

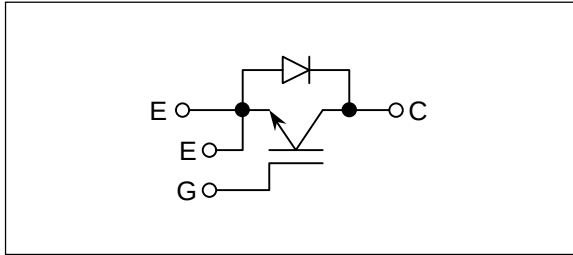
# MBN400GR12

[Rated 400A/1200V, Single-pack type]

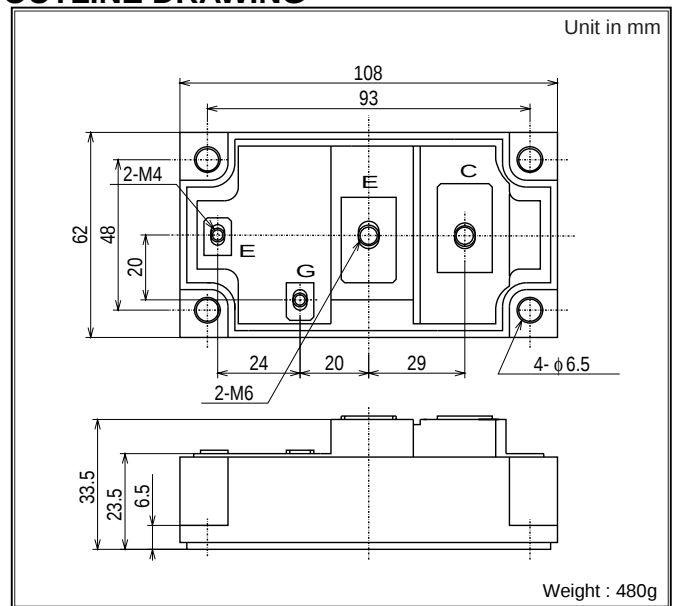
## FEATURES

- Low saturation voltage and high speed.
- Low turn-OFF switching loss.
- Low noise due to build-in free-wheeling diode.  
(Ultra Soft and Fast recovery Diode (USFD))
- High reliability structure.
- Isolated heat sink (terminals to base).

## CIRCUIT DIAGRAM



## OUTLINE DRAWING



## ABSOLUTE MAXIMUM RATINGS( $T_c=25^\circ\text{C}$ )

| Item                        | Symbol            | Unit             | Value                             |
|-----------------------------|-------------------|------------------|-----------------------------------|
| Collector-Emitter Voltage   | $V_{CES}$         | V                | 1200                              |
| Gate-Emitter Voltage        | $V_{GES}$         | V                | $\pm 20$                          |
| Collector Current           | DC                | A                | 400                               |
|                             | 1ms               |                  | 800                               |
| Forward Current             | DC                | A                | 400 <sup>*1</sup>                 |
|                             | 1ms               |                  | 800                               |
| Collector Power Dissipation | $P_C$             | W                | 2080                              |
| Junction Temperature        | $T_J$             | $^\circ\text{C}$ | -40 ~ +150                        |
| Storage Temperature         | $T_{stg}$         | $^\circ\text{C}$ | -40 ~ +125                        |
| Isolation Voltage           | $V_{iso}$         | $V_{RMS}$        | 2500(AC 1 minute)                 |
| Screw Torque                | Terminals (M4/M6) | N·m<br>(kgf·cm)  | 1.37(14) / 2.94(30) <sup>*2</sup> |
|                             | Mounting          |                  | 2.94(30) <sup>*3</sup>            |

Notes; <sup>\*1</sup>: RMS current of Diode  $\leq 120$  Arms

<sup>\*2</sup>: Recommended value 1.18 / 2.45 N·m (12 / 25 kgf·cm)

<sup>\*3</sup>: Recommended value 2.45 N·m (25 kgf·cm)

