SPTECH
深圳市质超微电子有限公司

# SPT25N135F1A

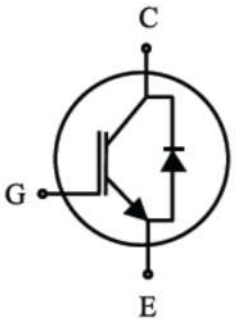
**1350V /25A Trench Field Stop IGBT**

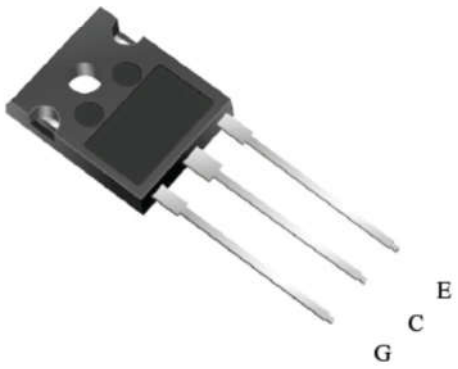
Field Stop Trench IGBTs offer low switching losses, high energy efficiency and high avalanche ruggedness for soft switching applications such as inductive heating, microwave oven, etc.

| | | |
|---|---|---|
| $V_{CE}$ | 1350 | V |
| $I_C$ | 25 | A |
| $V_{CE(SAT)}$ $I_C$=25A | 2.0 | V |

## FEATURES

- High breakdown voltage to 1350V for improved reliability
- Trench-Stop Technology offering :
  - ➢ High speed switching
  - ➢ High ruggedness, temperature stable
  - ➢ Low $V_{CEsat}$
  - ➢ Easy parallel switching capability due to positive temperature coefficient in $V_{CEsat}$
- Soft current turn-off waveforms
- Enhanced avalanche capability




## APPLICATION

- Inductive cooking
- Inverterized microwave ovens
- Resonant converters
- Soft switching applications

## Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Emitter Breakdown Voltage | $V_{CE}$ | 1350 | V |
| DC collector current, limited by $T_{jmax}$<br>$T_C$ = 25°C<br>$T_C$ = 100°C | $I_C$ | 50<br>25 | A |
| Diode Forward current, limited by $T_{jmax}$<br>$T_C$ = 25°C<br>$T_C$ = 100°C | $I_F$ | 50<br>25 | A |
| Pulsed collector current, $t_p$ limited by $T_{jmax}$ | $I_{Cpuls}$ | 75 | A |
| Turn off safe operating area $V_{CE}$ ≤1350V,<br>$T_j$ ≤ 150°C | - | 75 | A |
| 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) | 0.48 | K/W |
| Diode thermal resistance,<br>junction - case | $R_{\theta}$(j-c) | 1.2 | 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 , $I_C$=1mA | 1350 | 1450 | - | V |
| | | $V_{GE}$=0V , $I_C$=10mA | 1350 | 1450 | - | V |
| Gate threshold voltage | $V_{GE(th)}$ | $V_{GE}$=$V_{CE}$, $I_C$=250μA | 5.1 | 5.8 | 6.4 | V |
| Collector-Emitter Saturation voltage | $V_{CE(sat)}$ | $V_{GE}$=15V, $I_C$=25A<br>$T_j$ = 25°C<br>$T_j$ = 150°C | -<br>- | 2.0<br>2.5 | 2.5<br>- | V |
| Zero gate voltage collector current | $I_{CES}$ | $V_{CE}$ = 1350V, $V_{GE}$ = 0V<br>$T_j$ = 25°C<br>$T_j$ = 150°C | -<br>- | <1<br>- | 100<br>1000 | μA |
| Gate-emitter leakage current | $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = 20V | - | - | 100 | nA |

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Dynamic** | | | | | | |
| Input capacitance | $C_{ies}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | - | 2500 | - | pF |
| Output capacitance | $C_{oes}$ | | - | 70 | - | |
| Reverse transfer capacitance | $C_{res}$ | | - | 50 | - | |
| Gate charge | $Q_G$ | $V_{CC}$ = 600V, $I_C$ = 25A, $V_{GE}$ = 15V | - | 125 | - | nC |

