

# DATA SHEET

**J174; J175;  
J176; J177**  
P-channel silicon field-effect  
transistors

Product specification  
File under Discrete Semiconductors, SC07

April 1995

# P-channel silicon field-effect transistors

**J174; J175;  
J176; J177**

## DESCRIPTION

Silicon symmetrical p-channel junction FETs in a plastic TO-92 envelope and intended for application with analog switches, choppers, commutators etc.

A special feature is the interchangeability of the drain and source connections.

## PINNING

- 1 = source
- 2 = gate
- 3 = drain

Note: Drain and source are interchangeable.

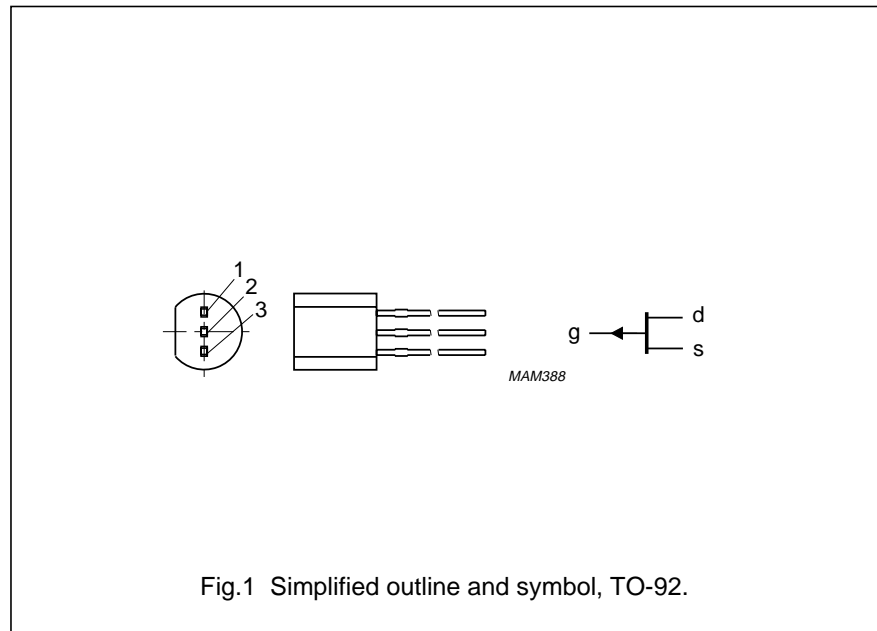


Fig.1 Simplified outline and symbol, TO-92.

## QUICK REFERENCE DATA

|   |              |      |             |             |             |             |          |
|---|--------------|------|-------------|-------------|-------------|-------------|----------|
| Drain-source voltage  | $\pm V_{DS}$ | max. | 30          | V           |             |             |          |
| Gate-source voltage   | $V_{GSO}$    | max. | 30          | V           |             |             |          |
| Gate current  | $-I_G$       | max. | 50          | mA          |             |             |          |
| Total power dissipation<br>up to $T_{amb} = 50\text{ }^\circ\text{C}$ | $P_{tot}$    | max. | 400         | mW          |             |             |          |
|   |              |      | <b>J174</b> | <b>J175</b> | <b>J176</b> | <b>J177</b> |          |
| Drain current   |              |      |             |             |             |             |          |
| $-V_{DS} = 15\text{ V}; V_{GS} = 0$                                   | $-I_{DSS}$   | min. | 20          | 7           | 2           | 1.5         | mA       |
|   |              | max. | 135         | 70          | 35          | 20          | mA       |
| Drain-source ON-resistance  |              |      |             |             |             |             |          |
| $-V_{DS} = 0.1\text{ V}; V_{GS} = 0$                                  | $R_{DS\ on}$ | max. | 85          | 125         | 250         | 300         | $\Omega$ |

