

DATA SHEET

PHE13007

Silicon Diffused Power Transistor

Product specification

February 2018

Silicon Diffused Power Transistor

PHE13007

GENERAL DESCRIPTION

The PHE13007 is a silicon npn power switching transistor in the TO220AB envelope intended for use in high frequency electronic lighting ballast applications, converters, inverters, switching regulators, motor control systems, etc.

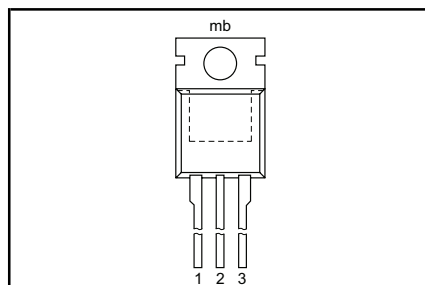
QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|-------------|---------------------------------------|--|------|------|------|
| V_{CESM} | Collector-emitter voltage peak value | $V_{BE} = 0 \text{ V}$ | - | 700 | V |
| V_{CBO} | Collector-Base voltage (open emitter) | | - | 700 | V |
| V_{CEO} | Collector-emitter voltage (open base) | | - | 400 | V |
| V_{EBO} | Emitter-Base voltage ($I_B = 0$) | | - | 9 | V |
| I_C | Collector current (DC) | | - | 8 | A |
| I_{CM} | Collector current peak value | | - | 16 | A |
| P_{tot} | Total power dissipation | $T_{mb} \leq 25 \text{ }^\circ\text{C}$ | - | 80 | W |
| V_{CESat} | Collector-emitter saturation voltage | $I_C = 5.0 \text{ A}; I_B = 1.0 \text{ A}$ | 0.35 | 2.0 | V |
| t_f | Fall time | $I_C = 5 \text{ A}; I_{B1} = 1 \text{ A}$ | 40 | 120 | ns |

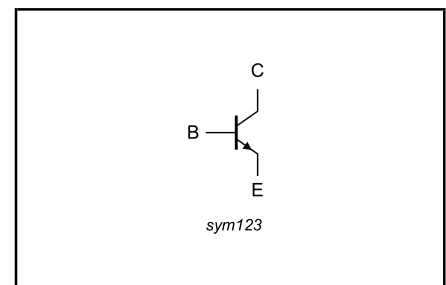
PINNING - TO220AB

| PIN | DESCRIPTION |
|-----|-------------|
| 1 | base |
| 2 | collector |
| 3 | emitter |
| tab | collector |

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum Rating System (IEC 134)

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|------------|--|---|------|------|------------------|
| V_{CESM} | Collector to emitter voltage | $V_{BE} = 0 \text{ V}$ | - | 700 | V |
| V_{CEO} | Collector to emitter voltage (open base) | | - | 400 | V |
| V_{CBO} | Collector to base voltage (open emitter) | | - | 700 | V |
| V_{EBO} | Emitter-Base voltage ($I_B = 0$) | | - | 9 | V |
| I_C | Collector current (DC) | | - | 8 | A |
| I_{CM} | Collector current peak value | | - | 16 | A |
| I_B | Base current (DC) | | - | 4 | A |
| I_{BM} | Base current peak value | | - | 8 | A |
| P_{tot} | Total power dissipation | $T_{mb} \leq 25 \text{ }^\circ\text{C}$ | - | 80 | W |
| T_{stg} | Storage temperature | | -65 | 150 | $^\circ\text{C}$ |
| T_j | Junction temperature | | - | 150 | $^\circ\text{C}$ |

THERMAL RESISTANCES

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|----------------|---------------------------|-------------|------|------|------|
| $R_{th\ j-mb}$ | Junction to mounting base | | - | 1.56 | K/W |
| $R_{th\ j-a}$ | Junction to ambient | in free air | 60 | - | K/W |

