

# TO-220 Power Package Transistors (NPN)

| Type No. | Maximum Ratings             |                             |                             |                                |                    | Electrical Characteristics (Ta=25°C, Unless Otherwise Specified) |   |                              |   |                        |                        |   |                     |                                 |                                 |                                 |                    |                             |     |                             |     |     |                     |  |
|----------|-----------------------------|-----------------------------|-----------------------------|--------------------------------|--------------------|--|---|------------------------------|---|------------------------|------------------------|---|---------------------|---------------------------------|---------------------------------|---------------------------------|--------------------|-----------------------------|-----|-----------------------------|-----|-----|---------------------|--|
|          | V <sub>CBO</sub> (V)<br>Min | V <sub>CEO</sub> (V)<br>Min | V <sub>EBO</sub> (V)<br>Min | P <sub>D</sub> (W)<br>@Tc=25°C | I <sub>C</sub> (A) | I <sub>CBO</sub> (μA)<br>Max                                     | V <sub>CB</sub> (V)<br>@ I <sub>C</sub> | I <sub>CES</sub> (μA)<br>Max | V <sub>CE</sub> (V)<br>@ I <sub>CES</sub> | h <sub>FE</sub><br>Min | h <sub>FE</sub><br>Max | I <sub>C</sub> & V <sub>CE</sub> (A)<br>(A) | V <sub>CE</sub> (V) | V <sub>CE(SAT)</sub> (V)<br>Max | V <sub>BE(SAT)</sub> (V)<br>Min | V <sub>BE(SAT)</sub> (V)<br>Max | I <sub>C</sub> (A) | C <sub>ob</sub> (pF)<br>Max | Typ | f <sub>t</sub> (MHz)<br>Min | Typ | Max | I <sub>C</sub> (mA) |  |
| 2SC2335R | 500                         | 400                         | 7                           | 40                             | 7                  | 10   | 400                                     |                              |   | 20                     | 80                     | 0.1   | 5                   | 1                               |                                 | 1.2                             | 3                  |                             |     |                             |     |     |                     |  |
| 2SC2335Y | 500                         | 400                         | 7                           | 40                             | 7                  | 10   | 400                                     |                              |   | 20                     | 80                     | 0.1   | 5                   | 1                               |                                 | 1.2                             | 3                  |                             |     |                             |     |     |                     |  |
| 2SC3039  | 500                         | 400                         | 7                           | 50                             | 7                  | 10   | 400                                     |                              |   | 15                     | 8                      | 0.8   | 5                   | 1                               |                                 | 1.5                             | 4                  | 80                          |     | 20                          |     |     | 800                 |  |
| 2SD1163  | 300                         | 120                         |                             | 40                             | 7                  | 5000   | 300                                     |                              |   | 25                     |                        | 5   | 5                   | 2                               |                                 | 1.2                             | 5                  |                             |     |                             |     |     |                     |  |
| 2SD1163A | 350                         | 150                         |                             | 40                             | 7                  | 5000   | 350                                     |                              |   | 25                     |                        | 5   | 5                   | 1                               |                                 | 1.2                             | 5                  |                             |     |                             |     |     |                     |  |
| 2SD288   | 80                          | 55                          | 5                           | 25                             | 3                  | 50   | 50                                      |                              |   | 40                     | 240                    | 0.5   | 5                   | 1                               |                                 |                                 | 1                  |                             |     |                             |     |     |                     |  |
| 2SD288O  | 80                          | 55                          | 5                           | 25                             | 3                  | 50   | 50                                      |                              |   | 70                     | 140                    | 0.5   | 5                   | 1                               |                                 |                                 | 1                  |                             |     |                             |     |     |                     |  |
| 2SD288R  | 80                          | 55                          | 5                           | 25                             | 3                  | 50   | 50                                      |                              |   | 40                     | 80                     | 0.5   | 5                   | 1                               |                                 |                                 | 1                  |                             |     |                             |     |     |                     |  |
| 2SD288Y  | 80                          | 55                          | 5                           | 25                             | 3                  | 50   | 50                                      | 120                          | 240                                       | 0.5                    | 5                      | 1   | 1                   |                                 |                                 |                                 |                    |                             |     |                             |     |     |                     |  |
| 2SD362   | 150                         | 70                          | 8                           | 40                             | 5                  | 20   | 100                                     |                              |   | 20                     | 140                    | 5   | 5                   | 1                               |                                 | 1.5                             | 5                  |                             |     |                             |     |     |                     |  |
