

MBL400E33D

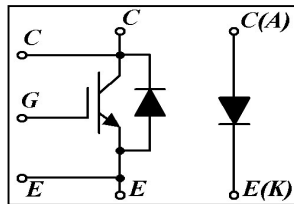
Preliminary SPEC.

Silicon N-channel IGBT

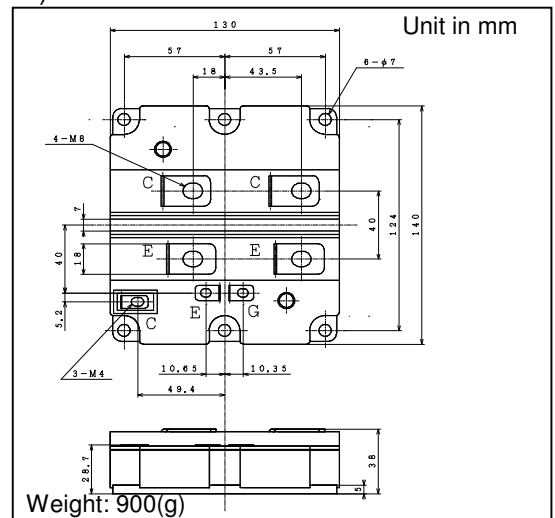
FEATURES

- * High thermal fatigue durability.($\Delta T_c=70^\circ\text{C}$, $N>30,000$ cycles)
- * High speed, low loss IGBT module.
- * Low noise due to built-in free-wheeling diode
– ultra soft fast recovery diode(USFD).
- * Low driving power due to low input capacitance MOS gate.
- * High reliability, high durability module.
- * Isolated heat sink (terminal to base).

CIRCUIT DIAGRAM



OUTLINE DRAWING



ABSOLUTE MAXIMUM RATINGS (T_C=25°C)

Item	Symbol	Unit	MBL400E33D
Collector Emitter Voltage	V _{CES}	V	3,300
Gate Emitter Voltage	V _{GES}	V	±20
Collector Current	DC	I _C	400
	1ms	I _{Cp}	800
Forward Current	DC	I _F	400
	1ms	I _{FM}	800
Junction Temperature	T _j	°C	-40 ~ +125
Storage Temperature	T _{stg}	°C	-40 ~ +125
Isolation Voltage	V _{ISO}	V _{RMS}	6,000(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	2/22 (1)
	Mounting (M6)	-	6 (2)

