

## N-Channel 240 V (D-S) MOSFET

| PRODUCT SUMMARY  |                     |                             |                         |                    |                       |
|------------------|---------------------|-----------------------------|-------------------------|--------------------|-----------------------|
| Part Number      | V <sub>DS</sub> (V) | R <sub>DS(on)</sub> (Ω)     | V <sub>GS(th)</sub> (A) | I <sub>D</sub> (A) | Q <sub>g</sub> (Typ.) |
| TN2404K          | 240                 | 4 at V <sub>GS</sub> = 10 V | 0.8 to 2                | 0.2                | 4.87 nC               |
| TN2404K, BS107KL |                     |                             |                         | 0.3                |                       |

### FEATURES

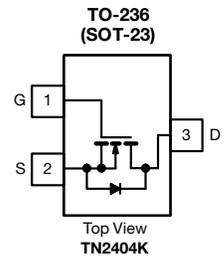
- Low On-Resistance: 4 Ω
- Secondary Breakdown Free: 260 V
- Low Power/Voltage Driven
- Low Input and Output Leakage
- Excellent Thermal Stability
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### APPLICATIONS

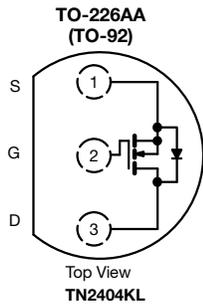
- High-Voltage Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Transistors, etc.
- Telephone Mute Switches, Ringer Circuits
- Power Supply, Converters
- Motor Control



### BENEFITS

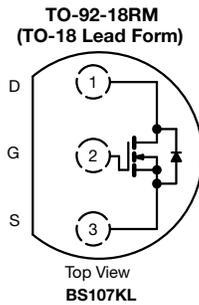
- Low Offset Voltage
- Full-Voltage Operation
- Easily Driven Without Buffer
- Low Error Voltage
- No High-Temperature "Run-Away"

Marking Code: K1ywl  
K1 = Part Number Code for TN2404K  
y = Year Code  
w = Week Code  
l = Lot Traceability



Device Marking  
Front View

"S" TN  
2404KL  
xxyy  
"S" = Siliconix Logo  
xxyy = Date Code



Device Marking  
Front View

"S" BS  
107KL  
xxyy  
"S" = Siliconix Logo  
xxyy = Date Code

### ORDERING INFORMATION

| Standard Partnumber | Ordering Part Number | Option                             |
|---------------------|----------------------|------------------------------------|
| TN2404K             | TN2404K-T1-E3        | Lead (Pb) free                     |
|                     | TN2404K-T1-GE3       | Lead (Pb) free and Halogen free    |
| TN2404KL            | TN2404KL-TR1-E3      | With Tape and Reel<br>Spool Option |
| BS107KL             | BS107KL-TR1-E3       |                                    |

### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C, unless otherwise noted)

| Parameter  | Symbol                            | TN2404K                | TN2404KL/BS107KL | Symbol |
|--|-----------------------------------|------------------------|------------------|--------|
| Drain-Source Voltage                               | V <sub>DS</sub>                   | 240                    |                  | V      |
| Gate-Source Voltage                                | V <sub>GS</sub>                   | ± 20                   |                  |        |
| Continuous Drain Current (T <sub>J</sub> = 150 °C) | I <sub>D</sub>                    | T <sub>A</sub> = 25 °C | 0.2              | 0.3    |
|  |                                   | T <sub>A</sub> = 70 °C | 0.16             | 0.25   |
| Pulsed Drain Current (t = 300 μs)                  | I <sub>DM</sub>                   | 0.8                    | 1.4              | A      |
| Maximum Power Dissipation                          | P <sub>D</sub>                    | T <sub>A</sub> = 25 °C | 0.36             | 0.8    |
|  |                                   | T <sub>A</sub> = 70 °C | 0.23             | 0.51   |
| Thermal Resistance Junction-to-Ambient             | R <sub>thJA</sub>                 | 350 <sup>b</sup>       | 156              | °C/W   |
| Operating Junction and Storage Temperature Range   | T <sub>J</sub> , T <sub>stg</sub> | - 55 to 150            |                  | °C     |

Notes:

