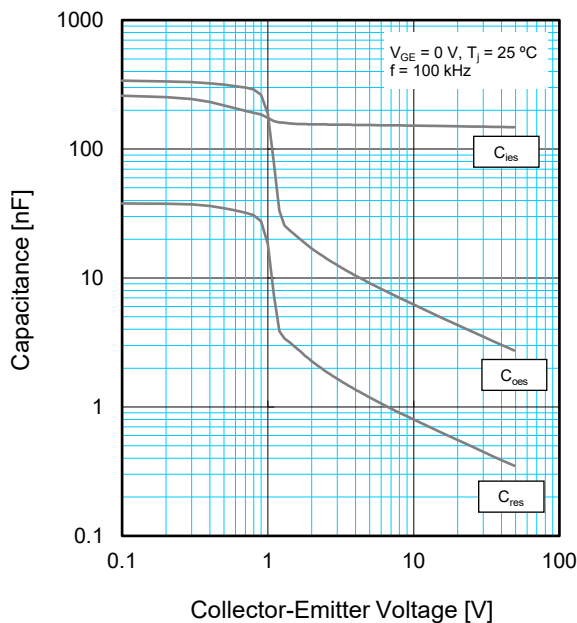
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HIGH POWER SWITCHING USE
INSULATED TYPE

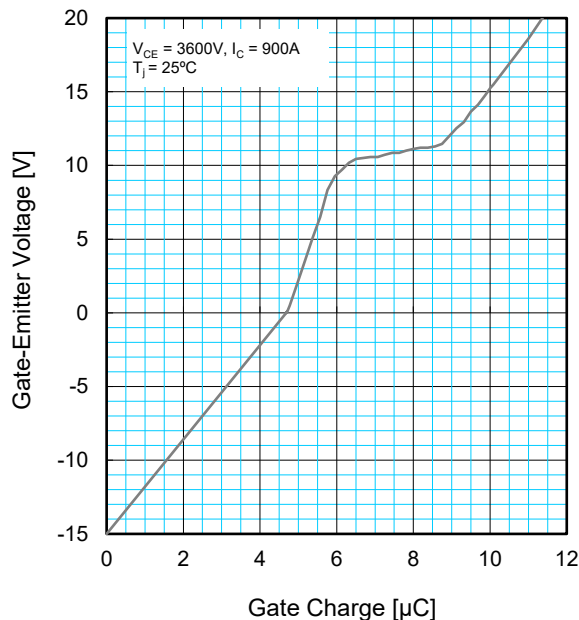
5th-Version HVIGBT (High Voltage Insulated Gate Bipolar Transistor) Modules

PERFORMANCE CURVES

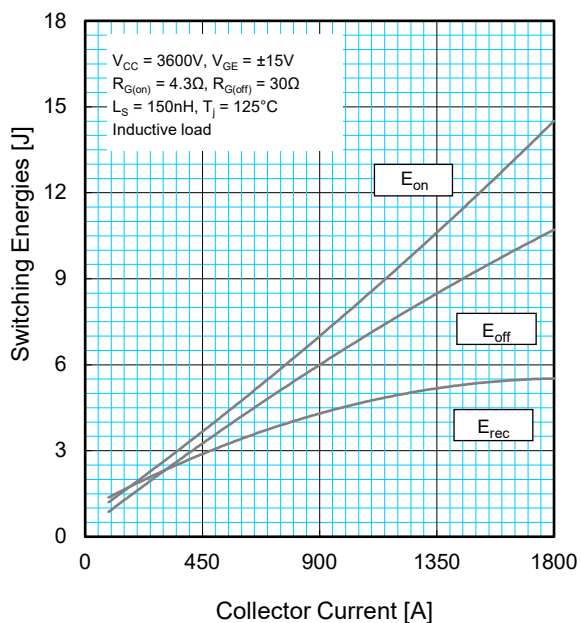
CAPACITANCE CHARACTERISTICS (TYPICAL)



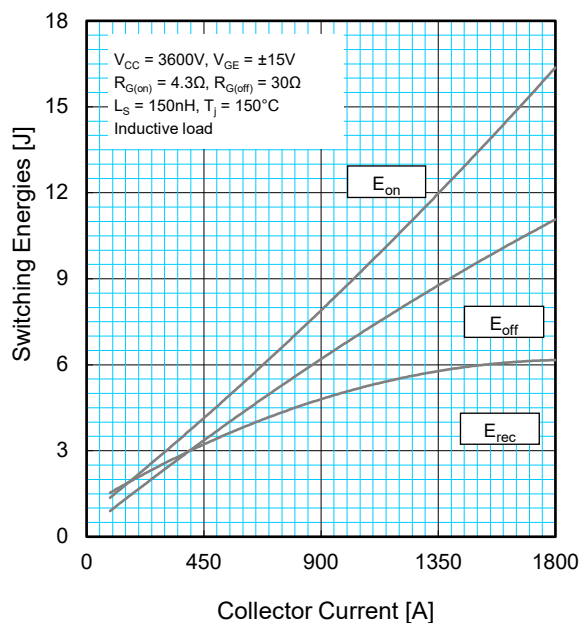
GATE CHARGE CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)