## P-channel silicon field-effect transistors

J174; J175;  
J176; J177**RATINGS**

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

|   |              |      |             |                  |
|---|--------------|------|-------------|------------------|
| Drain-source voltage  | $\pm V_{DS}$ | max. | 30          | V                |
| Gate-source voltage   | $V_{GSO}$    | max. | 30          | V                |
| Gate-drain voltage  | $V_{GDO}$    | max. | 30          | V                |
| Gate current (DC)   | $-I_G$       | max. | 50          | mA               |
| Total power dissipation<br>up to $T_{amb} = 50\text{ }^\circ\text{C}$ | $P_{tot}$    | max. | 400         | mW               |
| Storage temperature range   | $T_{stg}$    |      | -65 to +150 | $^\circ\text{C}$ |
| Junction temperature  | $T_j$        | max. | 150         | $^\circ\text{C}$ |

**THERMAL RESISTANCE**

|                                      |               |   |     |     |
|--------------------------------------|---------------|---|-----|-----|
| From junction to ambient in free air | $R_{th\ j-a}$ | = | 250 | K/W |
|--------------------------------------|---------------|---|-----|-----|

**STATIC CHARACTERISTICS** $T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified

|   |               |      | J174 | J175 | J176 | J177         |
|---|---------------|------|------|------|------|--------------|
| Gate cut-off current<br>$V_{GS} = 20\text{ V}; V_{DS} = 0$                  | $I_{GSS}$     | max. | 1    | 1    | 1    | 1 nA         |
| Drain cut-off current<br>$-V_{DS} = 15\text{ V}; V_{GS} = 10\text{ V}$      | $-I_{DSX}$    | max. | 1    | 1    | 1    | 1 nA         |
| Drain current<br>$-V_{DS} = 15\text{ V}; V_{GS} = 10\text{ V}$              | $-I_{DSS}$    | min. | 20   | 7    | 2    | 1.5 mA       |
|   |               | max. | 135  | 70   | 35   | 20 mA        |
| Gate-source breakdown voltage<br>$I_G = 1\text{ }\mu\text{A}; V_{DS} = 0$   | $V_{(BR)GSS}$ | min. | 30   | 30   | 30   | 30 V         |
| Gate-source cut-off voltage<br>$-I_D = 10\text{ nA}; V_{DS} = -15\text{ V}$ | $V_{GS\ off}$ | min. | 5    | 3    | 1    | 0.8 V        |
|   |               | max. | 10   | 6    | 4    | 2.25 V       |
| Drain-source ON-resistance<br>$-V_{DS} = 0.1\text{ V}; V_{GS} = 0$          | $R_{DSon}$    | max. | 85   | 125  | 250  | 300 $\Omega$ |

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**DYNAMIC CHARACTERISTICS**

$T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified

Input capacitance,  $f = 1\text{ MHz}$

$V_{GS} = 10\text{ V}; V_{DS} = 0\text{ V}$

$V_{GS} = V_{DS} = 0$

Feedback capacitance,  $f = 1\text{ MHz}$

$V_{GS} = 10\text{ V}; V_{DS} = 0\text{ V}$

Switching times (see Fig.2 + 3)

