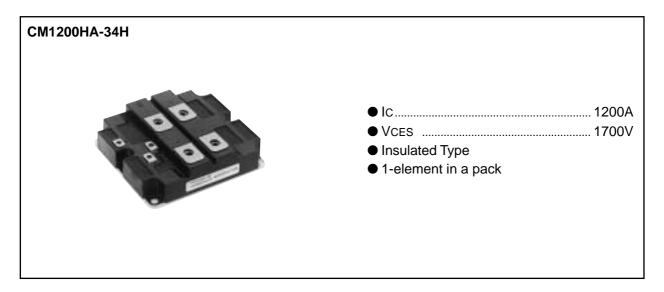




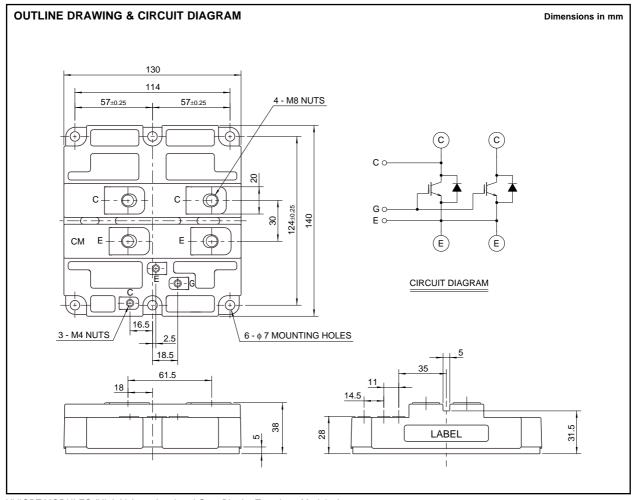
HVIGBT (High Voltage Insulated Gate Bipolar Transistor) Modules

HIGH POWER SWITCHING USE INSULATED TYPE



#### **APPLICATION**

Inverters, Converters, DC choppers, Induction heating, DC to DC converters.



HVIGBT MODULES (High Voltage Insulated Gate Bipolar Transistor Modules)





# HIGH POWER SWITCHING USE INSULATED TYPE

### HVIGBT (High Voltage Insulated Gate Bipolar Transistor) Modules

#### MAXIMUM RATINGS (Tj = 25°C)

| Symbol       | Item                          | Conditions  | Ratings      | Unit |
|--------------|-------------------------------|---|--------------|------|
| VCES         | Collector-emitter voltage     | VGE = 0V  | 1700         | V    |
| VGES         | Gate-emitter voltage          | VCE = 0V  | ±20          | V    |
| Ic           | Collector current             | Tc = 25°C   | 1200         | Α    |
| Ісм          | Collector current             | Pulse (Note 1)  | 2400         | Α    |
| IE (Note 2)  | Emitter current               | Tc = 25°C   | 1200         | Α    |
| IEM (Note 2) | Emilier current               | Pulse (Note 1)  | 2400         | Α    |
| PC (Note 3)  | Maximum collector dissipation | Tc = 25°C, IGBT part                                      | 12500        | W    |
| Tj           | Junction temperature          | _   | -40 ~ +150   | °C   |
| Tstg         | Storage temperature           | _   | -40 ~ +125   | °C   |
| Viso         | Isolation voltage             | Charged part to base plate, rms, sinusoidal, AC 60Hz 1min | 4000         | V    |
| _            | Mounting torque               | Main terminals screw M8                                   | 6.67 ~ 13.00 | N⋅m  |
|              |                               | Mounting screw M6   | 2.84 ~ 6.00  | N⋅m  |
|              |                               | Auxiliary terminals screw M4                              | 0.88 ~ 2.00  | N⋅m  |
| _            | Mass                          | Typical value   | 1.5          | kg   |

#### ELECTRICAL CHARACTERISTICS (Tj = 25°C)

| Symbol       | Item   | Conditions                             |                                  | Limits |       |       | Unit |
|--------------|--|--|----------------------------------|--------|-------|-------|------|
|              |  |  |                                  | Min    | Тур   | Max   | Unit |
| ICES         | Collector cutoff current   | VCE = VCES, VGE = 0V                   |                                  |        | _     | 24    | mA   |
| VGE(th)      | Gate-emitter threshold voltage   | IC = 120mA, VCE = 10V                  |                                  |        | 5.5   | 6.5   | V    |
| IGES         | Gate-leakage current   | VGE = VGES, VCE = 0V                   |                                  |        | _     | 0.5   | μΑ   |
| VCE(sat)     | Collector-emitter  | Tj = 25°C                              | 5°C (No. 40004 No. 45)/ (No. 45) | _      | 2.75  | 3.58  | V    |
|              | saturation voltage   | Tj = 125°C                             | IC = 1200A, VGE = 15V (Note 4)   | _      | 3.30  | _     |      |
| Cies         | Input capacitance  | V 40V                                  |                                  |        | 140   | _     | nF   |
| Coes         | Output capacitance   | VCE = 10V                              |                                  | _      | 20.0  | _     | nF   |
| Cres         | Reverse transfer capacitance   | VGE = 0V                               |                                  |        | 7.6   | _     | nF   |
| QG           | Total gate charge  | Vcc = 850V, Ic = 1200A, VGE = 15V      |                                  |        | 6.6   | _     | μC   |
| td (on)      | Turn-on delay time   | Vcc = 850V, Ic = 1200A                 |                                  |        | _     | 1.20  | μs   |
| tr           | Turn-on rise time  | VGE1 = VGE2 = 15V                      |                                  |        | _     | 1.50  | μs   |
| td (off)     | Turn-off delay time  | $RG = 1.6\Omega$                       |                                  |        | _     | 2.00  | μs   |
| tf           | Turn-off fall time   | Resistive load                         | _                                | _      | 0.60  | μs    |      |
| VEC (Note 2) | Emitter-collector voltage  | IE = 1200A, VGE = 0V                   |                                  |        | 2.40  | 3.12  | V    |
| trr (Note 2) | Reverse recovery time  | IE = 1200A                             |                                  | _      | _     | 2.00  | μs   |
| Qrr (Note 2) | Reverse recovery charge  | die / dt = -2400A / μs                 |                                  |        | 200   | _     | μС   |
| Rth(j-c)Q    | The amount on a single or a si | Junction to cas                        | se, IGBT part                    | _      | _     | 0.010 | K/W  |
| Rth(j-c)R    | Thermal resistance   | Junction to case, FWDi part            |                                  | _      | _     | 0.032 | K/W  |
| Rth(c-f)     | Contact thermal resistance   | Case to fin, conductive grease applied |                                  |        | 0.008 | _     | K/W  |

