



SANYO Semiconductors

# DATA SHEET

An ON Semiconductor Company

## TIG110GMH — N-Channel Non Punch Through IGBT High Power High Speed Switching Applications

### Features

- Low-saturation voltage
- Ultrahigh speed switching
- Enhancement type

### Specifications

Absolute Maximum Ratings at Ta=25°C, Unless otherwise specified

| Parameter                    | Symbol            | Conditions  | Ratings                  | Unit |
|------------------------------|-------------------|---|--------------------------|------|
| Collector-to-Emitter Voltage | V <sub>CE</sub> S |   | 600                      | V    |
| Gate-to-Emitter Voltage      | V <sub>GES</sub>  |   | ±30                      | V    |
| Collector Current (DC)       | I <sub>C</sub> *1 | Limited by T <sub>jmax</sub>                                      | 36                       | A    |
|                              | I <sub>C</sub> *2 | Limited by T <sub>jmax</sub>                                      | @T <sub>c</sub> =25°C*3  | 23   |
|                              |                   |   | @T <sub>c</sub> =100°C*3 | 12   |
| Collector Current (Pulse)    | I <sub>CP</sub>   | Pulse width Limited by T <sub>jmax</sub>                          | 144                      | A    |
| Allowable Power Dissipation  | P <sub>D</sub>    |   | 3                        | W    |
|                              |                   | T <sub>c</sub> =25°C (SANYO's ideal heat dissipation condition)*3 | 60                       | W    |
| Junction Temperature         | T <sub>j</sub>    |   | 150                      | °C   |
| Storage Temperature          | T <sub>stg</sub>  |   | -55 to +150              | °C   |

Note : \*1 Shows chip capability

\*2 Collector current is calculated from the following formula

$$I_C(T_C) = \frac{T_{jmax} - T_C}{R_{th(j-c)} \times V_{CE(sat)max}(T_{jmax}, I_C(T_C))}$$

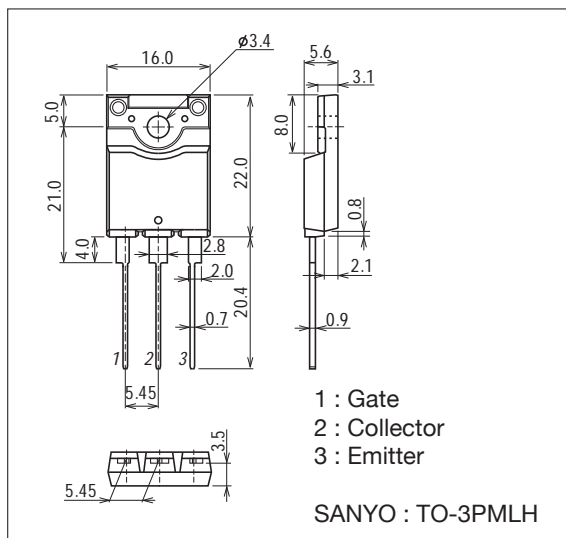
\*3 SANYO's condition is radiation from backside.

The method is applying silicone grease to the backside of the device and attaching the device to water-cooled radiator made of aluminium.

### Package Dimensions

unit : mm (typ)

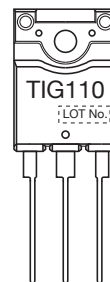
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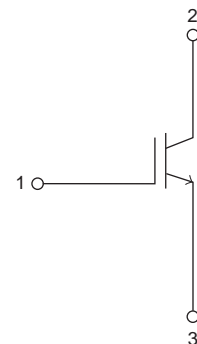
### Product & Package Information

- Package : TO-3PMLH
- JEITA, JEDEC : SC-93, TO-247, SOT-199
- Minimum Packing Quantity : 100 pcs./tray

