MBM400E33D-MFR

Silicon N-channel IGBT 3300V D-MF version

FEATURES

- Ultra High speed, low loss IGBT module.
- Low driving power due to low input capacitance MOS gate.
- High reliability, high durability module.
- High thermal fatigue durability. (delta Tc=70K, N>30,000cycles)
- Suitable for kHz order switching

ABSOLUTE MAXIMUM RATINGS (Tc=25°C)

Item		Symbol	Unit	MBM400E33D-MFR
Collector Emitter Voltage		V_{CES}	V	3,300
Gate Emitter Voltage		V_{GES}	V	±20
Collector Current	DC	I_C	A	400
	1ms	I_{Cp}		800
Forward Current	DC	I_F	A	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)	-	N·m	2/10 (1)
	Mounting (M6)	-		6 (2)

Notes: (1) Recommended Value 1.8±0.2/9±1N·m (2) Recommended Value 5.5±0.5N·m

ELECTRICAL CHARACTERISTICS

Item		Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current		I_{CES}	mA	-	-	12	V_{CE}=3,300V, V_{GE}=0V, Tj=25°C
				-	20	60	V_{CE}=3,300V, V_{GE}=0V, Tj=125°C
Gate Emitter Leakage Current		I_{GES}	nA	-500	-	+500	V_{GE}=±20V, V_{CE}=0V, Tj=25°C
Collector Emitter Saturation Voltage		$V_{CE(sat)}$	V	4.4	5.0	5.6	I_C=400A, V_{GE}=15V, Tj=125°C
Gate Emitter Threshold Voltage		$V_{GE(TO)}$	V	5.0	6.0	7.0	V_{CE}=10V, I_C=400mA, Tj=25°C
Input Capacitance		C_{ies}	nF	-	37	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, Tj=25°C
Internal Gate Resistance		Rge	Ω	-	3.6	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, Tj=25°C
Switching Times	Rise Time	t_r	μs	-	1.5	-	V_{CC}=1,650V, Ic=400A L=150nH R_G(on/off)= 10Ω/10Ω (3) V_{GE}=±15V, Tj=125°C
	Turn On Time	t_{on}		-	1.9	-	
	Fall Time	t_f		-	0.8	-	
	Turn Off Time	t_{off}		-	2.4	-	
Peak Forward Voltage Drop		V_{FM}	V	2.8	3.6	4.4	IF=400A, V_{GE}=0V, Tj=125°C
Reverse Recovery Time		t_{rr}	μs	-	0.36	-	V_{CC}=1,650V, Ic=400A, L=150nH R_G(on/off)= 10Ω/10Ω (3) V_{GE}=±15V, Tj=125°C
Turn On Loss		$E_{on(10\%)}$	J/P	-	0.55	-	
Turn Off Loss		$E_{off(10\%)}$	J/P	-	0.28	-	
Reverse Recovery Loss		$E_{rr(10\%)}$	J/P	-	0.23	-	
Stray inductance module		L_{SCE}	nH	-	36	-	Collector-main to Emitter-main
Thermal Impedance	IGBT	Rth(j-c)	K/W	-	-	0.026	Junction to case (per arm)
	FWD	Rth(j-c)		-	-	0.052	
Contact Thermal Impedance		Rth(c-f)	K/W	-	0.008	-	Case to fin (per module, λgrease=1W/(m·K), heat-sink flatness ≤50um)

Notes:(3) R_G value is the test condition's value for evaluation 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.

* Please contact our representatives at order.
* For improvement, specifications are subject to change without notice.
* For actual application, please confirm this spec sheet is the newest revision.