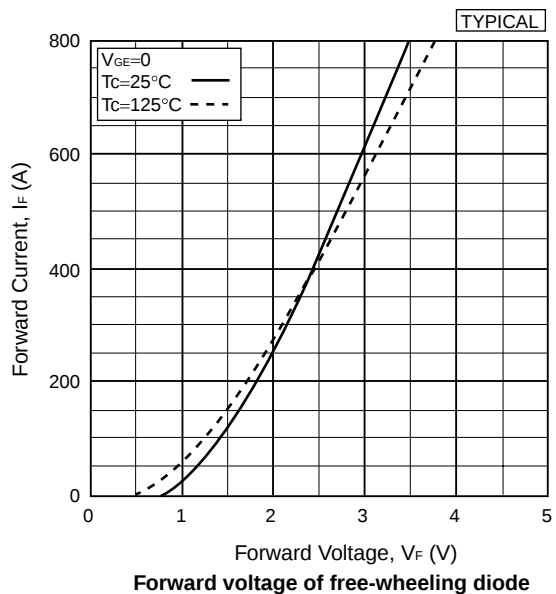
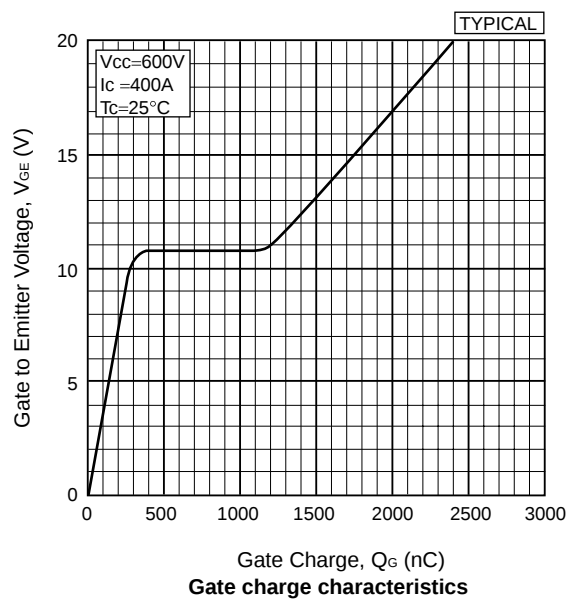
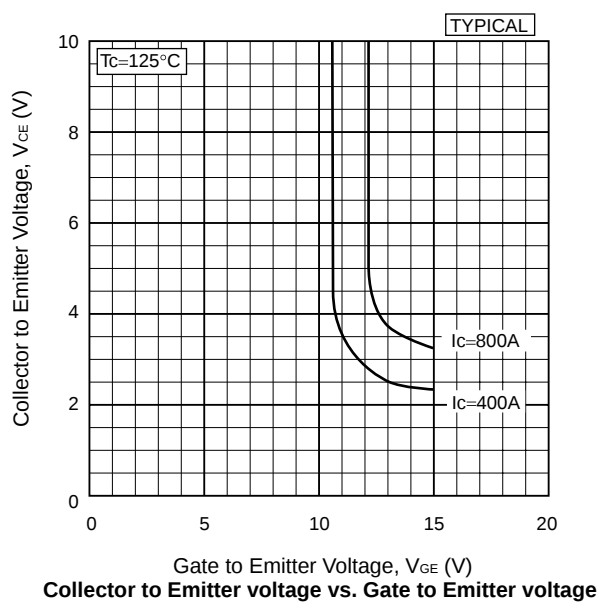
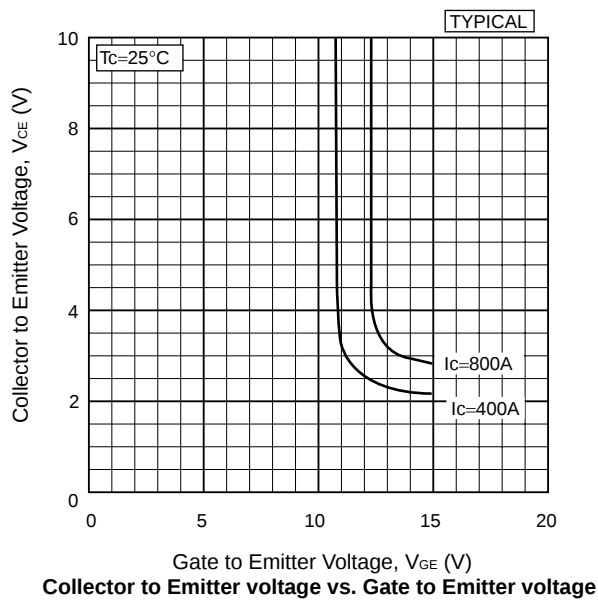