## Switching Characteristic, Inductive Load

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Dynamic , at $T_j$ = 25° C** | | | | | | |
| Turn-off delay time | $td_{(off)}$ | $V_{CC}$ = 600V, $I_C$ = 25A, $V_{GE}$ = 0/15V, $R_g$=10Ω | - | 180 | - | ns |
| Fall time | $t_f$ | | - | 40 | - | ns |
| Turn-off energy | $E_{off}$ | | - | 0.32 | - | mJ |
| **Dynamic , at $T_j$ = 150° C** | | | | | | |
| Turn-off delay time | $td_{(off)}$ | $V_{CC}$ = 600V, $I_C$ = 25A, $V_{GE}$ = 0/15V, $R_g$=10Ω | - | 220 | - | ns |
| Fall time | $t_f$ | | - | 90 | - | ns |
| Turn-off energy | $E_{off}$ | | - | 0.65 | - | mJ |

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

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Dynamic** | | | | | | |
| Diode Forward Voltage | $V_{FM}$ | $I_F$ = 25A | - | 2.3 | - | V |
| Reverse Recovery Time | $T_{rr}$ | $I_F$= 25A, di/dt= 200A/μs | - | 460 | - | ns |
| Reverse Recovery Current | $I_{rr}$ | | - | 17 | - | A |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 3600 | - | nC |