### Marking



### Electrical Connection



# TIG110GMH

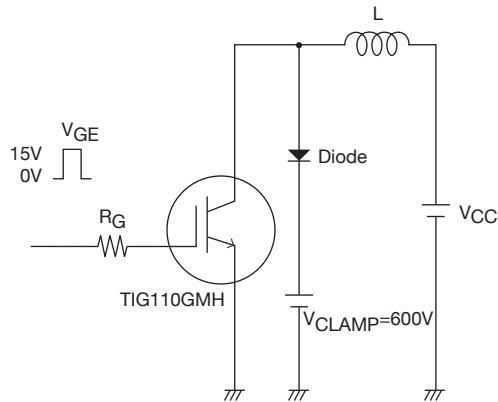
## Electrical Characteristics at $T_j=25^\circ\text{C}$ , Unless otherwise specified

| Parameter                               | Symbol         | Conditions  | Ratings |      |           | Unit          |
|---|----------------|---|---------|------|-----------|---------------|
|   |                |   | min     | typ  | max       |               |
| Collector-to-Emitter Breakdown Voltage  | $V_{(BR)CES}$  | $I_C=1\text{mA}, V_{GE}=0\text{V}$  | 600     |      |           | V             |
| Collector-to-Emitter Cutoff Current     | $I_{CES}$      | $V_{CE}=600\text{V}, V_{GE}=0\text{V}$  |         |      | 100       | $\mu\text{A}$ |
|   |                |   |         |      | 1         | mA            |
| Gate-to-Emitter Leakage Current         | $I_{GES}$      | $V_{GE}=\pm 30\text{V}, V_{CE}=0\text{V}$   |         |      | $\pm 100$ | nA            |
| Gate-to-Emitter Threshold Voltage       | $V_{GE(off)}$  | $V_{CE}=10\text{V}, I_C=1\text{mA}$   | 4.0     | 5.0  | 6.0       | V             |
| Collector-to-Emitter Saturation Voltage | $V_{CE(sat)1}$ | $V_{GE}=15\text{V}, I_C=15\text{A}$   |         | 1.6  | 2.0       | V             |
|   | $V_{CE(sat)2}$ | $V_{GE}=15\text{V}, I_C=40\text{A}$   |         | 2.2  |           | V             |
| Input Capacitance                       | $C_{ies}$      | $V_{CE}=30\text{V}, f=1\text{MHz}$  |         | 2880 |           | pF            |
| Output Capacitance                      | $C_{oes}$      |   |         | 45   |           | pF            |
| Reverse Transfer Capacitance            | $C_{res}$      |   |         | 38   |           | pF            |
| Turn-ON Delay Time                      | $t_{d(on)}$    |   |         | 65   |           | ns            |
| Rise Time                               | $t_r$          | $L=200\mu\text{H}, V_{GE}=15\text{V}, I_C=15\text{A}, V_{CC}=300\text{V}, R_g=30\Omega$ , See specified Test Circuit. |         | 30   |           | ns            |
| Turn-ON Time                            | $t_{on}$       |   |         | 300  |           | ns            |
| Turn-OFF Delay Time                     | $t_{d(off)}$   |   |         | 250  |           | ns            |
| Fall Time                               | $t_f$          |   |         | 120  |           | ns            |
| Turn-OFF Time                           | $t_{off}$      |   |         | 450  |           | ns            |
| Total Gate Charge                       | $Q_g$          |   |         |      | 95        |               |
| Gate-to-Source Charge                   | $Q_{gs}$       | $V_{CE}=300\text{V}, V_{GE}=15\text{V}, I_C=15\text{A}$   |         | 20   |           | nC            |
| Gate-to-Drain "Miller" Charge           | $Q_{gd}$       |   |         | 30   |           | nC            |

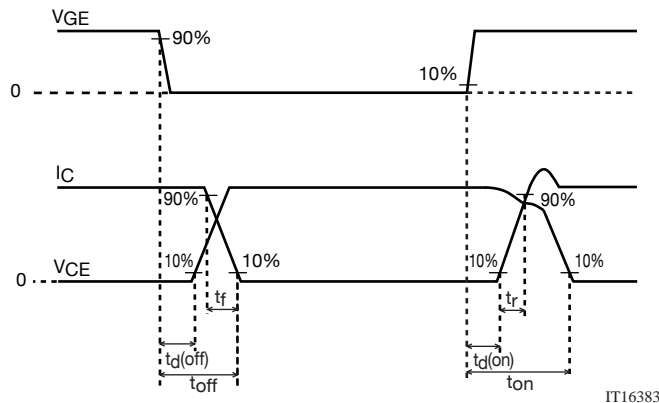
## Thermal Characteristics at $T_a=25^\circ\text{C}$ , Unless otherwise specified

| Parameter                                  | Symbol        | Conditions  | Ratings |     |      | Unit                        |
|--|---------------|---|---------|-----|------|-----------------------------|
|  |               |   | min     | typ | max  |                             |
| Thermal Resistance (Junction- Case)        | $R_{th(j-c)}$ | $T_c=25^\circ\text{C}$ (SANYO's ideal heat dissipation condition)*3 |         |     | 2.08 | $^\circ\text{C} / \text{W}$ |
| Thermal Resistance (Junction- at mosphere) | $R_{th(j-a)}$ |   |         |     | 41.7 | $^\circ\text{C} / \text{W}$ |

