

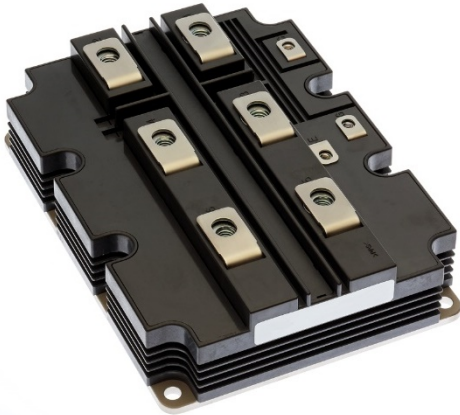
< High Voltage Insulated Gate Bipolar Transistor : HVIGBT >

CM1800HG-66X

HIGH POWER SWITCHING USE
INSULATED TYPE

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

CM1800HG-66X



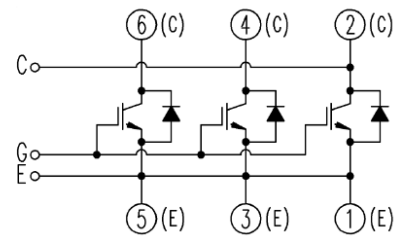
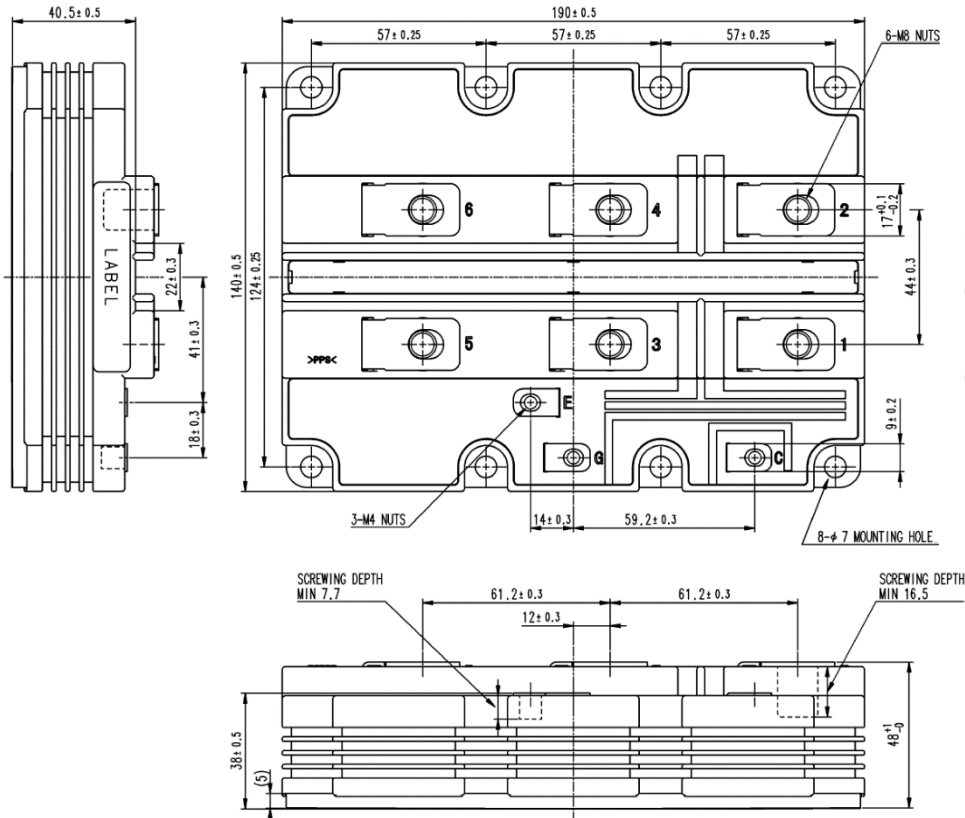
- I_c1800A
- V_{CES}3300V
- 1-element in a Pack
- Insulated Type
- CSTBT™(III) / RFC Diode
- AISiC Baseplate
- UL recognized under UL1557

APPLICATION

Traction drives, High Reliability Converters / Inverters, DC choppers

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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CIRCUIT DIAGRAM

