MBN1200H45E2

Silicon N-channel IGBT 4500V E2 version

FEATURES

- Low conduction loss IGBT module.
- Low noise due to ultra soft fast recovery diode.
- High reliability, high durability module.
- High thermal fatigue durability.
  (delta Tc=70°C, N>30,000cycles)
- Isolated heat sink (terminal to base).

ABSOLUTE MAXIMUM RATINGS (Tc=25ºC)

Item		Symbol	Unit	MBN1200H45E2
Collector Emitter Voltage		V_{CES}	V	4,500
Gate Emitter Voltage		V_{GES}	V	±20
Collector Current	DC	I_C	A	1,200 (Tc=80 ºC)
	1ms	I_{Cp}		2,400
Forward Current	DC	I_F	A	1,200
	1ms	I_{FM}		2,400
Junction Temperature		T_j	ºC	-40 ~ +125
Maximum Junction Temperature		$T_{vj\ max}$	ºC	150 (1)
Storage Temperature		T_{stg}	ºC	-50 ~ +125 (2)
Isolation Voltage		V_{ISO}	V_{RMS}	10,200 (AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	N·m	2/10 (3)
	Mounting (M6)	-		6 (4)

Notes: (1) Regarding the definition of $T_{vj\ max}$ for each operation mode, please refer to LD-ES-130737.
(2) Terminal temperature shall not exceed the specified temperature in any operation.
(3) Recommended Value 1.8±0.2/9±1N·m (4) 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	-	-	5	V_{CE}=4,500V, V_{GE}=0V, Tj=25ºC
				-	25	100	V_{CE}=4,500V, V_{GE}=0V, Tj=125ºC
Gate Emitter Leakage Current		I_{GES}	nA	-500	-	+500	V_{GE}=±20V, V_{CE}=0V, Tj=25ºC
Collector Emitter Saturation Voltage		$V_{CE(sat)}$	V	3.1	3.7	4.2	I_C=1200A, V_{GE}=15V, Tj=125ºC
Gate Emitter Threshold Voltage		$V_{GE(TO)}$	V	5.4	6.4	7.4	V_{CE}=10V, I_C=1200mA, Tj=25ºC
Input Capacitance		C_{ies}	nF	-	165	-	V_{CE}=10V,V_{GE}=0V, f=100kHz, Tj=25ºC
Internal Gate Resistance		Rge	Ω	-	1.6	-	V_{CE}=10V,V_{GE}=0V, f=100kHz, Tj=25ºC
Rise Time		t_r	μs	1.0	2.2	3.3	V_{CC}=2,600V, Ic=1200A
Turn On Delay Time		$t_{d(on)}$		-	0.9	-	Ls=150nH
Fall Time		t_f		1.5	3.0	4.5	R_G=3.3Ω (5)
Turn Off Delay Time		$t_{d(off)}$		-	2.5	-	V_{GE}=+/-15V, Tj=125ºC
Forward Voltage Drop		V_{FM}	V	2.3	2.9	3.4	IF=1200A, V_{GE}=0V, Tj=125ºC
Reverse Recovery Time		t_{rr}	μs	-	0.8	1.6	Vcc=2600V, IF=1200A, Ls=150nH Tj=125ºC
Turn On Loss		$E_{on(10\%)}$	J/p	-	3.9	5.8	V_{CC}=2600V, Ic= IF=1200A, Ls=150nH R_G= 3.3Ω (5) V_{GE}=+/-15V, Tj=125ºC
		$E_{on(full)}$		-	4.3	-	
Turn Off Loss		$E_{off(10\%)}$	J/ p	-	4.2	6.3	
		$E_{off(full)}$		-	4.8	-	
Reverse Recovery Loss		$E_{rr(10\%)}$	J/ p	-	3.2	4.8	
		$E_{rr(full)}$		-	3.5	-	
Thermal Impedance	IGBT	Rth(j-c)	K/W	-	-	0.0085	Junction to case
	FWD	Rth(j-c)		-	-	0.017	
Contact Thermal Impedance		Rth(c-f)	K/W	-	0.005	-	Case to fin (λgrease=1W/(m·K), heat-sink flatness ≤50um)

