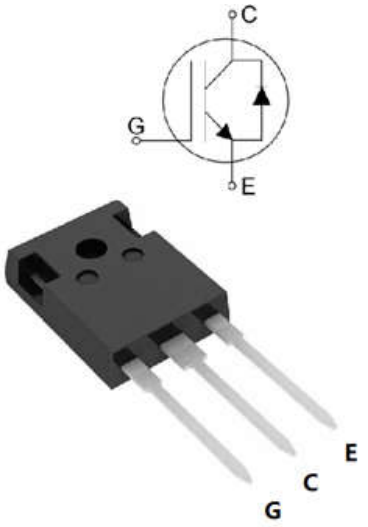
# HG10N120T1

***1200V /10A Trench Field Stop IGBT***

| | | |
|---|---|---|
| $V_{CE}$ | **1200** | **V** |
| $I_C$ | **10** | **A** |
| $V_{CE(SAT)}$ $I_C$=10A | **1.60** | **V** |

## FEATURES

- High breakdown voltage to 1200V for improved reliability
- Trench-Stop Technology offering :
  - very tight parameter distribution
  - high ruggedness, temperature stable behavior
  - Short circuit withstand time – 10μs
  - High ruggedness, temperature stable
  - Low $V_{CE(SAT)}$
  - Easy parallel switching capability due to positive temperature coefficient in $V_{CE(SAT)}$
- Enhanced avalanche capability




## APPLICATION

- Frequency Converters
- Motor Drive

| Product | Package | Packaging |
|---|---|---|
| HG10N120T1 | TO247 | Tube |

## Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Emitter Breakdown Voltage | $V_{CE}$ | 1200 | V |
| DC collector current, limited by $T_{jmax}$<br>$T_C$ = 25°C<br>$T_C$ = 100°C | $I_C$ | 20<br>10 | A |
| Diode Forward current, limited by $T_{jmax}$<br>$T_C$ = 25°C<br>$T_C$ = 100°C | $I_F$ | 20<br>10 | A |
| Continuous Gate-emitter voltage | $V_{GE}$ | ±20 | V |
| Transient Gate-emitter voltage | $V_{GE}$ | ±30 | V |
| Turn off safe operating area $V_{CE}$ ≤1200V,<br>$T_j$ ≤ 150°C | - | 40 | A |
| Pulsed collector current, $V_{GE}$= 15V,<br>$t_p$ limited by $T_{jmax}$ | $I_{CM}$ | 40 | A |
| Short Circuit Withstand Time, $V_{GE}$= 15V,<br>$V_{CE}$≤ 600V | Tsc | 10 | μs |
| Power dissipation , $T_j$=25°C | $P_{tot}$ | 260 | W |
| Operating junction temperature | $T_j$ | -40...+150 | °C |
| Storage temperature | $T_s$ | -55...+150 | °C |
| Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s | - | 260 | °C |

## Thermal Resistance

| Parameter | Symbol | Max. Value | Unit |
|---|---|---|---|
| IGBT thermal resistance,<br>junction - case | $R_{\theta}$(j-c) | 0.69 | K/W |
| Diode thermal resistance,<br>junction - case | $R_{\theta}$(j-c) | 1.5 | K/W |
| Thermal resistance,<br>junction - ambient | $R_{\theta}$(j-a) | 40 | K/W |

## Electrical Characteristics of the IGBT（$T_j$= 25℃ unless otherwise specified）：

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Collector-Emitter breakdown voltage | $BV_{CES}$ | $V_{GE}$=0V , $I_C$=250μA | 1200 | - | - | V |
| Gate threshold voltage | $V_{GE(th)}$ | $V_{GE}$=$V_{CE}$, $I_C$=250μA | 5.2 | 5.8 | 6.8 | V |
| Collector-Emitter Saturation voltage | $V_{CE(sat)}$ | $V_{GE}$=15V, $I_C$=10A<br>$T_j$ = 25°C<br>$T_j$ = 150°C | <br>-<br>- | <br>1.60<br>1.95 | <br>1.95<br>- | V |
| Zero gate voltage collector current | $I_{CES}$ | $V_{CE}$ = 1200V, $V_{GE}$ = 0V<br>$T_j$ = 25°C<br>$T_j$ = 150°C | <br>-<br>- | <br>-<br>- | <br>100<br>1000 | μA |
| Gate-emitter leakage current | $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ± 20V | - | - | 100 | nA |
| Transconductance | *gfs* | $V_{CE}$ = 20V, $I_C$ = 10A | - | 10 | - | S |