Delay time

Rise time

Turn-on time

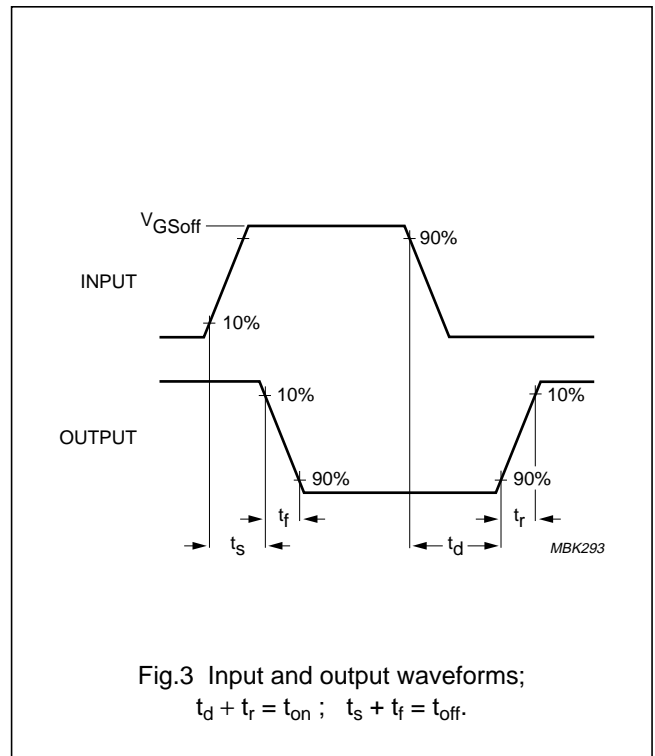
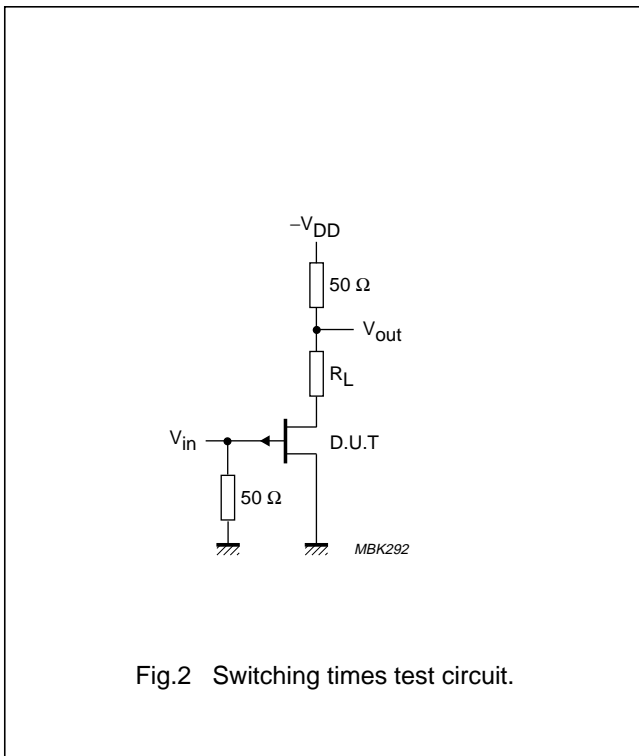
Storage time

Fall time

Turn-off time

Test conditions:

|               |      |     |             |             |             |             |  |
|---------------|------|-----|-------------|-------------|-------------|-------------|--|
| $C_{is}$      | typ. | 8   |             |             | pF          |             |  |
| $C_{is}$      | typ. | 30  |             |             | pF          |             |  |
| $C_{rs}$      | typ. | 4   |             |             | pF          |             |  |
|               |      |     | <b>J174</b> | <b>J175</b> | <b>J176</b> | <b>J177</b> |  |
| $t_d$         | typ. | 2   | 5           | 15          | 20          | ns          |  |
| $t_r$         | typ. | 5   | 10          | 20          | 25          | ns          |  |
| $t_{on}$      | typ. | 7   | 15          | 35          | 45          | ns          |  |
| $t_s$         | typ. | 5   | 10          | 15          | 20          | ns          |  |
| $t_f$         | typ. | 10  | 20          | 20          | 25          | ns          |  |
| $t_{off}$     | typ. | 15  | 30          | 35          | 45          | ns          |  |
| $-V_{DD}$     |      | 10  | 6           | 6           | 6           | V           |  |
| $V_{GS\ off}$ |      | 12  | 8           | 6           | 3           | V           |  |
| $R_L$         |      | 560 | 1200        | 2000        | 2900        | $\Omega$    |  |
| $V_{GS\ on}$  |      | 0   | 0           | 0           | 0           | V           |  |