Notes: (1) Recommended Value 1.8±0.2/22±1N·m (2) Recommended Value 5.5±0.5N·m

ELECTRICAL CHARACTERISTICS

1) IGBT + FWD

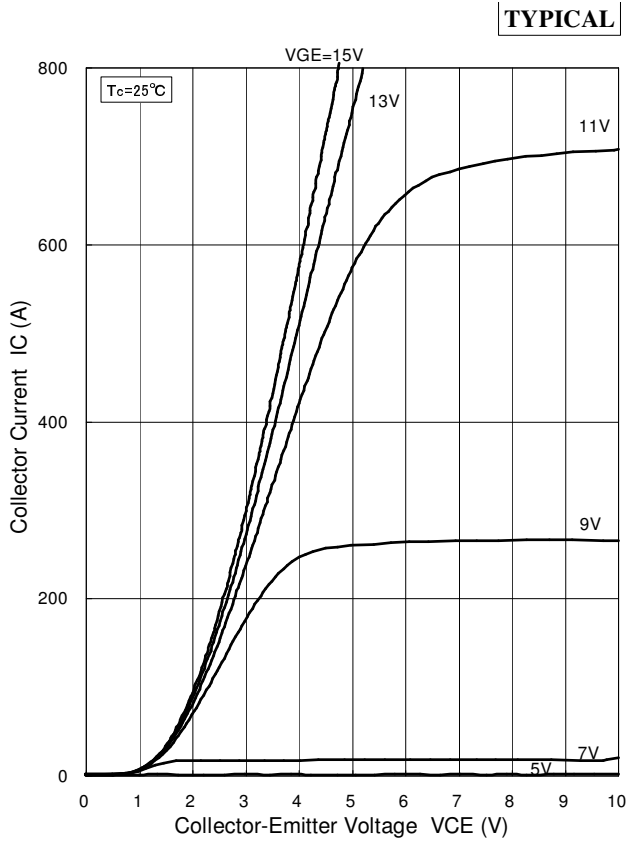
Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current	I _{CES}	mA	-	-	12.0	V _{CE} =3,300V, V _{GE} =0V, T _j =25°C
Gate Emitter Leakage Current	I _{GES}	nA	-	-	±500	V _{GE} =±20V, V _{CE} =0V, T _j =25°C
Collector Emitter Saturation Voltage	V _{CE(sat)}	V	3.5	4.2	5.0	I _C =400A, V _{GE} =15V, T _j =125°C
Gate Emitter Threshold Voltage	V _{GE(TH)}	V	4.5	6.0	7.0	V _{CE} =10V, I _C =400mA, T _j =25°C
Input Capacitance	C _{ies}	nF	-	35	-	V _{CE} =10V, V _{GE} =0V, f=100kHz, T _j =25°C
Internal Gate Resistance	R _{ge}	Ω	-	3.6	-	
Switching Times	Rise Time	t _r	1.0	1.9	3.1	V _{CC} =1,650V, I _C =400A
	Turn On Time	t _{on}	1.5	2.4	3.3	L=150nH
	Fall Time	t _f	0.5	1.0	2.5	R _G =10Ω (3)
	Turn Off Time	t _{off}	2.0	3.0	5.1	V _{GE} =±15V, T _j =125°C
Peak Forward Voltage Drop	V _{FM}	V	2.0	2.5	3.0	-I _C =400A, V _{GE} =0V, T _j =125°C
Reverse Recovery Time	t _{rr}	μs	-	0.6	-	V _{CC} =1,650V, I _F =400A (4) L=150nH, T _j =125°C
Thermal Impedance	IGBT	R _{th(j-c)}	-	-	0.026	Junction to case
	FWD	R _{th(j-c)}	-	-	0.052	

2) DIODE

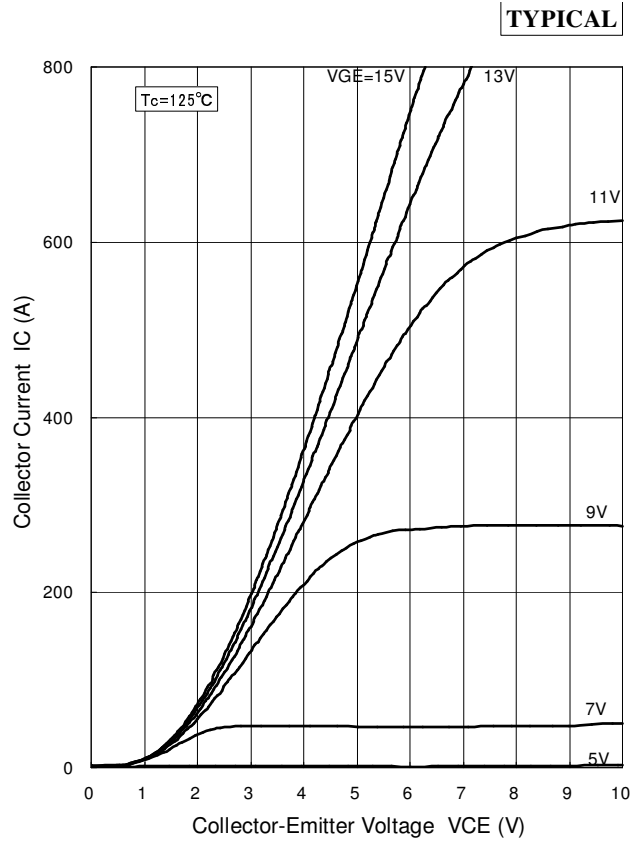
Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current	I _{AKS}	mA	-	-	12.0	V _{AK} =3,300V, T _j =25°C
Peak Forward Voltage Drop	V _F	V	2.2	2.7	3.2	I _F =400A, T _j =125°C At Main terminal (Terminal resistance:0.5mΩ typical)
Reverse Recovery Time	t _{rr}	μs	0.2	0.6	1.1	I _F =400A, V _{CC} =1,650V (4) L=150nH, T _j =125°C
Thermal Impedance	R _{th(j-c)}	K/W	-	-	0.052	Junction to case

