

## 2SK3541PT-VB Datasheet

### N-Channel 20 V (D-S) MOSFET

#### PRODUCT SUMMARY

| $V_{DS}$ (V) | $R_{DS(on)}$ ( $\Omega$ ) Max. | $I_D$ (A) | $Q_g$ (Typ.) |
|--------------|--------------------------------|-----------|--------------|
| 20           | 0.300 at $V_{GS} = 4.5$ V      | 0.9       | 3.5          |
|              | 0.350 at $V_{GS} = 2.5$ V      | 0.7       |              |

#### FEATURES

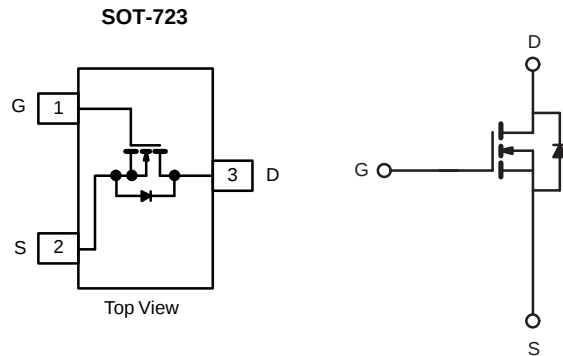
- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- 100 %  $R_g$  Tested
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

#### APPLICATIONS

- Load Switching for Portable Devices
- DC/DC Converter



#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

| Parameter                                                           | Symbol         | 5 s         | Steady State | Unit             |
|---------------------------------------------------------------------|----------------|-------------|--------------|------------------|
| Drain-Source Voltage                                                | $V_{DS}$       | 20          |              | V                |
| Gate-Source Voltage                                                 | $V_{GS}$       | $\pm 12$    |              |                  |
| Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) <sup>a</sup> | $I_D$          | 0.9         | 0.72         | A                |
|                                                                     |                | 0.68        | 0.57         |                  |
| Pulsed Drain Current ( $t = 300 \mu\text{s}$ ) <sup>b</sup>         | $I_{DM}$       | 3.5         |              |                  |
| Continuous Source Current (Diode Conduction) <sup>a</sup>           | $I_S$          | 0.72        | 0.6          |                  |
| Power Dissipation <sup>a</sup>                                      | $P_D$          | 0.35        | 0.28         | W                |
|                                                                     |                | 0.21        | 0.16         |                  |
| Operating Junction and Storage Temperature Range                    | $T_J, T_{stg}$ | - 55 to 150 |              | $^\circ\text{C}$ |

#### THERMAL RESISTANCE RATINGS

| Parameter                                | Symbol     | Typical | Maximum | Unit               |
|------------------------------------------|------------|---------|---------|--------------------|
| Maximum Junction-to-Ambient <sup>a</sup> | $R_{thJA}$ | 120     | 145     | $^\circ\text{C/W}$ |
|                                          |            | 140     | 175     |                    |
| Maximum Junction-to-Foot                 | $R_{thJF}$ | 62      | 78      |                    |

Notes:

a. Surface mounted on 1" x 1" FR4 board.

b. Pulse width limited by maximum junction temperature.