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Dynamic** | | | | | | |
| Input capacitance | $C_{ies}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | - | 1510 | - | pF |
| Output capacitance | $C_{oes}$ | | - | 50 | - | |
| Reverse transfer capacitance | $C_{res}$ | | - | 18 | - | |
| Gate charge | $Q_G$ | $V_{CC}$ = 960V, $I_C$ = 15A, $V_{GE}$ = 15V | - | 84 | - | nC |

## Switching Characteristic, Inductive Load

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Dynamic , at $T_j$ = 25° C** | | | | | | |
| Turn-on delay Time | $t_{d(on)}$ | $V_{CC}$ = 600V, $I_C$ = 10A, $V_{GE}$ = 0/15V, $R_g$=12Ω | - | 22 | - | ns |
| Rise Time | $t_r$ | | - | 15 | - | ns |
| Turn-off delay time | $td_{(off)}$ | | - | 70 | - | ns |
| Fall time | $t_f$ | | - | 77 | - | ns |
| Turn-on Energy | $E_{on}$ | | | 1.20 | - | mJ |
| Turn-off energy | $E_{off}$ | | - | 0.17 | - | mJ |

## Electrical Characteristics of the DIODE（$T_j$= 25℃ unless otherwise specified）

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Dynamic** | | | | | | |
| Diode Forward Voltage | $V_{FM}$ | $I_F$ = 10A | - | 2.3 | - | V |
| Reverse Recovery Time | $T_{rr}$ | $I_F$= 15A, di/dt= 600A/μs | - | 270 | - | ns |
| Reverse Recovery Current | $I_{rr}$ | | - | 10 | - | A |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 1800 | - | nC |