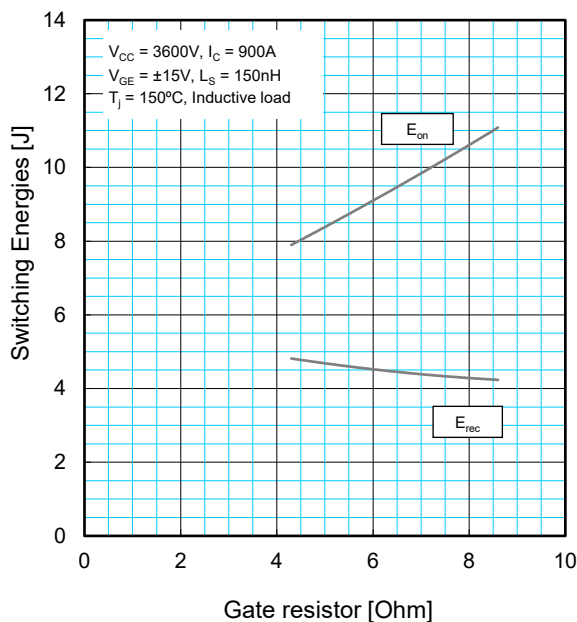
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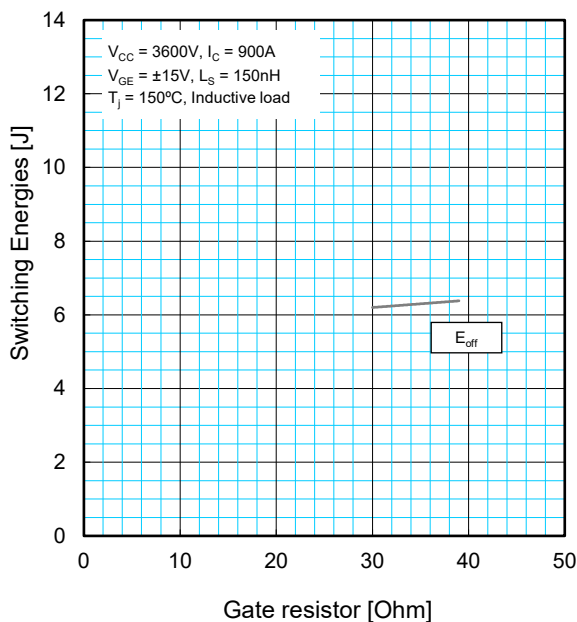
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PERFORMANCE CURVES

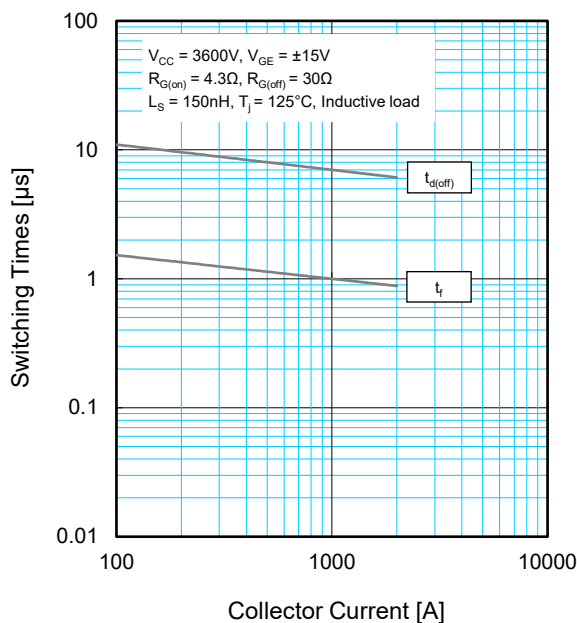
HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)



