



**MEDIUM POWER LINEAR AND SWITCHING APPLICATIONS**

**DESCRIPTION**

The 2N5190, 2N5191, 2N5192 are silicon epitaxial-base NPN power transistors in Jedec TO-126 plastic package, intended for use in medium power linear and switching applications. The complementary PNP types are the 2N5193, 2N5194 and 2N5195 respectively.



**INTERNAL SCHEMATIC DIAGRAMS**



**ABSOLUTE MAXIMUM RATINGS**

| Symbol    | Parameter  | NPN<br>PNP* | 2N5190<br>2N5193 | 2N5191<br>2N5194 | 2N5192<br>2N5195 | Unit |
|-----------|--|-------------|------------------|------------------|------------------|------|
| $V_{CBO}$ | Collector-base Voltage ( $I_E = 0$ )             |             | 40               | 60               | 80               | V    |
| $V_{CEO}$ | Collector-emitter Voltage ( $I_B = 0$ )          |             | 40               | 60               | 80               | V    |
| $V_{EBO}$ | Emitter-base Voltage ( $I_C = 0$ )               |             |                  | 5                |                  | V    |
| $I_C$     | Collector Current                                |             |                  | 4                |                  | A    |
| $I_{CM}$  | Collector Peak Current ( $t \leq 10$ ms)         |             |                  | 7                |                  | A    |
| $I_B$     | Base Current                                     |             |                  | 1                |                  | A    |
| $P_{TOT}$ | Total Power Dissipation at $T_{case} \leq 25$ °C |             |                  | 40               |                  | W    |
| $T_{stg}$ | Storage Temperature                              |             |                  | - 65 to 150      |                  | °C   |
| $T_j$     | Junction Temperature                             |             |                  | 150              |                  | °C   |

\* For PNP types voltage and current values are negative.

## THERMAL DATA

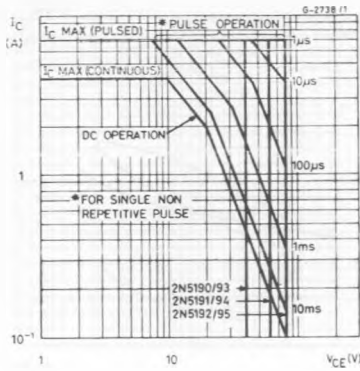
|                  |                                     |     |      |      |
|------------------|-------------------------------------|-----|------|------|
| $R_{th\ j-case}$ | Thermal Resistance Junction-case    | Max | 3.12 | °C/W |
| $R_{th\ j-amb}$  | Thermal Resistance Junction-ambient | Max | 100  | °C/W |

ELECTRICAL CHARACTERISTICS ( $T_{case} = 25\text{ °C}$  unless otherwise specified)