Notes:(5) 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

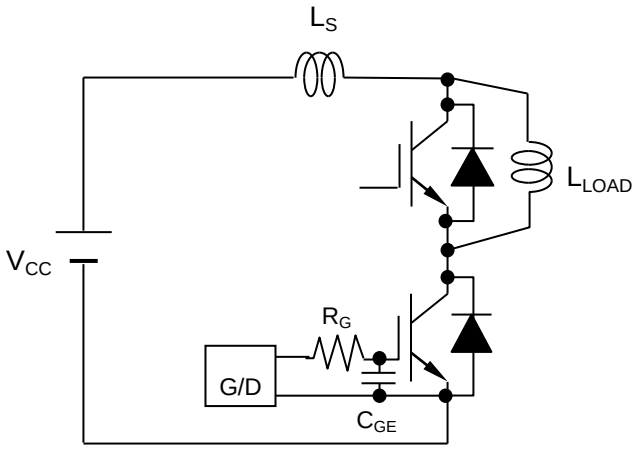
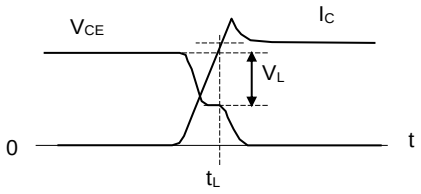
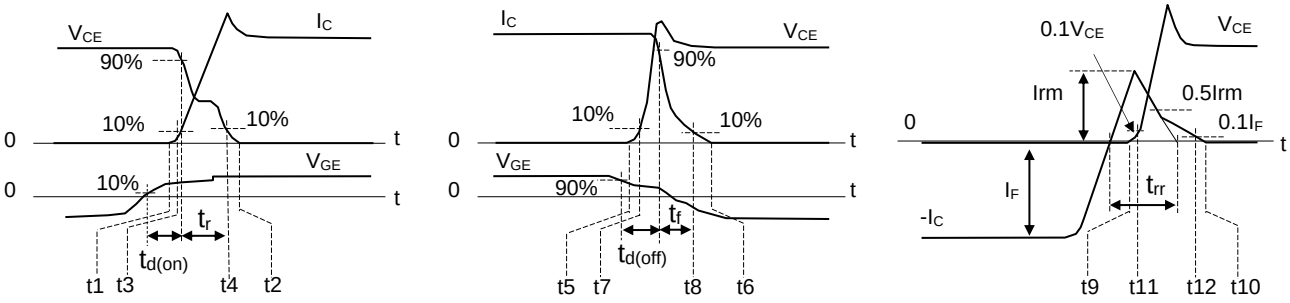


Fig.1 Switching test circuit



$$L_S = \frac{V_L}{\left(\frac{dI_C}{dt}\right)_{t=t_L}}$$

Fig.2 Definition of stray inductance



$$E_{on(10\%)} = \int_{t3}^{t4} I_C \cdot V_{CE}\, dt \qquad E_{off(10\%)} = \int_{t7}^{t8} I_C \cdot V_{CE}\, dt \qquad E_{rr(10\%)} = \int_{t11}^{t12} I_F \cdot V_{CE}\, dt$$

