

MITSUBISHI HVIGBT MODULES  
**CM1200HC-66H**

3rd-Version HVIGBT (High Voltage Insulated Gate Bipolar Transistor) Modules

HIGH POWER SWITCHING USE  
 INSULATED TYPE

**CM1200HC-66H**



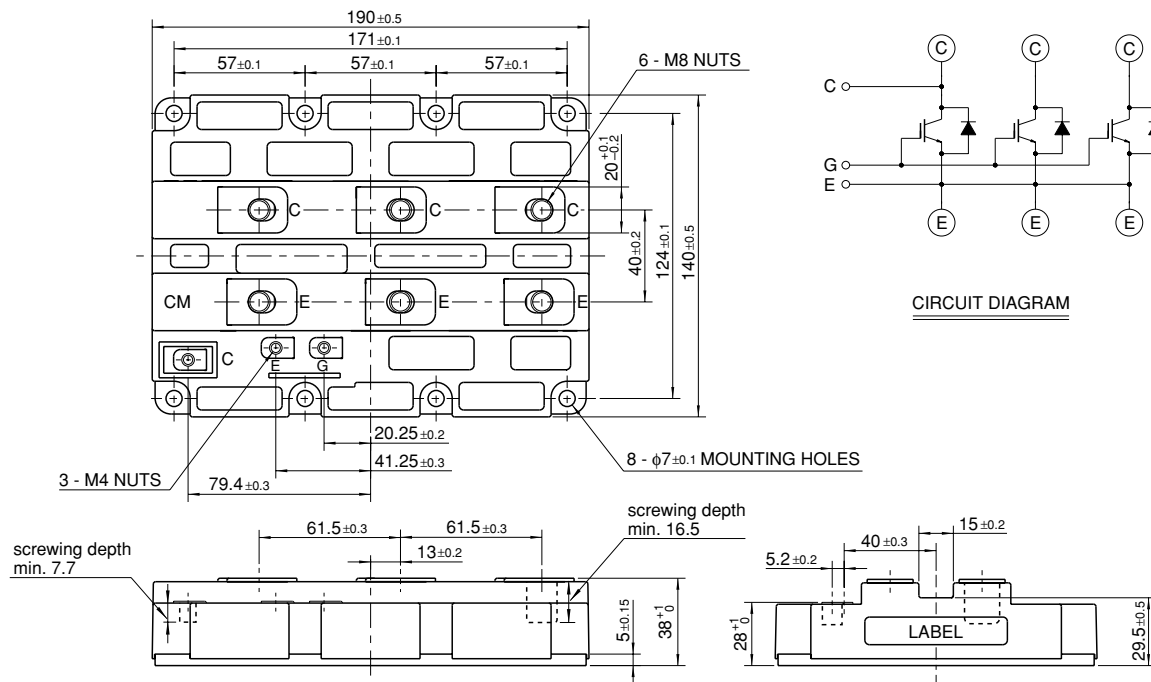
- IC ..... 1200A
- VCES ..... 3300V
- Insulated Type
- 1-element in a Pack
- AISiC Baseplate