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Definition of test circuit

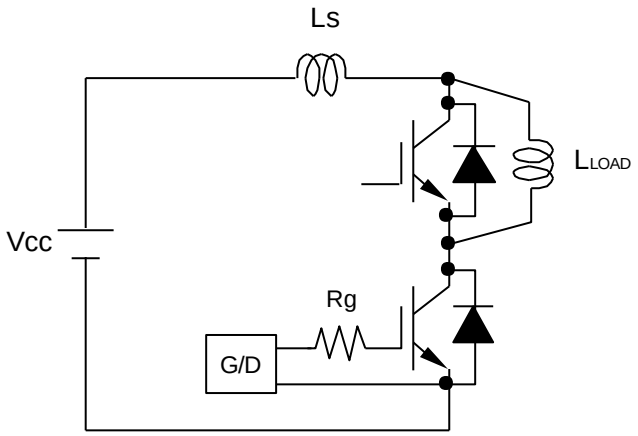
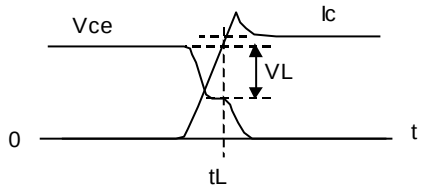
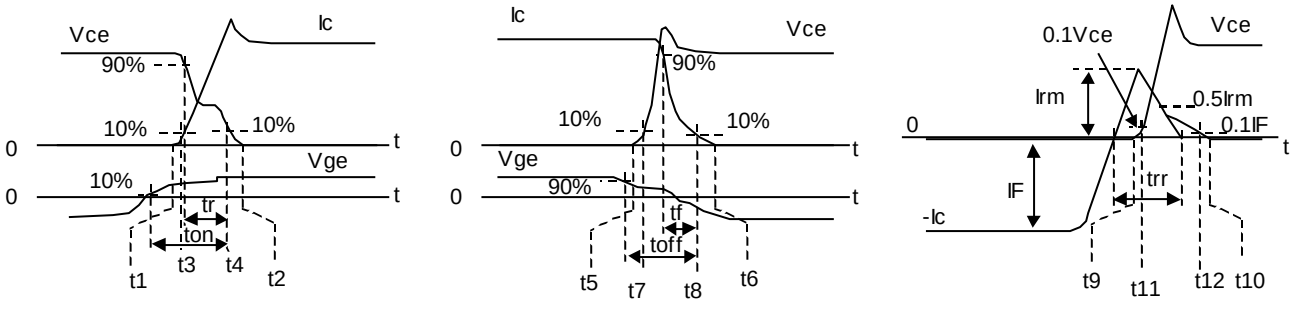


Fig.1 Switching test circuit



$$Ls = \frac{VL}{\left(\frac{dIc}{dt}\right)_{t=tL}}$$

Fig.2 Definition of Ls



$$Eon(10\%) = \int_{t3}^{t4} Ic \cdot Vce\, dt \qquad Eoff(10\%) = \int_{t7}^{t8} Ic \cdot Vce\, dt \qquad Err(10\%) = \int_{t11}^{t12} IF \cdot Vce\, dt$$

$$Eon(Full) = \int_{t1}^{t2} Ic \cdot Vce\, dt \qquad Eoff(Full) = \int_{t5}^{t6} Ic \cdot Vce\, dt \qquad Err(Full) = \int_{t9}^{t10} IF \cdot Vce\, dt$$

