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September 2015

## KSP44 / KSP45 NPN Epitaxial Silicon Transistor

### Features

- High-Voltage Transistor
- Collector-Emitter Voltage:  $V_{CEO}$  = KSP44: 400 V  
KSP45: 350 V



### Ordering Information

| Part Number | Top Mark | Package  | Packing Method |
|-------------|----------|----------|----------------|
| KSP44BU     | KSP44    | TO-92 3L | Bulk           |
| KSP44TA     | KSP44    | TO-92 3L | Ammo           |
| KSP44TF     | KSP44    | TO-92 3L | Tape and Reel  |
| KSP45TA     | KSP45    | TO-92 3L | Ammo           |

### Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

| Symbol    | Parameter                 |       | Value      | Unit             |
|-----------|---------------------------|-------|------------|------------------|
| $V_{CBO}$ | Collector-Base Voltage    | KSP44 | 500        | V                |
|           |                           | KSP45 | 400        |                  |
| $V_{CEO}$ | Collector-Emitter Voltage | KSP44 | 400        | V                |
|           |                           | KSP45 | 350        |                  |
| $V_{EBO}$ | Emitter-Base Voltage      |       | 6          | V                |
| $I_C$     | Collector Current         |       | 300        | mA               |
| $T_J$     | Junction Temperature      |       | 150        | $^\circ\text{C}$ |
| $T_{STG}$ | Storage Temperature       |       | -55 to 150 | $^\circ\text{C}$ |

**Thermal Characteristics<sup>(1)</sup>**

Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

| Symbol          | Parameter                               |                          | Value | Unit               |
|-----------------|-----------------------------------------|--------------------------|-------|--------------------|
| $P_D$           | Power Dissipation                       | $T_A = 25^\circ\text{C}$ | 625   | mW                 |
|                 |                                         | $T_C = 25^\circ\text{C}$ | 1.5   | W                  |
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case    |                          | 83.3  | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient |                          | 200   | $^\circ\text{C/W}$ |

**Note:**

1. PCB size: FR-4, 76 mm x 114 mm x 1.57 mm (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.

**Electrical Characteristics**

Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

| Symbol        | Parameter                                           |       | Conditions                                             | Min. | Max. | Unit          |
|---------------|-----------------------------------------------------|-------|--------------------------------------------------------|------|------|---------------|
| $BV_{CBO}$    | Collector-Base Breakdown Voltage                    | KSP44 | $I_C = 100\text{ }\mu\text{A}, I_E = 0$                | 500  |      | V             |
|               |                                                     | KSP45 |                                                        | 400  |      |               |
| $BV_{CEO}$    | Collector-Emitter Breakdown Voltage <sup>(2)</sup>  | KSP44 | $I_C = 1\text{ mA}, I_B = 0$                           | 400  |      | V             |
|               |                                                     | KSP45 |                                                        | 350  |      |               |
| $BV_{EBO}$    | Emitter-Base Breakdown Voltage                      |       | $I_E = 100\text{ }\mu\text{A}, I_C = 0$                | 6    |      | V             |
| $I_{CBO}$     | Collector Cut-Off Current                           | KSP44 | $V_{CB} = 400\text{ V}, I_E = 0$                       |      | 0.1  | $\mu\text{A}$ |
|               |                                                     | KSP45 | $V_{CB} = 320\text{ V}, I_E = 0$                       |      | 0.1  |               |
| $I_{CES}$     | Collector Cut-Off Current                           | KSP44 | $V_{CE} = 400\text{ V}, I_B = 0$                       |      | 0.5  | $\mu\text{A}$ |
|               |                                                     | KSP45 | $V_{CE} = 320\text{ V}, I_B = 0$                       |      | 0.5  |               |
| $I_{EBO}$     | Emitter Cut-Off Current                             |       | $V_{EB} = 4\text{ V}, I_C = 0$                         |      | 0.1  | $\mu\text{A}$ |
| $h_{FE}$      | DC Current Gain <sup>(2)</sup>                      |       | $V_{CE} = 10\text{ V}, I_C = 1\text{ mA}$              | 40   |      |               |
|               |                                                     |       | $V_{CE} = 10\text{ V}, I_C = 10\text{ mA}$             | 50   | 200  |               |
|               |                                                     |       | $V_{CE} = 10\text{ V}, I_C = 50\text{ mA}$             | 45   |      |               |
|               |                                                     |       | $V_{CE} = 10\text{ V}, I_C = 100\text{ mA}$            | 40   |      |               |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage <sup>(2)</sup> |       | $I_C = 1\text{ mA}, I_B = 0.1\text{ mA}$               |      | 0.40 | V             |
|               |                                                     |       | $I_C = 10\text{ mA}, I_B = 1\text{ mA}$                |      | 0.50 |               |
|               |                                                     |       | $I_C = 50\text{ mA}, I_B = 5\text{ mA}$                |      | 0.75 |               |
| $V_{BE(sat)}$ | Base-Emitter Saturation Voltage <sup>(2)</sup>      |       | $I_C = 10\text{ mA}, I_B = 1\text{ mA}$                |      | 0.75 | V             |
| $C_{ob}$      | Output Capacitance                                  |       | $V_{CB} = 20\text{ V}, I_E = 0,$<br>$f = 1\text{ MHz}$ |      | 7    | pF            |