**SPECIFICATIONS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

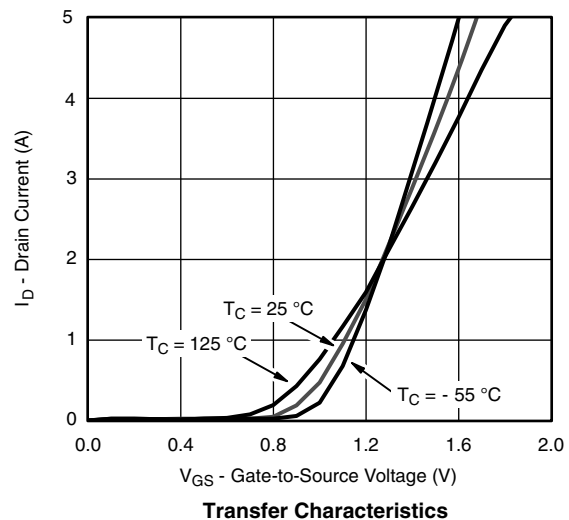
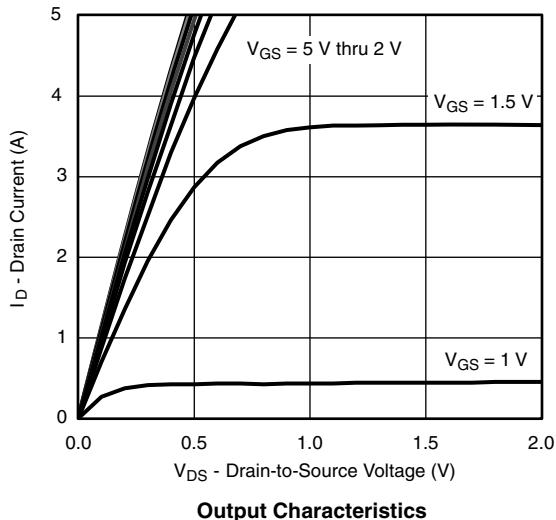
| Parameter                               | Symbol              | Test Conditions                                                                                                           | Limits |       |       | Unit |
|-----------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------|--------|-------|-------|------|
|                                         |                     |                                                                                                                           | Min.   | Typ.  | Max.  |      |
| Static                                  |                     |                                                                                                                           |        |       |       |      |
| Drain-Source Breakdown Voltage          | V <sub>DS</sub>     | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA                                                                            | 20     |       |       | V    |
| Gate-Threshold Voltage                  | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA                                                               | 0.50   |       | 0.90  |      |
| Gate-Body Leakage                       | I <sub>GSS</sub>    | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 8 V                                                                            |        |       | ± 100 | nA   |
| Zero Gate Voltage Drain Current         | I <sub>DSS</sub>    | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V                                                                             |        |       | 1     | μA   |
|                                         |                     | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 70 °C                                                     |        |       | 75    |      |
| On-State Drain Current <sup>a</sup>     | I <sub>D(on)</sub>  | V <sub>DS</sub> ≥ 10 V, V <sub>GS</sub> = 4.5 V                                                                           | 6      |       |       | A    |
| Drain-Source On-Resistance <sup>a</sup> | R <sub>DS(on)</sub> | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 0.9A                                                                            |        | 0.300 |       | Ω    |
|                                         |                     | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 0.7 A                                                                           |        | 0.350 |       |      |
| Forward Transconductance <sup>a</sup>   | g <sub>fs</sub>     | V <sub>DS</sub> = 5 V, I <sub>D</sub> = 0.9 A                                                                             |        | 13    |       | S    |
| Diode Forward Voltage                   | V <sub>SD</sub>     | I <sub>S</sub> = 0.95 A, V <sub>GS</sub> = 0 V                                                                            |        | 0.7   | 1.2   | V    |
| Dynamic <sup>b</sup>                    |                     |                                                                                                                           |        |       |       |      |
| Total Gate Charge                       | Q <sub>g</sub>      | V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 0.9A                                                    |        | 1.5   | 1.9   | nC   |
| Gate-Source Charge                      | Q <sub>gs</sub>     |                                                                                                                           |        | 0.25  |       |      |
| Gate-Drain Charge                       | Q <sub>gd</sub>     |                                                                                                                           |        | 0.40  |       |      |
| Gate Resistance                         | R <sub>g</sub>      | f = 1 MHz                                                                                                                 | 2      | 4     | 8     | Ω    |
| Switching                               |                     |                                                                                                                           |        |       |       |      |
| Turn-On Delay Time                      | t <sub>d(on)</sub>  | V <sub>DD</sub> = 10 V, R <sub>L</sub> = 2.78 Ω<br>I <sub>D</sub> ≅ 0.9 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 1 Ω |        | 8     | 15    | ns   |
| Rise Time                               | t <sub>r</sub>      |                                                                                                                           |        | 7     | 15    |      |
| Turn-Off Delay Time                     | t <sub>d(off)</sub> |                                                                                                                           |        | 30    | 45    |      |
| Fall Time                               | t <sub>f</sub>      |                                                                                                                           |        | 7     | 15    |      |
| Source-Drain Reverse Recovery Time      | t <sub>rr</sub>     | I <sub>F</sub> = 0.9 A, dI/dt = 100 A/μs                                                                                  |        | 8.5   | 15    | nC   |
| Body Diode Reverse Recovery Charge      | Q <sub>rr</sub>     |                                                                                                                           |        | 2     | 4     |      |