Fig. 1 FBSOA characteristics

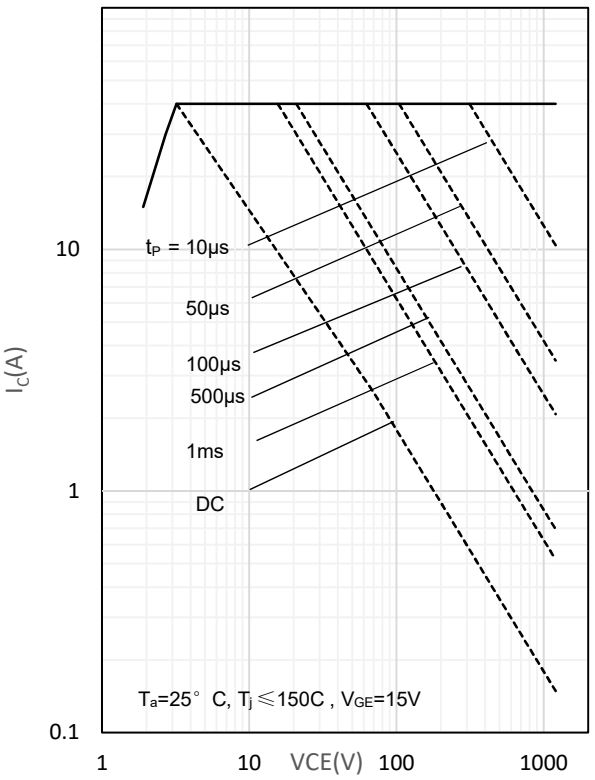



Fig. 2 Load Current vs. Frequency

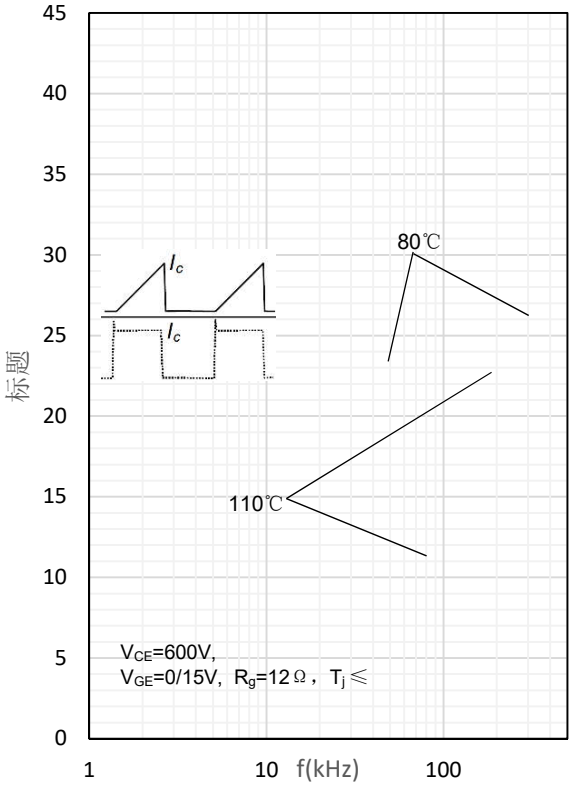



Fig. 3 Output characteristics

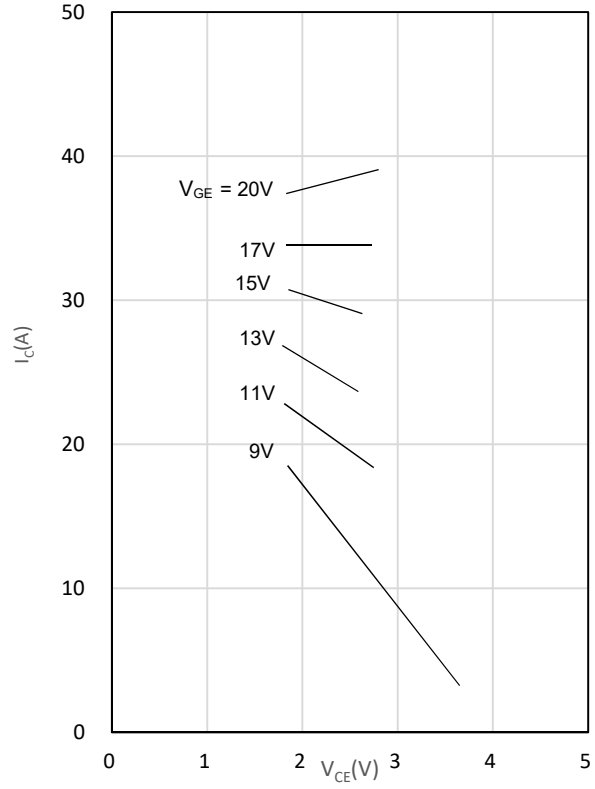



Fig. 4 Saturation voltage characteristics