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MAXIMUM RATINGS

Symbol	Item	Conditions	Ratings	Unit
V _{CES}	Collector-emitter voltage	V _{GE} = 0V, T _j = -40...+150°C	3300	V
		V _{GE} = 0V, T _j = -50°C	3200	V
V _{GES}	Gate-emitter voltage	V _{CE} = 0V, T _j = 25°C	± 20	V
I _C	Collector current	DC, T _c = 105°C	1800	A
I _{CRM}		Pulse (Note1)	3600	A
I _E	Emitter current (Note2)	DC, T _c = 95°C	1800	A
I _{ERM}		Pulse (Note1)	3600	A
P _{tot}	Maximum power dissipation (Note3)	T _c = 25°C, IGBT part	17800	W
V _{iso}	Isolation voltage	RMS, sinusoidal, f = 60Hz, t = 1 min.	10200	V
V _e	Partial discharge extinction voltage	RMS, sinusoidal, f = 60Hz, Q _{PD} ≤ 10 pC	5100	V
T _j	Junction temperature		-50 ~ +150	°C
T _{jop}	Operating junction temperature		-50 ~ +150	°C
T _{stg}	Storage temperature		-55 ~ +150	°C
t _{psc}	Short circuit pulse width	V _{CC} = 2500V, 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	—	6.0	—	
			T _j = 150 °C	—	36.0	—	
V _{GE(th)}	Gate-emitter threshold voltage	V _{CE} = 10 V, I _C = 180 mA, T _j = 25 °C	6.5	7.0	7.5	V	
I _{GES}	Gate leakage current	V _{GE} = V _{GES} , V _{CE} = 0 V, T _j = 25 °C	-0.5	—	0.5	μA	
C _{ies}	Input capacitance	V _{CE} = 10 V, V _{GE} = 0 V, f = 100 kHz T _j = 25 °C	—	208	—	nF	
C _{oes}	Output capacitance		—	14.0	—		
C _{res}	Reverse transfer capacitance		—	1.9	—		
Q _G	Total gate charge	V _{CC} = 1800 V, I _C = 1800 A, V _{GE} = ±15 V	—	13.5	—	μC	
V _{CEsat}	Collector-emitter saturation voltage	I _C = 1800 A (Note4) V _{GE} = 15 V	T _j = 25 °C	—	2.00	—	V
			T _j = 125 °C	—	2.50	—	
			T _j = 150 °C	—	2.60	3.10	
t _{d(on)}	Turn-on delay time	V _{CC} = 1800 V I _C = 1800 A V _{GE} = ±15 V R _{G(on)} = 1.5 Ω L _S = 150 nH Inductive load	T _j = 150 °C	—	—	0.90	μs
t _r	Rise time		T _j = 150 °C	—	—	0.50	μs
E _{on(10%)}	Turn-on switching energy per pulse (Note 5)		T _j = 25 °C	—	2.75	—	J
		T _j = 125 °C	—	3.05	—		
		T _j = 150 °C	—	3.20	—		
E _{on}	Turn-on switching energy per pulse (Note 6)	T _j = 25 °C	—	2.80	—	J	
		T _j = 125 °C	—	3.20	—		
		T _j = 150 °C	—	3.35	—		
t _{d(off)}	Turn-off delay time	T _j = 25 °C	—	2.90	—	μs	
		T _j = 125 °C	—	3.20	—		
		T _j = 150 °C	—	3.20	4.25		
t _f	Fall time	T _j = 25 °C	—	0.40	—	μs	
		T _j = 125 °C	—	0.45	—		
		T _j = 150 °C	—	0.50	1.00		
E _{off(10%)}	Turn-off switching energy per pulse (Note 5)	T _j = 25 °C	—	2.40	—	J	
		T _j = 125 °C	—	3.15	—		
		T _j = 150 °C	—	3.20	—		
E _{off}	Turn-off switching energy per pulse (Note 6)	T _j = 25 °C	—	2.55	—	J	
		T _j = 125 °C	—	3.20	—		
		T _j = 150 °C	—	3.45	—		

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ELECTRICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
V _{EC}	Emitter-collector voltage (Note2)	I _E = 1800 A (Note4) V _{GE} = 0 V	T _J = 25 °C	—	2.20	—	V
			T _J = 125 °C	—	2.40	—	
			T _J = 150 °C	—	2.50	3.00	
t _{rr}	Reverse recovery time (Note2)		T _J = 25 °C	—	1.20	—	μs
			T _J = 125 °C	—	1.35	—	
			T _J = 150 °C	—	1.40	—	
I _{rr}	Reverse recovery current (Note2)		T _J = 25 °C	—	—	—	A
			T _J = 125 °C	—	2200	—	
			T _J = 150 °C	—	2350	—	
Q _{rr(10%)}	Reverse recovery charge (Note2, 7)	V _{CC} = 1800 V I _E = 1800 A V _{GE} = ±15 V	T _J = 25 °C	—	1600	—	μC
			T _J = 125 °C	—	2400	—	
			T _J = 150 °C	—	2500	—	
Q _{rr}	Reverse recovery charge (Note 2,6)	R _{G(on)} = 1.5 Ω L _S = 150 nH Inductive load	T _J = 25 °C	—	1800	—	μC
			T _J = 125 °C	—	2600	—	
			T _J = 150 °C	—	2700	—	
E _{rec(10%)}	Reverse recovery energy per pulse (Note 2, 5)		T _J = 25 °C	—	1.85	—	J
			T _J = 125 °C	—	2.65	—	
			T _J = 150 °C	—	3.00	—	
E _{rec}	Reverse recovery energy per pulse (Note 2,6)		T _J = 25 °C	—	2.00	—	J
			T _J = 125 °C	—	2.80	—	
			T _J = 150 °C	—	3.15	—	

THERMAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R _{th(j-c)Q}	Thermal resistance	Junction to Case, IGBT part	—	—	7.0	K/kW
R _{th(j-c)D}		Junction to Case, FWDi part	—	—	11.0	K/kW
R _{th(c-s)}	Contact thermal resistance	Case to heat sink λ _{grease} = 1W/m·k, D _(c-s) = 80μm	—	5.0	—	K/kW

MECHANICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
M _t	Mounting torque	Main terminals screw : M8	7.0	—	19.0	N·m
M _s		Mounting screw : M6	3.0	—	6.0	N·m
M _t		Auxiliary terminals screw : M4	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 _{P CE}	Parasitic stray inductance		—	13.5	—	nH
R _{CC'+EE'}	Internal lead resistance	T _c = 25 °C	—	0.12	—	mΩ

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 (FWDi).

Note3. Junction temperature (T_J) should not exceed T_{Jmax} rating (150°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.

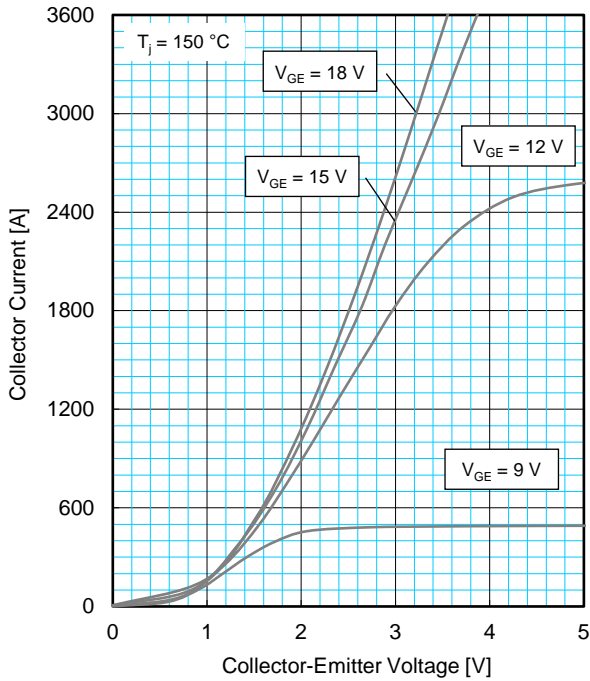
Note7. The integration range of reverse recovery charge is from I_E = 0A to 10%I_E.

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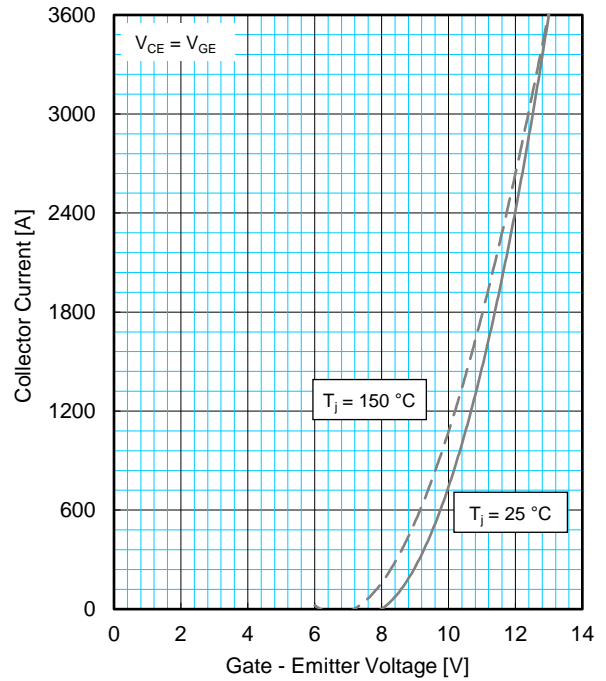
HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

