



**SPTECH**

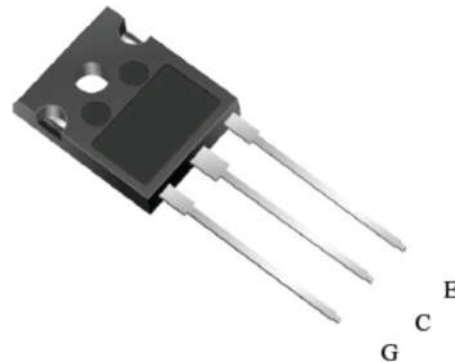
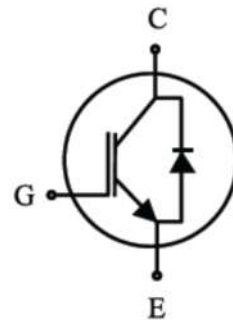
深圳市质超微电子有限公司

# SPT25N120F1A1

**1200V /25A Trench Field Stop IGBT**

- High breakdown voltage to 1200V 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  $V_{CEsat}$
- Enhanced avalanche capability

|                       |      |   |
|-----------------------|------|---|
| $V_{CE}$              | 1200 | V |
| $I_C$                 | 25   | A |
| $V_{CE(SAT)} I_C=25A$ | 2.0  | V |



## APPLICATION

- Uninterruptible Power Supplies
- Solar inverter
- Welding
- PFC applications



## Maximum Ratings

| Parameter   | Symbol   | Value      | Unit             |
|---|----------|------------|------------------|
| Collector-Emitter Breakdown Voltage   | $V_{CE}$ | 1200       | V                |
| DC collector current, limited by $T_{jmax}$<br>$T_C = 25^\circ\text{C}$<br>$T_C = 100^\circ\text{C}$  | $I_C$    | 50<br>25   | A                |
| Diode Forward current, limited by $T_{jmax}$<br>$T_C = 25^\circ\text{C}$<br>$T_C = 100^\circ\text{C}$ | $I_F$    | 50<br>25   | A                |
| Turn off safe operating area $V_{CE} \leq 1350\text{V}$ ,<br>$T_j \leq 150^\circ\text{C}$             | -        | 50         | A                |
| Operating junction temperature $T_j$  | -        | -40...+150 | $^\circ\text{C}$ |
| Storage temperature   | $T_s$    | -55...+150 | $^\circ\text{C}$ |
| Soldering temperature, wave soldering 1.6mm<br>(0.063in.) from case for 10s                           | -        | 260        | $^\circ\text{C}$ |

## 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** ( $T_j = 25^\circ\text{C}$  unless otherwise specified) :

| Parameter                            | Symbol        | Conditions   | Min.   | Typ.       | Max.        | Unit    |
|--------------------------------------|---------------|--|--------|------------|-------------|---------|
| <b>Static</b>                        |               |  |        |            |             |         |
| Collector-Emitter breakdown voltage  | $BV_{CES}$    | $V_{GE}=0V, I_C=1mA$   | 1200   | -          | -           | V       |
| Gate threshold voltage               | $V_{GE(th)}$  | $V_{GE}=V_{CE}, I_C=250\mu A$  | 5.1    | 5.8        | 6.4         | V       |
| Collector-Emitter Saturation voltage | $V_{CE(sat)}$ | $V_{GE}=15V, I_C=25A$<br>$T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$         | -<br>- | 2.0<br>2.5 | 2.5<br>-    | V       |
| Zero gate voltage collector current  | $I_{CES}$     | $V_{CE} = 1350V, V_{GE} = 0V$<br>$T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | -<br>- | <1<br>-    | 100<br>1000 | $\mu A$ |
| Gate-emitter leakage current         | $I_{GES}$     | $V_{CE} = 0V, V_{GE} = 20V$  | -      | -          | 100         | nA      |

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

**Switching Characteristic, Inductive Load**

| Parameter   | Symbol       | Conditions   | Min. | Typ. | Max. | Unit |
|---|--------------|--|------|------|------|------|
| <b>Dynamic , at <math>T_j = 25^\circ\text{C}</math></b> |              |  |      |      |      |      |
| Turn-on delay time                                      | $td_{(on)}$  | $V_{CC} = 600V, I_C = 25A,$<br>$V_{GE} = 0/15V,$<br>$R_g=10\Omega$ | -    | 35   | -    | nS   |
| Rise time   | $t_r$        |  | -    | 32   | -    | nS   |
| Turn-on energy  | $E_{on}$     |  | -    | 2.0  | -    | mJ   |
| Turn-off delay time                                     | $td_{(off)}$ |  | -    | 180  | -    | nS   |
| Fall time   | $t_f$        |  | -    | 40   | -    | nS   |
| Turn-off energy   | $E_{off}$    |  | -    | 0.32 | -    | mJ   |