Notes: (3) R_G value is the test condition's value for decision of the switching times, not recommended value. Please, determine the suitable R_G value after the measurement of switching waveforms(overshoot voltage,etc.)with appliance mounted.(4)Counter arm IGBT V_{GE}=-15V

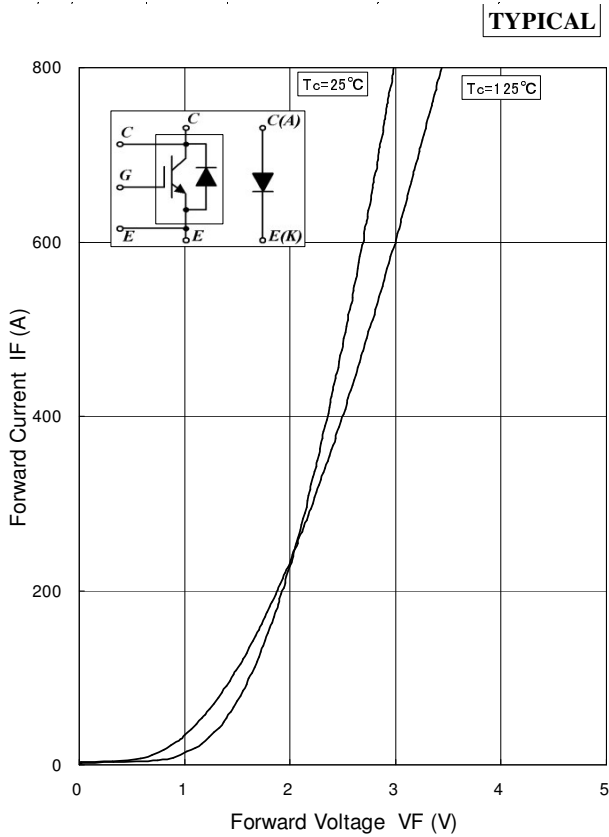
STATIC CHARACTERISTICS



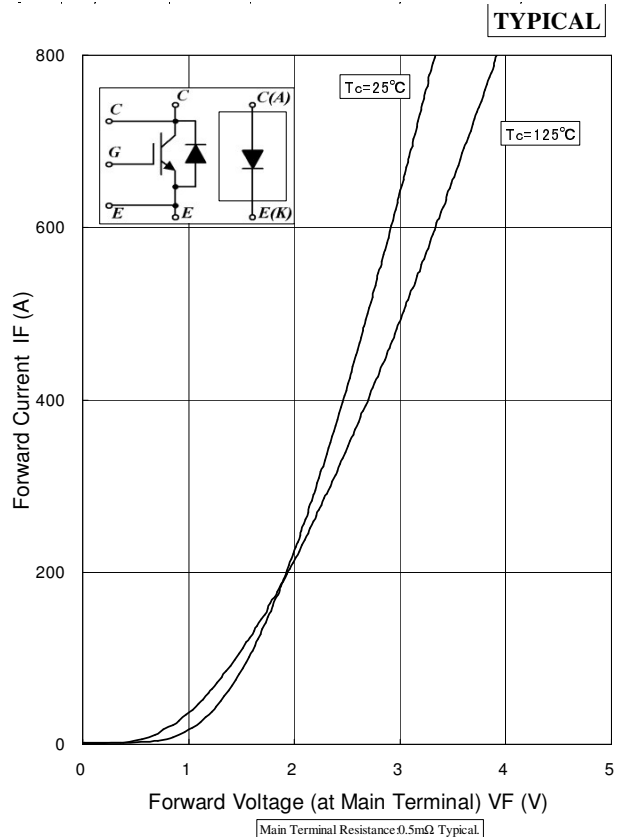
Collector Current vs. Collector to Emitter Voltage