$$E_{on(Full)} = \int_{t1}^{t2} I_C \cdot V_{CE}\, dt \qquad E_{off(Full)} = \int_{t5}^{t6} I_C \cdot V_{CE}\, dt \qquad E_{rr(Full)} = \int_{t9}^{t10} I_F \cdot V_{CE}\, dt$$

Fig.3 Definition of switching loss

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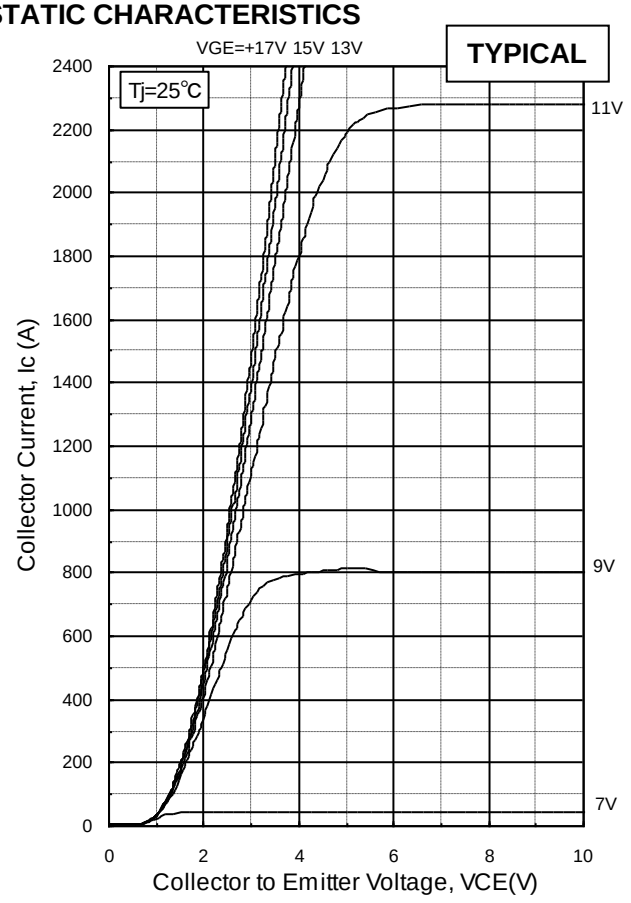
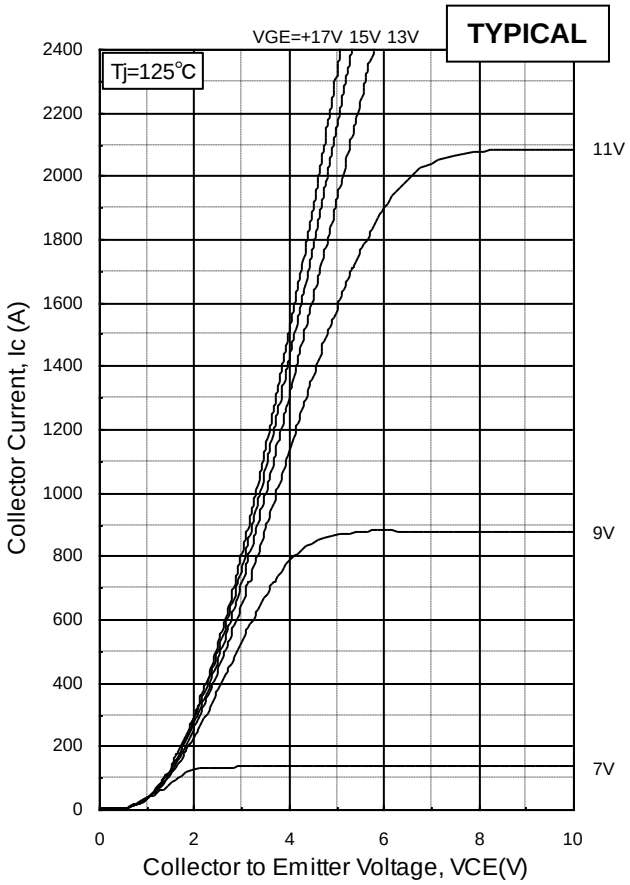
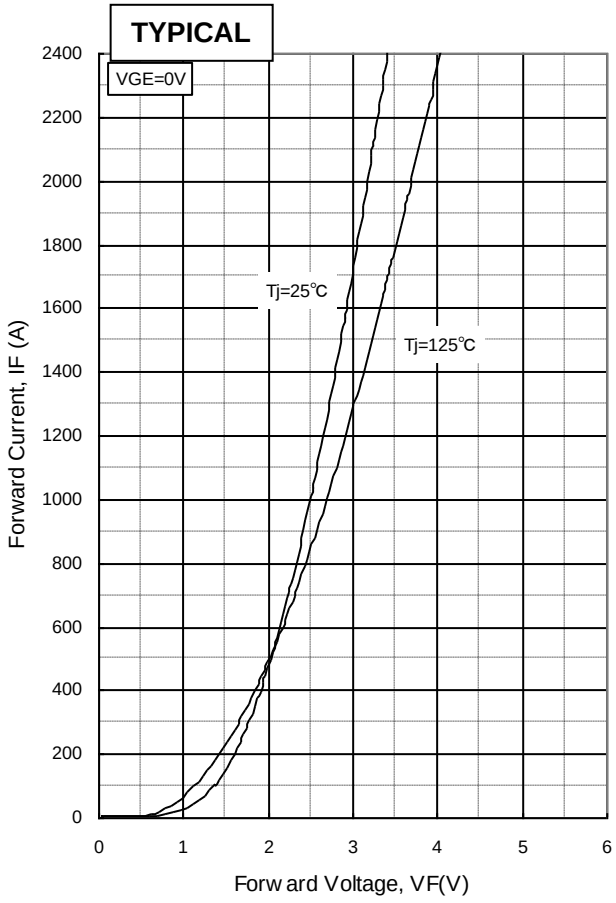
STATIC CHARACTERISTICS