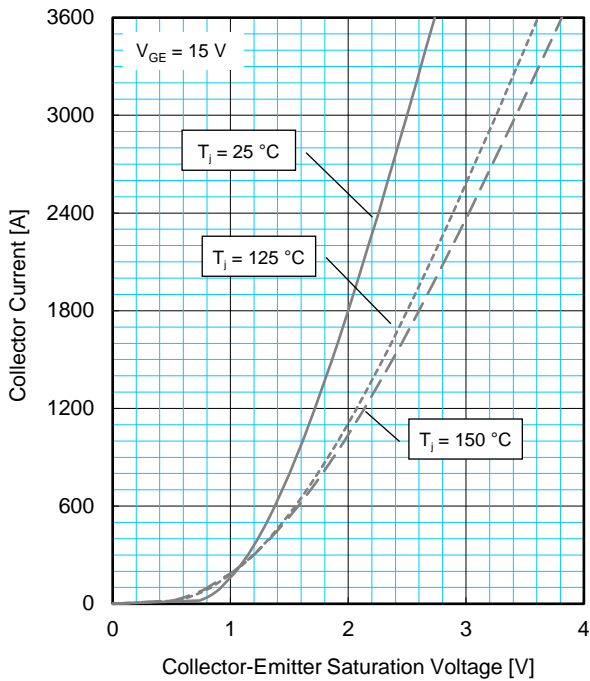
OUTPUT CHARACTERISTICS (TYPICAL)



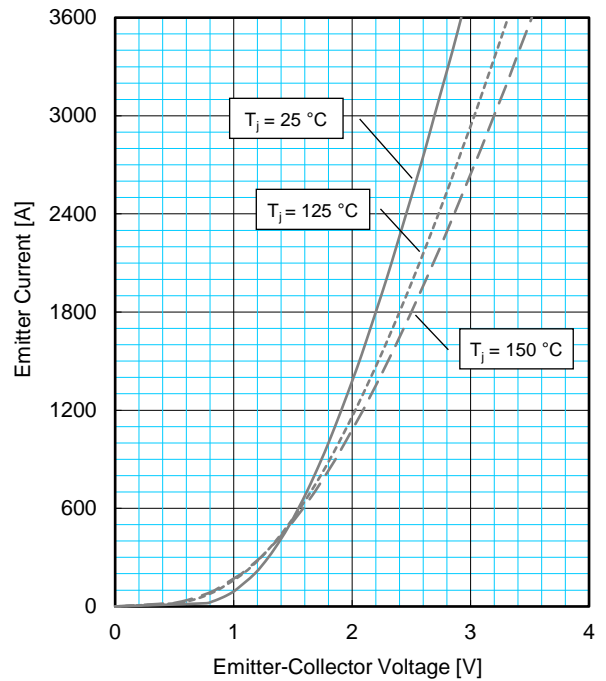
TRANSFER CHARACTERISTICS (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



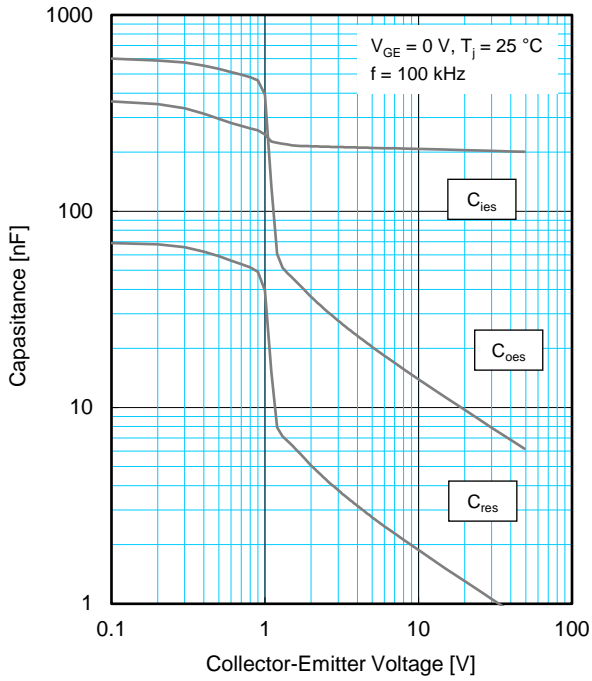
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HIGH POWER SWITCHING USE
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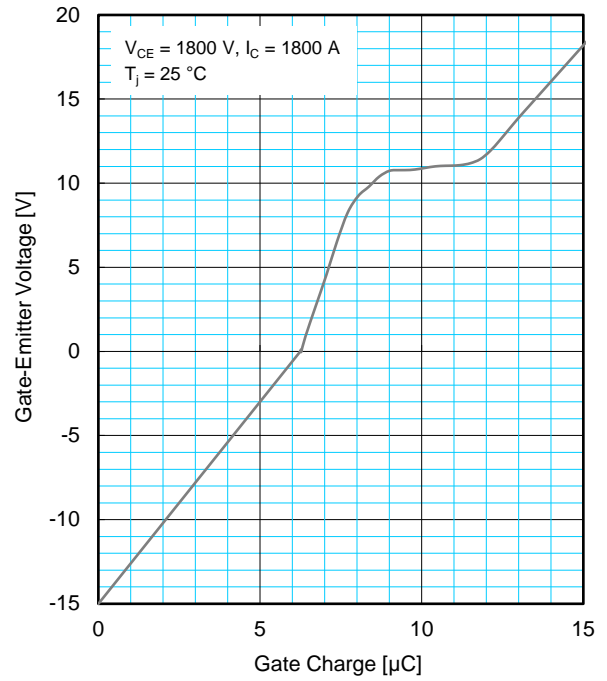
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PERFORMANCE CURVES