**APPLICATION**

Traction drives, High Reliability Converters / Inverters, DC choppers

**OUTLINE DRAWING & CIRCUIT DIAGRAM**

Dimensions in mm



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Jul. 2005

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## MAXIMUM RATINGS

| Symbol                   | Item                              | Conditions                                                                                         | Ratings    | Unit |
|--------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------|------------|------|
| V <sub>CES</sub>         | Collector-emitter voltage         | V <sub>GE</sub> = 0V, T <sub>j</sub> = 25°C                                                        | 3300       | V    |
| V <sub>GES</sub>         | Gate-emitter voltage              | V <sub>CE</sub> = 0V, T <sub>j</sub> = 25°C                                                        | ±20        | V    |
| I <sub>C</sub>           | Collector current                 | T <sub>C</sub> = 100°C                                                                             | 1200       | A    |
| I <sub>CM</sub>          |                                   | Pulse (Note 1)                                                                                     | 2400       | A    |
| I <sub>E</sub> (Note 2)  | Emitter current                   |                                                                                                    | 1200       | A    |
| I <sub>EM</sub> (Note 2) |                                   | Pulse (Note 1)                                                                                     | 2400       | A    |
| P <sub>C</sub> (Note 3)  | Maximum power dissipation         | T <sub>C</sub> = 25°C, IGBT part                                                                   | 14700      | W    |
| T <sub>j</sub>           | Junction temperature              |                                                                                                    | −40 ~ +150 | °C   |
| T <sub>op</sub>          | Operating temperature             |                                                                                                    | −40 ~ +125 | °C   |
| T <sub>stg</sub>         | Storage temperature               |                                                                                                    | −40 ~ +125 | °C   |
| V <sub>iso</sub>         | Isolation voltage                 | RMS, sinusoidal, f = 60Hz, t = 1min.                                                               | 6000       | V    |
| t <sub>psc</sub>         | Maximum short circuit pulse width | V <sub>CC</sub> = 2200V, V <sub>CES</sub> ≤ 3300V, V <sub>GE</sub> = 15V<br>T <sub>j</sub> = 125°C | 10         | μs   |

## ELECTRICAL CHARACTERISTICS

| Symbol                    | Item                                 | Conditions                                                                                    | Limits |      |      | Unit    |
|---------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------|--------|------|------|---------|
|                           |                                      |                                                                                               | Min    | Typ  | Max  |         |
| I <sub>CES</sub>          | Collector cut-off current            | V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V, T <sub>j</sub> = 25°C              | —      | —    | 15   | mA      |
| V <sub>GE(th)</sub>       | Gate-emitter threshold voltage       | I <sub>C</sub> = 120mA, V <sub>CE</sub> = 10V, T <sub>j</sub> = 25°C                          | 5.0    | 6.0  | 7.0  | V       |
| I <sub>GES</sub>          | Gate leakage current                 | V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V, T <sub>j</sub> = 25°C              | —      | —    | 0.5  | μA      |
| V <sub>CE(sat)</sub>      | Collector-emitter saturation voltage | I <sub>C</sub> = 1200A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 25°C (Note 4)                 | —      | 3.30 | 4.20 | V       |
|                           |                                      | I <sub>C</sub> = 1200A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 125°C (Note 4)                | —      | 3.60 | —    |         |
| C <sub>ies</sub>          | Input capacitance                    | V <sub>CE</sub> = 10V, f = 100kHz<br>V <sub>GE</sub> = 0V, T <sub>j</sub> = 25°C              | —      | 180  | —    | nF      |
| C <sub>oes</sub>          | Output capacitance                   |                                                                                               | —      | 18.0 | —    | nF      |
| C <sub>res</sub>          | Reverse transfer capacitance         |                                                                                               | —      | 5.4  | —    | nF      |
| Q <sub>g</sub>            | Total gate charge                    | V <sub>CC</sub> = 1650V, I <sub>C</sub> = 1200A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 25°C | —      | 8.6  | —    | μC      |
| V <sub>EC</sub> (Note 2)  | Emitter-collector voltage            | I <sub>E</sub> = 1200A, V <sub>GE</sub> = 0V, T <sub>j</sub> = 25°C (Note 4)                  | —      | 2.80 | 3.60 | V       |
|                           |                                      | I <sub>E</sub> = 1200A, V <sub>GE</sub> = 0V, T <sub>j</sub> = 125°C (Note 4)                 | —      | 2.70 | —    |         |
| t <sub>d(on)</sub>        | Turn-on delay time                   | V <sub>CC</sub> = 1650V, I <sub>C</sub> = 1200A, V <sub>GE</sub> = ±15V                       | —      | —    | 1.60 | μs      |
| t <sub>r</sub>            | Turn-on rise time                    | R <sub>G(on)</sub> = 1.6Ω, T <sub>j</sub> = 125°C, L <sub>s</sub> = 100nH                     | —      | —    | 1.00 | μs      |
| E <sub>on</sub>           | Turn-on switching energy             | Inductive load                                                                                | —      | 1.60 | —    | J/pulse |
| t <sub>d(off)</sub>       | Turn-off delay time                  | V <sub>CC</sub> = 1650V, I <sub>C</sub> = 1200A, V <sub>GE</sub> = ±15V                       | —      | —    | 2.50 | μs      |
| t <sub>f</sub>            | Turn-off fall time                   | R <sub>G(off)</sub> = 1.6Ω, T <sub>j</sub> = 125°C, L <sub>s</sub> = 100nH                    | —      | —    | 1.00 | μs      |
| E <sub>off</sub>          | Turn-off switching energy            | Inductive load                                                                                | —      | 1.55 | —    | J/pulse |
| t <sub>rr</sub> (Note 2)  | Reverse recovery time                | V <sub>CC</sub> = 1650V, I <sub>C</sub> = 1200A, V <sub>GE</sub> = ±15V                       | —      | —    | 1.40 | μs      |
| Q <sub>rr</sub> (Note 2)  | Reverse recovery charge              | R <sub>G(on)</sub> = 1.6Ω, T <sub>j</sub> = 125°C, L <sub>s</sub> = 100nH                     | —      | 800  | —    | μC      |
| E <sub>rec</sub> (Note 2) | Reverse recovery energy              | Inductive load                                                                                | —      | 0.90 | —    | J/pulse |