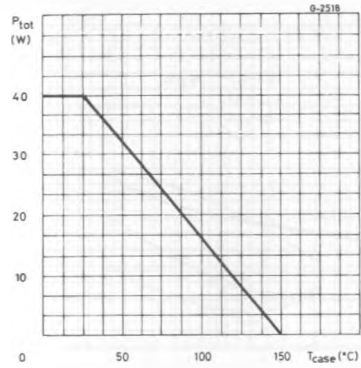
| Symbol           | Parameter   | Test Conditions  | Min.                            | Typ. | Max.                             | Unit  |
|------------------|---|--|---------------------------------|------|----------------------------------|---|
| $I_{CBO}$        | Collector Cutoff Current<br>( $I_E = 0$ )               | for <b>2N5190/93</b> $V_{CB} = 40\text{ V}$<br>for <b>2N5191/94</b> $V_{CB} = 60\text{ V}$<br>for <b>2N5192/95</b> $V_{CB} = 80\text{ V}$  |                                 |      | 100<br>100<br>100                | $\mu\text{A}$<br>$\mu\text{A}$<br>$\mu\text{A}$                   |
| $I_{CEX}$        | Collector Cutoff Current<br>( $V_{EB} = 1.5\text{ V}$ ) | for <b>2N5190/93</b> $V_{CE} = 40\text{ V}$<br>for <b>2N5191/94</b> $V_{CE} = 60\text{ V}$<br>for <b>2N5192/95</b> $V_{CE} = 80\text{ V}$<br>$T_{case} = 125\text{ °C}$<br>for <b>2N5190/93</b> $V_{CE} = 40\text{ V}$<br>for <b>2N5191/94</b> $V_{CE} = 60\text{ V}$<br>for <b>2N5192/95</b> $V_{CE} = 80\text{ V}$ |                                 |      | 100<br>100<br>100<br>2<br>2<br>2 | $\mu\text{A}$<br>$\mu\text{A}$<br>$\mu\text{A}$<br>mA<br>mA<br>mA |
| $I_{CEO}$        | Collector Cutoff Current<br>( $I_B = 0$ )               | for <b>2N5190/93</b> $V_{CE} = 40\text{ V}$<br>for <b>2N5191/94</b> $V_{CE} = 60\text{ V}$<br>for <b>2N5192/95</b> $V_{CE} = 80\text{ V}$  |                                 |      | 1<br>1<br>1                      | mA<br>mA<br>mA  |
| $I_{EBO}$        | Emitter Cutoff Current<br>( $I_C = 0$ )                 | $V_{EB} = 5\text{ V}$  |                                 |      | 1                                | mA  |
| $V_{CEO(sus)}^*$ | Collector-emitter Sustaining<br>Voltage ( $I_B = 0$ )   | $I_C = 100\text{ mA}$ for <b>2N5190/93</b><br>for <b>2N5191/94</b><br>for <b>2N5192/95</b>   | 40<br>60<br>80                  |      |                                  | V<br>V<br>V   |
| $V_{CE(sat)}^*$  | Collector-emitter Saturation<br>Voltage                 | $I_C = 1.5\text{ A}$ $I_B = 0.15\text{ A}$<br>$I_C = 4\text{ A}$ $I_B = 1\text{ A}$<br>for <b>2N5190/91/92</b><br>for <b>2N5193/94/95</b>  |                                 |      | 0.6<br>1.4<br>1.2                | V<br>V<br>V   |
| $V_{BE}^*$       | Base-emitter Voltage                                    | $I_C = 1.5\text{ A}$ $V_{CE} = 2\text{ V}$   |                                 |      | 1.2                              | V   |
| $h_{FE}^*$       | DC Current Gain   | $I_C = 1.5\text{ A}$ $V_{CE} = 2\text{ V}$<br>for <b>2N5190/93</b><br>for <b>2N5191/94</b><br>for <b>2N5192/95</b><br>$I_C = 4\text{ A}$ $V_{CE} = 2\text{ V}$<br>for <b>2N5190/93</b><br>for <b>2N5191/94</b><br>for <b>2N5192/95</b>   | 25<br>25<br>20<br>10<br>10<br>7 |      | 100<br>100<br>80                 |   |
| $f_T$            | Transistion Frequency                                   | $I_C = 1\text{ A}$ $V_{CE} = 10\text{ V}$  | 2                               |      |                                  | MHz   |

\* Pulsed : pulse duration =  $300\mu\text{s}$  duty cycle = 1.5%.  
For NPN types voltage and current values are negative.

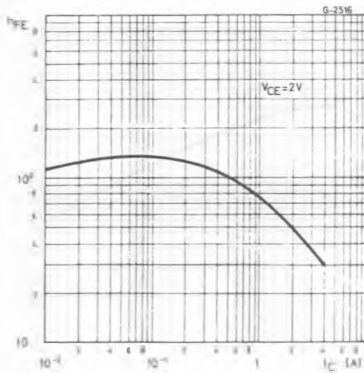
Safe Operating Areas.



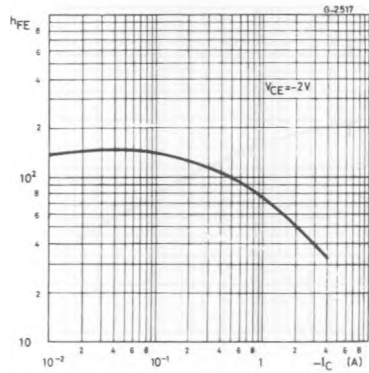
Power Rating Chart.



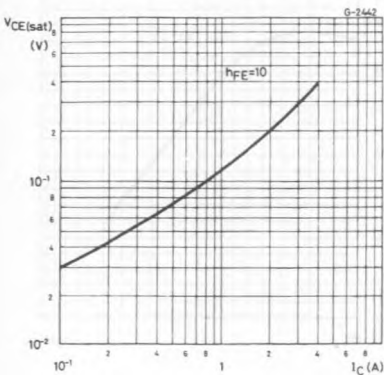
DC Current Gain (NPN types).