**Electrical Characteristics of the DIODE** ( $T_j = 25^\circ\text{C}$  unless otherwise specified)

| Parameter                | Symbol   | Conditions   | Min. | Typ. | Max. | Unit |
|--------------------------|----------|--|------|------|------|------|
| <b>Dynamic</b>           |          |  |      |      |      |      |
| Diode Forward Voltage    | $V_{FM}$ | $I_F = 25\text{A}$                                       | -    | 3.1  | -    | V    |
| Reverse Recovery Time    | $T_{rr}$ | $I_F = 25\text{A},$<br>$di/dt = 600\text{A}/\mu\text{s}$ | -    | 420  | -    | nS   |
| Reverse Recovery Current | $I_{rr}$ |  | -    | 17   | -    | A    |
| Reverse Recovery Charge  | $Q_{rr}$ |  | -    | 2570 | -    | nC   |



### IGBT Characteristics

Fig. 1 Output characteristics

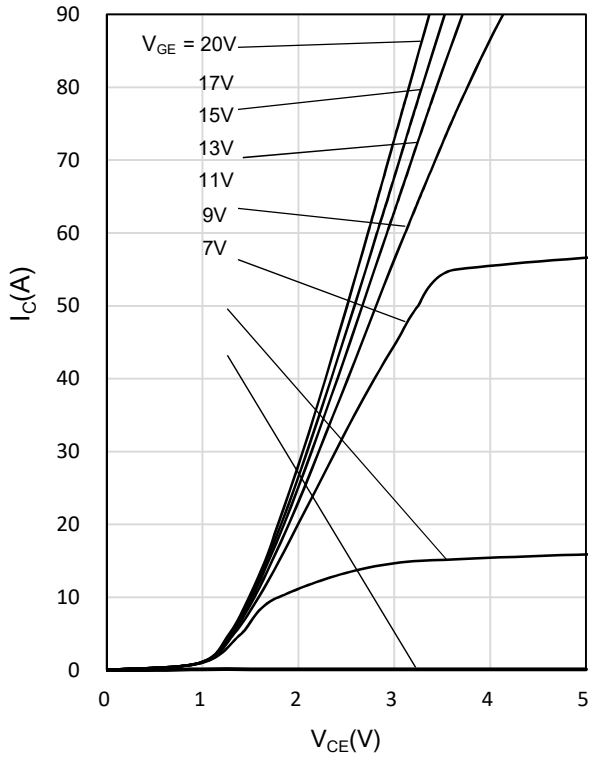


Fig. 2 Saturation voltage characteristics

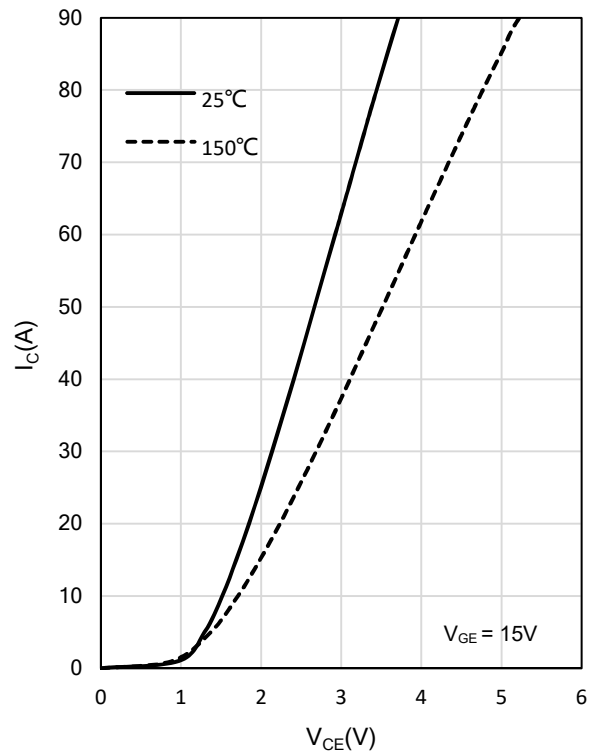


Fig. 3 Turn-off time vs. gate resistor

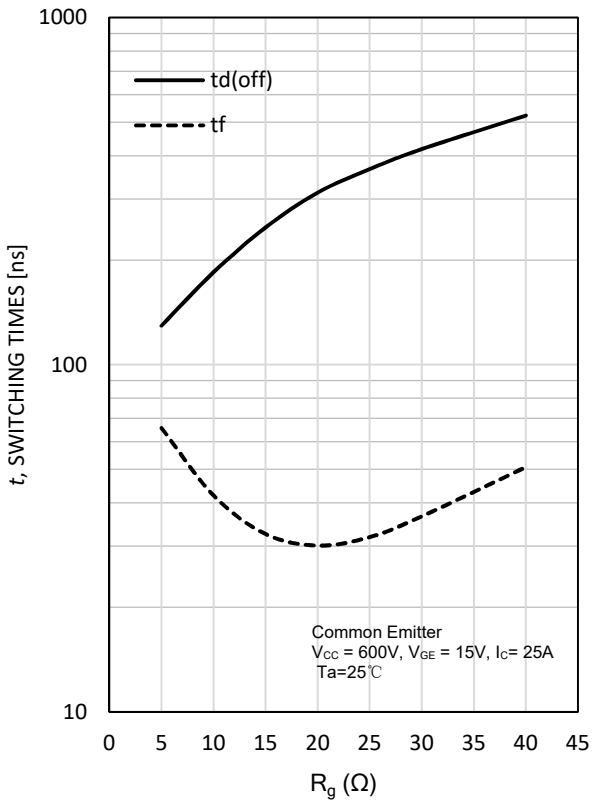
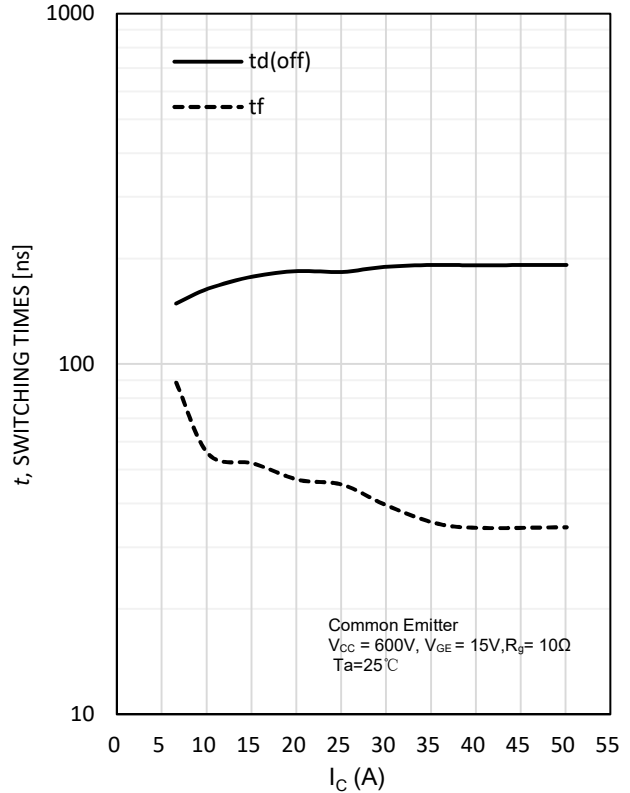