Notes:

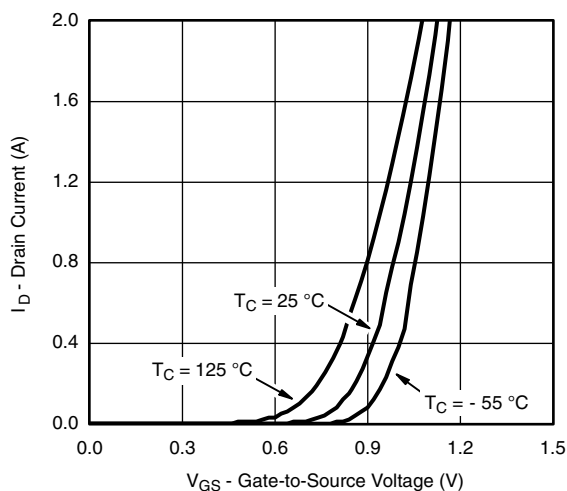
a. Pulse test: Pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

b. Guaranteed by design, not subject to production testing.

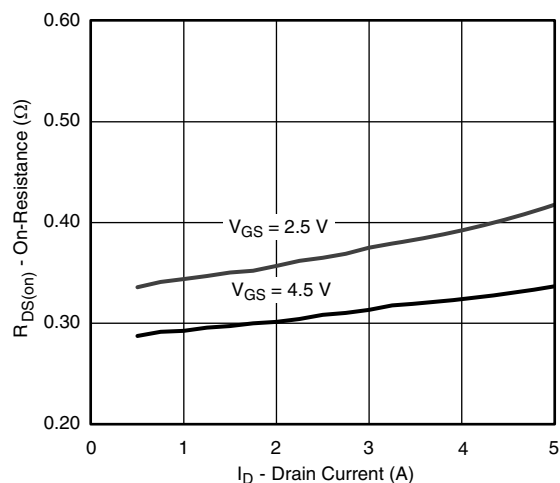
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**TYPICAL CHARACTERISTICS** ( $25^\circ\text{C}$ , unless otherwise noted)

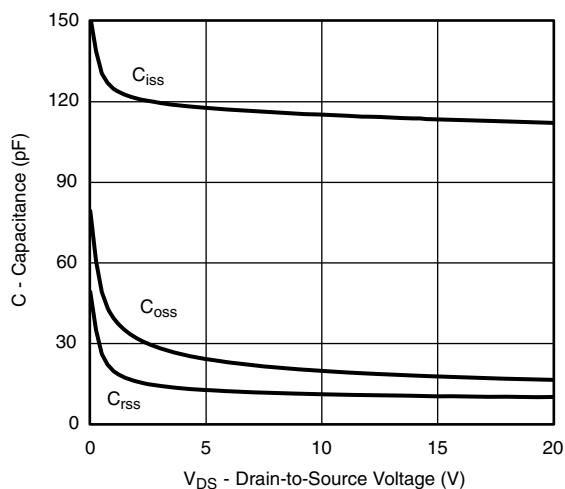
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