Fig.3 Definition of switching loss

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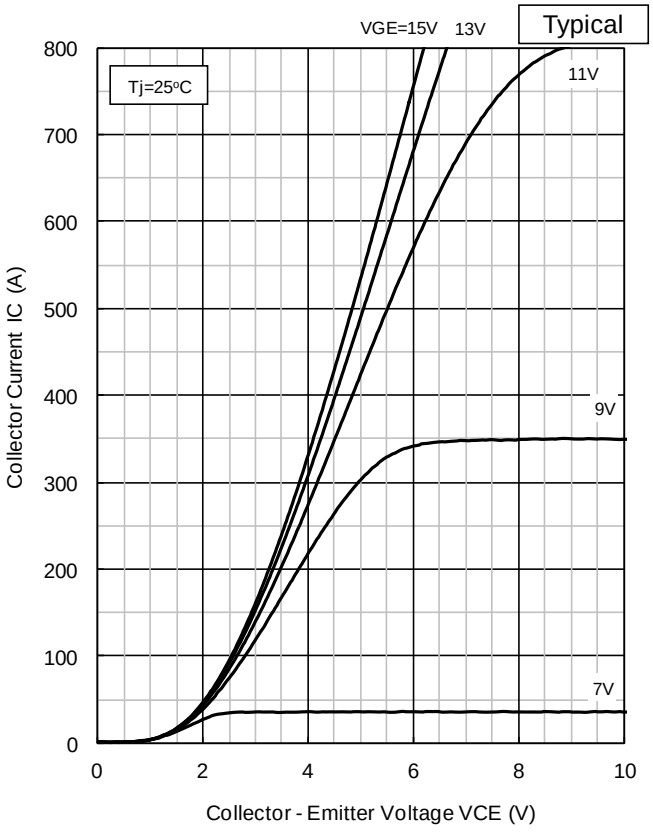
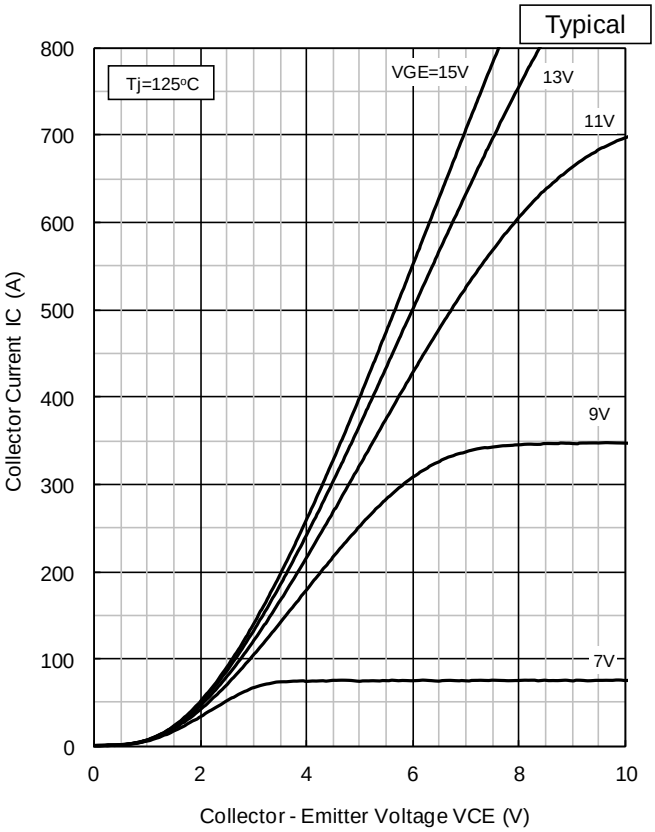
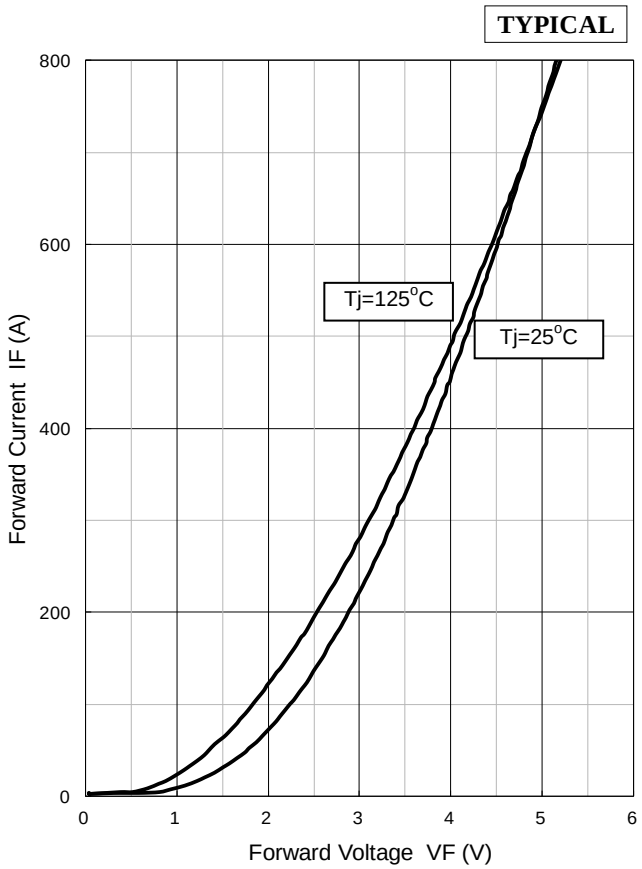
Static characteristics



IC vs. VCE (Tj=25ºC)



IC vs. VCE (Tj=125ºC)