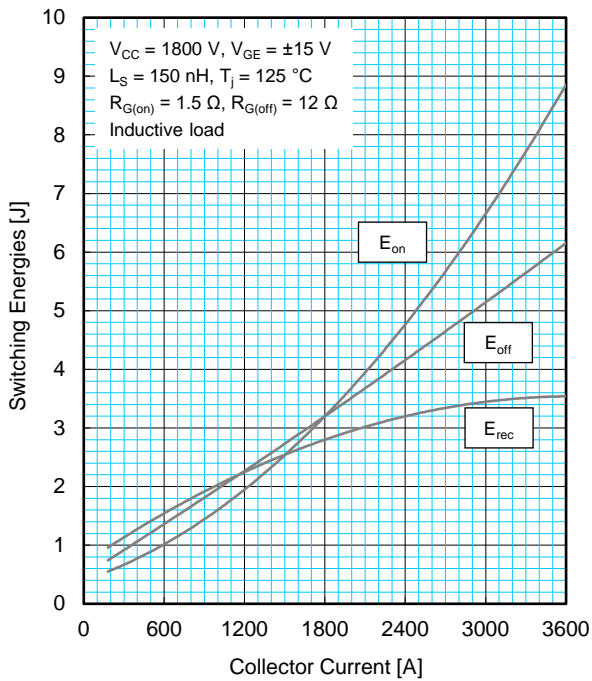
CAPACITANCE CHARACTERISTICS (TYPICAL)



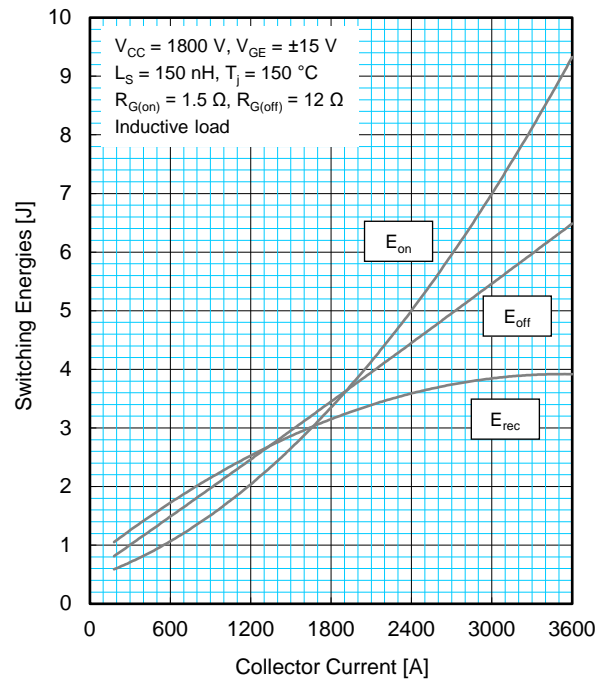
GATE CHARGE CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)



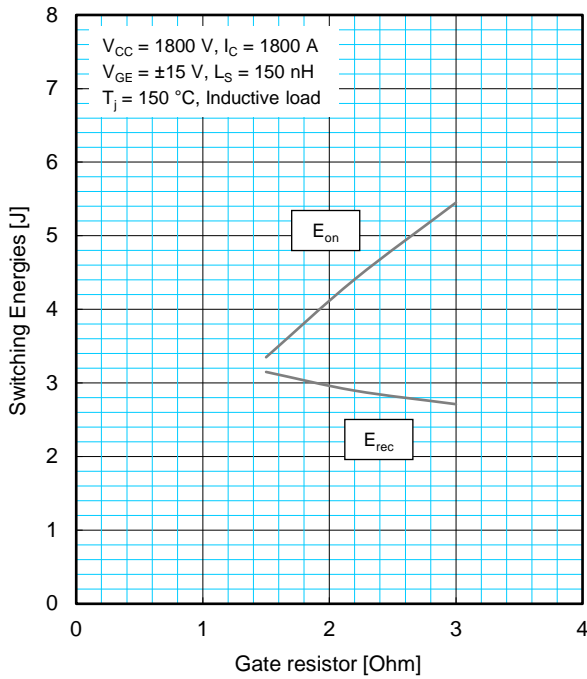
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HIGH POWER SWITCHING USE
INSULATED TYPE