Note 1. Pulse width and repetition rate should be such that junction temperature (T<sub>j</sub>) does not exceed T<sub>opmax</sub> rating (125°C).

2. The symbols represent characteristics of the anti-parallel, emitter to collector free-wheel diode (FWDi).

3. Junction temperature (T<sub>j</sub>) should not exceed T<sub>jmax</sub> rating (150°C).

4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

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## THERMAL CHARACTERISTICS

| Symbol         | Item                       | Conditions                                     | Limits |     |      | Unit |
|----------------|----------------------------|------------------------------------------------|--------|-----|------|------|
|                |                            |                                                | Min    | Typ | Max  |      |
| $R_{th(j-c)Q}$ | Thermal resistance         | Junction to Case, IGBT part                    | —      | —   | 8.5  | K/kW |
| $R_{th(j-c)R}$ |                            | Junction to Case, FWDi part                    | —      | —   | 17.0 | K/kW |
| $R_{th(c-f)}$  | Contact thermal resistance | Case to Fin, $\lambda_{grease} = 1W/m \cdot K$ | —      | 6.0 | —    | K/kW |

## MECHANICAL CHARACTERISTICS

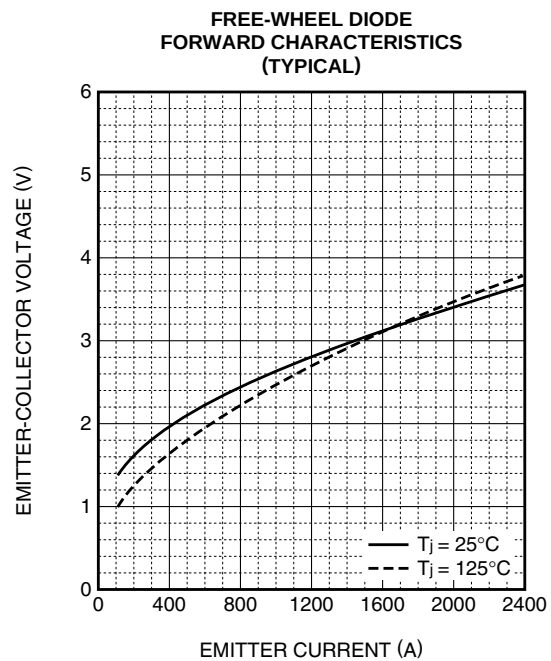
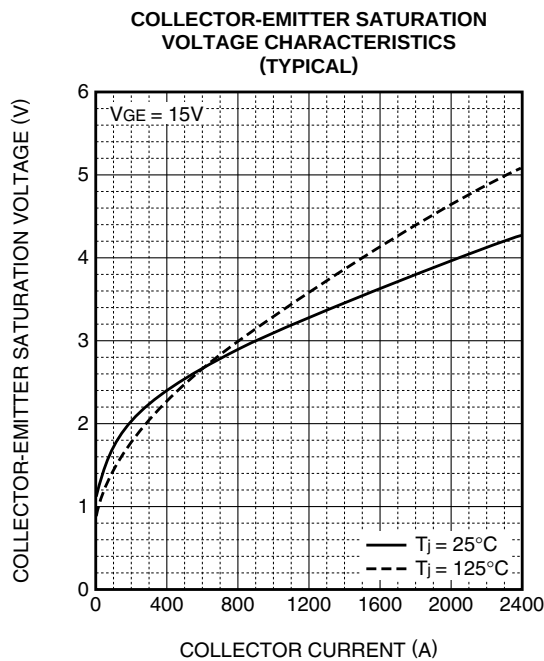
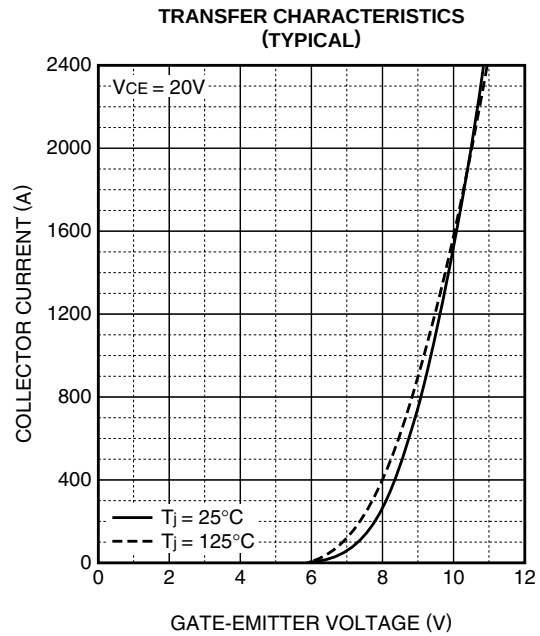