Forward Voltage of free-wheeling diode

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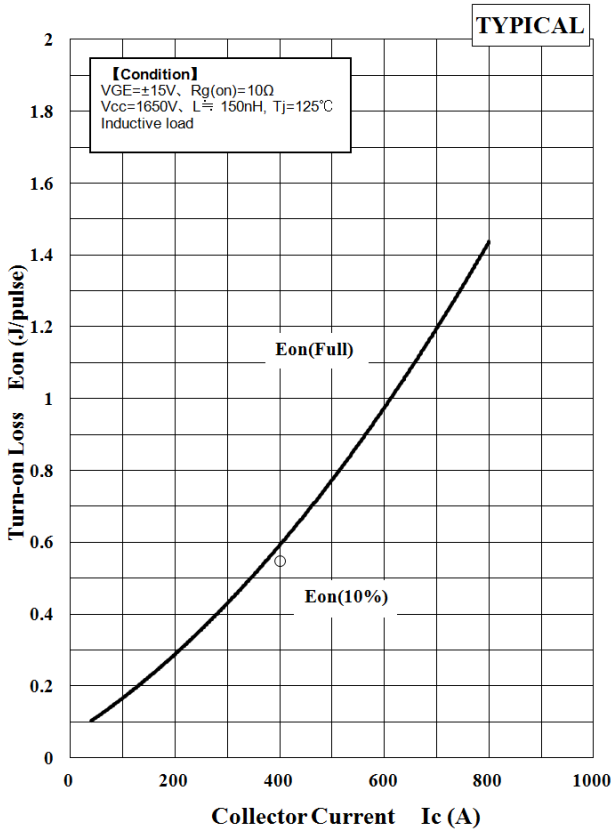
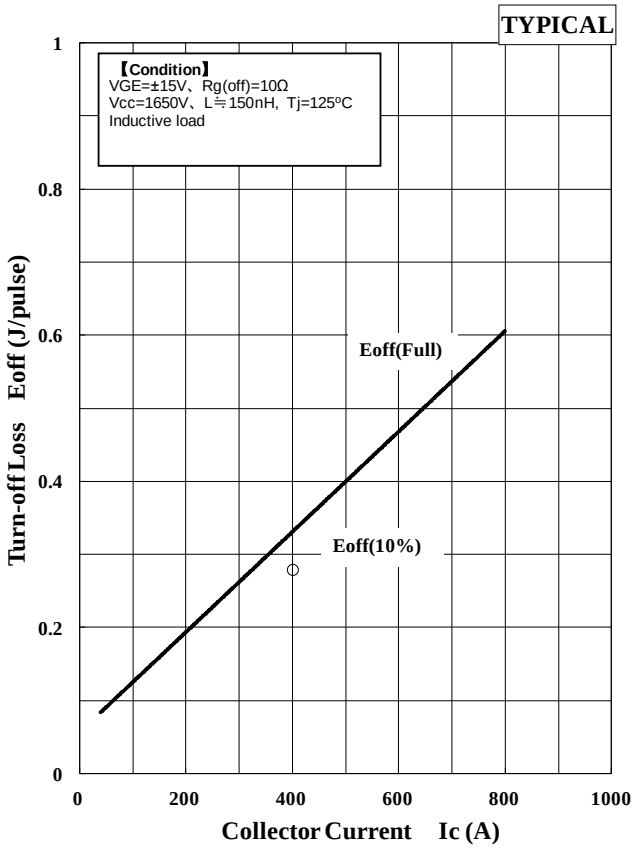
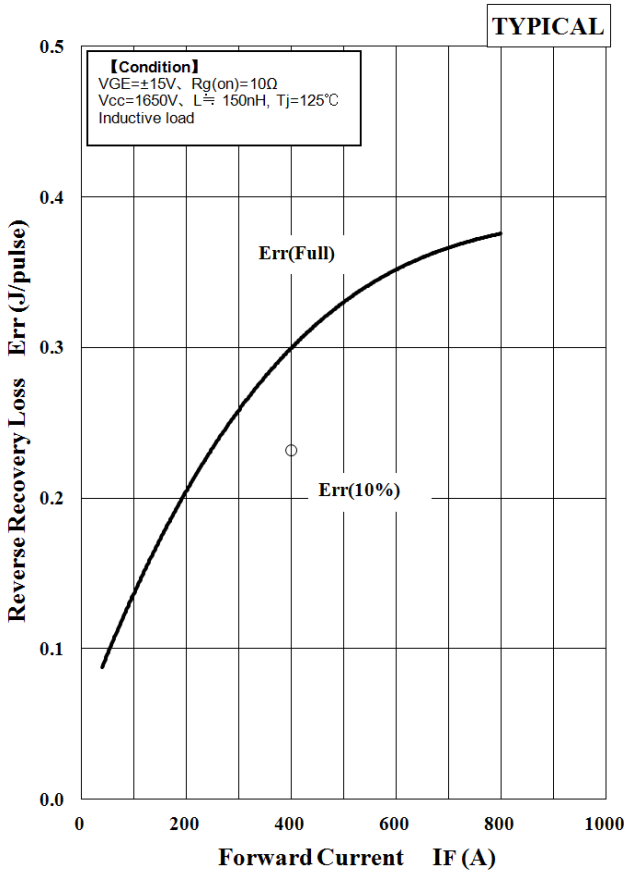
Dynamic characteristics