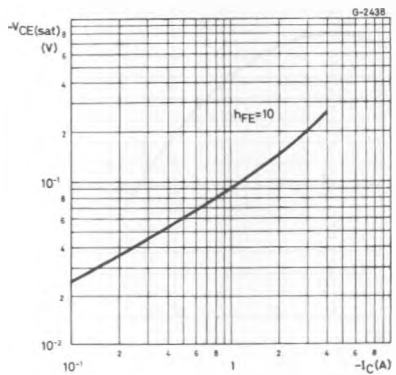
DC Current Gain (PNP types).



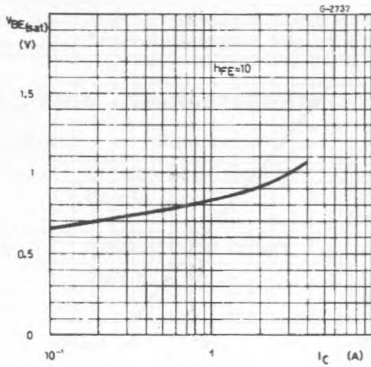
Collector-emitter Saturation Voltage (NPN types).



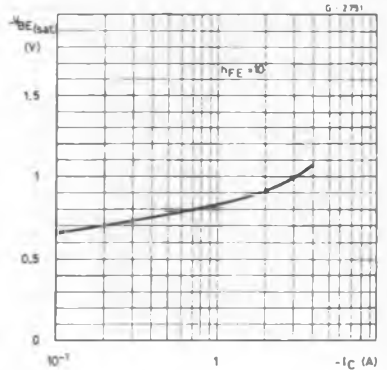
Collector-emitter Saturation Voltage (PNP types).



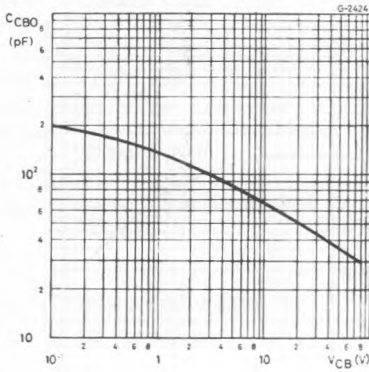
Base-emitter Saturation Voltage (NPN types).



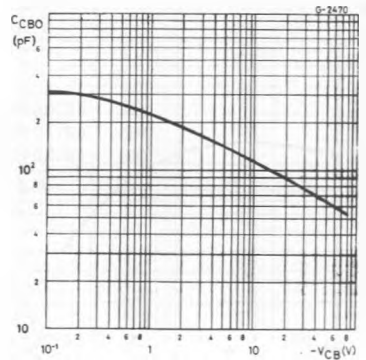
Base-emitter Saturation Voltage (PNP types).



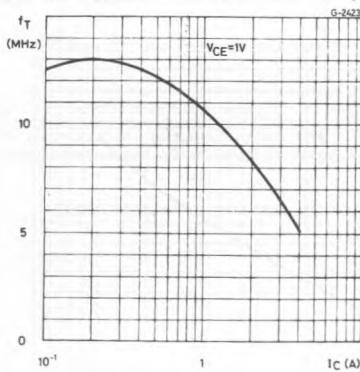
Collector-base Capacitance (NPN types).



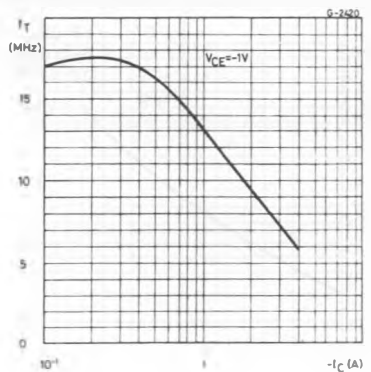
Collector-base Capacitance (PNP types).



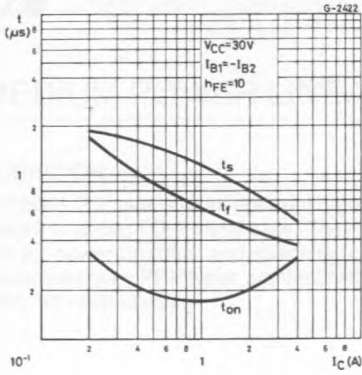
Transition Frequency (NPN types).



Transition Frequency (PNP types).



Saturated Switching Characteristics (NPN types).



Saturated Switching Characteristics (PNP types).