Collector Current vs. Collector to Emitter Voltage

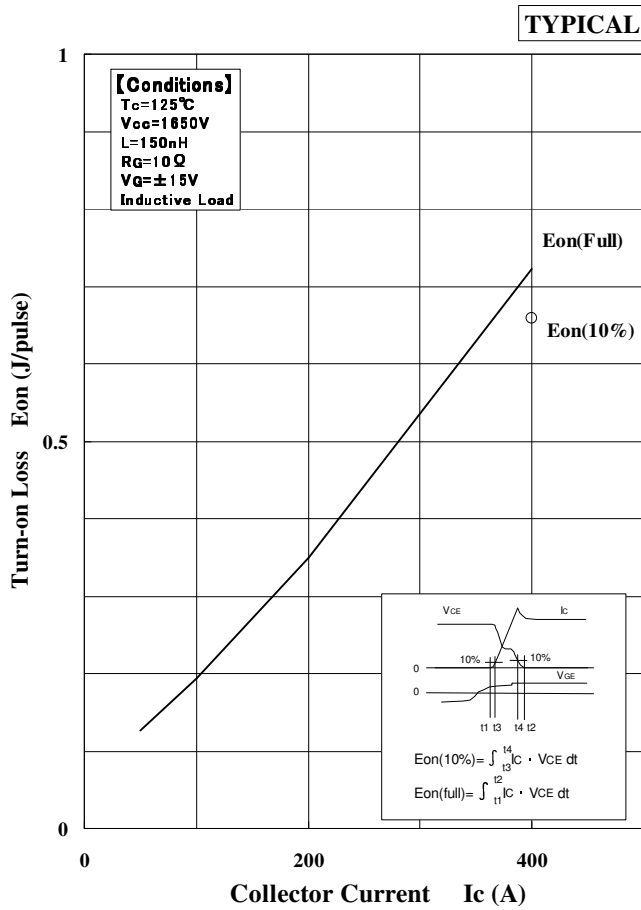


Forward Voltage of free-wheeling diode