Fig. 1 FBSOA characteristics

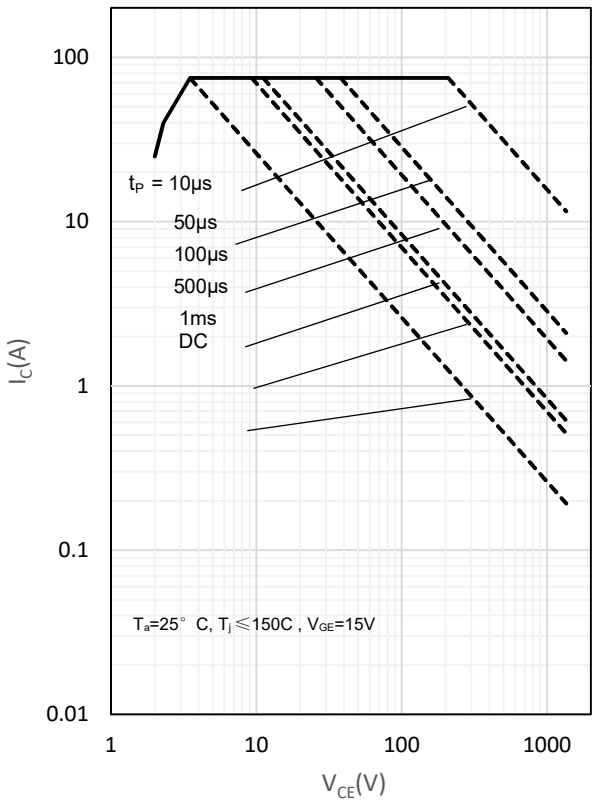



Fig. 2 Load Current vs. Frequency

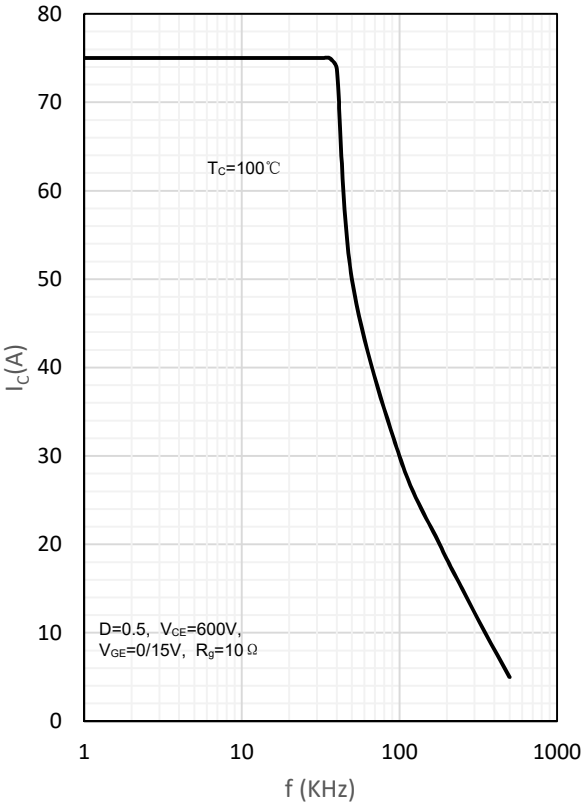



Fig. 3 Output characteristics

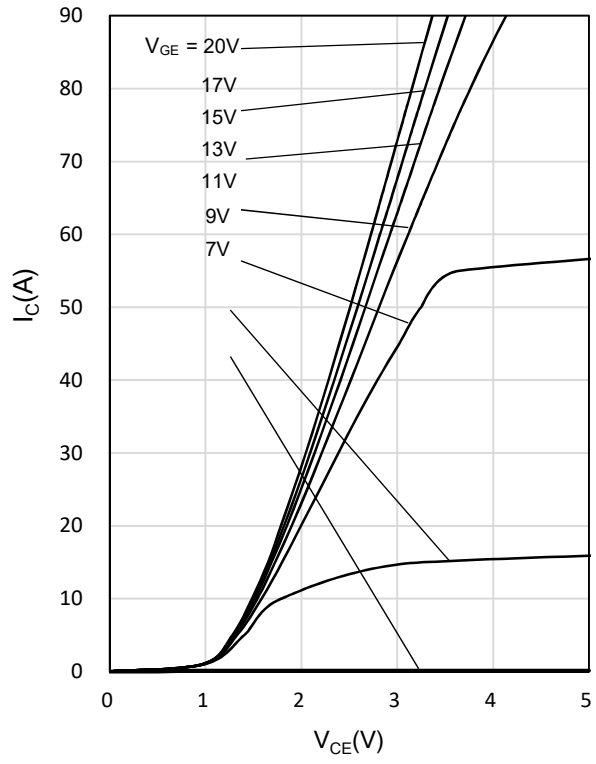



Fig. 4 Saturation voltage characteristics