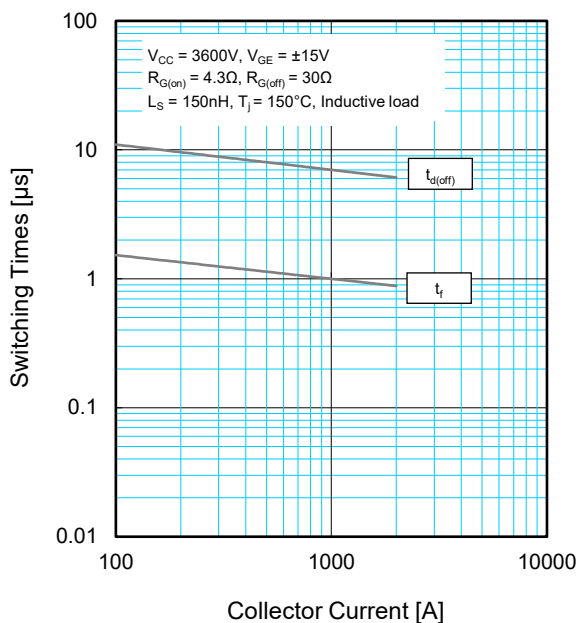
HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING TIME CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING TIME CHARACTERISTICS (TYPICAL)

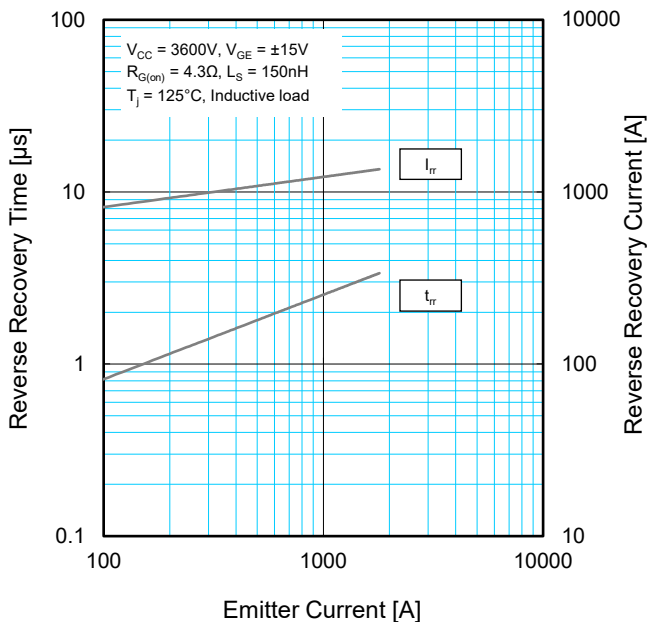


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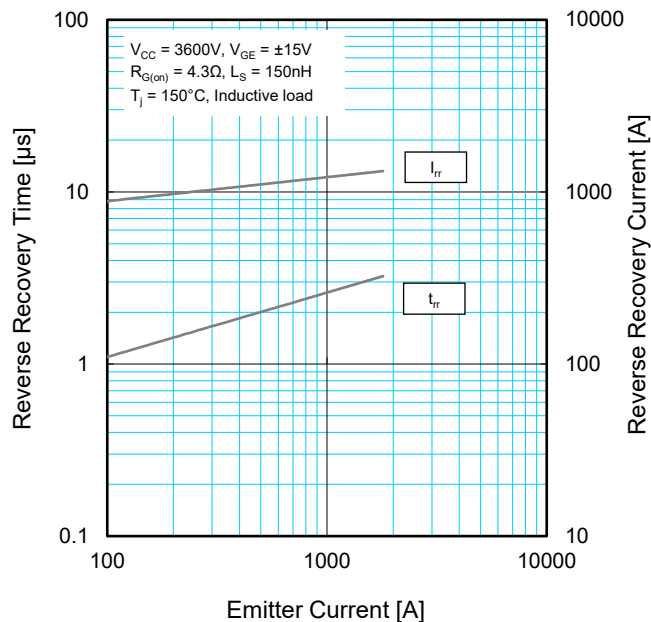
HIGH POWER SWITCHING USE
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PERFORMANCE CURVES

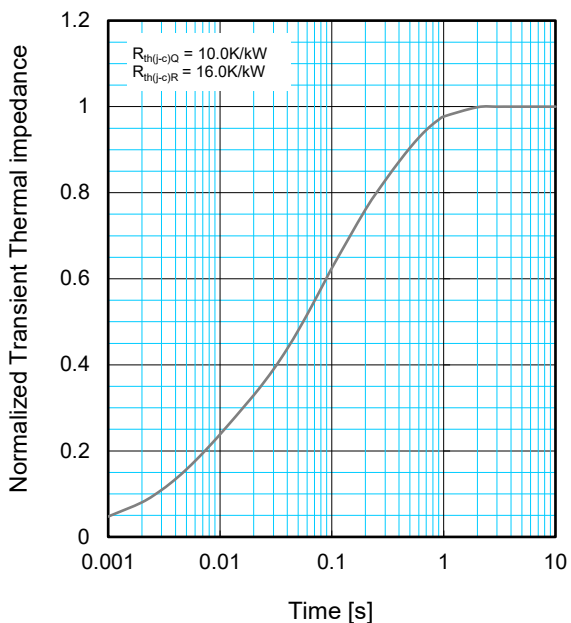
FREE-WHEEL DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