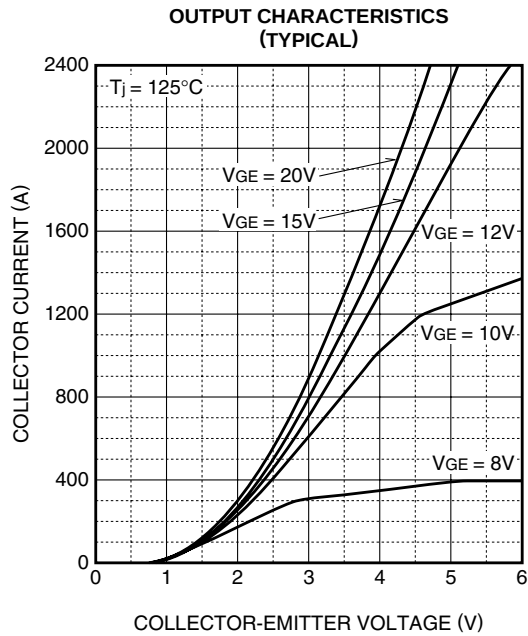
| Symbol    | Item                            | Conditions                     | Limits |      |      | Unit |
|-----------|---------------------------------|--------------------------------|--------|------|------|------|
|           |                                 |                                | Min    | Typ  | Max  |      |
| M         | Mounting torque                 | M8 : Main terminals screw      | 7.0    | —    | 13.0 | N·m  |
|           |                                 | M6 : Mounting screw            | 3.0    | —    | 6.0  |      |
|           |                                 | M4 : Auxiliary terminals screw | 1.0    | —    | 2.0  |      |
| —         | Mass                            |                                | —      | 1.5  | —    | kg   |
| CTI       | Comparative tracking index      |                                | 600    | —    | —    | —    |
| $d_a$     | Clearance distance in air       |                                | 19.5   | —    | —    | mm   |
| $d_s$     | Creepage distance along surface |                                | 32.0   | —    | —    | mm   |
| LC-E(int) | Internal inductance             | IGBT part                      | —      | 10   | —    | nH   |
| RC-E(int) | Internal lead resistance        | $T_c = 25^\circ C$             | —      | 0.16 | —    | mΩ   |