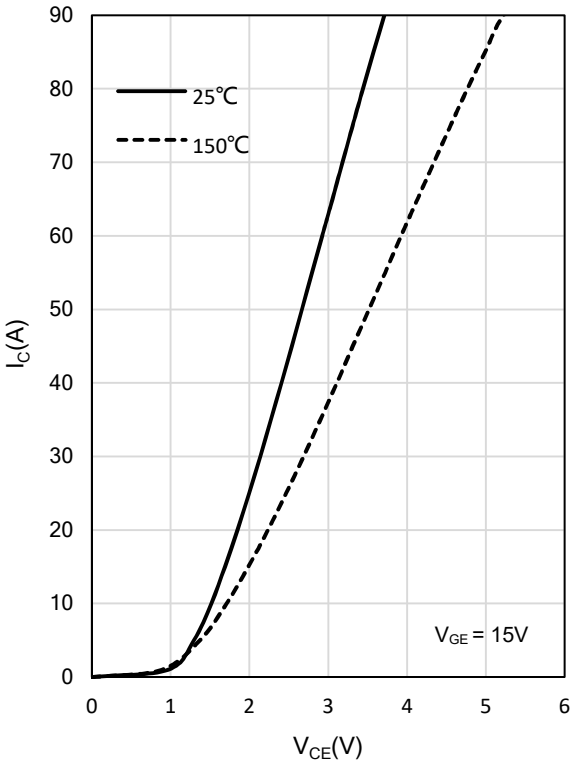


Fig. 5 Turn-off time vs. gate resistor

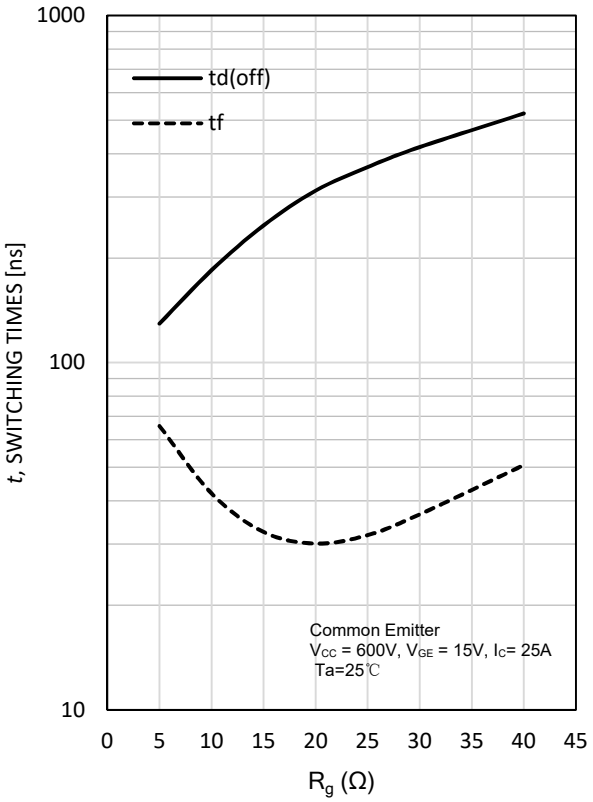



Fig. 6 Turn-off time vs. collector current

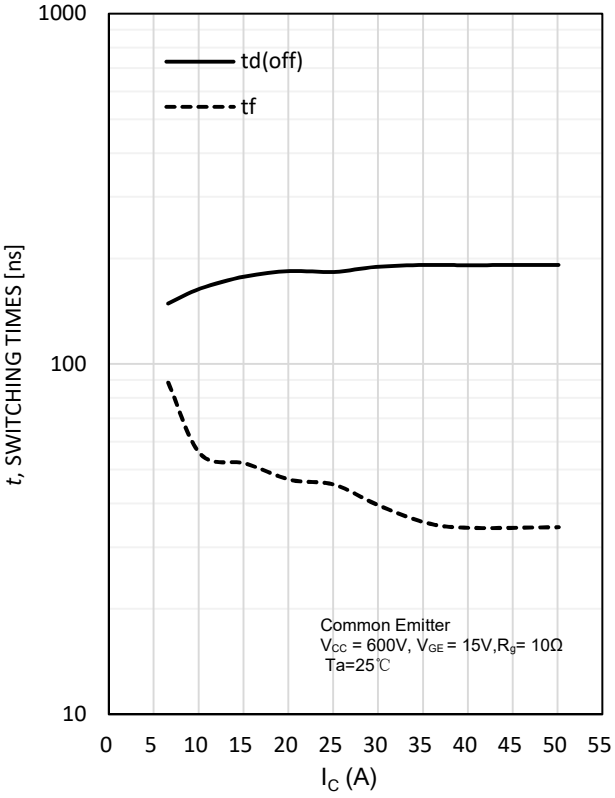



Fig. 7 Switching loss vs. gate resistor