Ic vs. VCE(Tj=25ºC)



Ic vs. VCE(Tj=125ºC)



IF vs. VF

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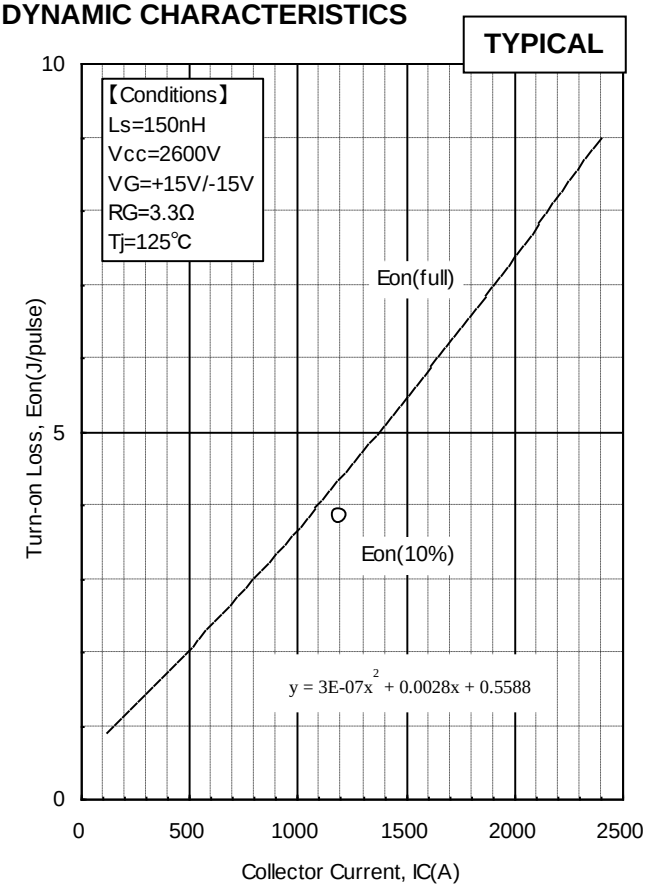
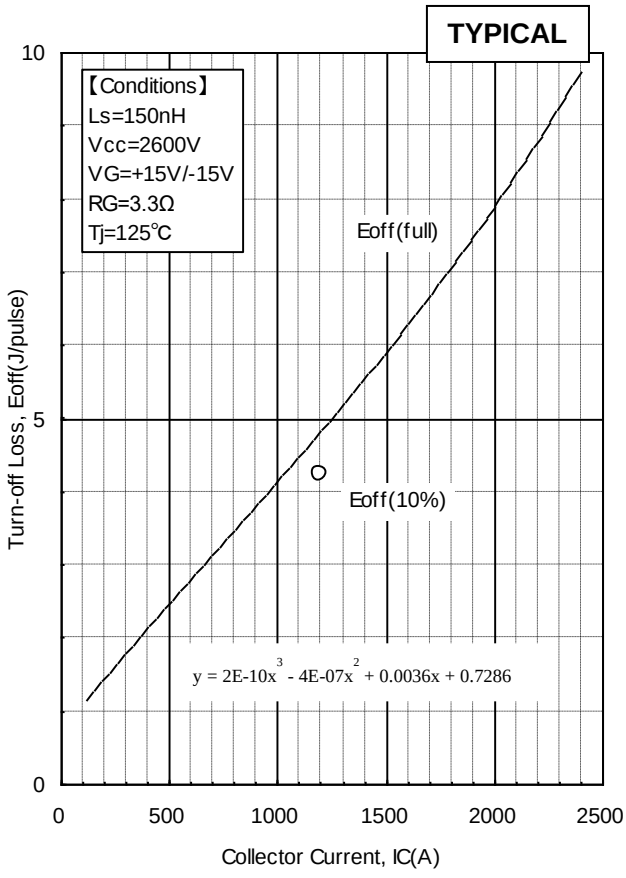
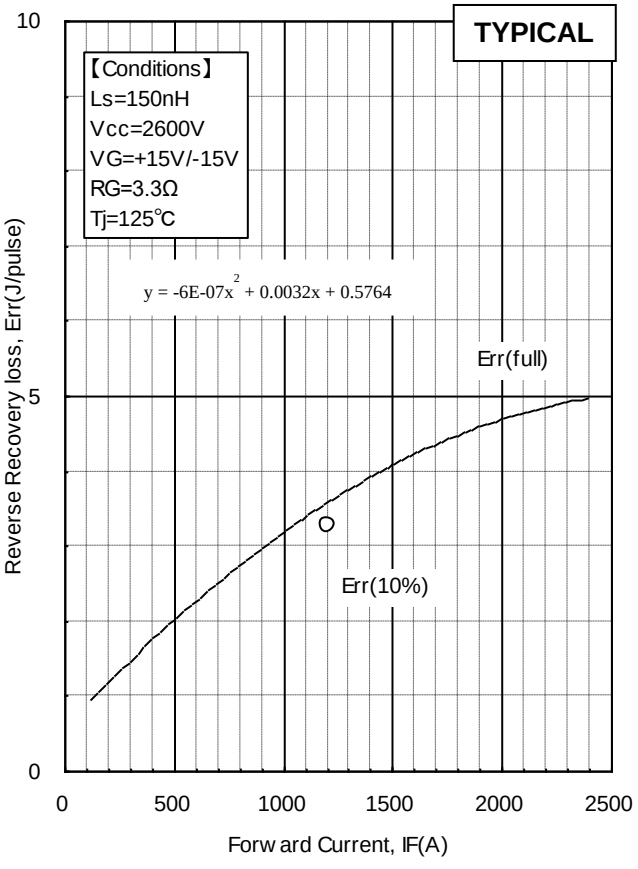
DYNAMIC CHARACTERISTICS



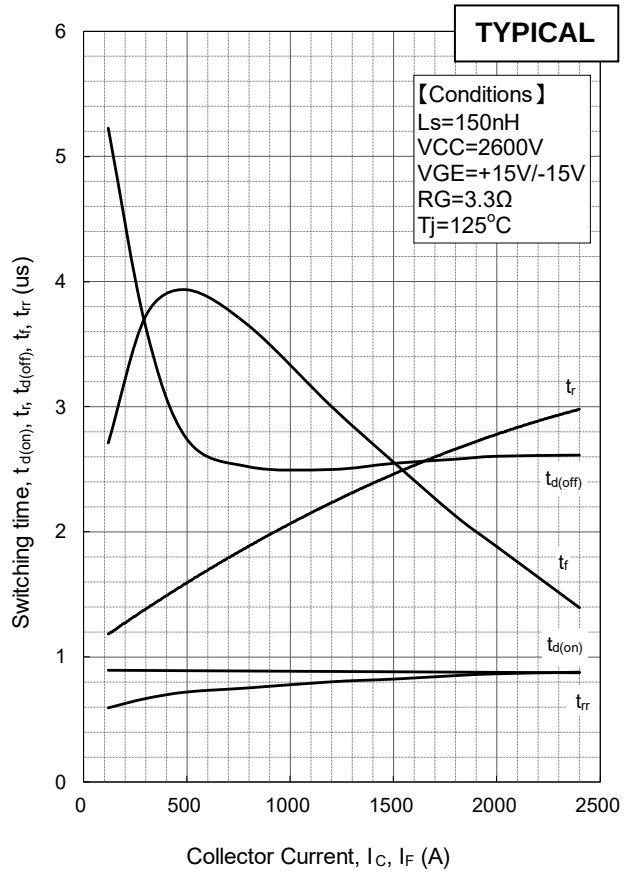
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current