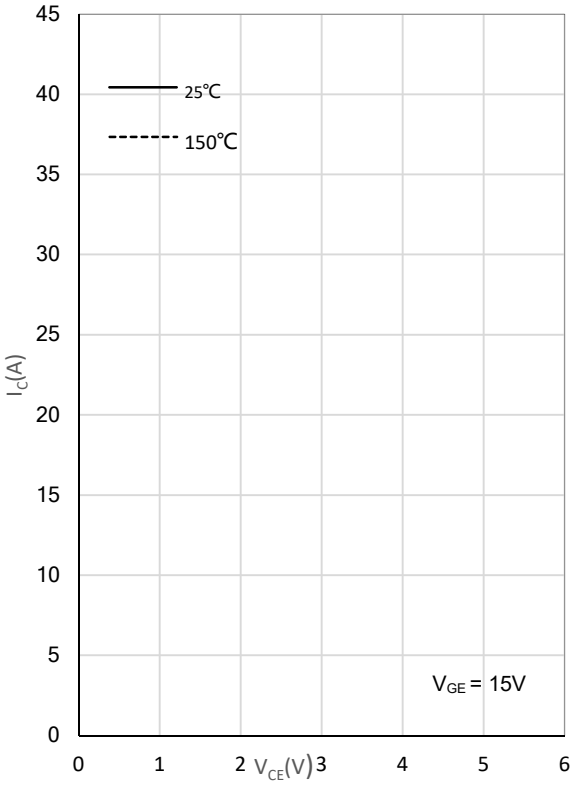


Fig. 5 Switching times vs. gate resistor

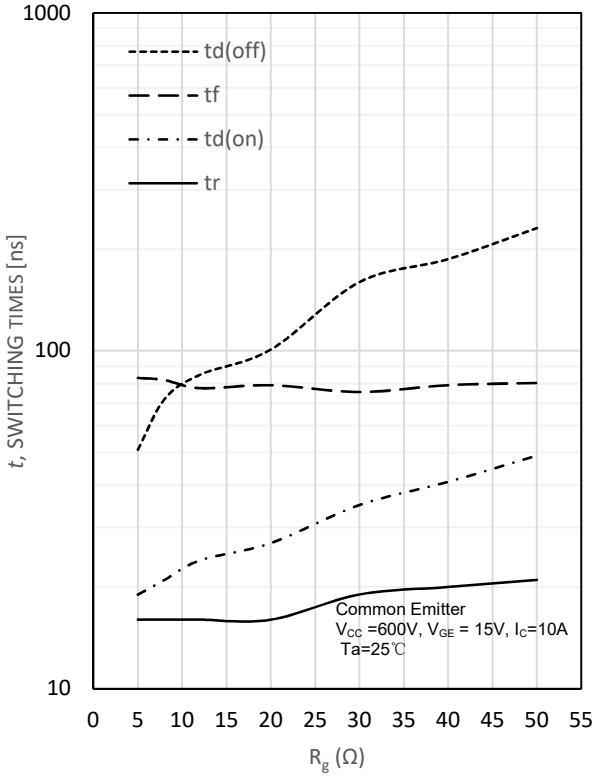



Fig. 6 Switching times vs. collector current

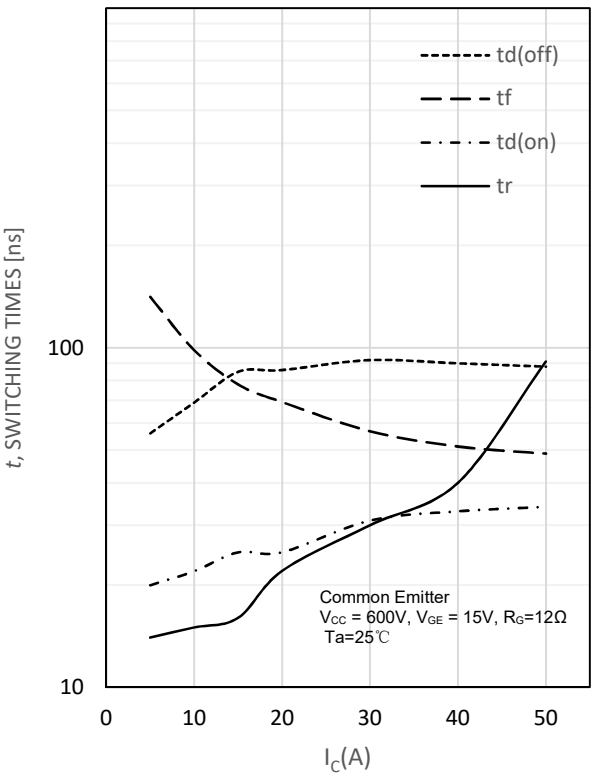



Fig. 7 Switching loss vs. gate resistor