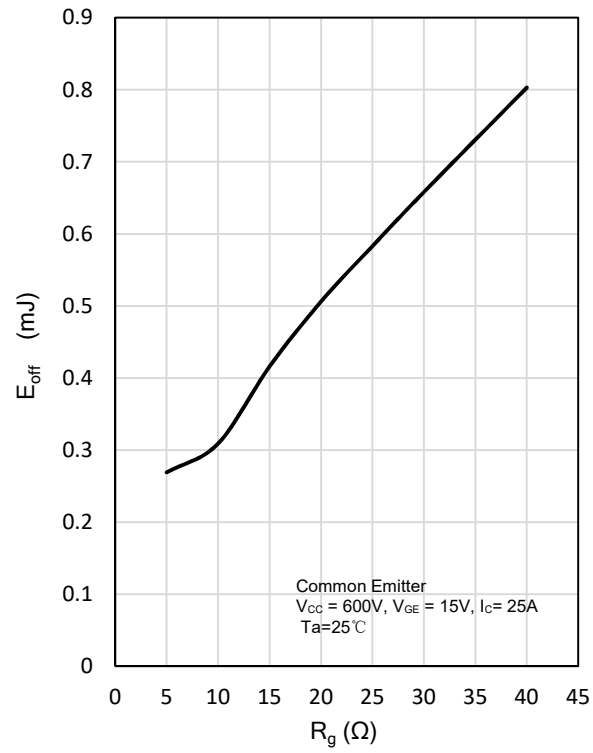



Fig. 8 Switching loss vs. collector current

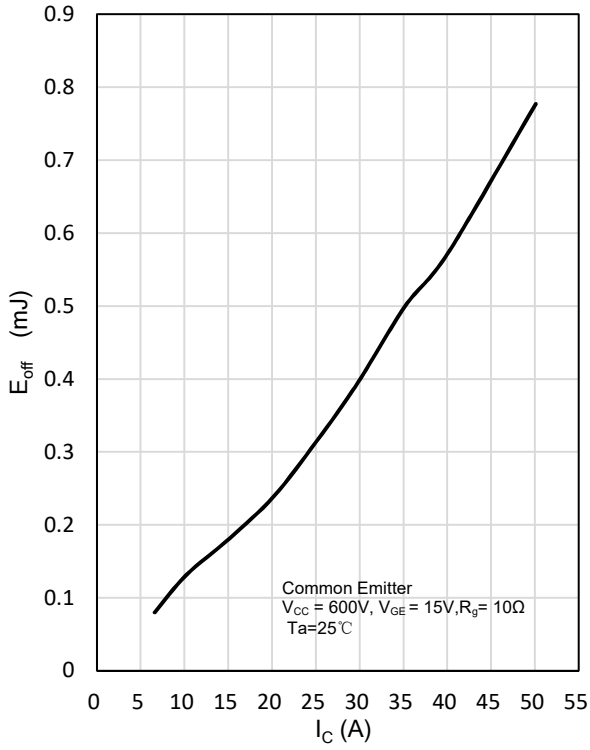


Fig. 9 Gate charge characteristics

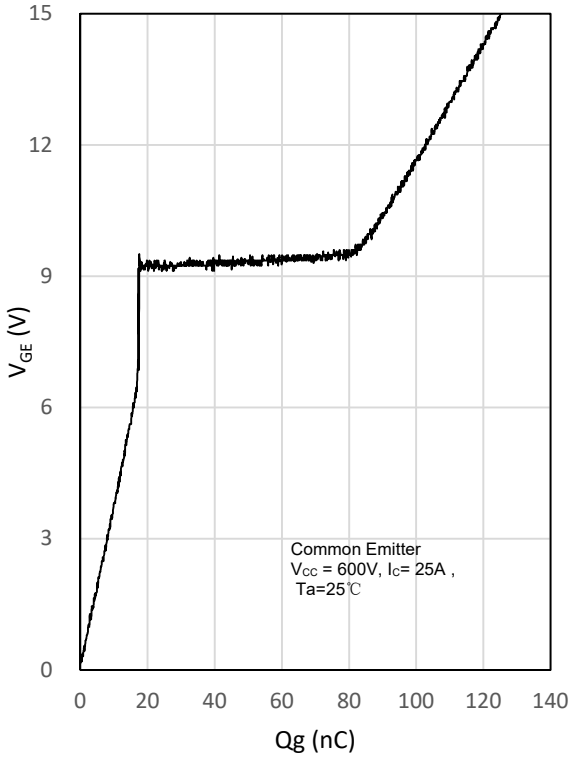
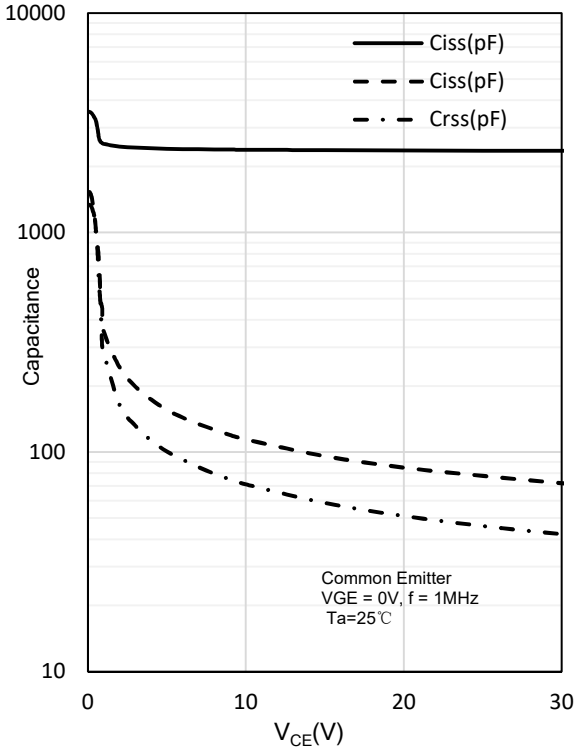
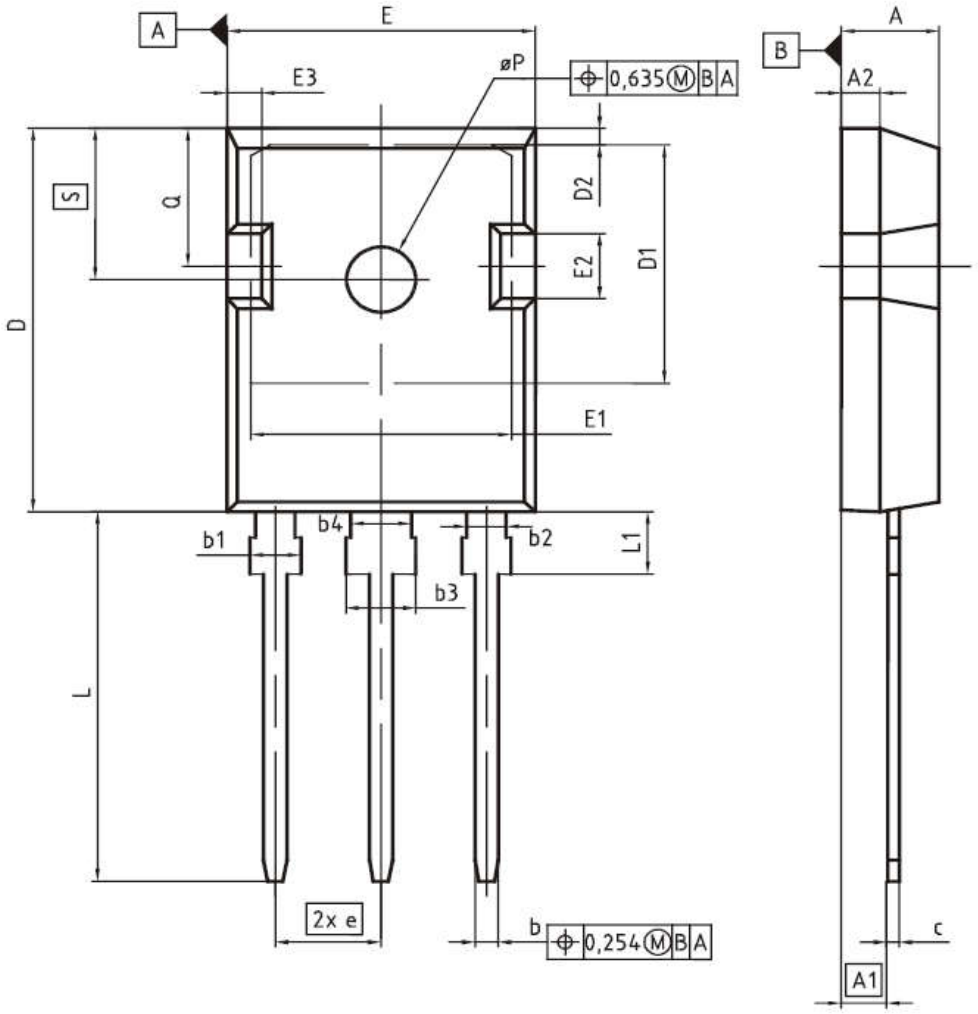