Recovery loss vs. Forward current



Switching time vs. Collector current

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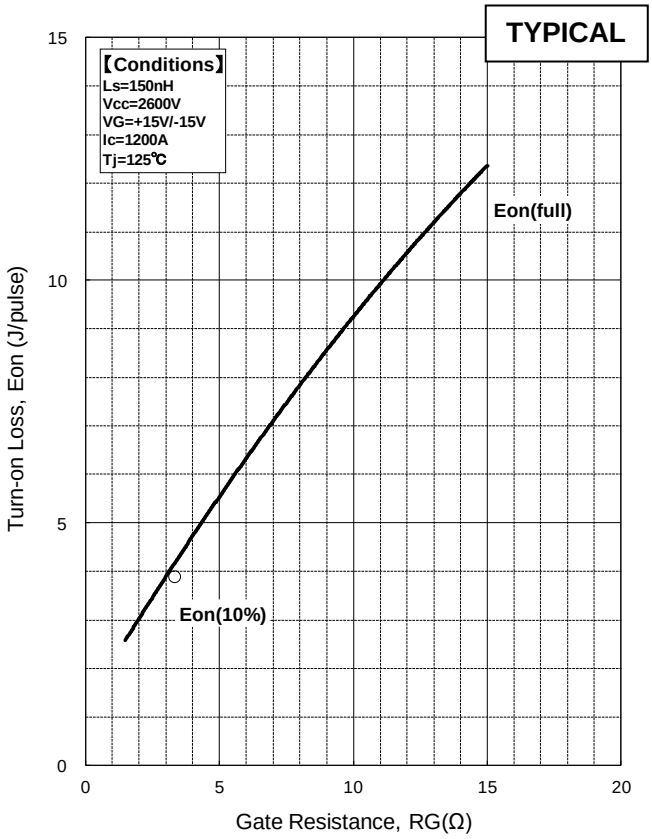
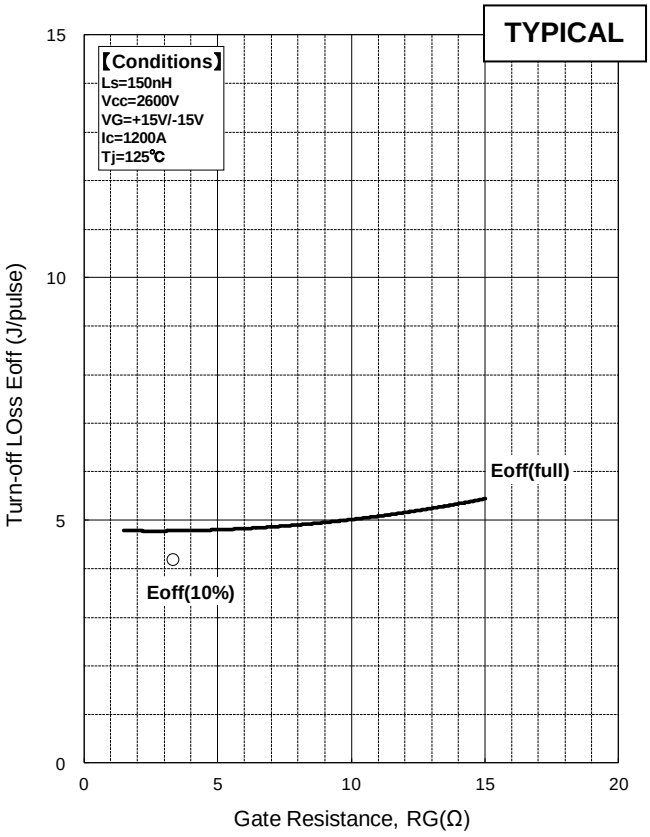
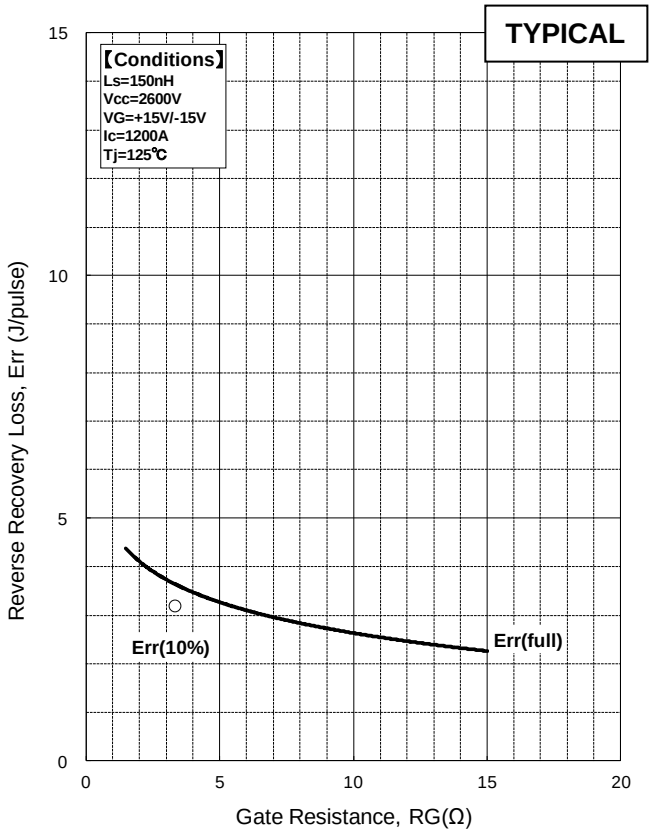
DYNAMIC CHARACTERISTICS