**Note:**

2. Pulse test: pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

## Typical Performance Characteristics

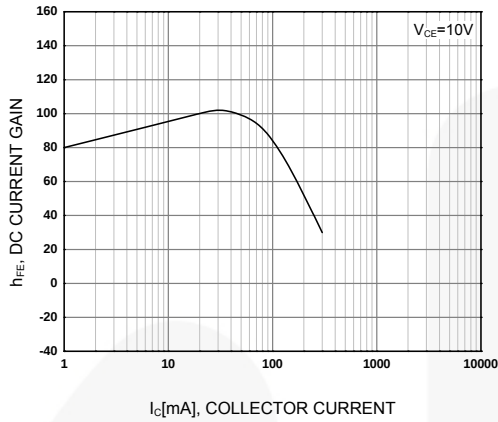


Figure 1. DC Current Gain

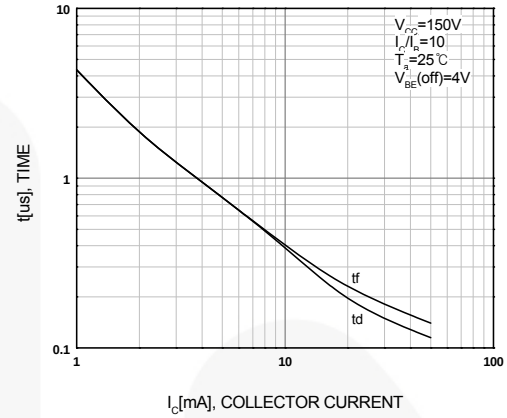


Figure 2. Turn-On Switching Times

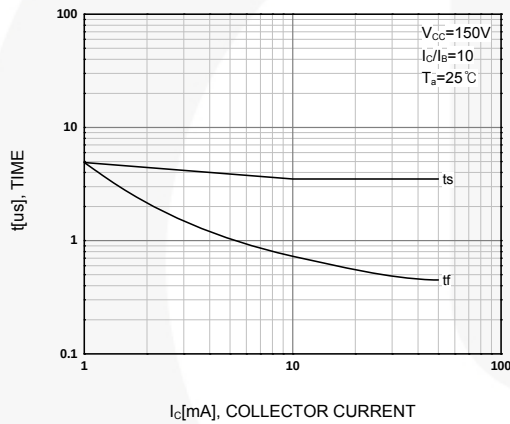


Figure 3. Turn-Off Switching Times

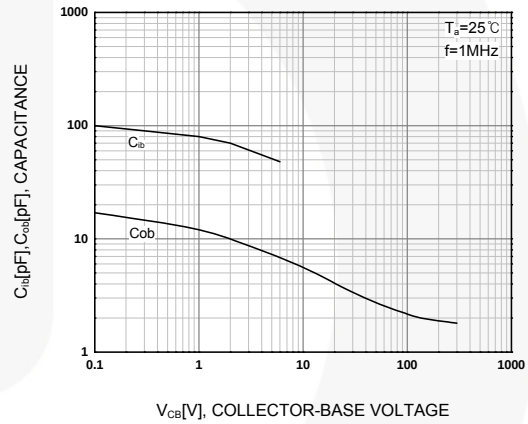