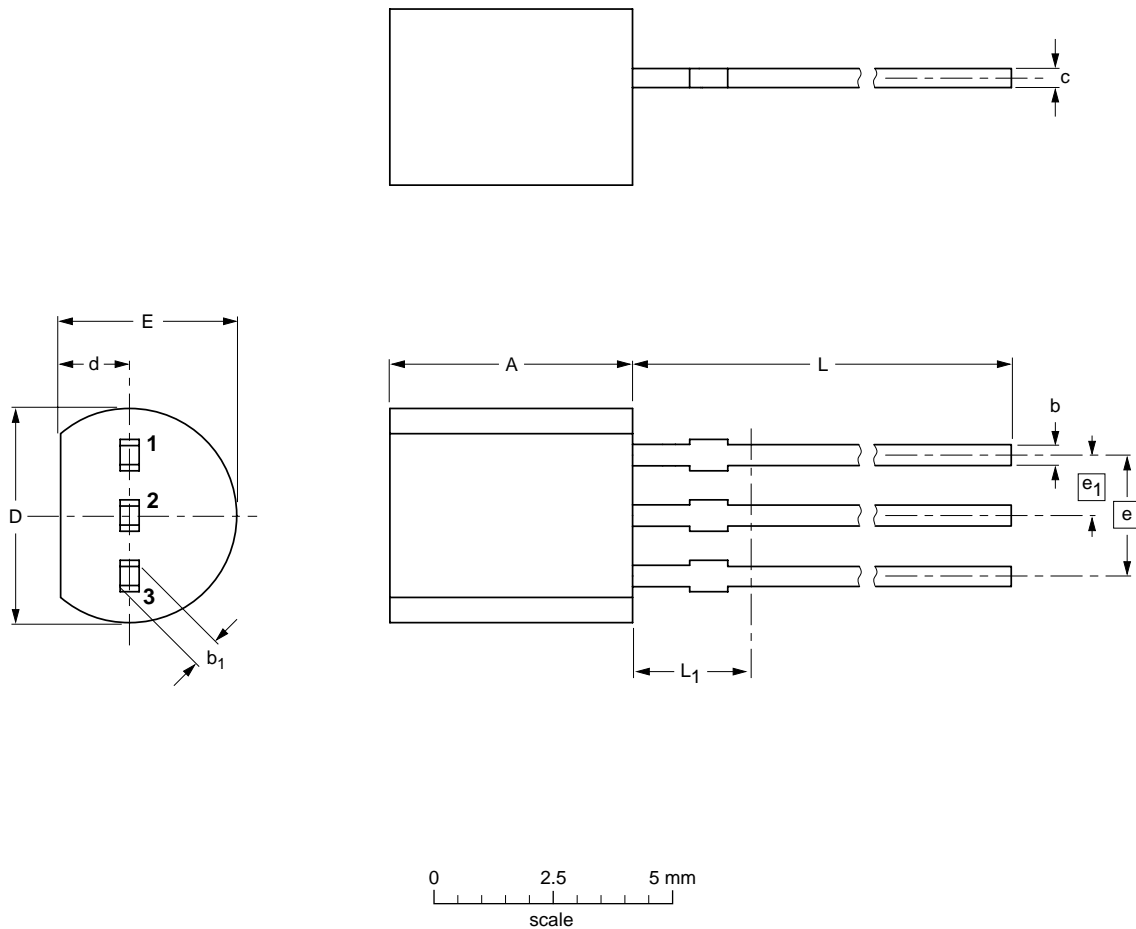
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PACKAGE OUTLINE

Plastic single-ended leaded (through hole) package; 3 leads

SOT54



DIMENSIONS (mm are the original dimensions)

| UNIT | A   | b    | b <sub>1</sub> | c    | D   | d   | E   | e    | e <sub>1</sub> | L    | L <sub>1</sub> (1) |
|------|-----|------|----------------|------|-----|-----|-----|------|----------------|------|--------------------|
| mm   | 5.2 | 0.48 | 0.66           | 0.45 | 4.8 | 1.7 | 4.2 | 2.54 | 1.27           | 14.5 | 2.5                |
|      | 5.0 | 0.40 | 0.56           | 0.40 | 4.4 | 1.4 | 3.6 |      |                |      |                    |

Note

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

| OUTLINE VERSION | REFERENCES |       |       |  | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|-------|--|---------------------|------------|
|                 | IEC        | JEDEC | EIAJ  |  |                     |            |
| SOT54           |            | TO-92 | SC-43 |  |                     | 97-02-28   |

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**DEFINITIONS**

| <b>Data sheet status</b>  |  |
|---|--|
| Objective specification   | This data sheet contains target or goal specifications for product development.  |
| Preliminary specification   | This data sheet contains preliminary data; supplementary data may be published later.  |
| Product specification   | This data sheet contains final product specifications.   |
| Short-form specification  | The data in this specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook. |
| <b>Limiting values</b>  |  |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. |  |
| <b>Application information</b>  |  |
| Where application information is given, it is advisory and does not form part of the specification.   |  |

**LIFE SUPPORT APPLICATIONS**

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