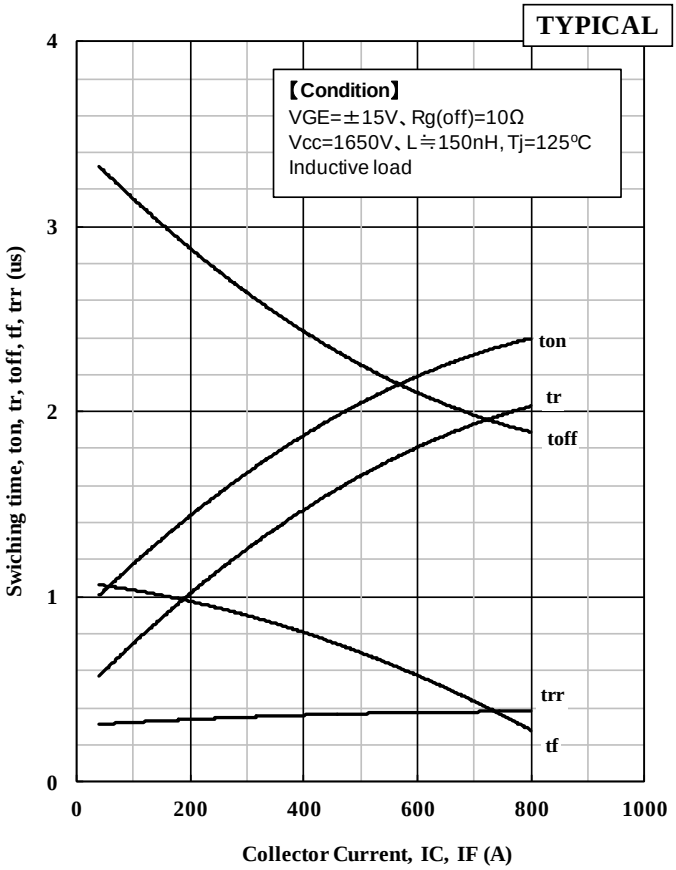
Turn-on Loss vs. Collector Current



Turn-off Loss vs. Collector Current



Recovery Loss vs. Forward Current



Switching time vs. Collector current

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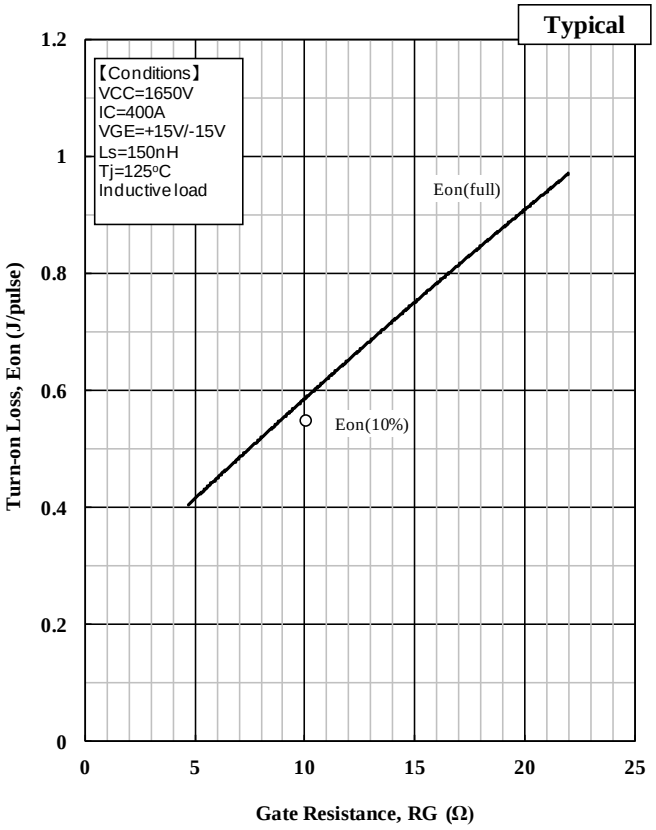
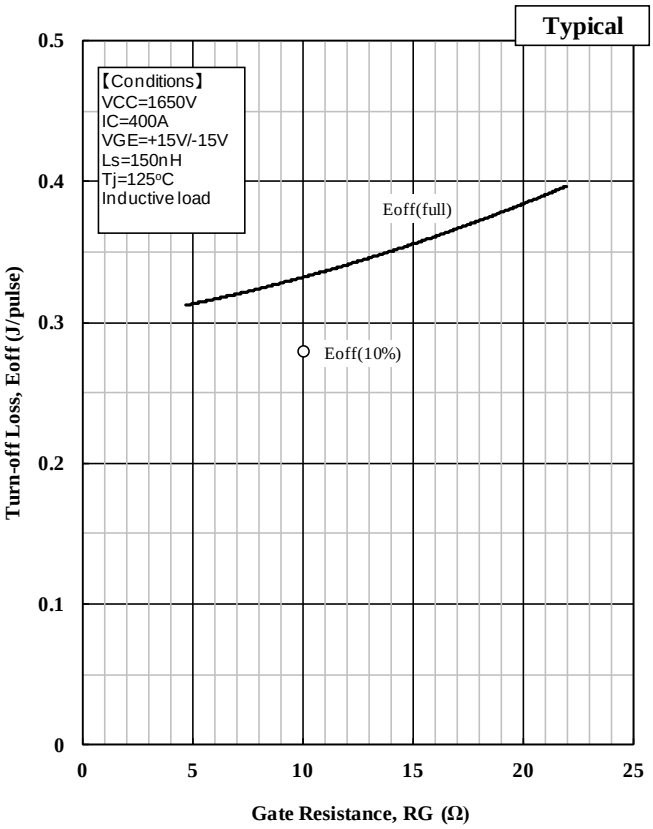
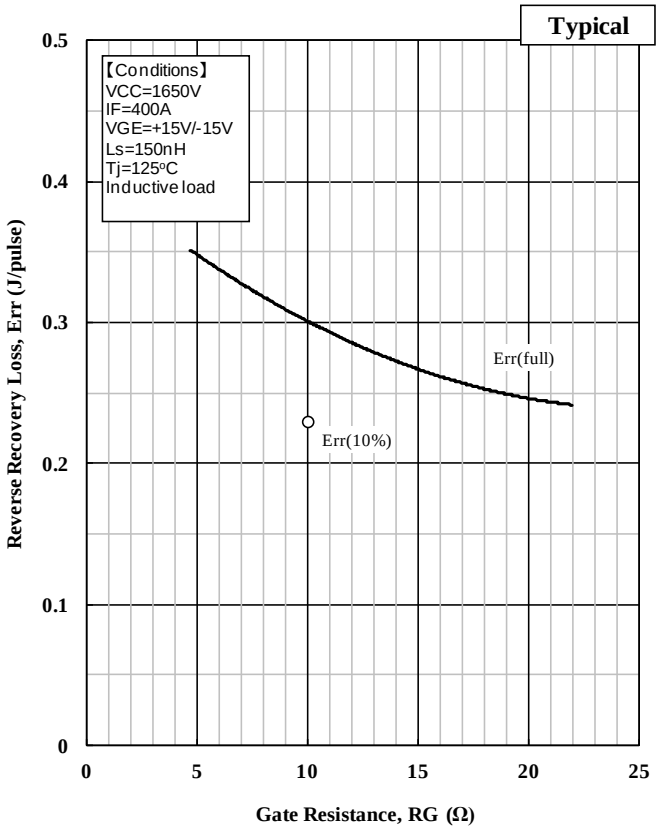