## Switching Time Test Circuit

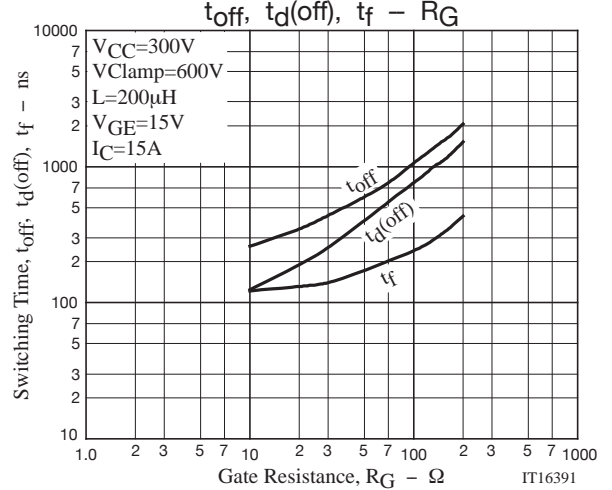
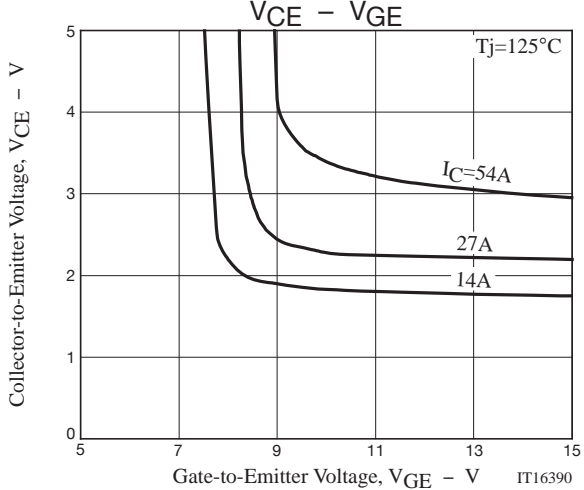
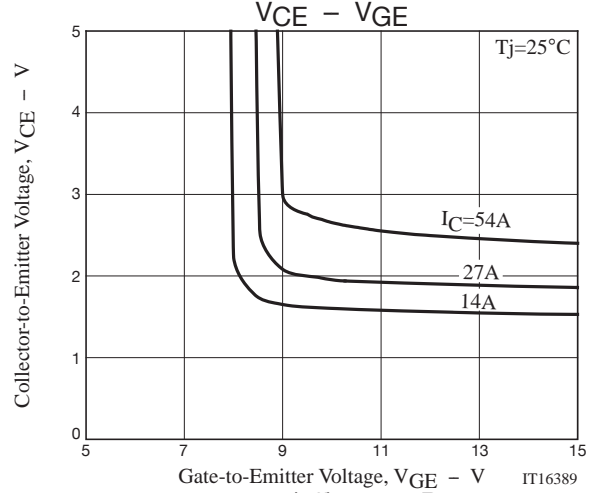
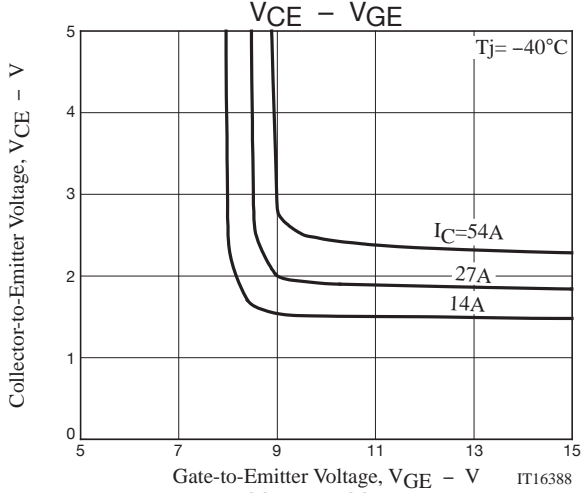