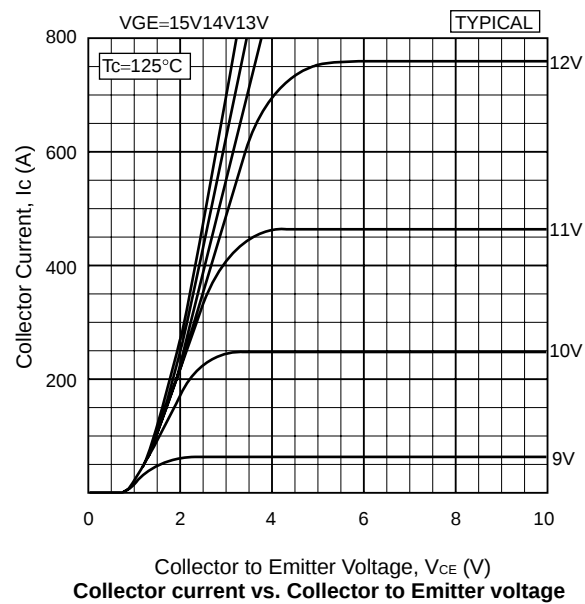
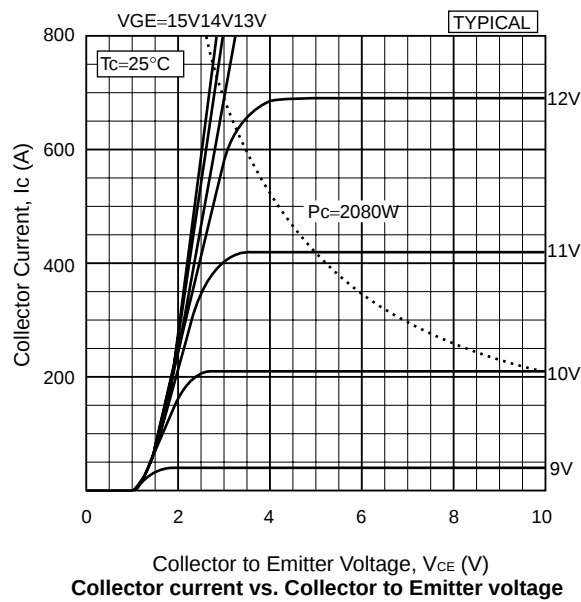
## CHARACTERISTICS ( $T_c=25^\circ\text{C}$ )