Turn-on loss vs. Gate Resistance



Turn-off loss vs. Gate Resistance



Recovery loss vs. Gate Resistance

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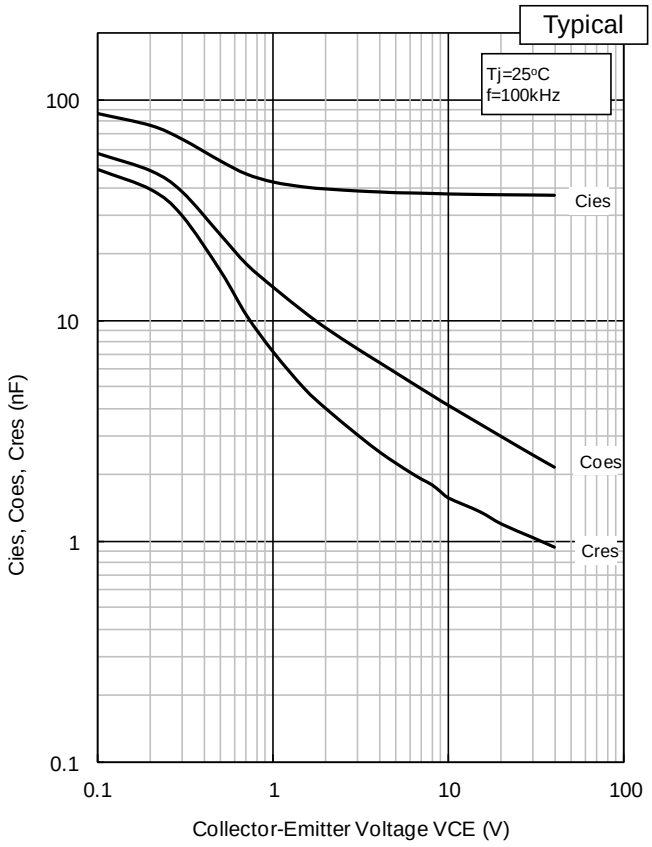
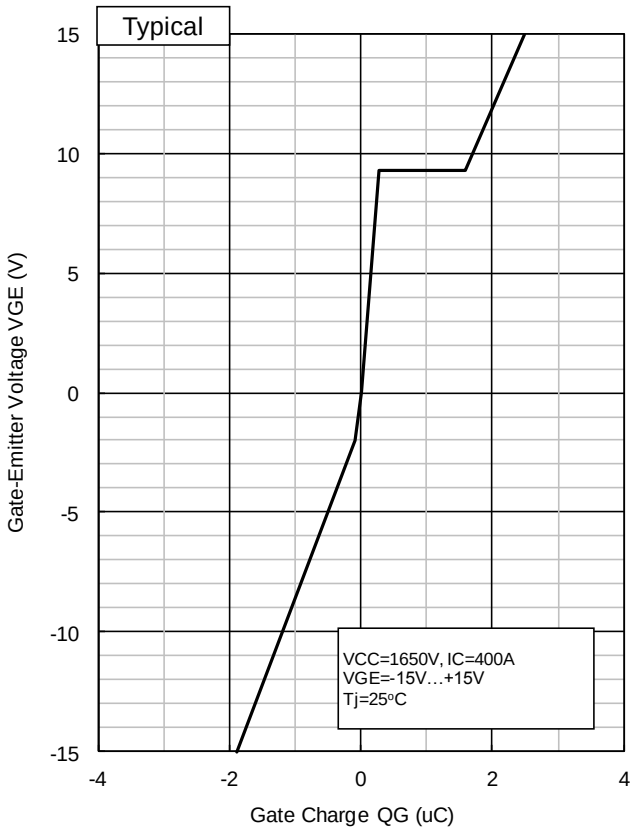
Capacitance vs. Collector to Emitter Voltage