Turn-on loss vs. Gate Resistance



Turn-off loss vs. Gate Resistance



Recovery loss vs. Gate Resistance

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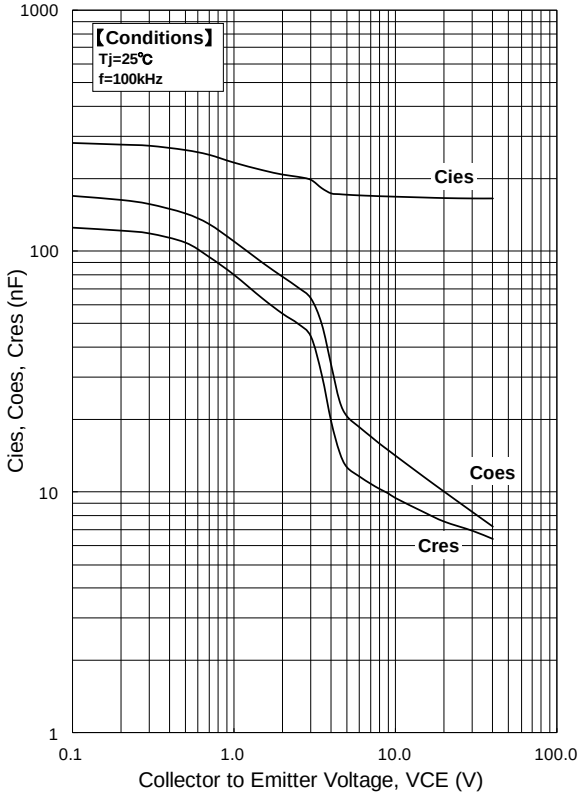
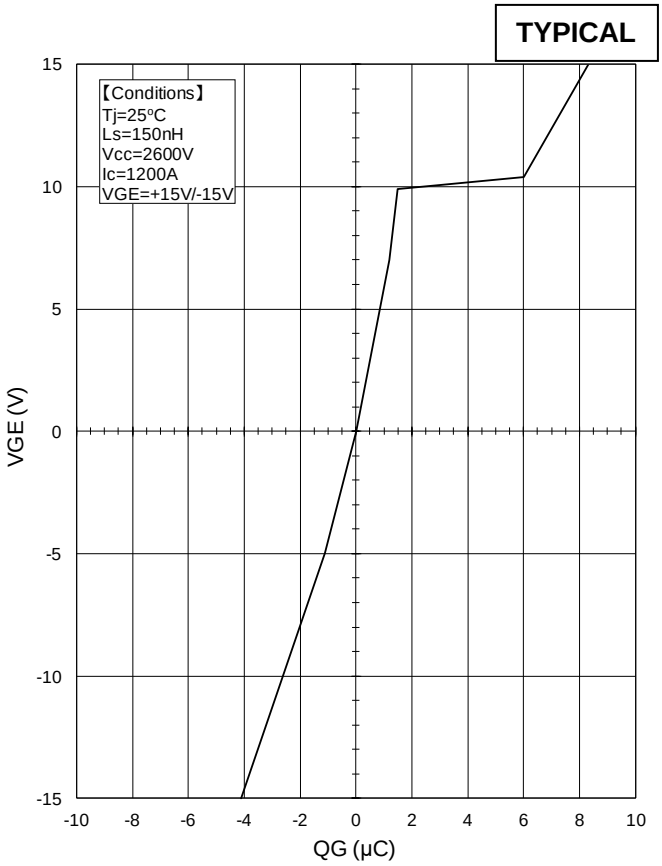
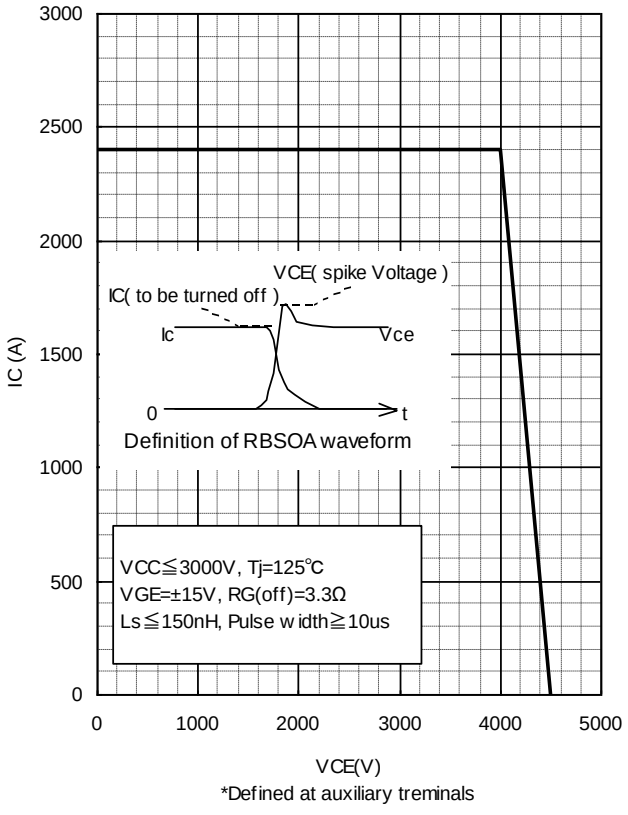