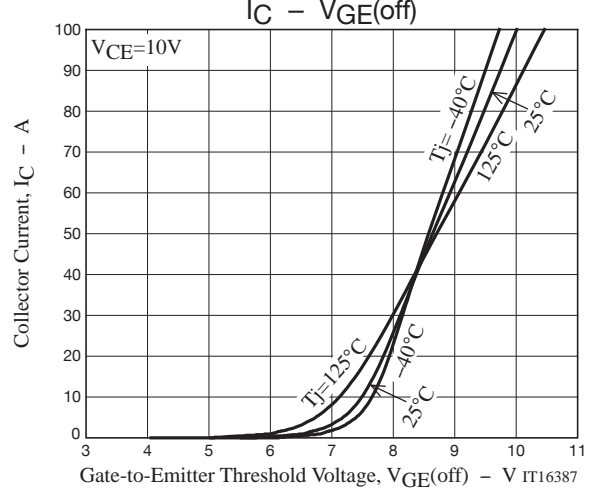
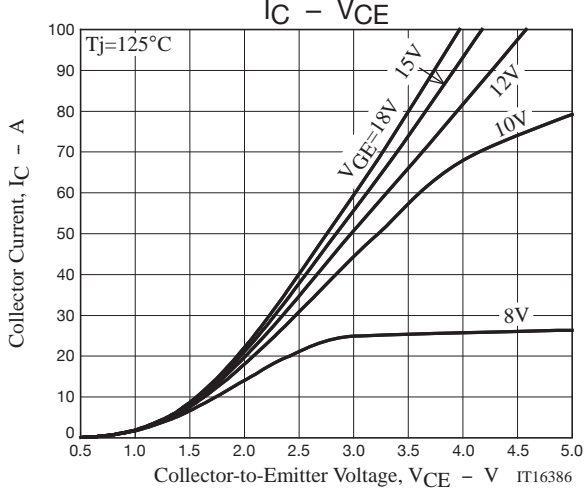
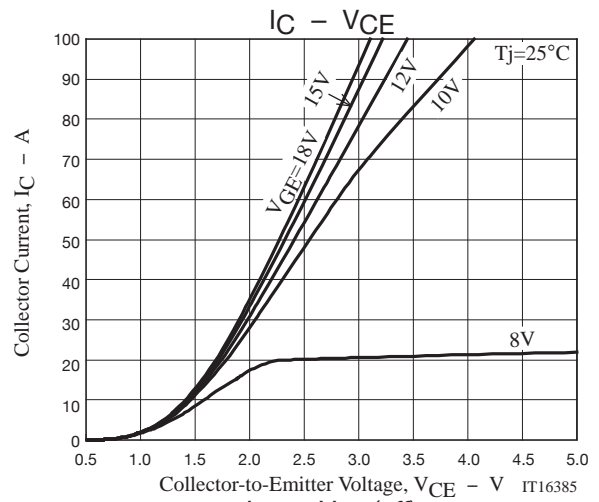
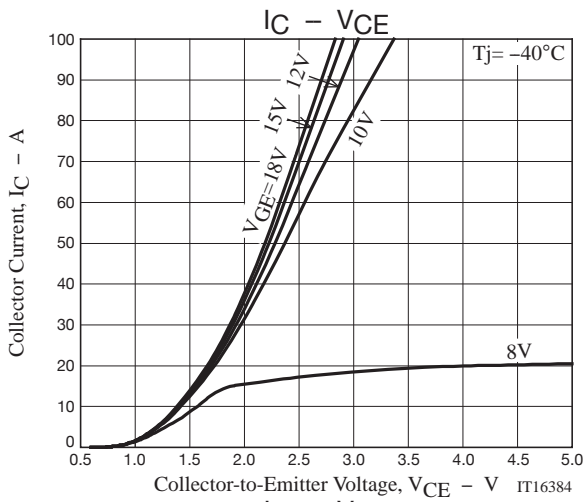