Figure 4. Capacitance

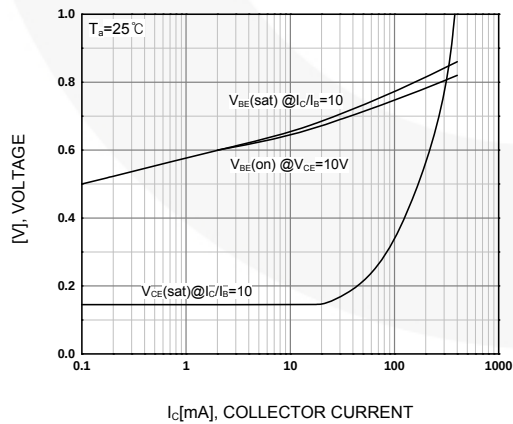


Figure 5. On Voltage

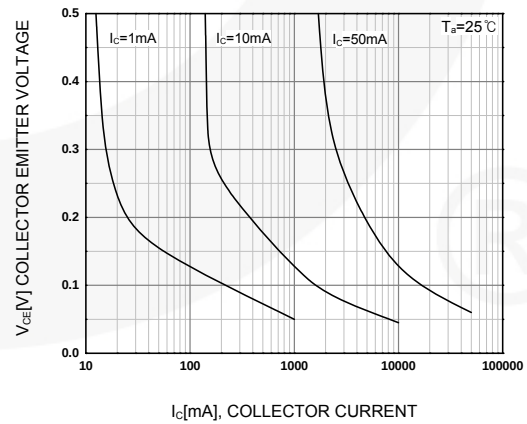


Figure 6. Collector Saturation Region

## Typical Performance Characteristics (Continued)

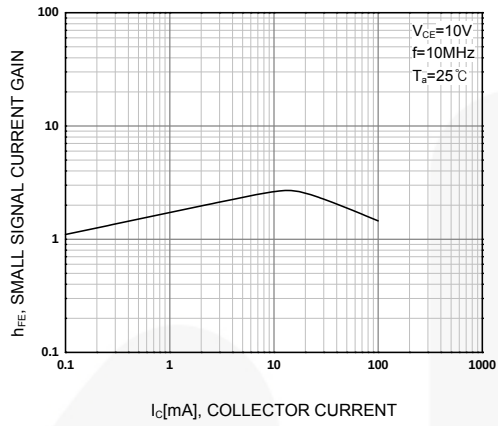


Figure 7. High-Frequency Current Gain

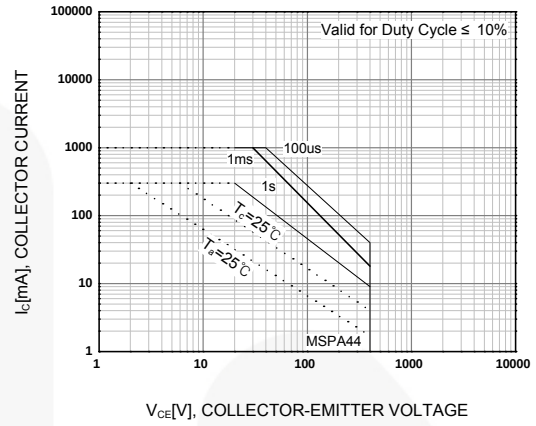
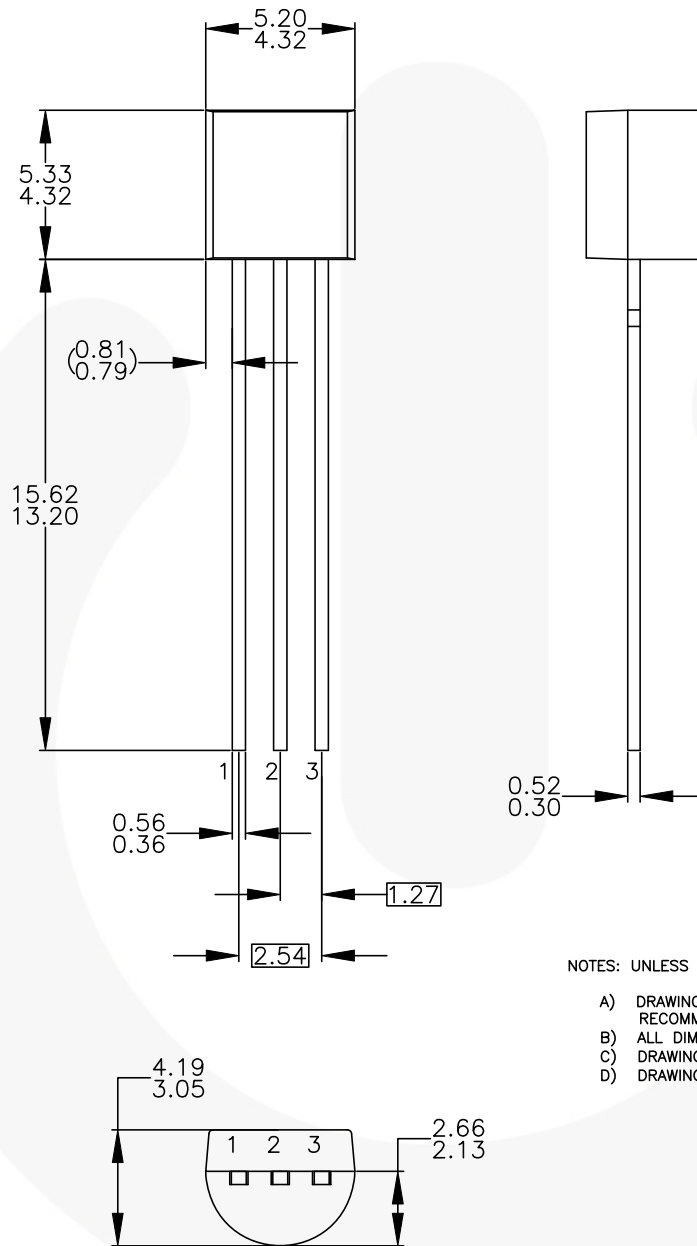