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STATIC CHARACTERISTICS $T_{mb} = 25\text{ °C}$ unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------|--|---|------|------|------|------|
| I_{CES} | Collector cut-off current ¹ | $V_{BE} = 0\text{ V}; V_{CE} = V_{CESMmax}$ | - | - | 0.2 | mA |
| I_{CES} | | $V_{BE} = 0\text{ V}; V_{CE} = V_{CESMmax}$ | - | - | 1.0 | mA |
| I_{EBO} | Emitter cut-off current | $T_j = 125\text{ °C}$ $V_{EB} = 9\text{ V}; I_C = 0\text{ A}$ | - | - | 1.0 | mA |
| $V_{CEOsust}$ | Collector-emitter sustaining voltage | $I_B = 0\text{ A}; I_C = 10\text{ mA};$ $L = 25\text{ mH}$ | 400 | - | - | V |
| V_{CEsat} | Collector-emitter saturation voltage | $I_C = 2.0\text{ A}; I_B = 0.4\text{ A}$ | - | 0.15 | 1.0 | V |
| V_{CEsat} | | $I_C = 5.0\text{ A}; I_B = 1.0\text{ A}$ | - | 0.35 | 2.0 | V |
| V_{CEsat} | | $I_C = 5.0\text{ A}; I_B = 1.0\text{ A}$ ($T_C = 100\text{ °C}$) | - | 0.51 | 3.0 | V |
| V_{BEsat} | Base-emitter saturation voltage | $I_C = 2.0\text{ A}; I_B = 0.4\text{ A}$ | - | 0.92 | 1.2 | V |
| V_{BEsat} | | $I_C = 5.0\text{ A}; I_B = 1.0\text{ A}$ | - | 1.05 | 1.6 | V |
| V_{BEsat} | | $I_C = 5.0\text{ A}; I_B = 1.0\text{ A}$ ($T_C = 100\text{ °C}$) | - | 1.00 | 1.5 | V |
| h_{FE} | DC current gain | $I_C = 2.0\text{ A}; V_{CE} = 5\text{ V}$ | 8 | 17 | 40 | |
| h_{FEsat} | | $I_C = 5.0\text{ A}; V_{CE} = 5\text{ V}$ | 5 | 9 | 30 | |