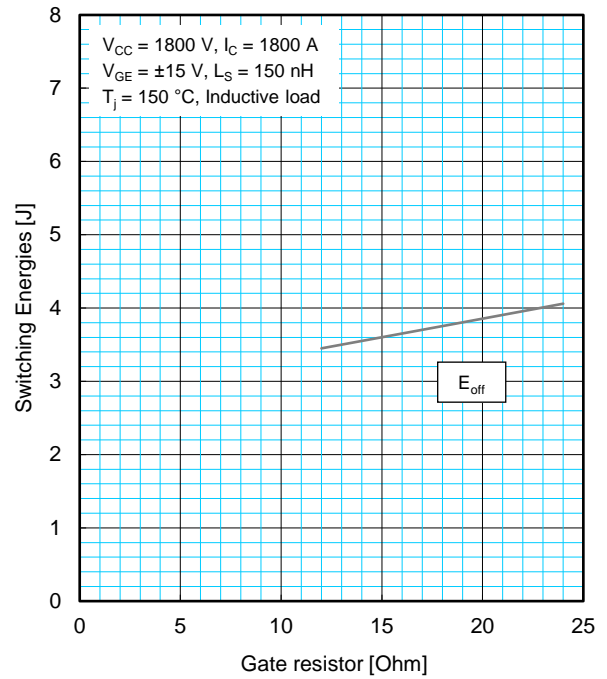
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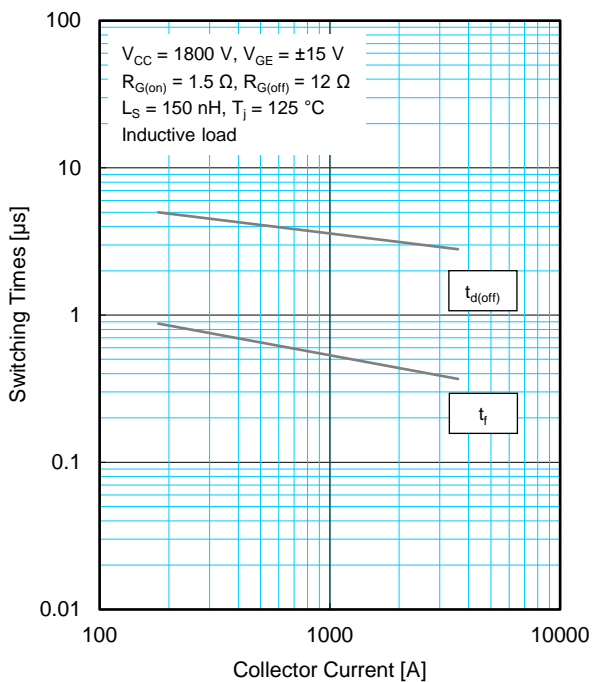
HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)



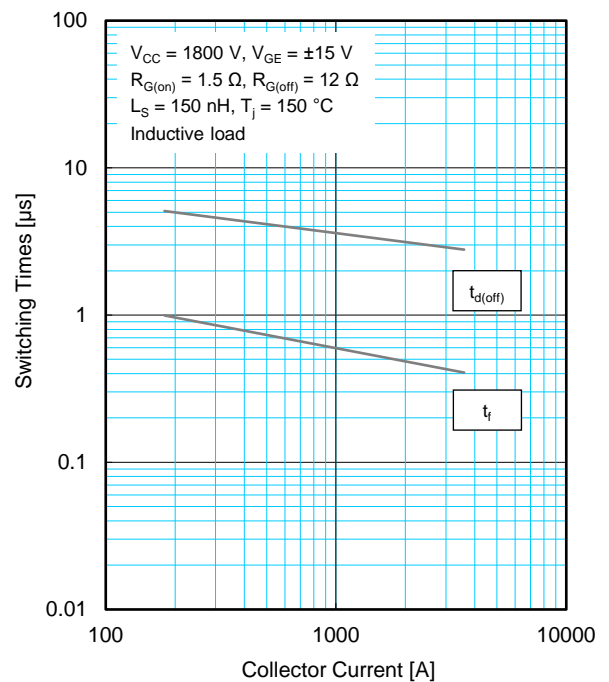
HALF-BRIDGE SWITCHING ENERGY CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING TIME CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING TIME CHARACTERISTICS (TYPICAL)