## Timing Chart

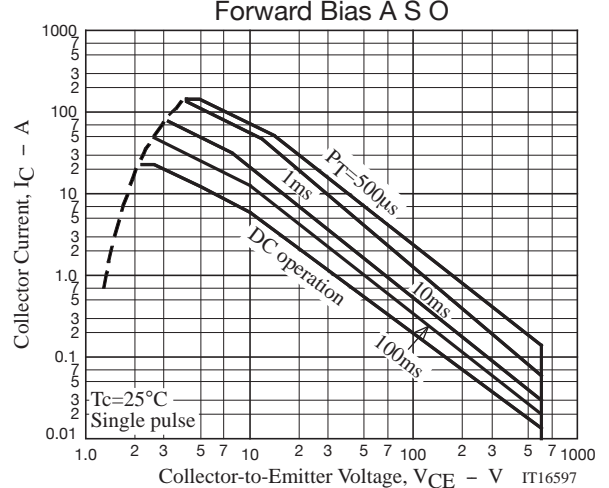
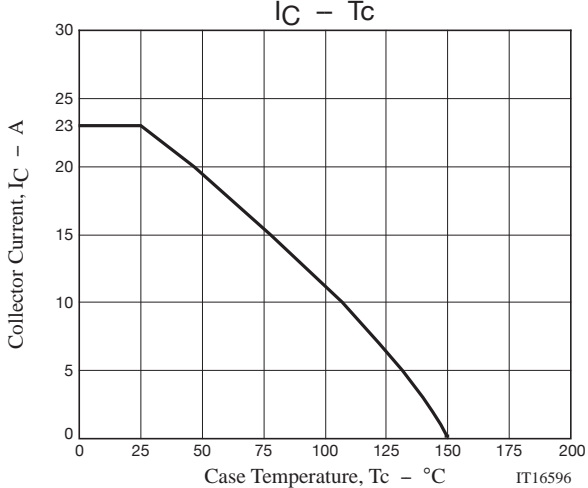
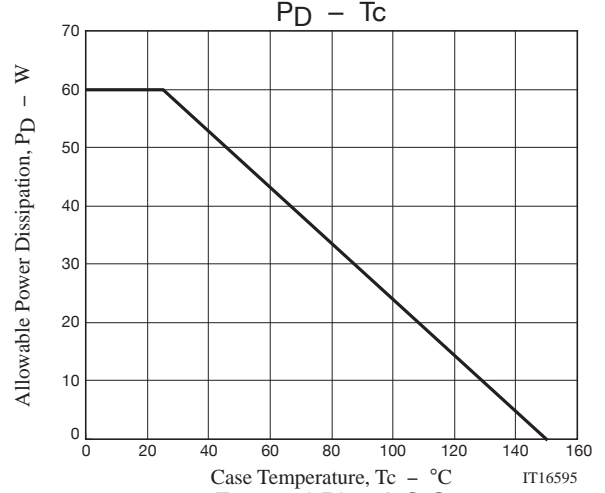
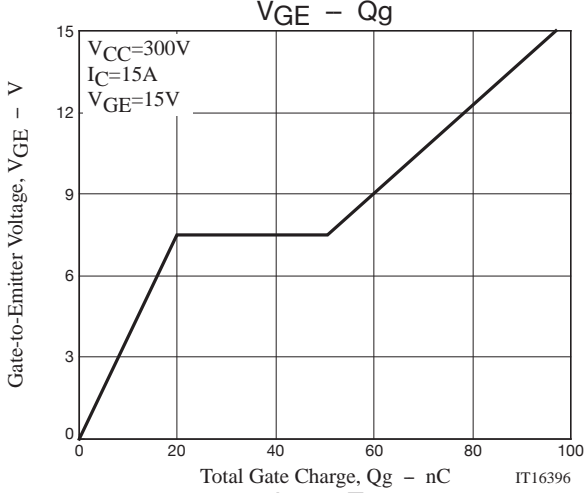
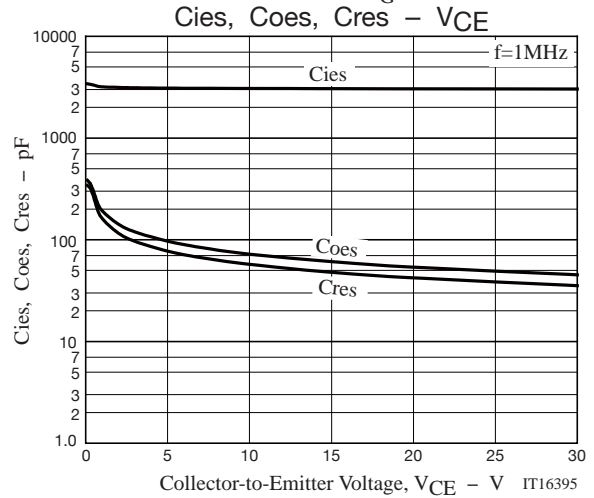