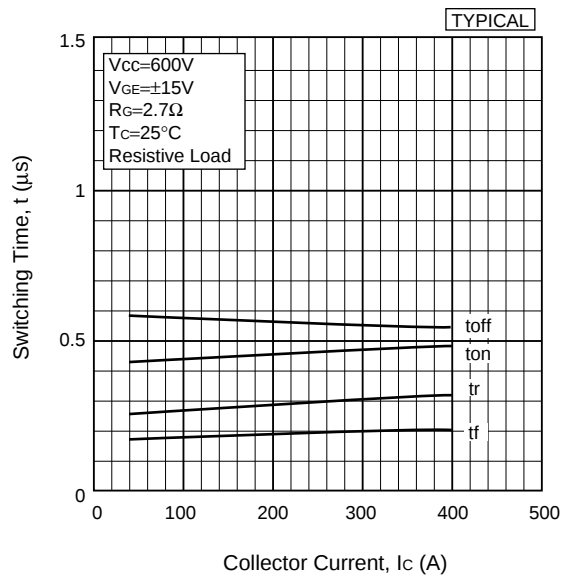
| Item                                 | Symbol        | Unit          | Min.               | Typ.  | Max.      | Test Conditions                                                                                     |
|--------------------------------------|---------------|---------------|--------------------|-------|-----------|-----------------------------------------------------------------------------------------------------|
| Collector-Emitter Cut-Off Current    | $I_{CES}$     | mA            | —                  | —     | 1.0       | $V_{CE}=1200\text{V}$ , $V_{GE}=0\text{V}$                                                          |
| Gate-Emitter Leakage Current         | $I_{GES}$     | nA            | —                  | —     | $\pm 500$ | $V_{GE}=\pm 20\text{V}$ , $V_{CE}=0\text{V}$                                                        |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | V             | —                  | 2.2   | 2.8       | $I_C=400\text{A}$ , $V_{GE}=15\text{V}$                                                             |
| Gate-Emitter Threshold Voltage       | $V_{GE(TH)}$  | V             | —                  | —     | 10        | $V_{CE}=5\text{V}$ , $I_C=400\text{mA}$                                                             |
| Input Capacitance                    | $C_{ies}$     | pF            | —                  | 37000 | —         | $V_{CE}=10\text{V}$ , $V_{GE}=0\text{V}$ , $f=1\text{MHz}$                                          |
| Switching Times                      | Rise Time     | $t_r$         | —                  | 0.25  | 0.7       | $V_{CC}=600\text{V}$<br>$R_L=1.5\Omega$<br>$R_G=2.7\Omega$ <sup>*4</sup><br>$V_{GE}=\pm 15\text{V}$ |
|                                      | Turn-ON Time  | $t_{on}$      | —                  | 0.4   | 0.9       |                                                                                                     |
|                                      | Fall Time     | $t_f$         | —                  | 0.2   | 0.35      |                                                                                                     |
|                                      | Turn-Off Time | $t_{off}$     | —                  | 0.7   | 1.1       |                                                                                                     |
| Peak Forward Voltage Drop            | $V_{FM}$      | V             | —                  | 2.5   | 3.5       | $I_F=400\text{A}$ , $V_{GE}=0\text{V}$                                                              |
| Reverse Recovery Time                | $t_{rr}$      | $\mu\text{s}$ | —                  | —     | 0.4       | $I_F=400\text{A}$ , $V_{GE}=-10\text{V}$ , $di/dt=400\text{A}/\mu\text{s}$                          |
| Thermal Impedance                    | IGBT          | $R_{th(j-c)}$ | $^\circ\text{C/W}$ | —     | 0.06      | Junction to case                                                                                    |
|                                      | FWD           | $R_{th(f-c)}$ |                    |       | 0.10      |                                                                                                     |