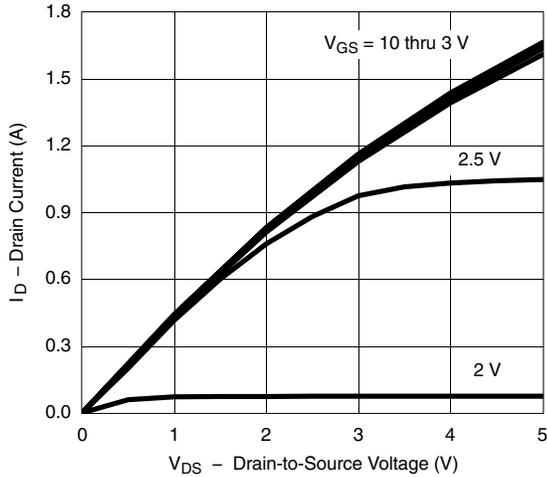
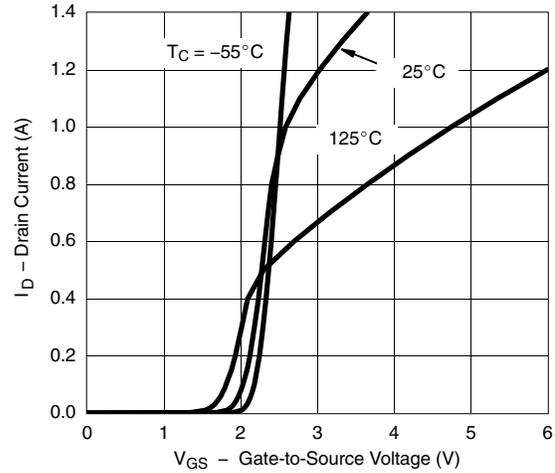
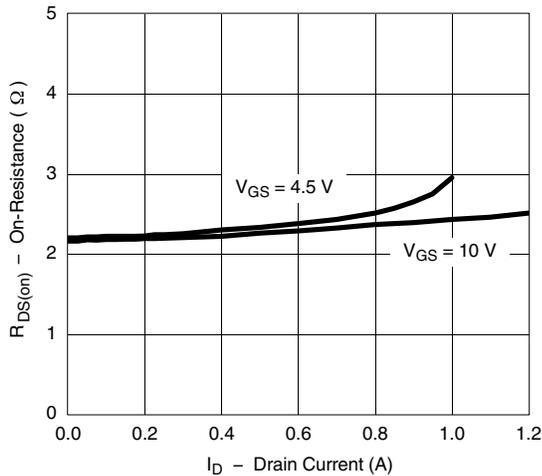
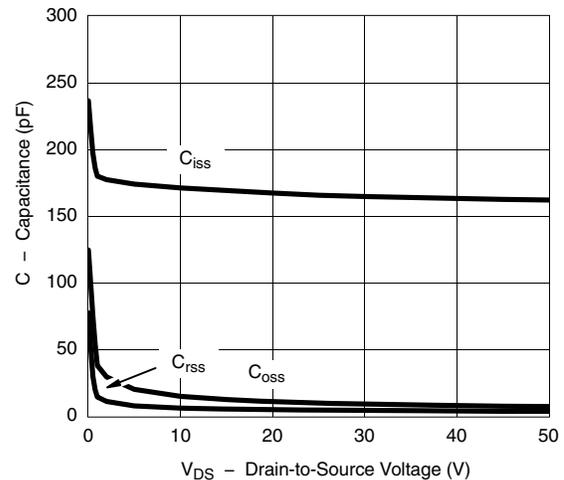
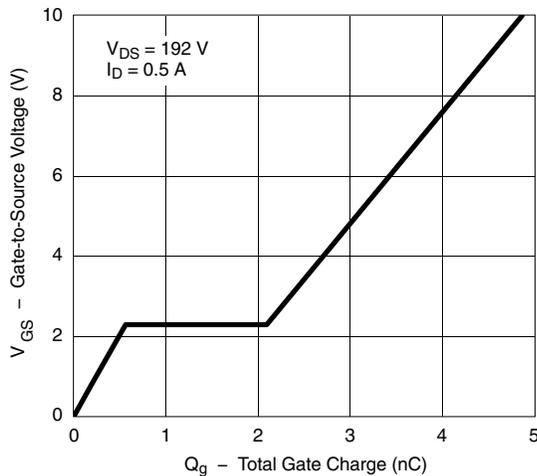
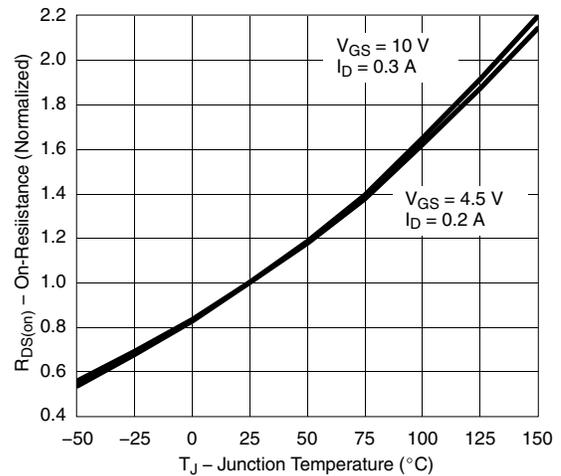
- Pulse width limited by maximum junction temperature.
- Surface mounted on an FR4 board.