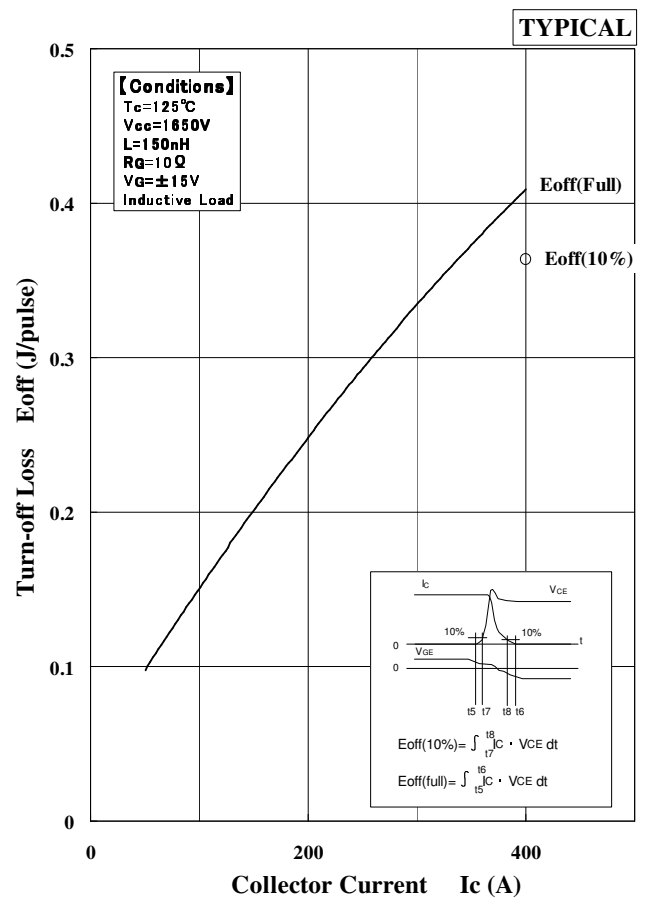


Forward Voltage of chopper diode

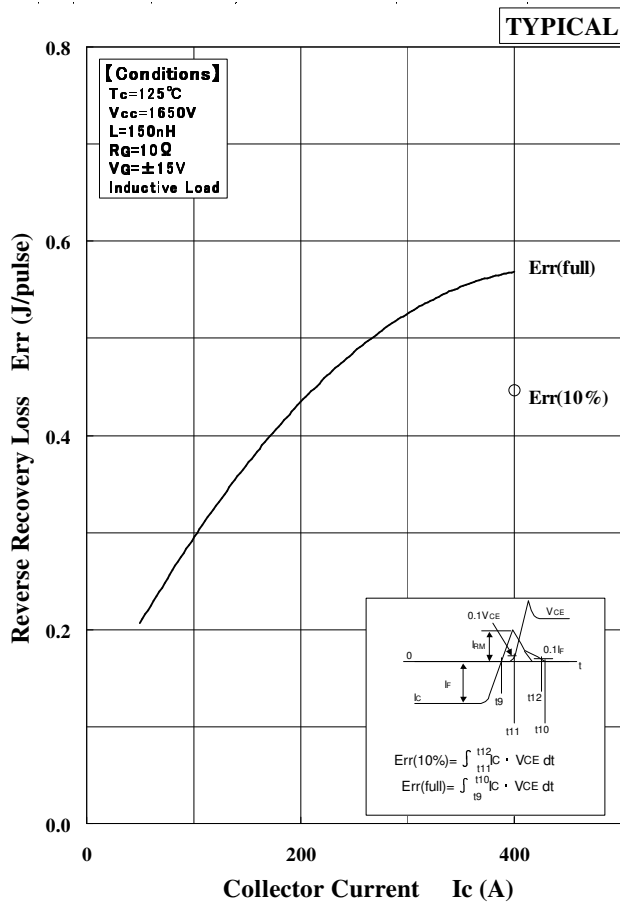
DEPENDENCE OF CURRENT