| 2SD880   | 60                          | 60                          | 7                           | 30                             | 3                  | 100  | 60                                      |                              |   | 60                     | 300                    | 0.5   | 5                   | 1                               |                                 |                                 | 3                  | 70                          |     | 3                           |     |     | 500                 |  |
| 2SD880GR | 60                          | 60                          | 7                           | 30                             | 3                  | 100  | 60                                      |                              |   | 150                    | 300                    | 0.5   | 5                   | 1                               |                                 |                                 | 3                  | 70                          |     | 3                           |     |     | 500                 |  |
| 2SD880O  | 60                          | 60                          | 7                           | 30                             | 3                  | 100  | 60                                      |                              |   | 60                     | 120                    | 0.5   | 5                   | 1                               |                                 |                                 | 3                  | 70                          |     | 3                           |     |     | 500                 |  |
| 2SD880Y  | 60                          | 60                          | 7                           | 30                             | 3                  | 100  | 60                                      |                              |   | 100                    | 200                    | 0.5   | 5                   | 1                               |                                 |                                 | 3                  | 70                          |     | 3                           |     |     | 500                 |  |
| BD239    | 55                          | 45                          | 5                           | 30                             | 2                  |  |   | 200                          | 45  | 40                     | 15                     | 0.2   | 4                   | 0.7                             |                                 |                                 | 1                  |                             |     | 3                           |     |     | 200                 |  |
| BD239A   | 70                          | 60                          | 5                           | 30                             | 2                  |  |   | 200                          | 60  | 40                     | 15                     | 0.2   | 4                   | 0.7                             |                                 |                                 | 1                  |                             |     | 3                           |     |     | 200                 |  |
| BD239B   | 90                          | 80                          | 5                           | 30                             | 2                  |  |   | 200                          | 80  | 40                     | 15                     | 0.2   | 4                   | 0.7                             |                                 |                                 | 1                  |                             |     | 3                           |     |     | 200                 |  |
| BD239C   | 115                         | 100                         | 5                           | 30                             | 2                  |  |   | 200                          | 100                                       | 40                     | 15                     | 0.2   | 4                   | 0.7                             |                                 |                                 | 1                  |                             |     | 3                           |     |     | 200                 |  |
| BD241    | ## 55                       | 45                          | 5                           | 40                             | 3                  |  |   | 200                          | 45  | 25                     | 10                     | 1   | 4                   | 1.2                             |                                 |                                 | 3                  |                             |     | 3                           |     |     | 500                 |  |
| BD241A   | ## 70                       | 60                          | 5                           | 40                             | 3                  |  |   | 200                          | 60  | 25                     | 10                     | 1   | 4                   | 1.2                             |                                 |                                 | 3                  |                             |     | 3                           |     |     | 500                 |  |
| BD241B   | ## 90                       | 80                          | 5                           | 40                             | 3                  |  |   | 200                          | 80  | 25                     | 10                     | 1   | 4                   | 1.2                             |                                 |                                 | 3                  |                             |     | 3                           |     |     | 500                 |  |
| BD241C   | ## 115                      | 100                         | 5                           | 40                             | 3                  |  |   | 200                          | 100                                       | 25                     | 10                     | 1   | 4                   | 1.2                             |                                 |                                 | 3                  |                             |     | 3                           |     |     | 500                 |  |
| BD243    | 45                          | 45                          | 5                           | 65                             | 6                  |  |   | 400                          | 45  | 30                     | 15                     | 0.3   | 4                   | 1.5                             |                                 |                                 | 6                  |                             |     | 3                           |     |     | 500                 |  |
| BD243A   | 60                          | 60                          | 5                           | 65                             | 6                  |  |   | 400                          | 60  | 30                     | 15                     | 0.3   | 4                   | 1.5                             |                                 |                                 | 6                  |                             |     | 3                           |     |     | 500                 |  |