Fig. 4 Turn-off time vs. collector current





## IGBT Characteristics

Fig. 5 Switching loss vs. gate resistor

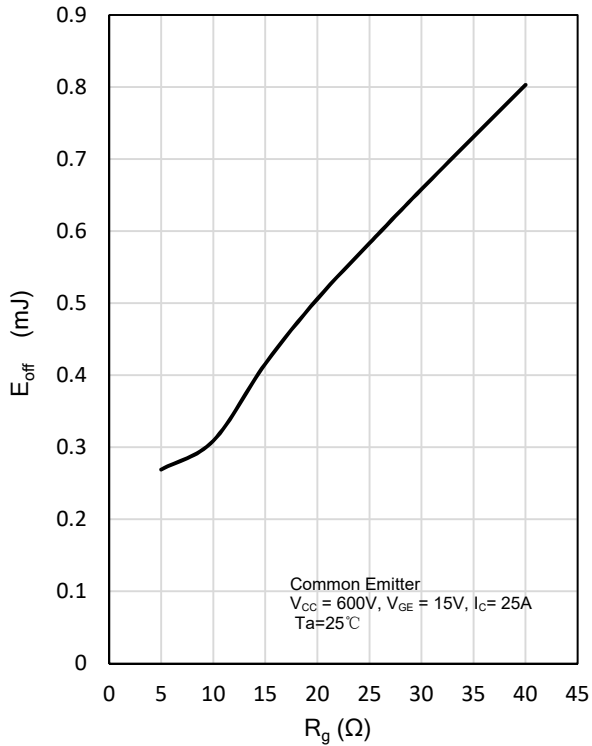


Fig. 6 Switching loss vs. collector current

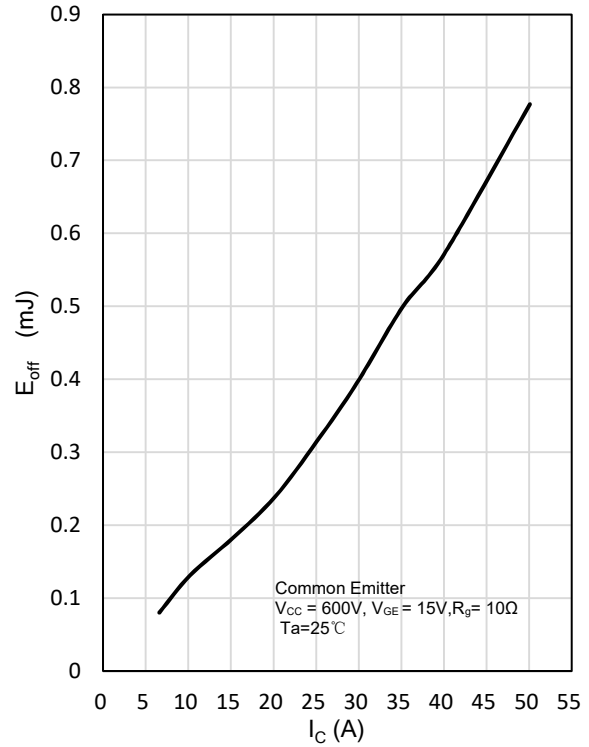


Fig. 7 Gate charge characteristics

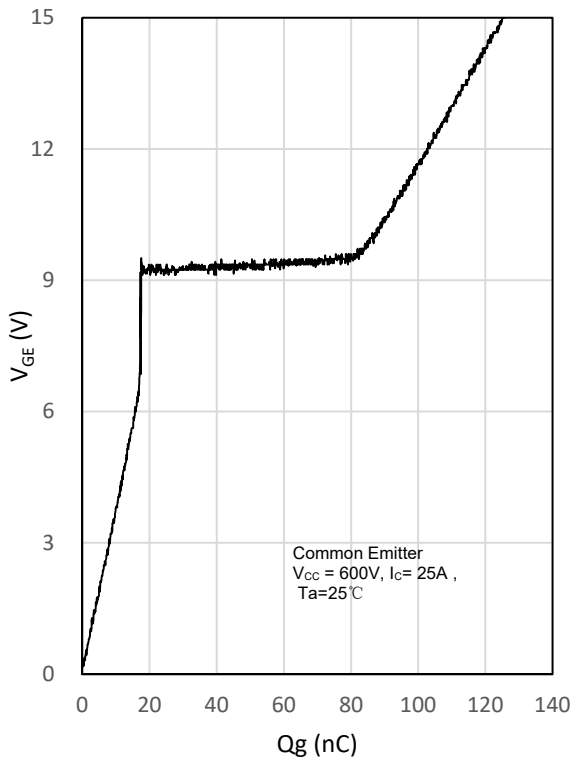