FREE-WHEEL DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS



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

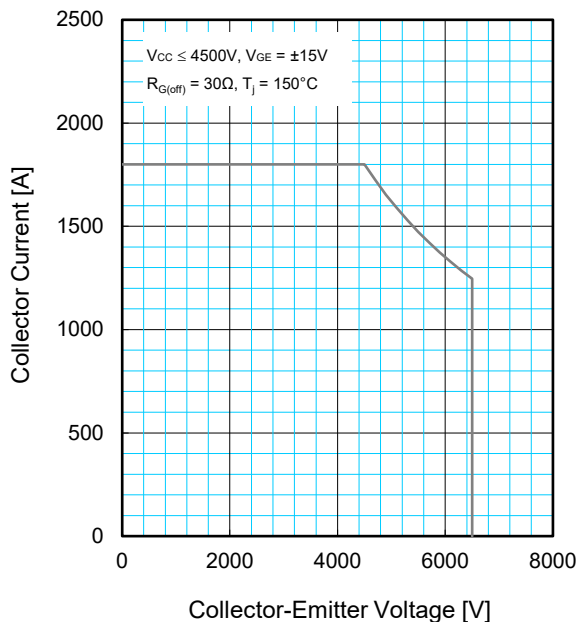
	1	2	3	4
$R_i / R_{th(j-c)}$	0.0096	0.1893	0.4044	0.3967
τ_i [sec]	0.0001	0.0058	0.0602	0.3512

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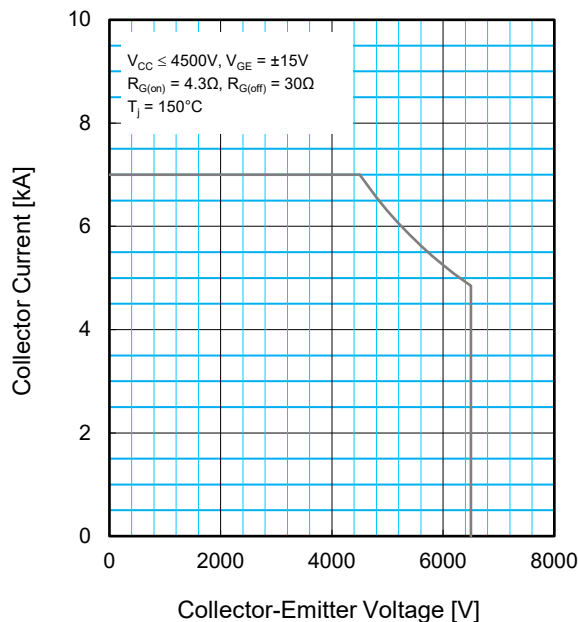
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PERFORMANCE CURVES

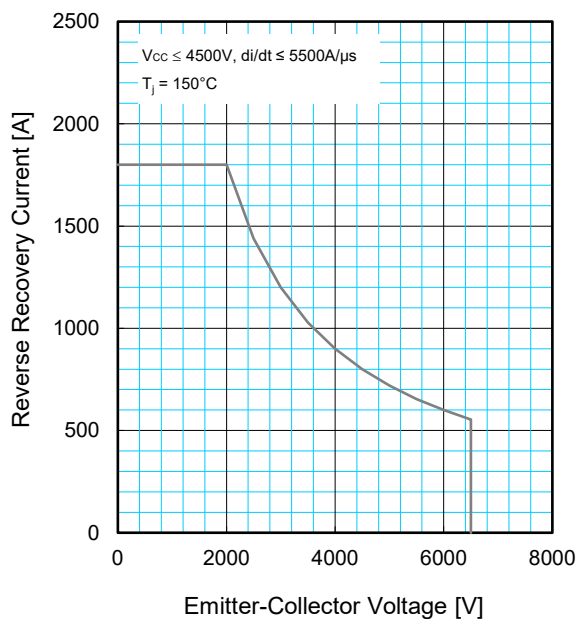
REVERSE BIAS SAFE OPERATING AREA (RBSOA)



SHORT CIRCUIT SAFE OPERATING AREA (SCSOA)



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



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