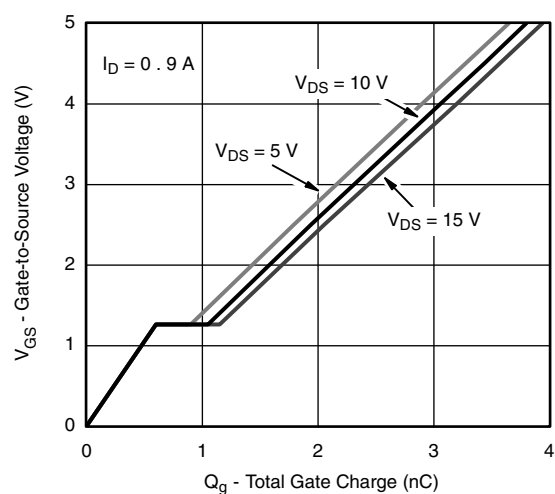
**Transfer Characteristics**



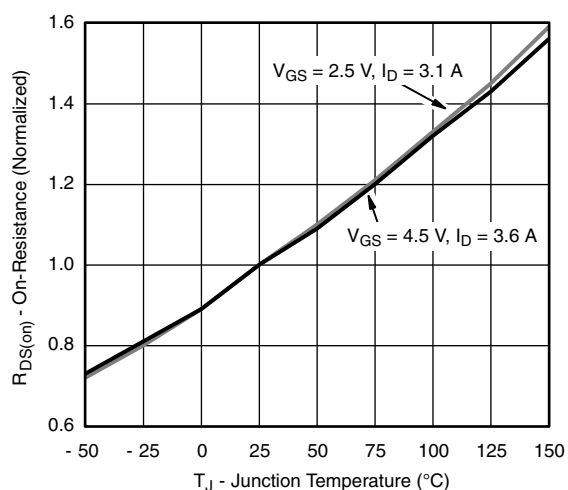
**On-Resistance vs. Drain Current**



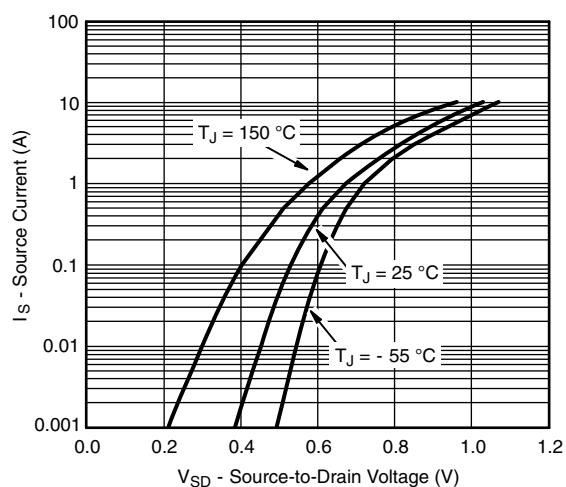
**Capacitance**



**Gate Charge**

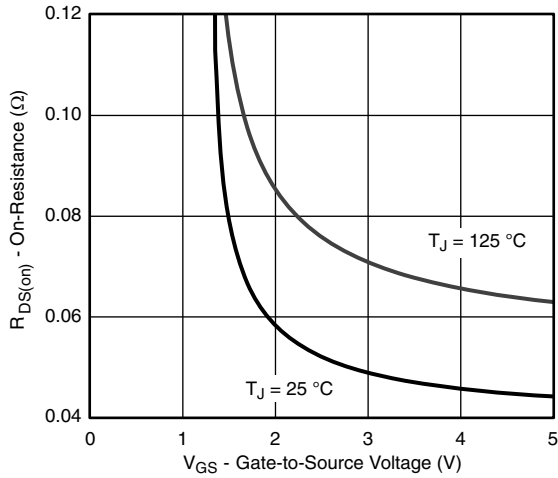


**On-Resistance vs. Junction Temperature**

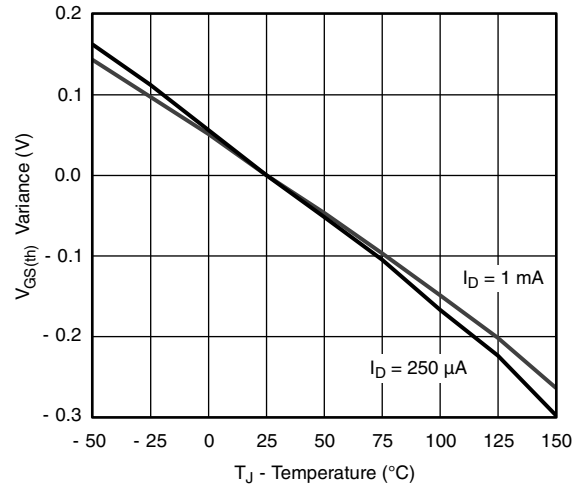


**Source-Drain Diode Forward Voltage**

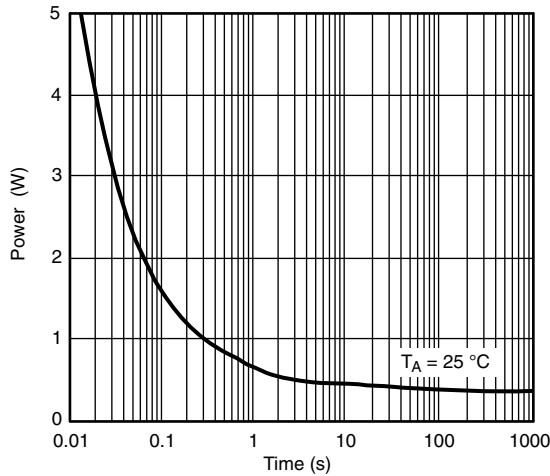
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