Figure 8. Safe Operating Area

## Physical Dimensions



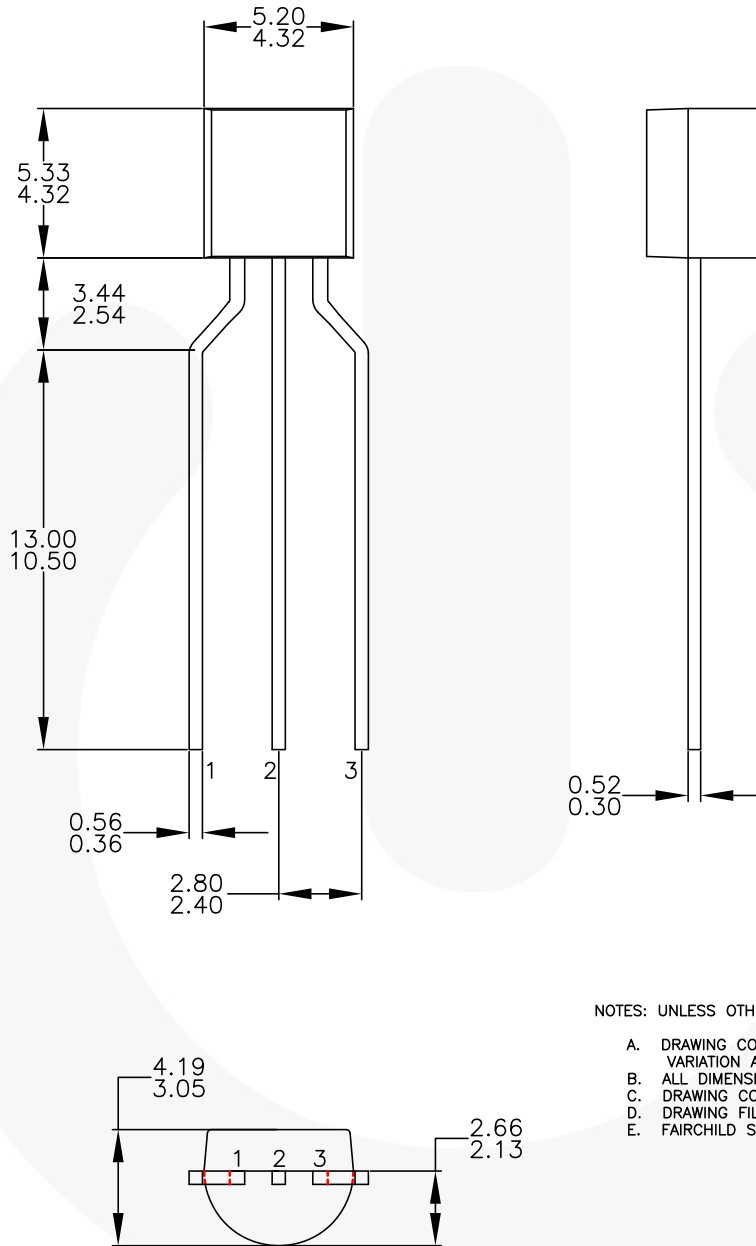
NOTES: UNLESS OTHERWISE SPECIFIED

- A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DRAWING CONFORMS TO ASME Y14.5M-2009.
- D) DRAWING FILENAME: MKT-ZA03DREV4.



Figure 9. 3-Lead, TO-92, JEDEC TO-92 Compliant Straight Lead Configuration, Bulk Type

**Physical Dimensions** (Continued)



NOTES: UNLESS OTHERWISE SPECIFIED

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**Figure 10. 3-Lead, TO-92, Molded, 0.2 In Line Spacing Lead Form, Ammo, Tape and Reel Type**



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