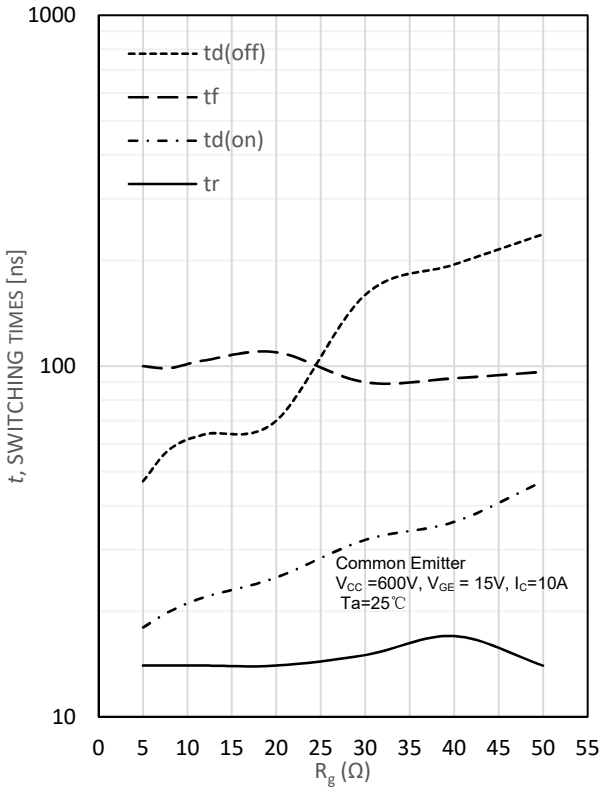



Fig. 8 Switching loss vs. collector current

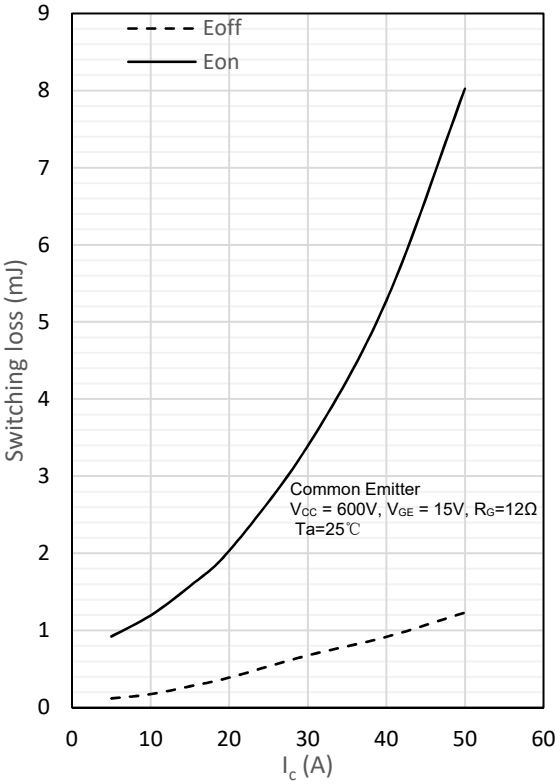


Fig. 9 Gate charge characteristics

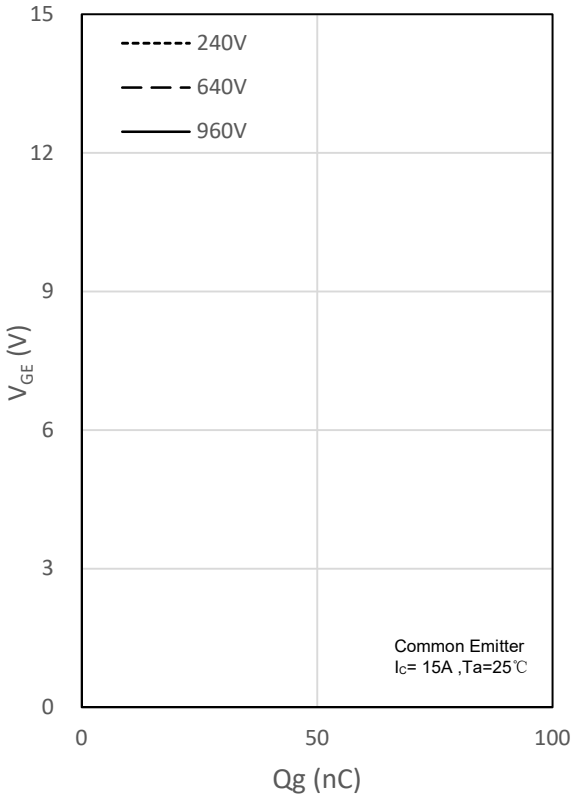
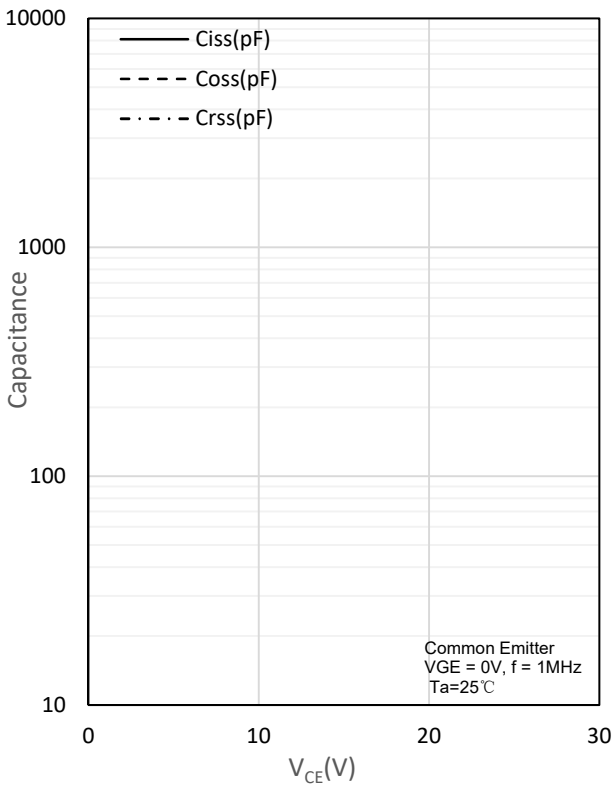