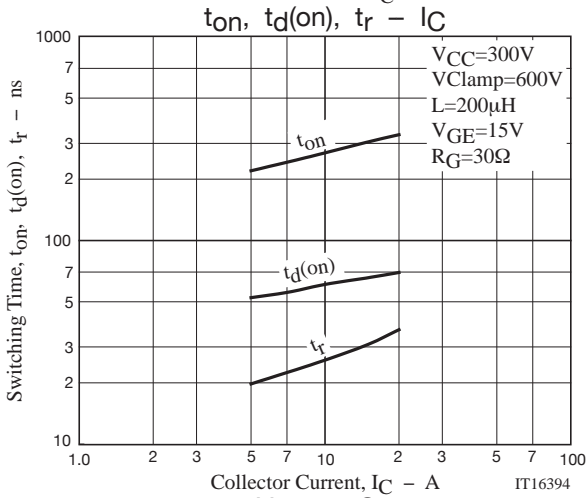
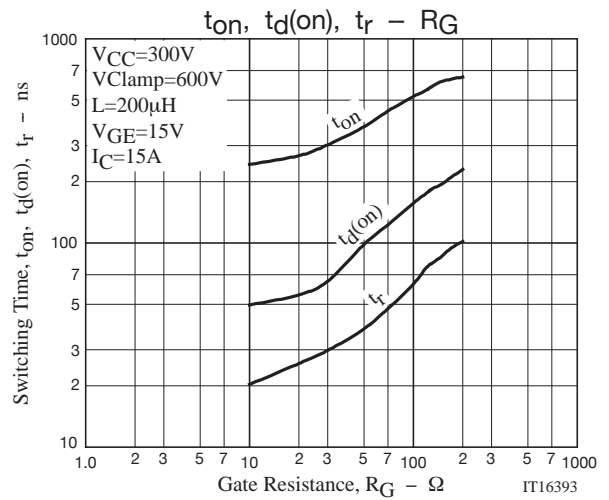
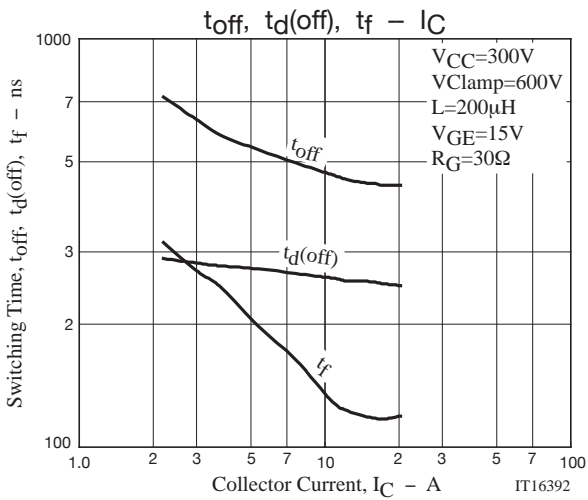


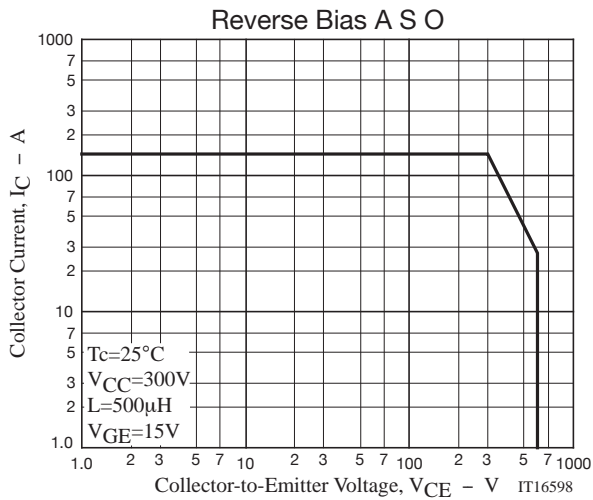
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