Notes; <sup>\*4</sup>:  $R_G$  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.

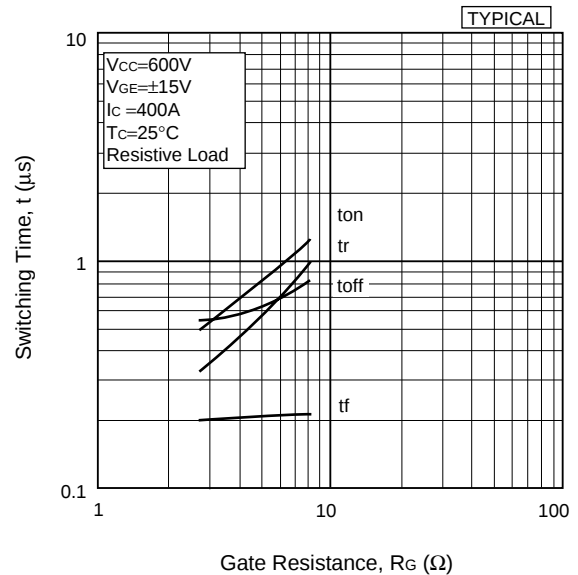
Remark; The specification given herein, is subject to change without prior notice to improve product characteristics.

# HITACHI

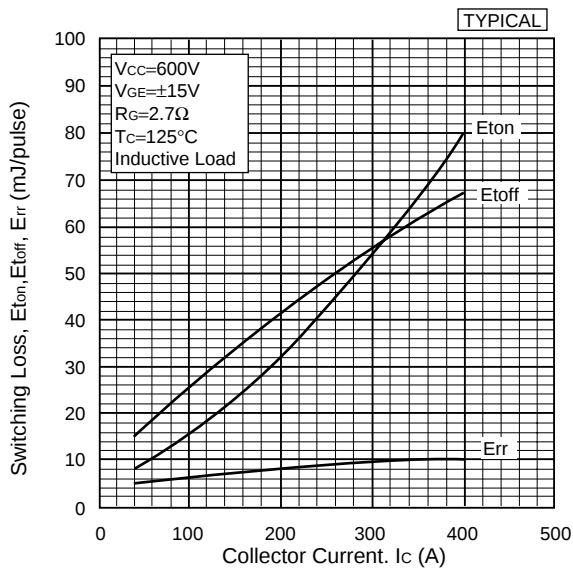




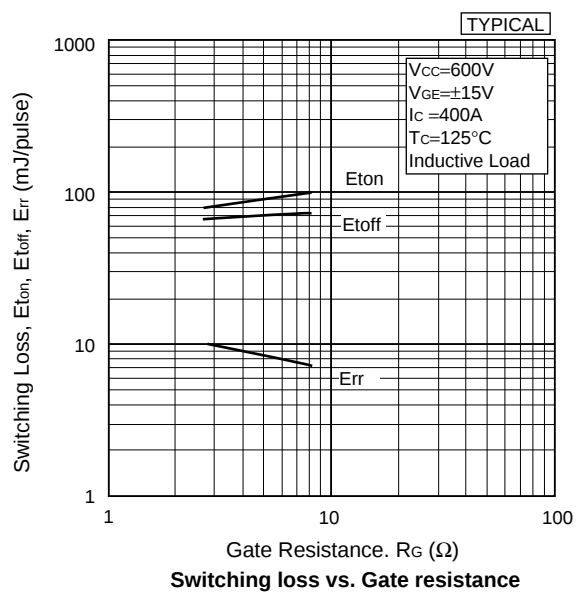
Switching time vs. Collector current



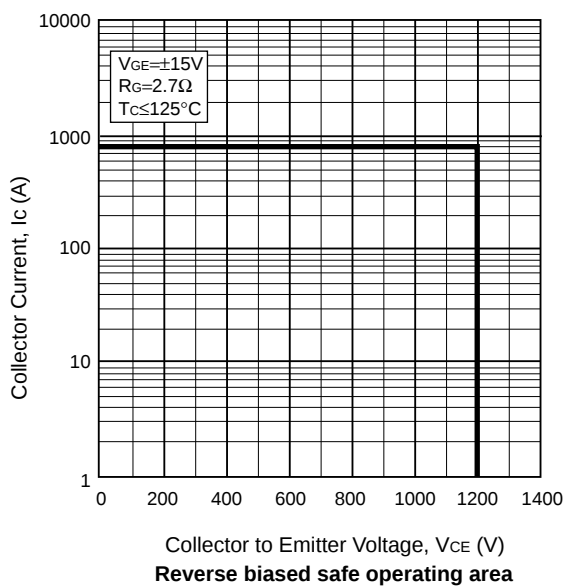
Switching time vs. Gate resistance



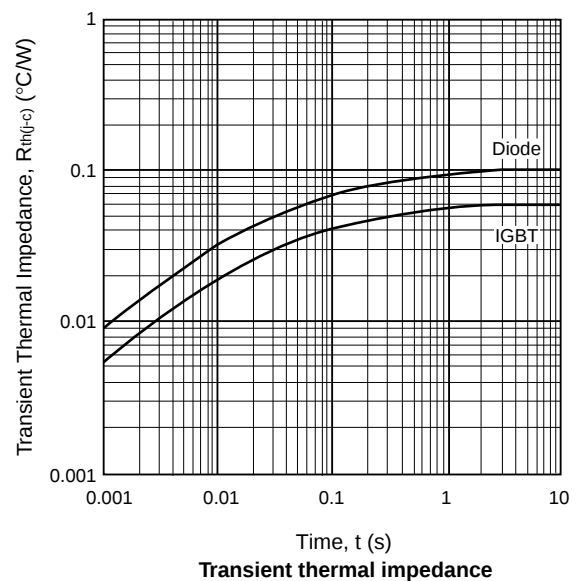
Switching loss vs. Collector current



Switching loss vs. Gate resistance



Reverse biased safe operating area



Transient thermal impedance

# HITACHI POWER SEMICONDUCTORS

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