Fig. 10 Capacitance characteristics



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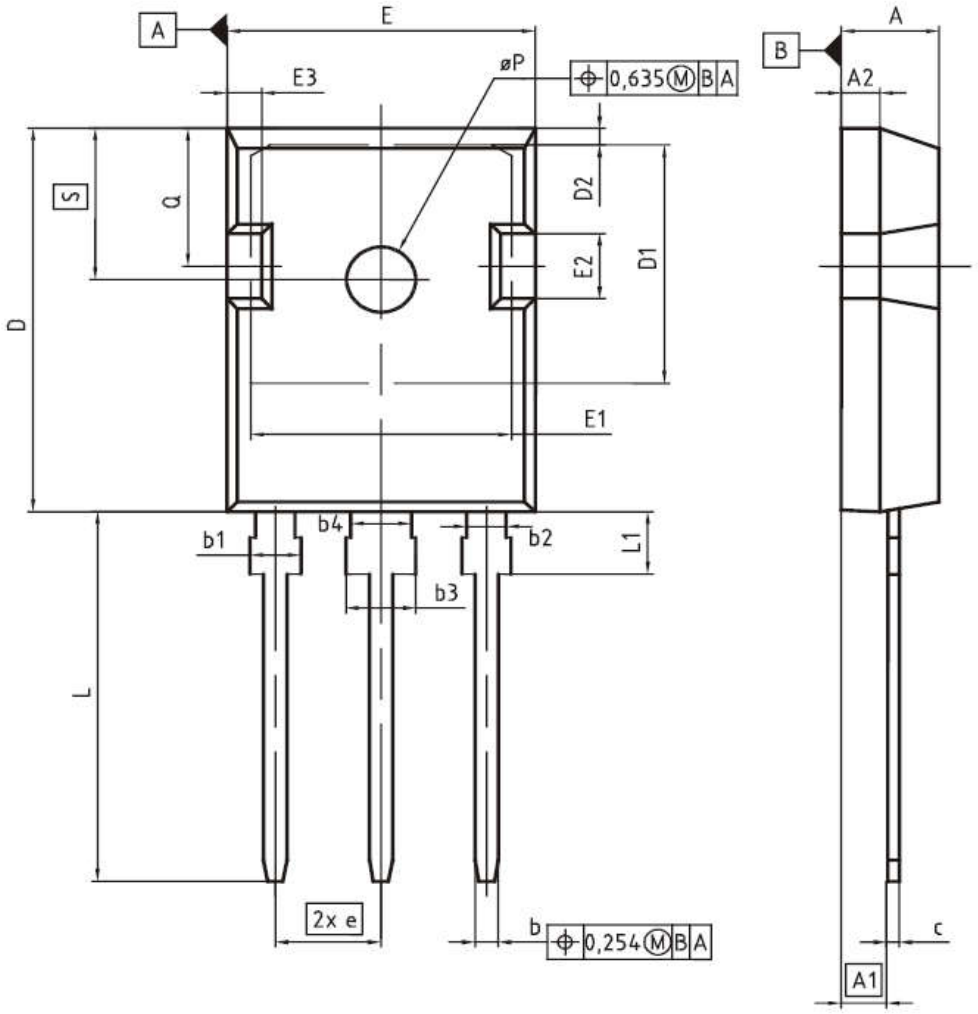
A
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c
A1