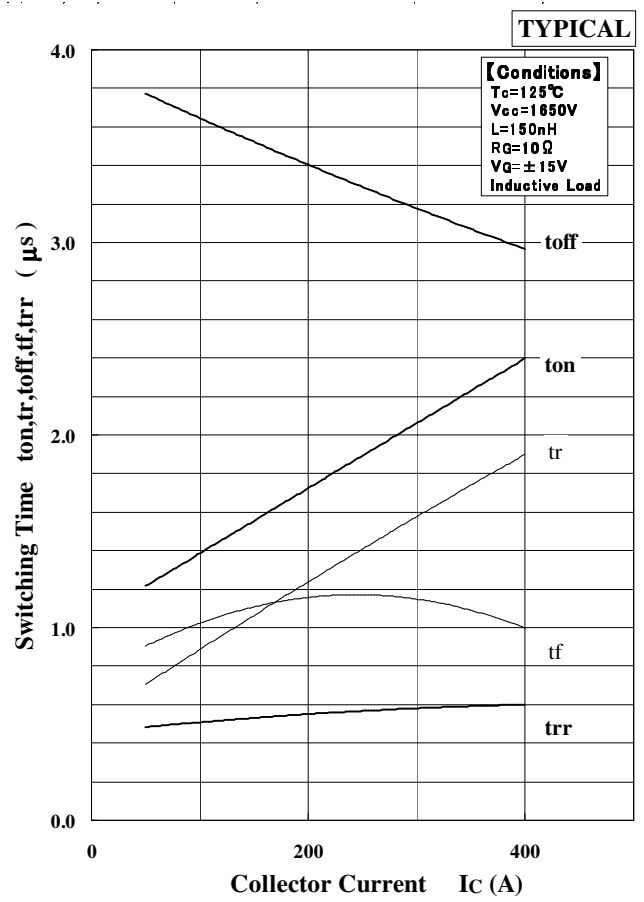
Turn-on Loss vs. Collector Current



Turn-off Loss vs. Collector Current

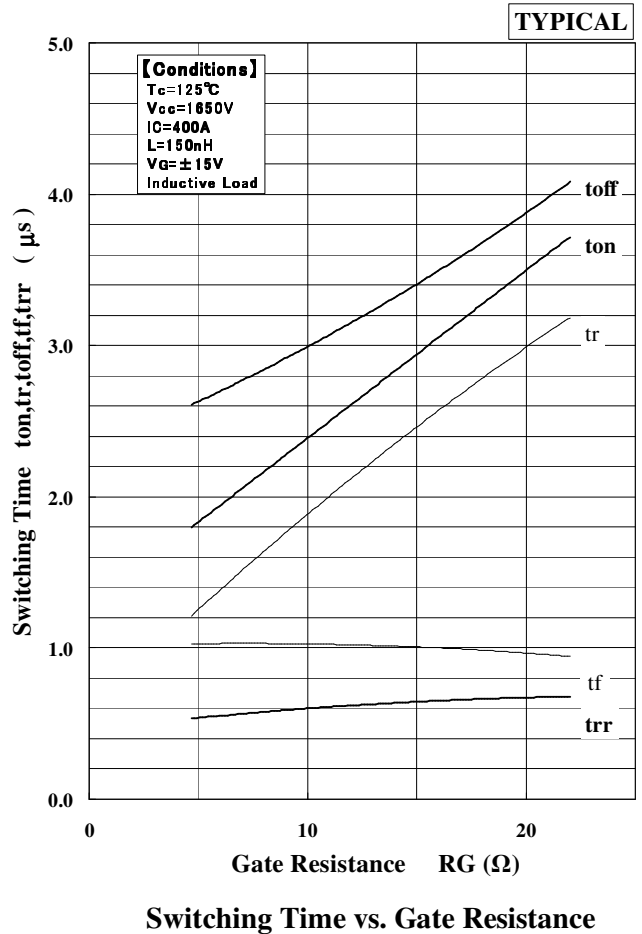