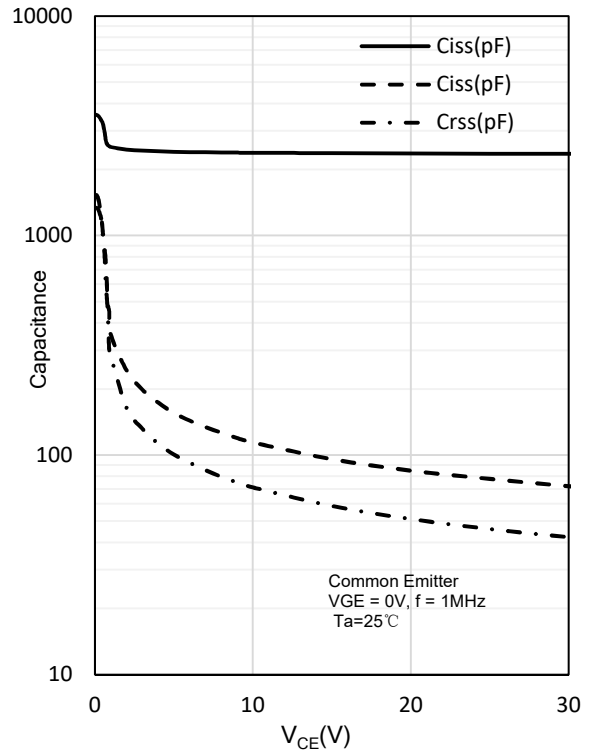
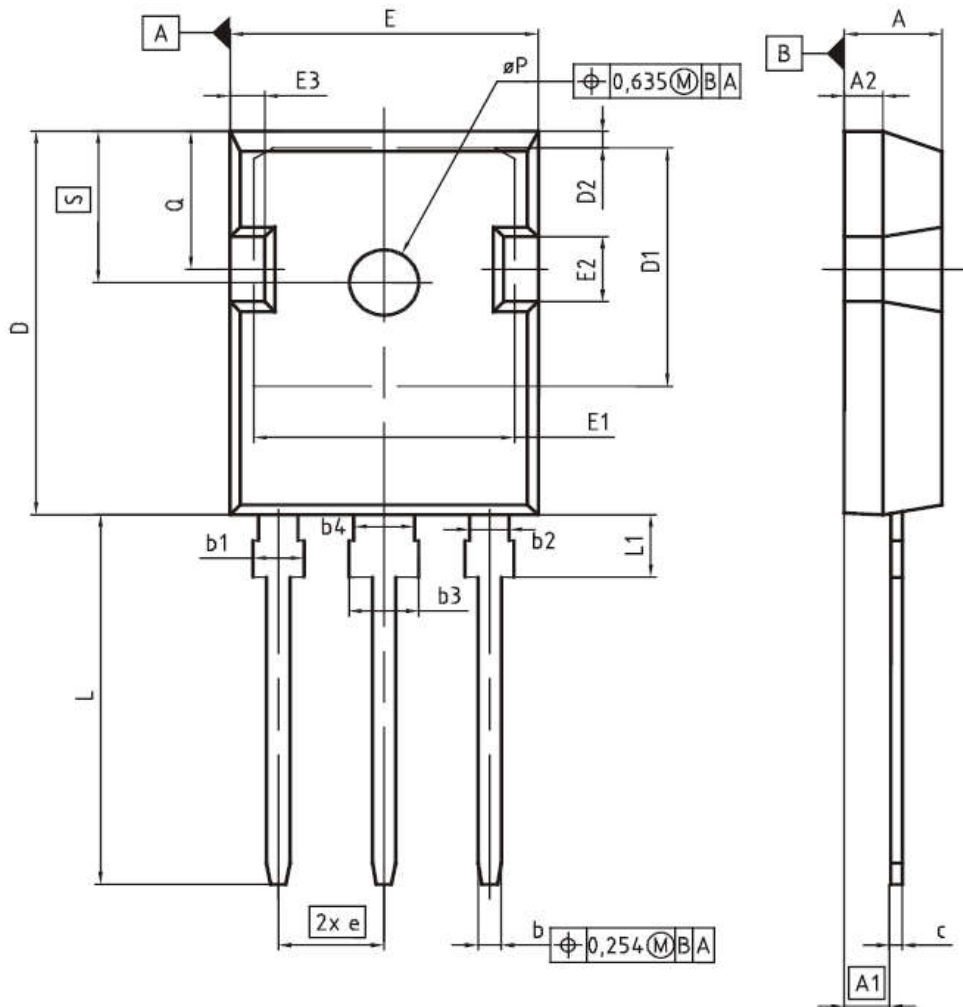


Fig. 8 Capacitance characteristics





**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 |
| $\phi P$ | 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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