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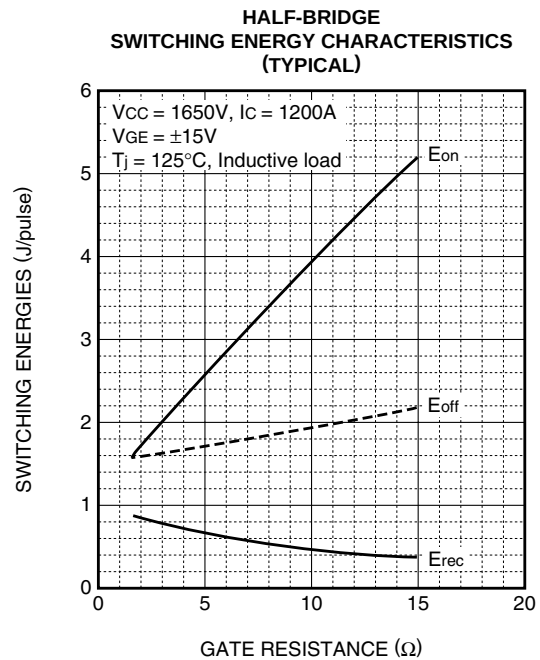
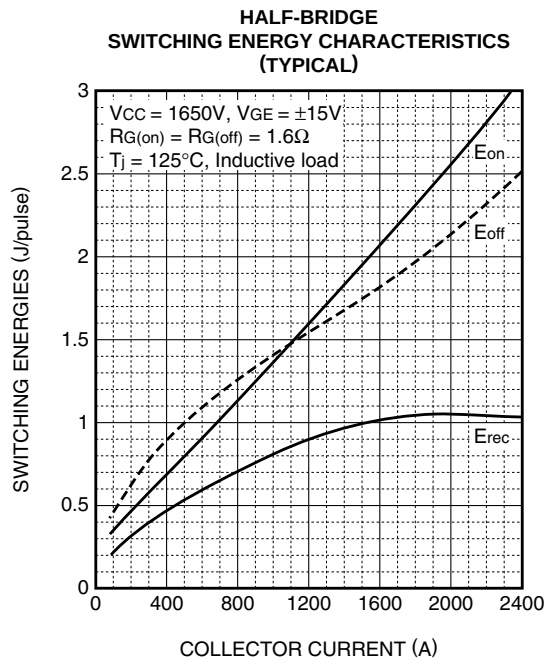
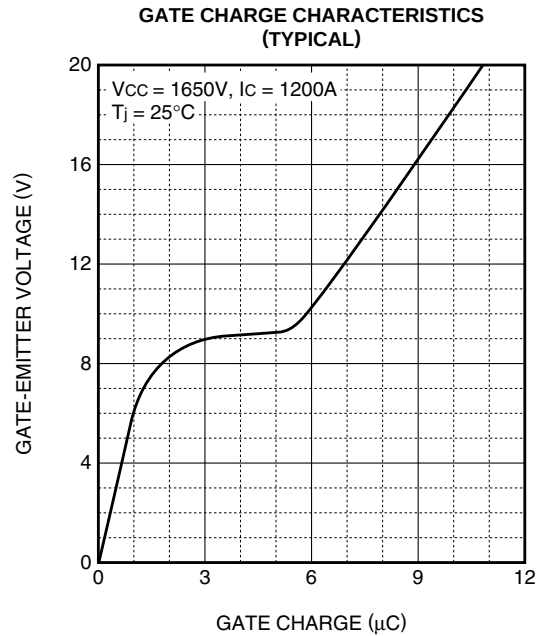
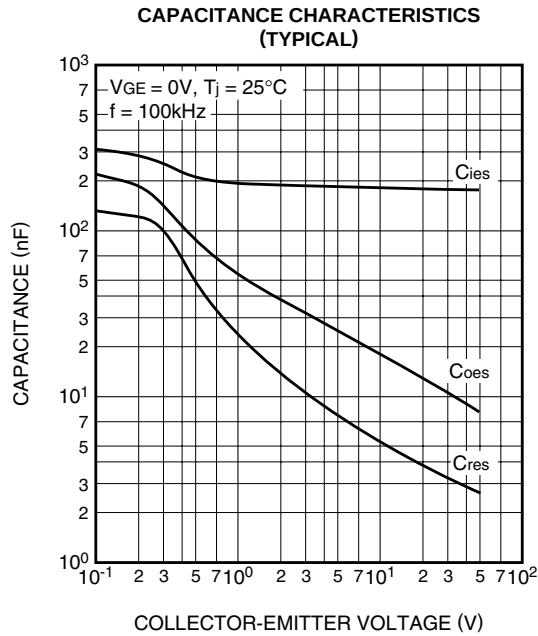
## PERFORMANCE CURVES