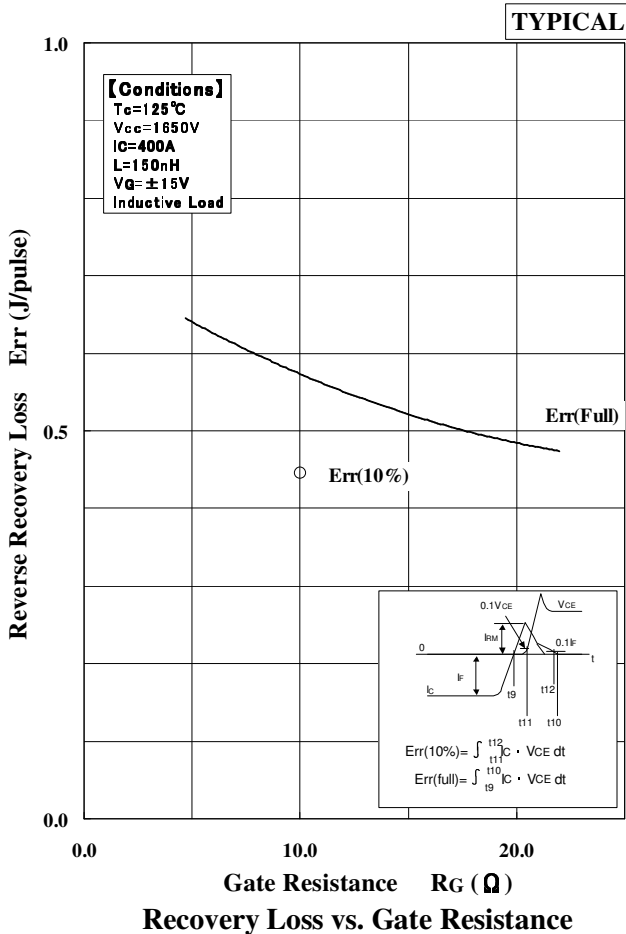
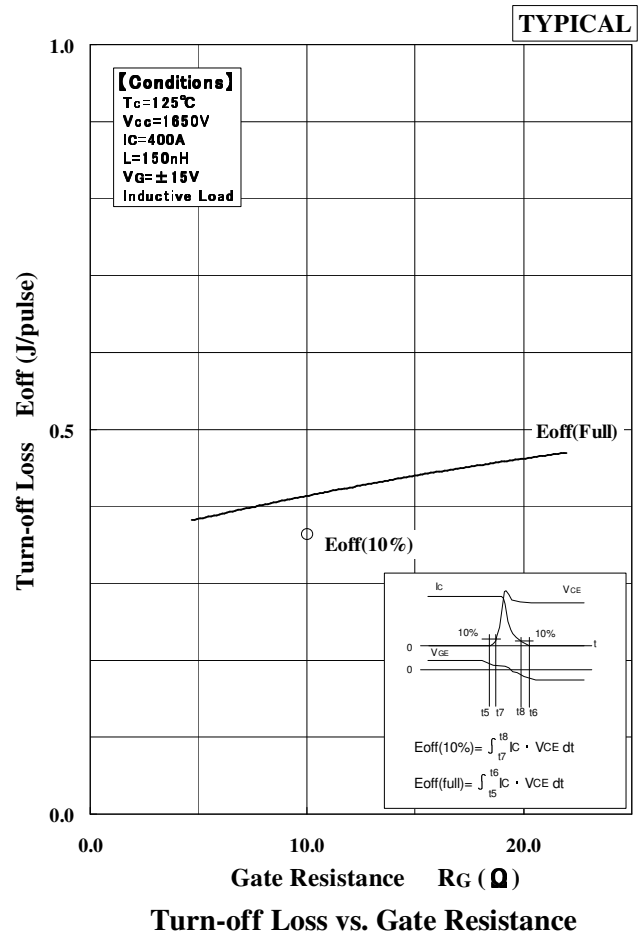
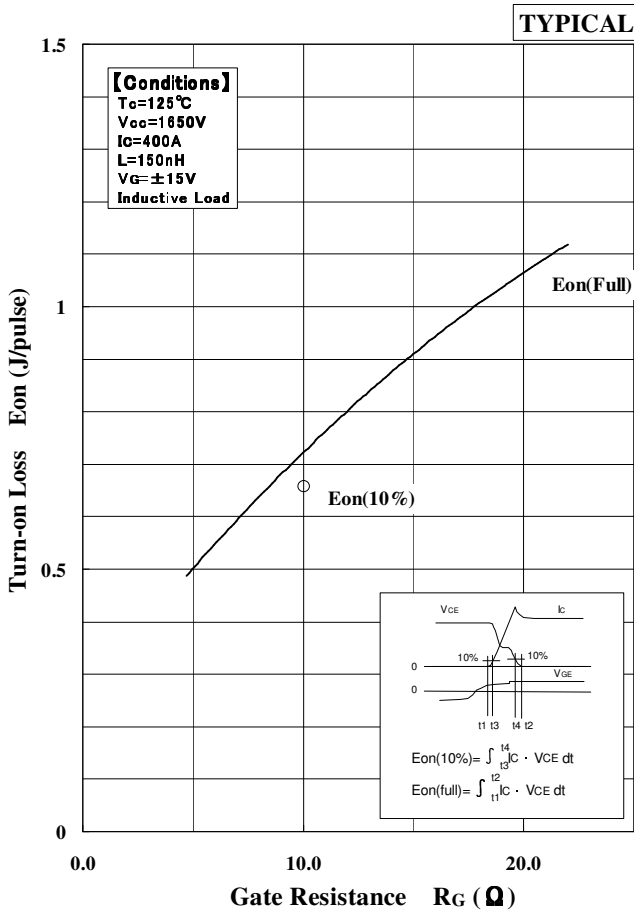