- Note 1. Pulse width and repetition rate should be such that the device junction temp. (Tj) does not exceed T<sub>jmax</sub> rating.

  2. IE, VEC, trr, Qrr & die/dt represent characteristics of the anti-parallel, emitter to collector free-wheel diode.
  - IE, VEC, trr, Qrr & die/dt represent characteristics of the anti-parallel
     Junction temperature (Tj) should not increase beyond 150°C.
  - 4. Pulse width and repetition rate should be such as to cause negligible temperature rise.



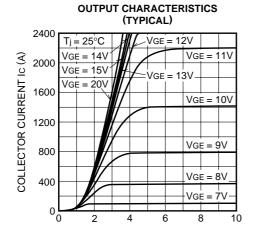


**HIGH POWER SWITCHING USE INSULATED TYPE** 

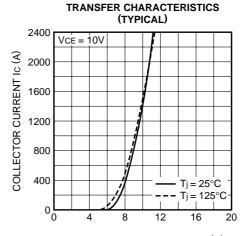
#### HVIGBT (High Voltage Insulated Gate Bipolar Transistor) Modules

#### **PERFORMANCE CURVES**

COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (V)

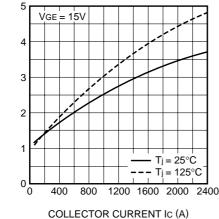


COLLECTOR-EMITTER SATURATION VOLTAGE VCE(sat) (V)

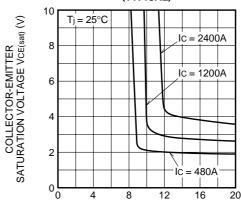


GATE-EMITTER VOLTAGE VGE (V)

#### **COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS** (TYPICAL)

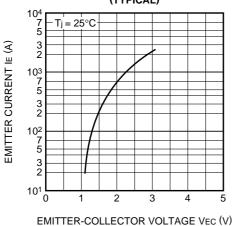


**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS** (TYPICAL)

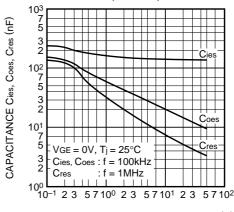


GATE-EMITTER VOLTAGE VGE (V)

#### FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



**CAPACITANCE VS. VCE** (TYPICAL)



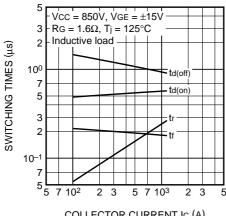
COLLECTOR-EMITTER VOLTAGE VCE (V)



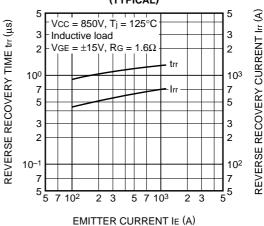
**HIGH POWER SWITCHING USE INSULATED TYPE** 

#### HVIGBT (High Voltage Insulated Gate Bipolar Transistor) Modules

## HALF-BRIDGE **SWITCHING CHARACTERISTICS** (TYPICAL)

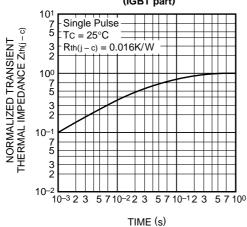


#### REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)

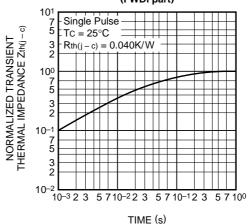


#### COLLECTOR CURRENT IC (A)

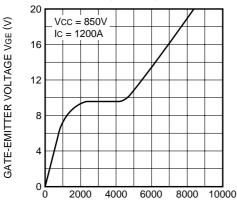
TRANSIENT THERMAL **IMPEDANCE CHARACTERISTICS** (IGBT part)



#### TRANSIENT THERMAL **IMPEDANCE CHARACTERISTICS** (FWDi part)



#### **VGE - GATE CHARGE** (TYPICAL)



GATE CHARGE QG (nC)