Fig. 10 Capacitance characteristics



## PG-TO247-3




| DIM | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 4.83 | 5.21 | 0.190 | 0.205 |
| A1 | 2.27 | 2.54 | 0.089 | 0.100 |
| A2 | 1.85 | 2.16 | 0.073 | 0.085 |
| b | 1.07 | 1.33 | 0.042 | 0.052 |
| b1 | 1.90 | 2.41 | 0.075 | 0.095 |
| b2 | 1.90 | 2.16 | 0.075 | 0.085 |
| b3 | 2.87 | 3.38 | 0.113 | 0.133 |
| b4 | 2.87 | 3.13 | 0.113 | 0.123 |
| c | 0.55 | 0.68 | 0.022 | 0.027 |
| D | 20.80 | 21.10 | 0.819 | 0.831 |
| D1 | 16.25 | 17.65 | 0.640 | 0.695 |
| D2 | 0.95 | 1.35 | 0.037 | 0.053 |
| E | 15.70 | 16.13 | 0.618 | 0.635 |
| E1 | 13.10 | 14.15 | 0.516 | 0.557 |
| E2 | 3.68 | 5.10 | 0.145 | 0.201 |
| E3 | 1.00 | 2.60 | 0.039 | 0.102 |
| e | 5.44 (BSC) | | 0.214 (BSC) | |
| N | 3 | | 3 | |
| L | 19.80 | 20.32 | 0.780 | 0.800 |
| L1 | 4.10 | 4.47 | 0.161 | 0.176 |
| øP | 3.50 | 3.70 | 0.138 | 0.146 |
| Q | 5.49 | 6.00 | 0.216 | 0.236 |
| S | 6.04 | 6.30 | 0.238 | 0.248 |

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