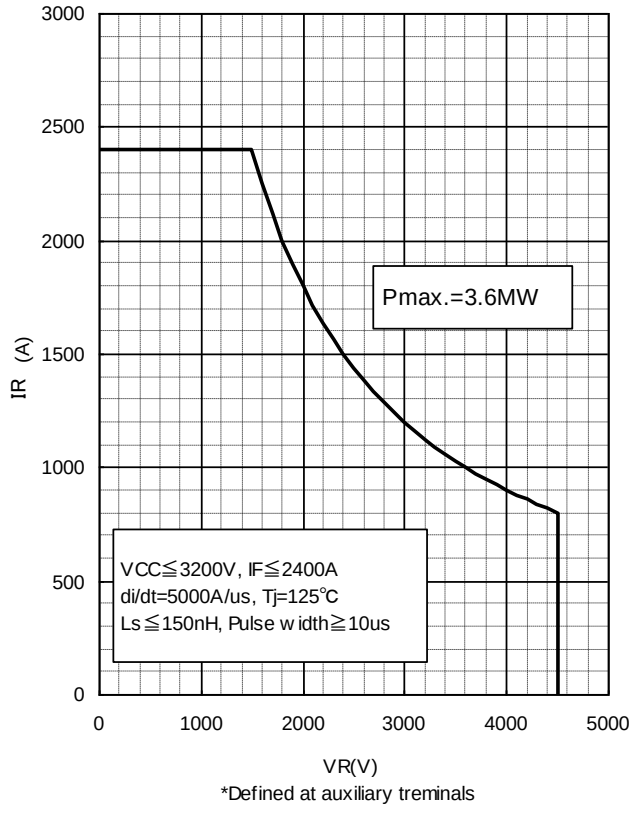
Cies, Coes, Cres - VCE



QG - VGE



RBSOA



RecSOA

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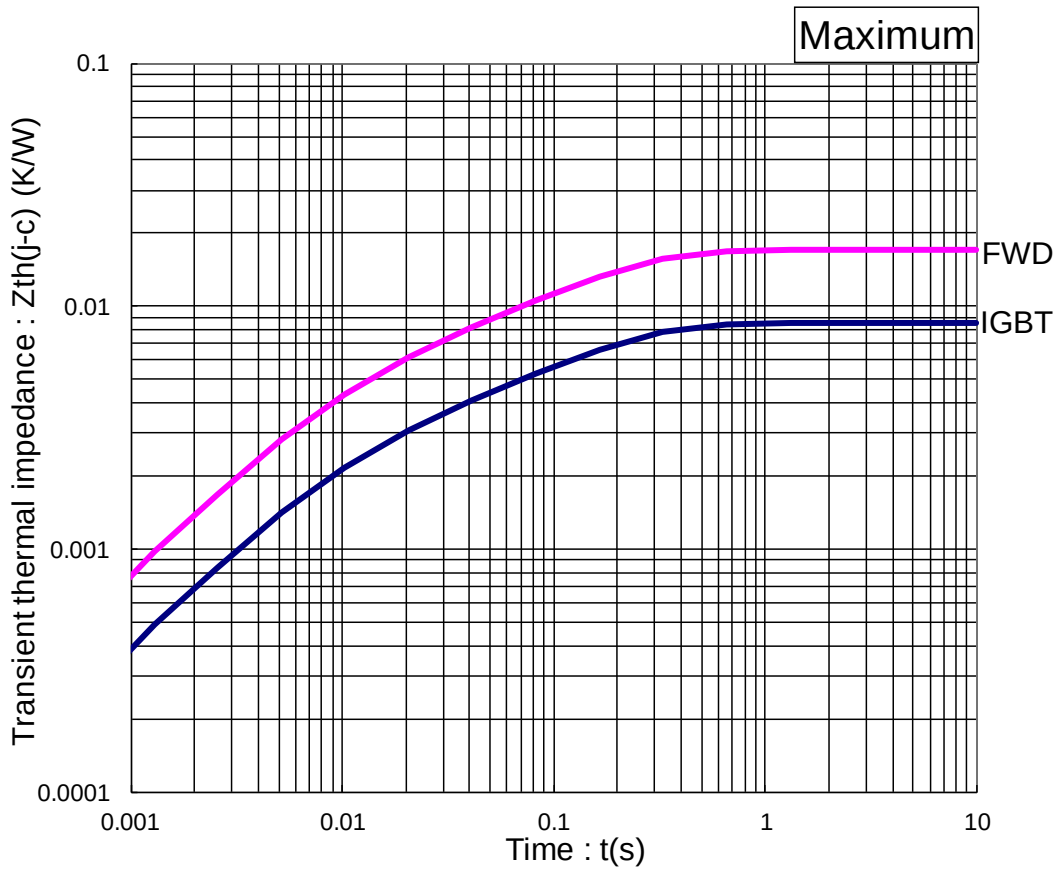
TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve

Curve Approximation Model
Σ rth[n]*(1-exp(-t/τth[n]))

n	1	2	3	4	Unit
τ th[n]	1.63E-01	2.71E-02	6.12E-03	8.66E-04	sec
rth[n,IGBT]	5.24E-03	1.61E-03	1.56E-03	8.64E-05	K/W
rth[n,Diode]	1.05E-02	3.18E-03	3.13E-03	1.71E-04	K/W

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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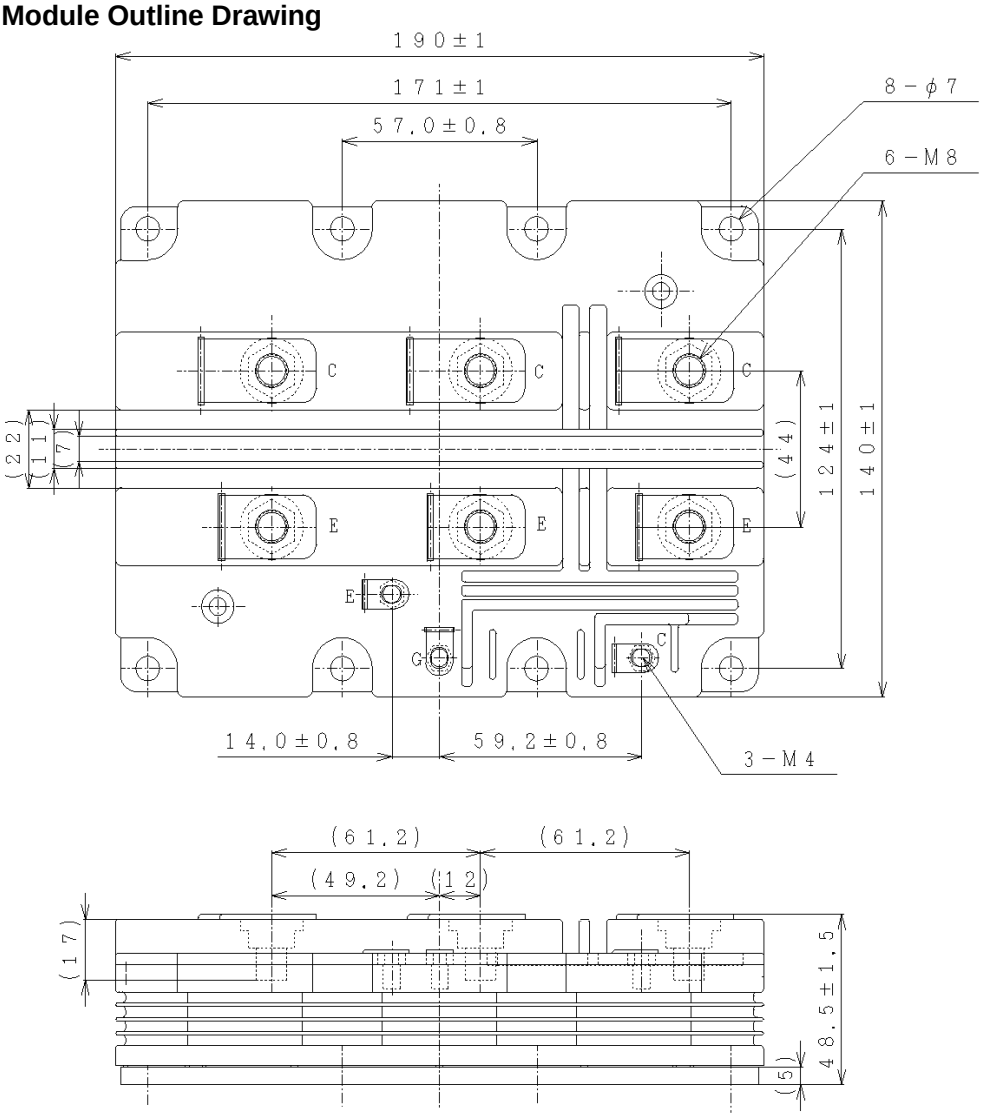
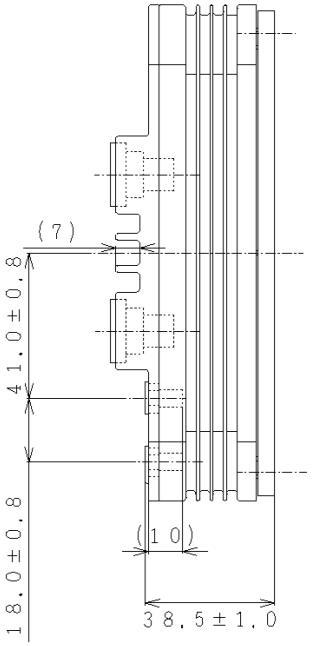
Module Outline Drawing

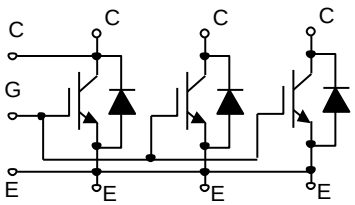




Unit: mm

Weight: 1550(g)

CIRCUIT DIAGRAM



TERMINALS

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Minebea POWER SEMICONDUCTORS

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