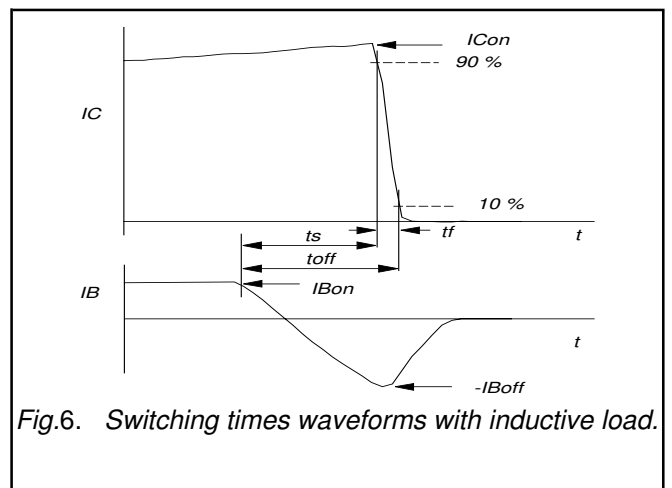
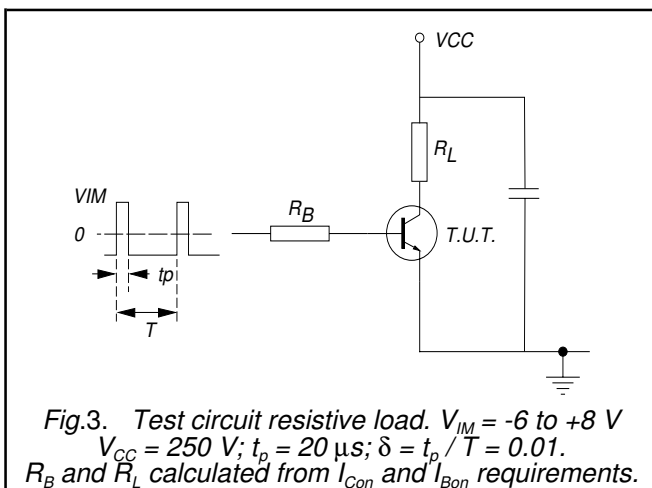
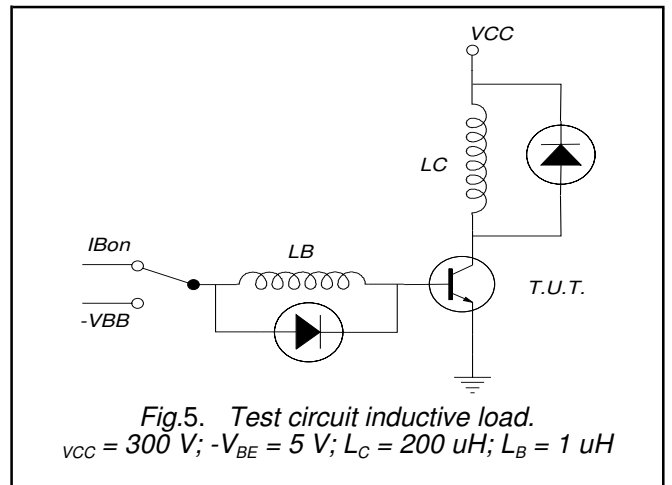
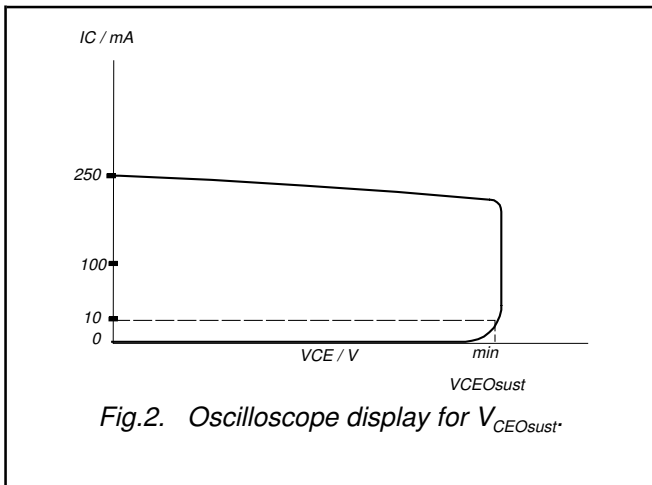
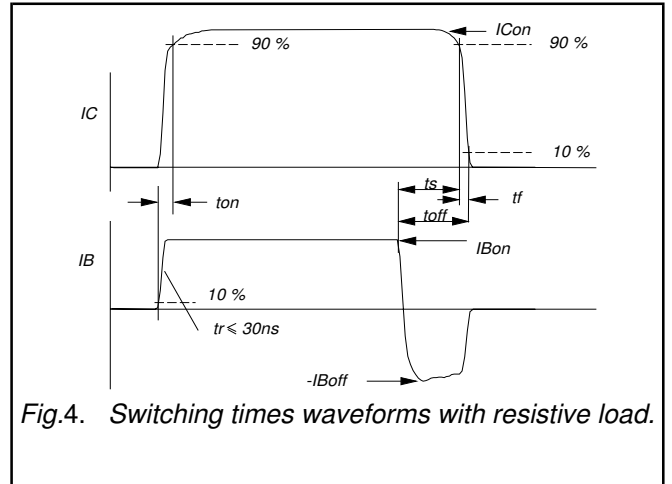
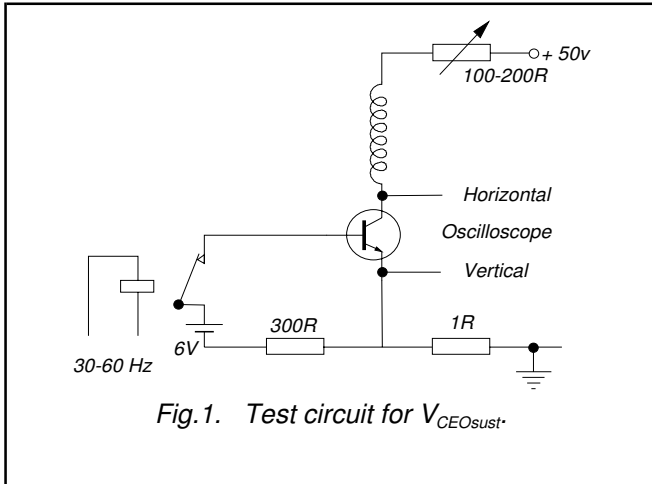
DYNAMIC CHARACTERISTICS $T_{mb} = 25\text{ °C}$ unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|--------|----------------------------------|--|------|------|---------------|
| | Switching times (resistive load) | $I_{Con} = 5\text{ A}; I_{Bon} = -I_{Boff} = 1\text{ A};$ $R_L = 75\text{ ohms}; V_{BB2} = 4\text{ V};$ | | | |
| t_s | Turn-off storage time | | 1.8 | 3.0 | μs |
| t_f | Turn-off fall time | | 0.3 | 0.7 | μs |
| | Switching times (inductive load) | $I_{Con} = 5\text{ A}; I_{Bon} = 1\text{ A}; L_B = 1\text{ }\mu\text{H};$ $-V_{BB} = 5\text{ V}$ | | | |
| t_s | Turn-off storage time | | 1.2 | 2.0 | μs |
| t_f | Turn-off fall time | | 40 | 120 | ns |
| | Switching times (inductive load) | $I_{Con} = 5\text{ A}; I_{Bon} = 1\text{ A}; L_B = 1\text{ }\mu\text{H};$ $-V_{BB} = 5\text{ V}; T_j = 100\text{ °C}$ | | | |
| t_s | Turn-off storage time | | 1.6 | 3.0 | μs |
| t_f | Turn-off fall time | | 100 | 200 | ns |