Recovery Loss vs. Collector Current

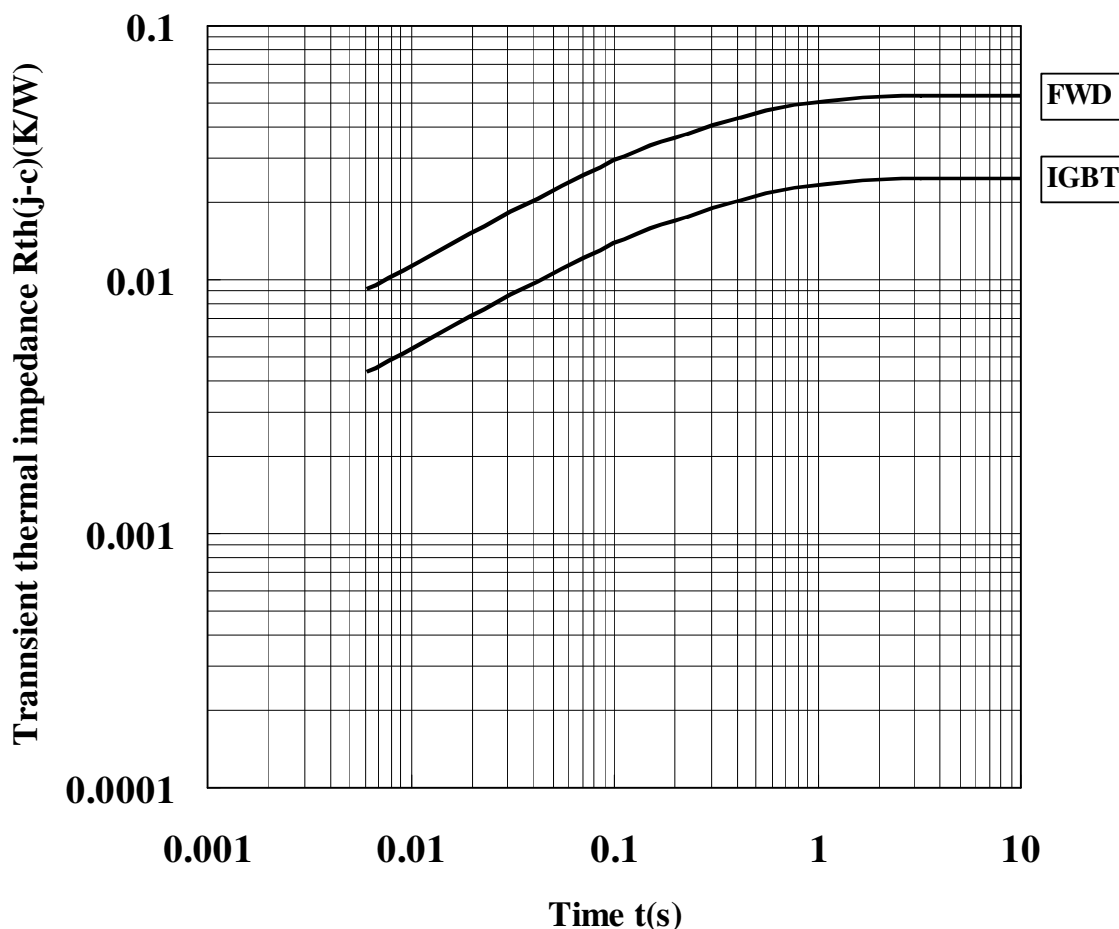


Switching Time vs. Collector Current

DEPENDENCE OF RG



Thermal Impedance
TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve (Maximum Value)

Negative environmental impact material

Please note the following negative environmental impact materials are contained in the product in order to keep product characteristic and reliability level.

Material	Contained part
Lead (Pb) and its compounds	Solder
Arsenic and its compounds	Si chip

HITACHI POWER SEMICONDUCTORS

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