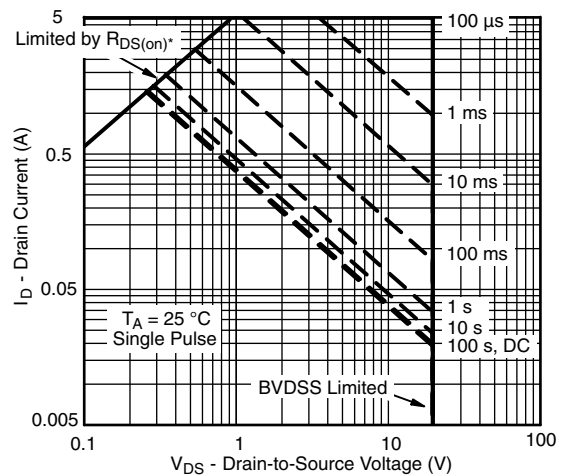
**On-Resistance vs. Gate-to-Source Voltage**



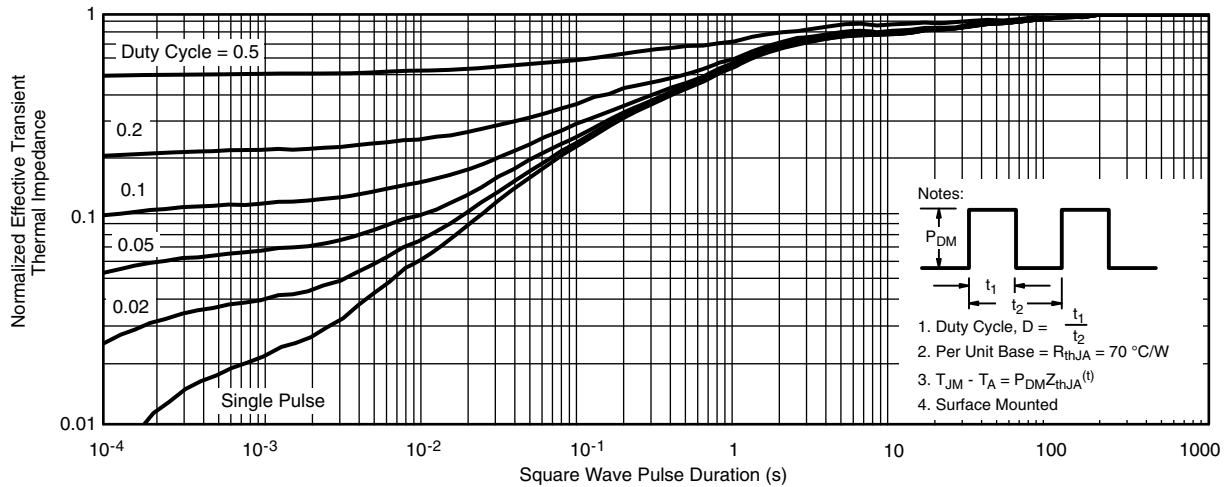
**Threshold Voltage**



**Single Pulse Power**



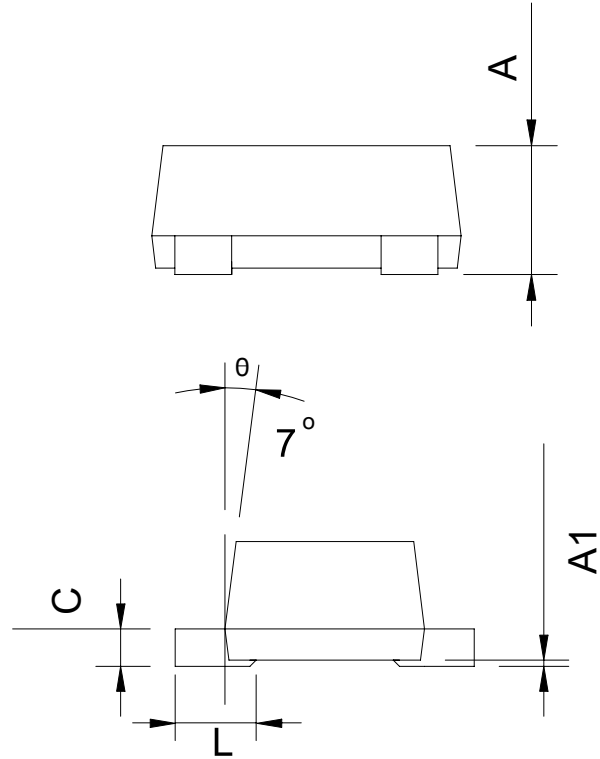
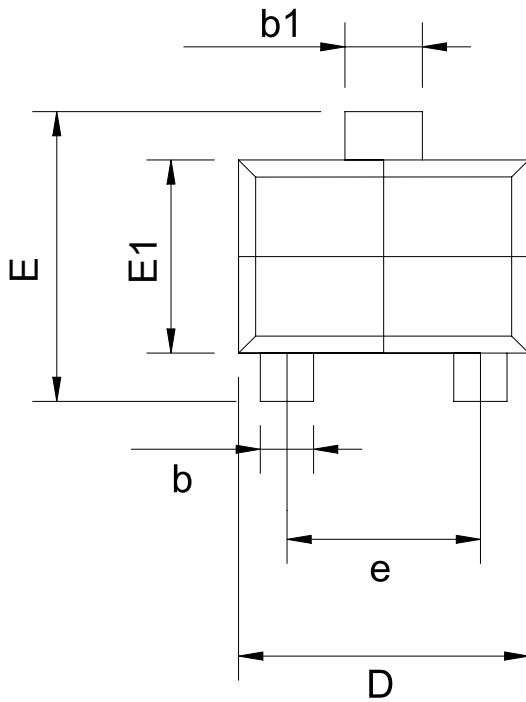
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified  
**Safe Operating Area, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Ambient**

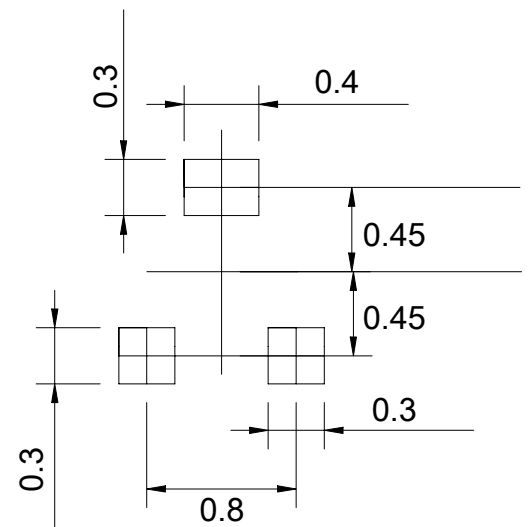
- Notes:
- 
- Duty Cycle,  $D = \frac{t_1}{t_2}$
  - Per Unit Base =  $R_{thJA} = 70^\circ\text{C/W}$
  - $T_{JM} - T_A = P_{DM}Z_{thJA}^{(t)}$
  - Surface Mounted

## SOT-723: 3 Leads



| SYMBOL | SOT-723     |       |            |       |
|--------|-------------|-------|------------|-------|
|        | MILLIMETERS |       | INCHES     |       |
|        | MIN.        | MAX.  | MIN.       | MAX.  |
| A      | -           | 0.500 | -          | 0.020 |
| A1     | 0.000       | 0.050 | 0.000      | 0.002 |
| b      | 0.170       | 0.270 | 0.007      | 0.011 |
| b1     | 0.270       | 0.370 | 0.011      | 0.015 |
| c      | -           | 0.150 | -          | 0.006 |
| D      | 1.150       | 1.250 | 0.045      | 0.049 |
| E      | 1.150       | 1.250 | 0.045      | 0.049 |
| E1     | 0.750       | 0.850 | 0.030      | 0.033 |
| e      | 0.800 TYP.  |       | 0.031 TYP. |       |
| L      | 0.32 BSC    |       | 0.013 BSC  |       |
| -      | ° REF.      |       | ° REF.     |       |

### RECOMMENDED LAND PATTERN



UNIT: mm

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