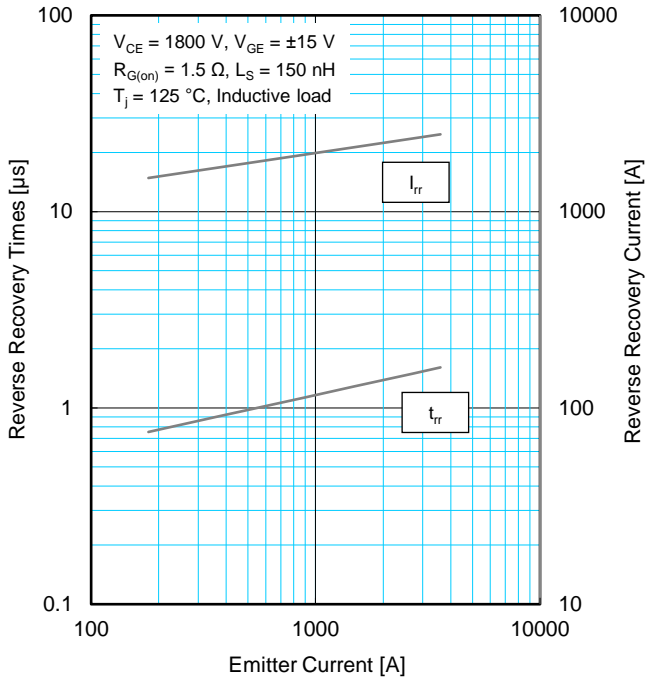
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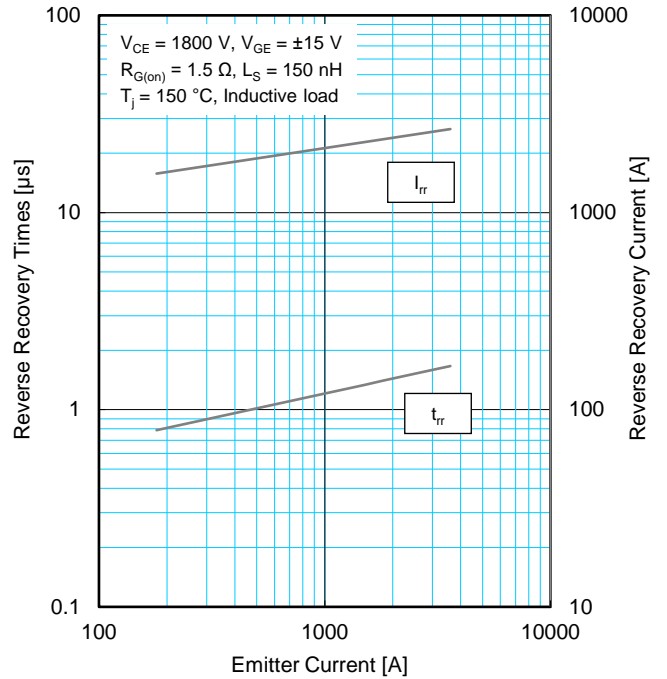
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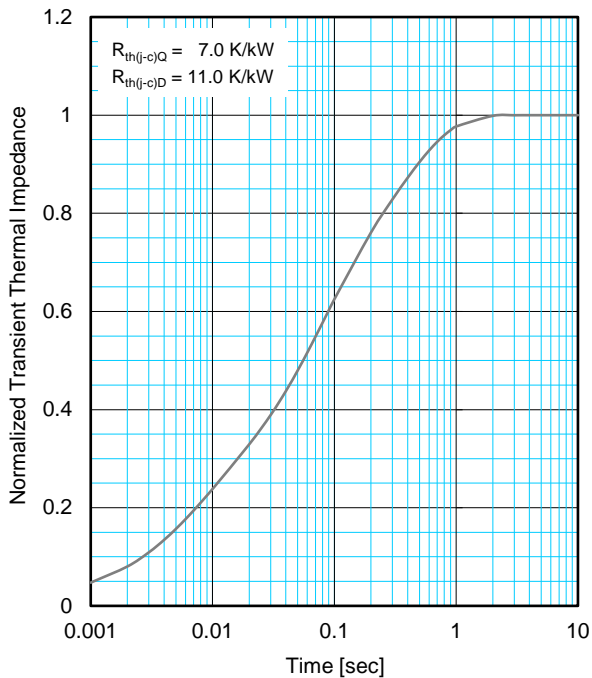
FREE-WHEEL DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