¹ Measured with half sine-wave voltage (curve tracer).

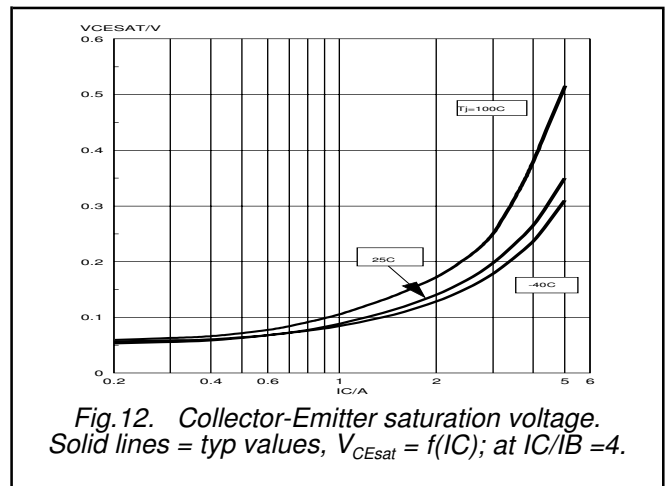
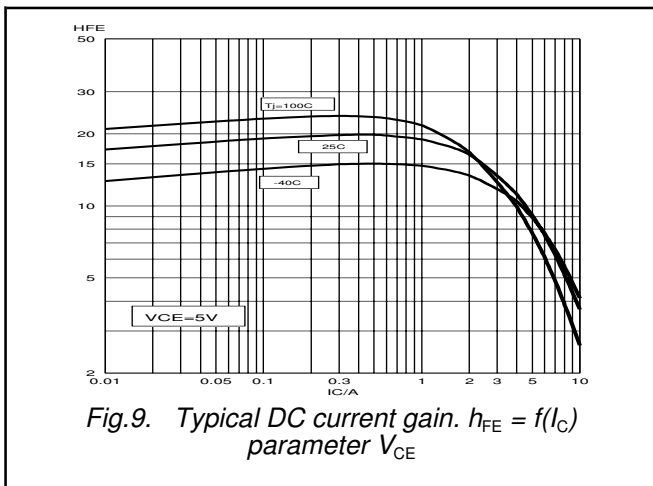
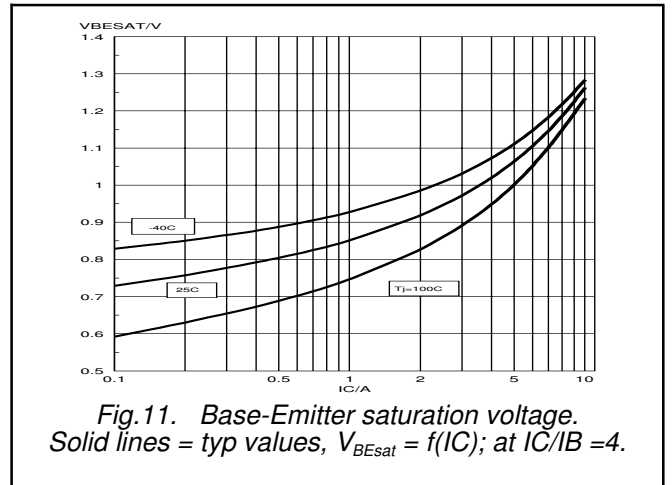
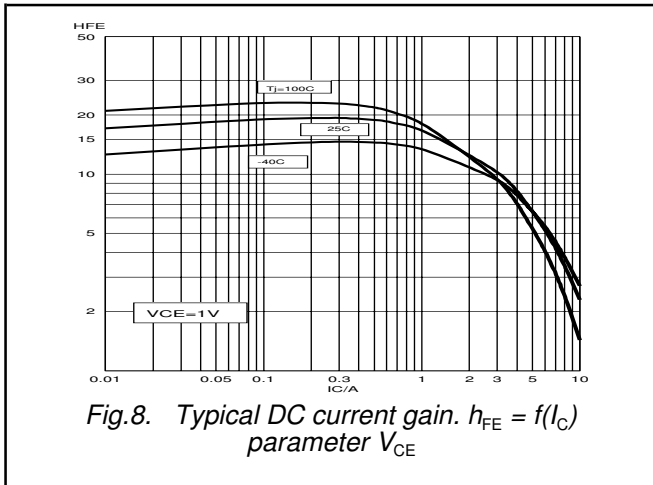
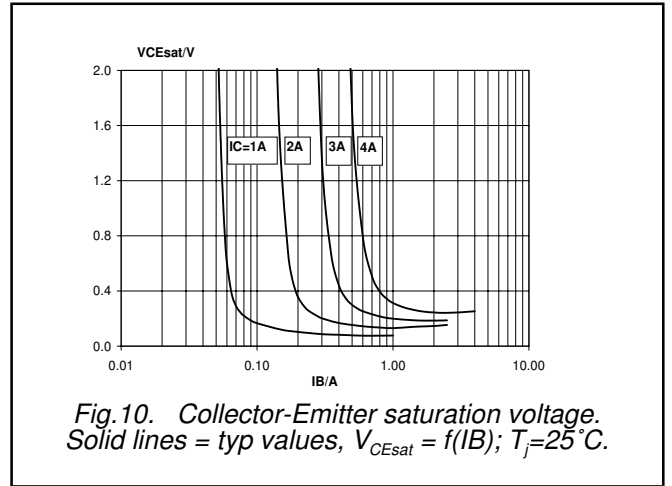
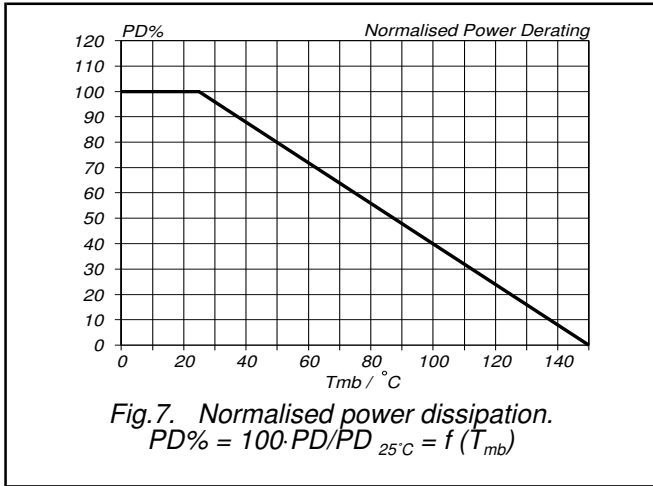
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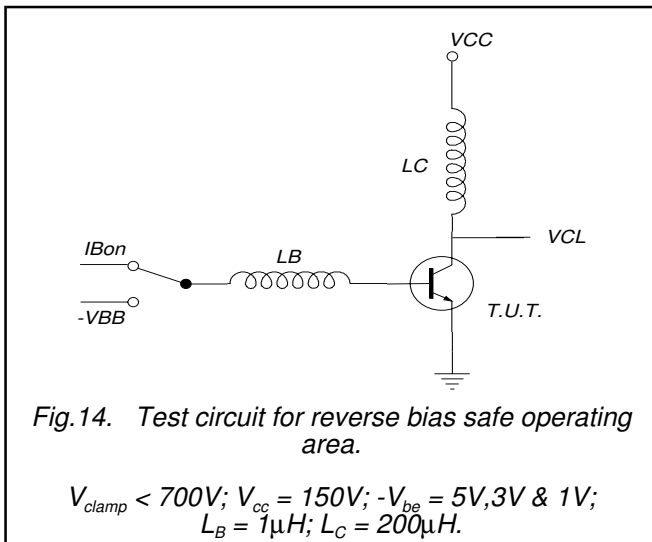
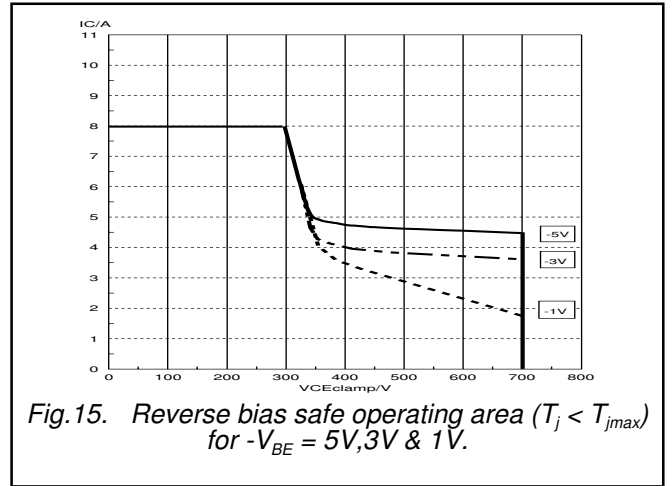
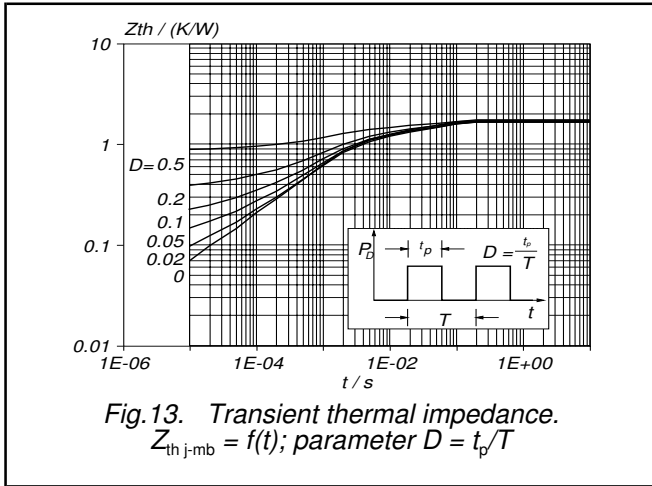
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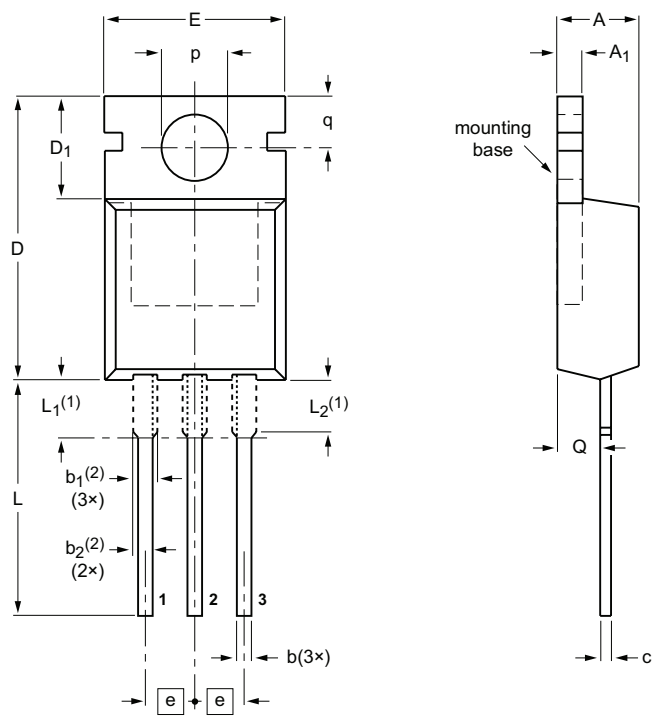
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MECHANICAL DATA

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

SOT78



DIMENSIONS (mm are the original dimensions)

| UNIT | A | A ₁ | b | b ₁ (2) | b ₂ (2) | c | D | D ₁ | E | e | L | L ₁ (1) | L ₂ (1) max. | p | q | Q |
|------|------------|----------------|------------|--------------------|--------------------|------------|--------------|----------------|-------------|------|--------------|--------------------|----------------------------|------------|------------|------------|
| mm | 4.7 4.1 | 1.40 1.25 | 0.9 0.6 | 1.6 1.0 | 1.3 1.0 | 0.7 0.4 | 16.0 15.2 | 6.6 5.9 | 10.3 9.7 | 2.54 | 15.0 12.8 | 3.30 2.79 | 3.0 | 3.8 3.5 | 3.0 2.7 | 2.6 2.2 |

Notes

- Lead shoulder designs may vary.
- Dimension includes excess dambar.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-----------------|-------|--|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT78 | | 3-lead TO-220AB | SC-46 | | | 08-04-23 08-06-13 |

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|--------------------------------|--------------------|---|
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