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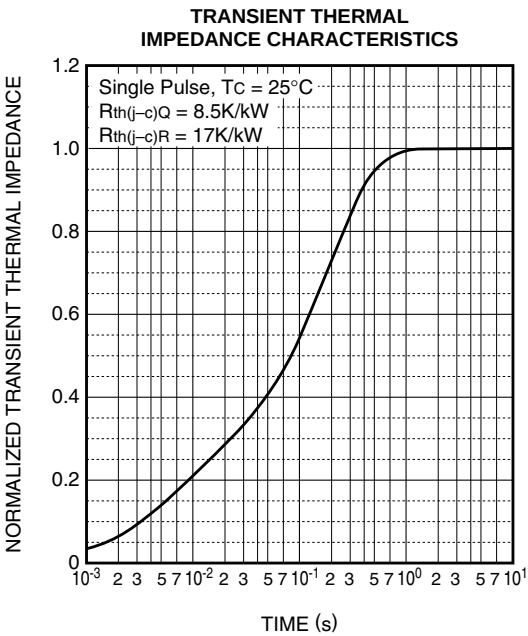
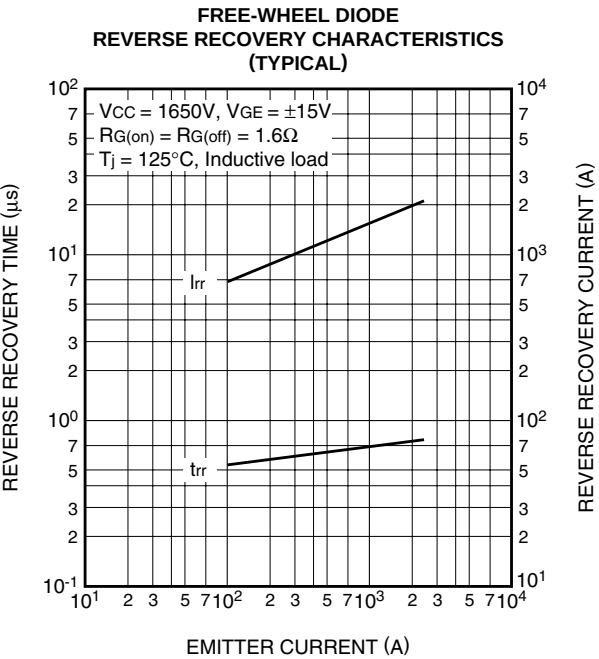
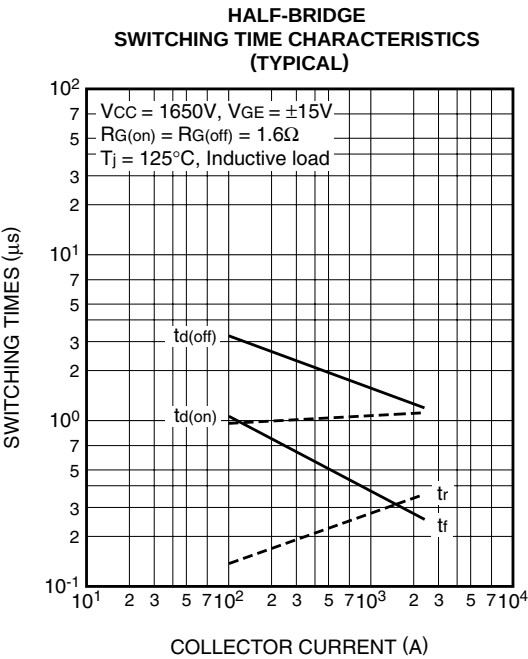
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