## NOTE : V<sub>CES</sub>

■ 2383394 0000999 725 ■

isc Silicon NPN Power Transistor

2SD362

**DESCRIPTION**

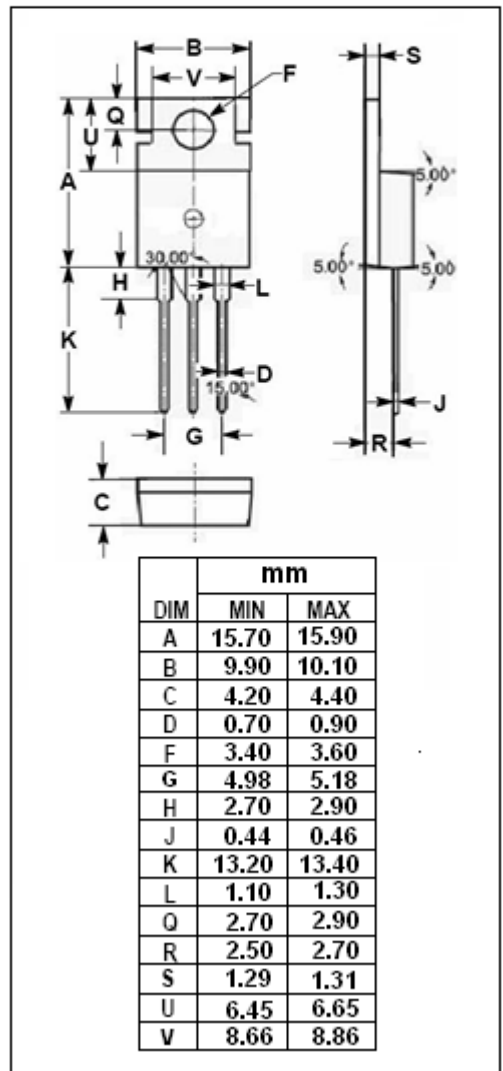
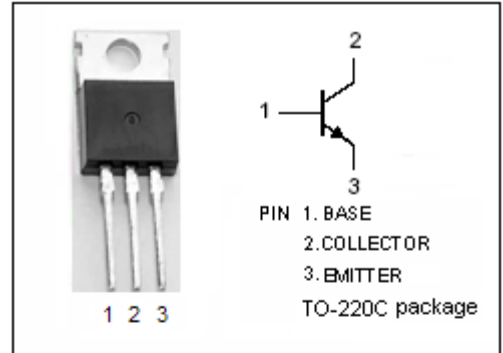
- Collector-Emitter Breakdown Voltage-  
:  $V_{(BR)CEO} = 70V(\text{Min})$
- Collector Power Dissipation-  
:  $P_C = 40W(\text{Max}) @ T_C = 25^\circ\text{C}$

**APPLICATIONS**

- Designed for B/W TV horizontal deflection output applications.

**ABSOLUTE MAXIMUM RATINGS( $T_a=25^\circ\text{C}$ )**

| SYMBOL    | PARAMETER   | VALUE   | UNIT             |
|-----------|---|---------|------------------|
| $V_{CBO}$ | Collector-Base Voltage                                  | 150     | V                |
| $V_{CEO}$ | Collector-Emitter Voltage                               | 70      | V                |
| $V_{EBO}$ | Emitter-Base Voltage                                    | 8       | V                |
| $I_C$     | Collector Current-Continuous                            | 5       | A                |
| $P_C$     | Collector Power Dissipation<br>@ $T_C=25^\circ\text{C}$ | 40      | W                |
| $T_J$     | Junction Temperature                                    | 150     | $^\circ\text{C}$ |
| $T_{stg}$ | Storage Temperature Range                               | -55~150 | $^\circ\text{C}$ |



**isc Silicon NPN Power Transistor****2SD362****ELECTRICAL CHARACTERISTICS** $T_C=25^{\circ}\text{C}$  unless otherwise specified

| SYMBOL        | PARAMETER                            | CONDITIONS                          | MIN | TYP. | MAX | UNIT          |
|---------------|--------------------------------------|-------------------------------------|-----|------|-----|---------------|
| $V_{(BR)CEO}$ | Collector-Emitter Breakdown Voltage  | $I_C=2\text{mA}; R_{BE}=\infty$     | 70  |      |     | V             |
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage     | $I_C=1\text{mA}; I_E=0$             | 150 |      |     | V             |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage       | $I_E=1\text{mA}; I_C=0$             | 8   |      |     | V             |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C=5\text{A}; I_B=0.5\text{A}$    |     |      | 1.0 | V             |
| $V_{BE(sat)}$ | Base-Emitter Saturation Voltage      | $I_C=5\text{A}; I_B=0.5\text{A}$    |     |      | 1.5 | V             |
| $I_{CBO}$     | Collector Cutoff Current             | $V_{CB}=100\text{V}; I_E=0$         |     |      | 20  | $\mu\text{A}$ |
| $h_{FE}$      | DC Current Gain                      | $I_C=5\text{A}; V_{CE}=5\text{V}$   | 20  |      | 140 |               |
| $f_T$         | Current-Gain—Bandwidth Product       | $I_C=0.5\text{A}; V_{CE}=5\text{V}$ |     | 10   |     | MHz           |

◆  **$h_{FE}$  Classifications**

| N     | R     | O      |
|-------|-------|--------|
| 20-50 | 40-80 | 70-140 |