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}	0.0096	0.1893	0.4044	0.3967
τ_i [sec]	0.0001	0.0058	0.0602	0.3512

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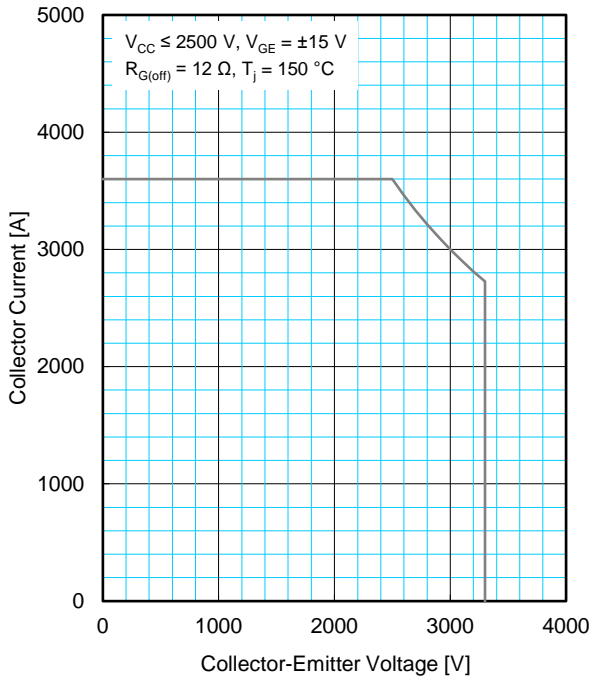
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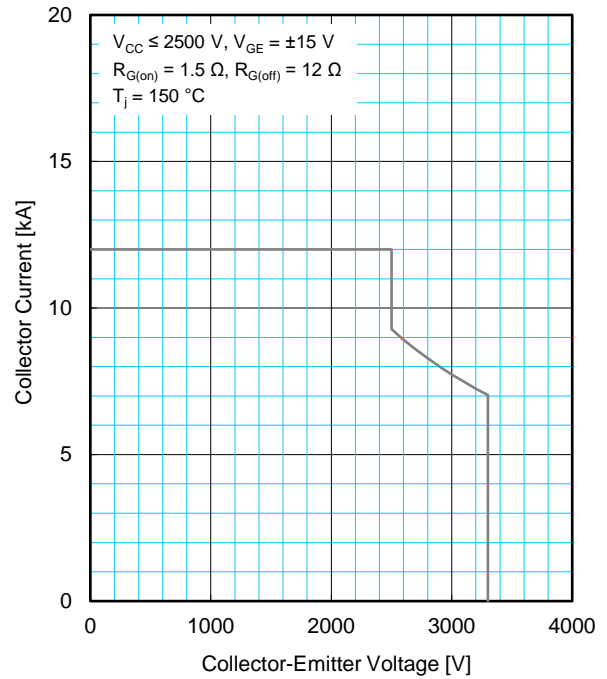
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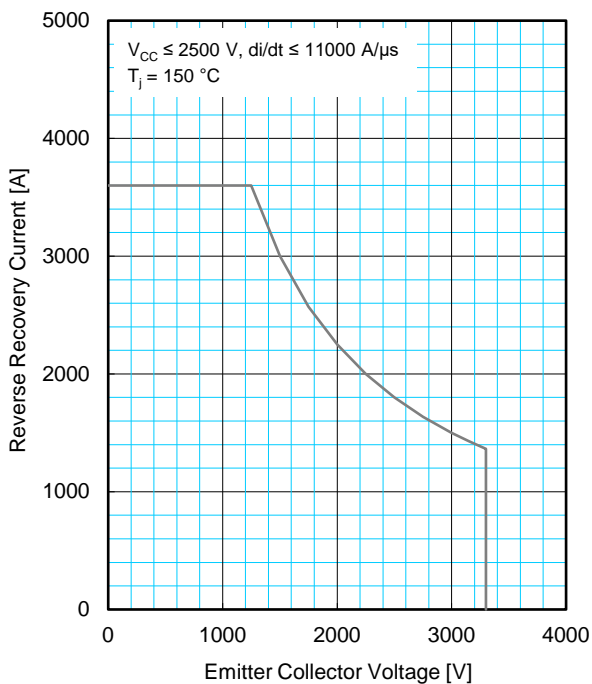
**REVERSE BIAS
SAFE OPERATING AREA (RBSOA)**



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



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



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