Cies, Coes, Cres - VCE

QG-VGE CURVE



QG - VGE

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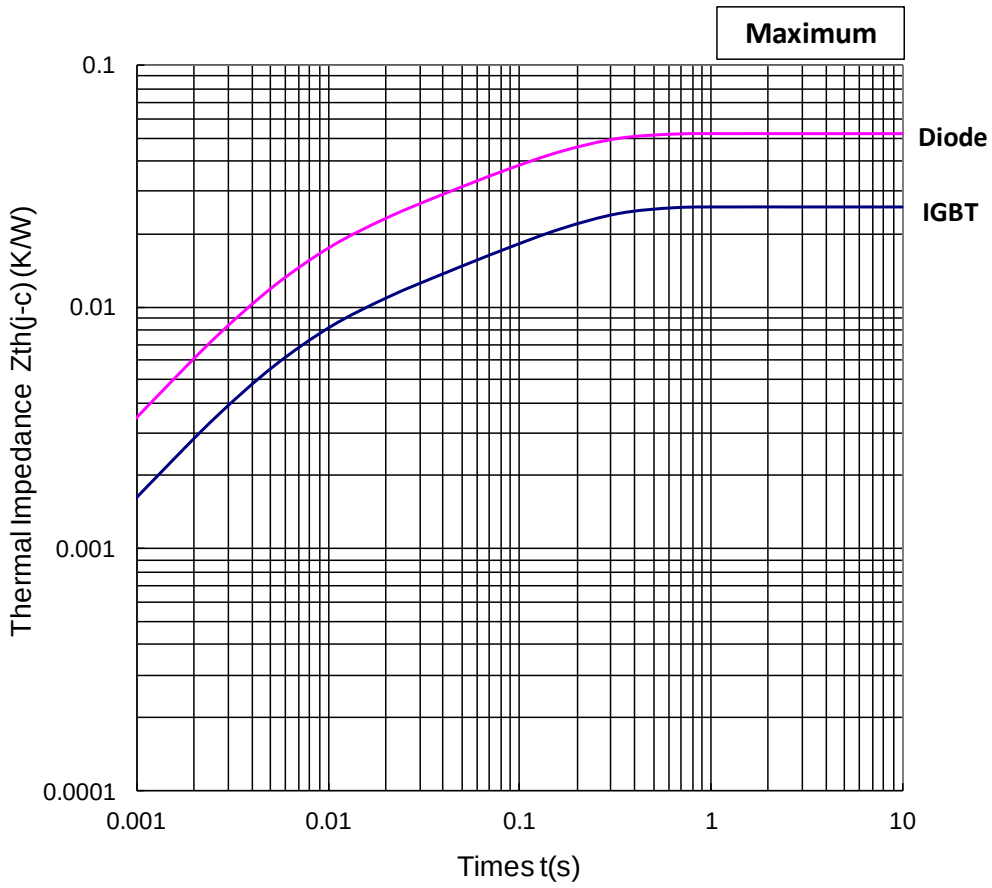
TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve

Curve approximation model

Σrth[n]*(1-exp(-t/τth[n]))

n	1	2	3	4	Unit
τ th[n]	1.39E-01	1.36E-02	3.61E-03	2.38E-04	sec
rth[n,IGBT]	1.58E-02	5.95E-03	4.16E-03	1.00E-04	K/W
rth[n,Diode]	2.94E-02	1.38E-02	8.55E-03	2.20E-04	K/W

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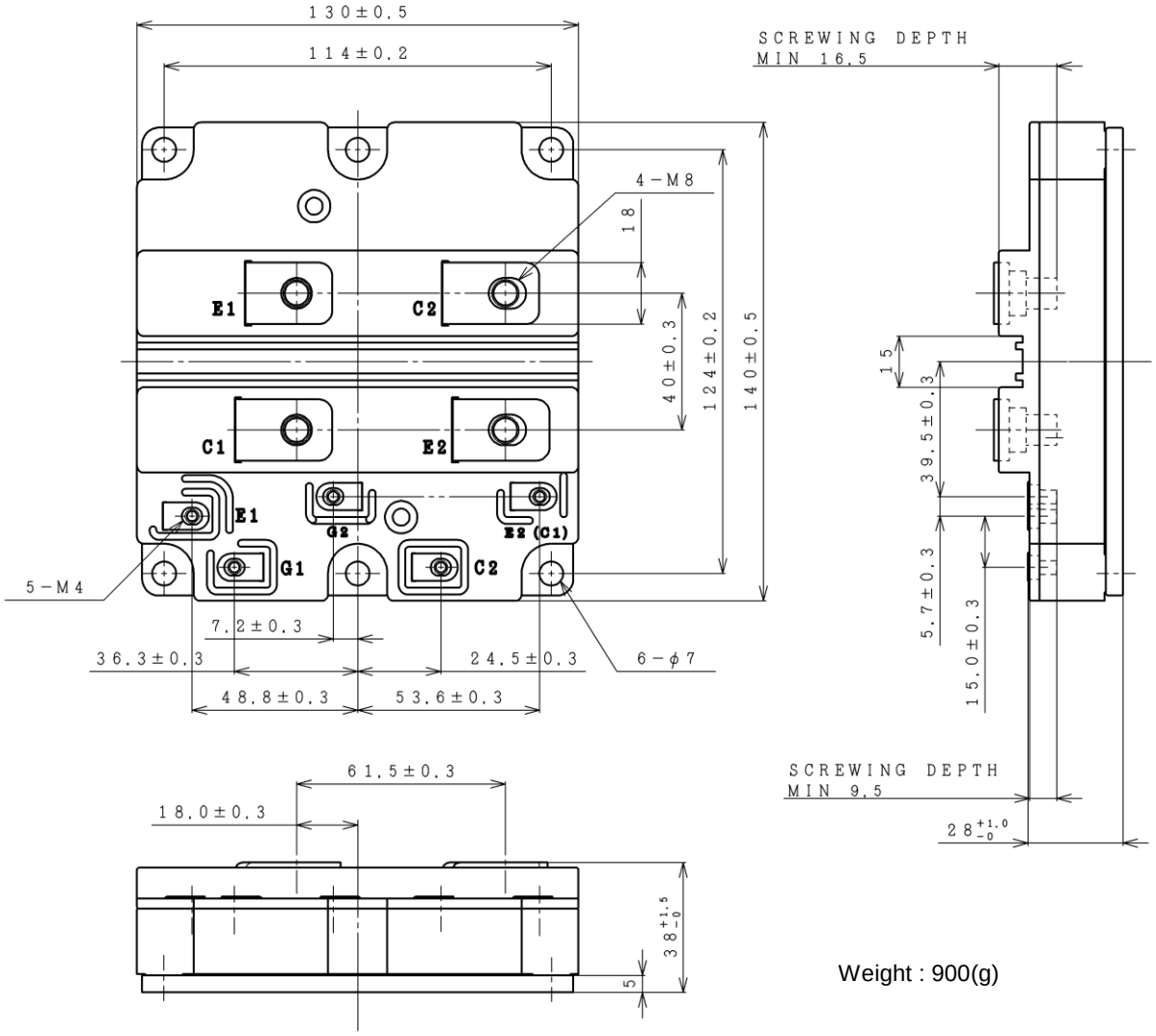
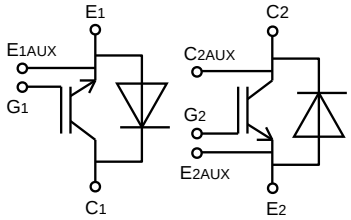
OUTLINE DRAWINGS

Unit in mm



Weight : 900(g)

CIRCUIT DIAGRAM



Material declaration

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

Material	Contained part
Lead (Pb) and its compounds	Solder

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HITACHI POWER SEMICONDUCTORS

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