| <b>SPECIFICATIONS</b> ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted) |              |  |        |                   |           |               |
|--|--------------|--|--------|-------------------|-----------|---------------|
| Parameter  | Symbol       | Test Conditions  | Limits |                   |           |               |
|  |              |  | Min.   | Typ. <sup>a</sup> | Max.      | Unit          |
| <b>Static</b>  |              |  |        |                   |           |               |
| Drain-Source Breakdown Voltage   | $V_{DS}$     | $V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$  | 240    | 257               |           | V             |
| Gate-Source Threshold Voltage  | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$  | 0.8    | 1.65              | 2         |               |
| Gate-Source Leakage  | $I_{GSS}$    | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$  |        |                   | $\pm 100$ | nA            |
| Zero Gate Voltage Drain Current  | $I_{DSS}$    | $V_{DS} = 192\text{ V}, V_{GS} = 0\text{ V}$   |        |                   | 1         | $\mu\text{A}$ |
|  |              | $V_{DS} = 192\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$   |        |                   | 10        |               |
| On-State Drain Current <sup>a</sup>  | $I_{D(on)}$  | $V_{DS} = 10\text{ V}, V_{GS} = 10\text{ V}$   | 0.8    |                   |           | A             |
|  |              | $V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}$  | 0.5    |                   |           |               |
| Drain-Source On-State Resistance <sup>a</sup>                                      | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 0.3\text{ A}$   |        | 2.2               | 4         | $\Omega$      |
|  |              | $V_{GS} = 4.5\text{ V}, I_D = 0.2\text{ A}$  |        | 2.3               | 4         |               |
|  |              | $V_{GS} = 2.5\text{ V}, I_D = 0.1\text{ A}$  |        | 2.4               | 6         |               |
| Forward Transconductance <sup>a</sup>  | $g_{fs}$     | $V_{DS} = 10\text{ V}, I_D = 0.3\text{ A}$   |        | 1.6               |           | S             |
| Diode Forward Voltage  | $V_{SD}$     | $V_{GS} = 0\text{ V}, I_S = 0.3\text{ A}$  |        | 0.8               | 1.2       | V             |
| <b>Dynamic<sup>b</sup></b>   |              |  |        |                   |           |               |
| Total Gate Charge  | $Q_g$        | $V_{DS} = 192\text{ V}, V_{GS} = 10\text{ V}, I_D = 0.5\text{ A}$  |        | 4.87              | 8         | nC            |
| Gate-Source Charge   | $Q_{gs}$     |  |        | 0.56              |           |               |
| Gate-Drain Charge  | $Q_{gd}$     |  |        | 1.53              |           |               |
| Turn-On Delay Time   | $t_{d(on)}$  | $V_{DD} = 60\text{ V}, R_L = 200\text{ }\Omega$<br>$I_D \cong 0.3\text{ A}, V_{GEN} = 10\text{ V}, R_g = 25\text{ }\Omega$ |        | 5                 | 10        | ns            |
| Rise Time  | $t_r$        |  |        | 12                | 20        |               |
| Turn-Off Delay Time  | $t_{d(off)}$ |  |        | 35                | 60        |               |
| Fall Time  | $t_f$        |  |        | 16                | 25        |               |

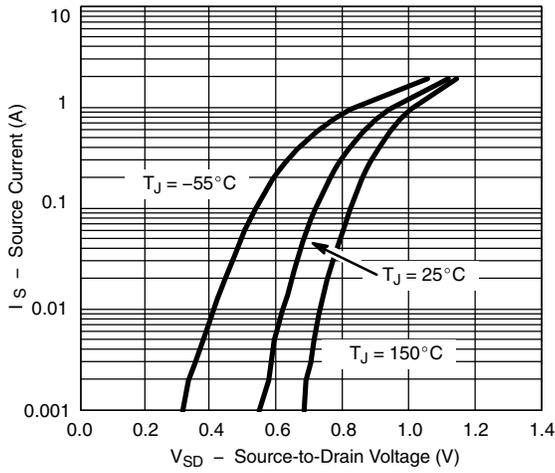
Notes:

- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$
- b. Guaranteed by design, not subject to production testing.

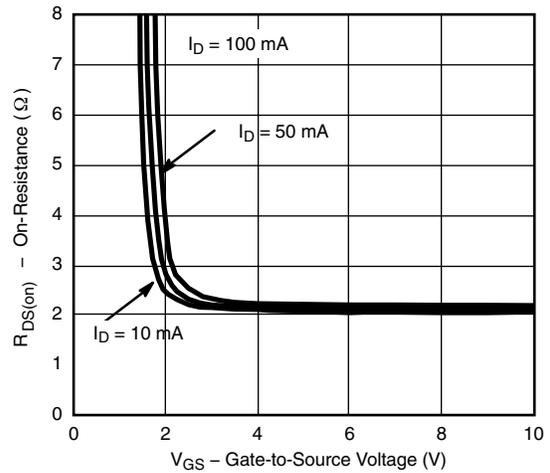
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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

**Output Characteristics**

**Transfer Characteristics**

**On-Resistance vs. Drain Current**

**Capacitance**

**Gate Charge**

**On-Resistance vs. Junction Temperature**

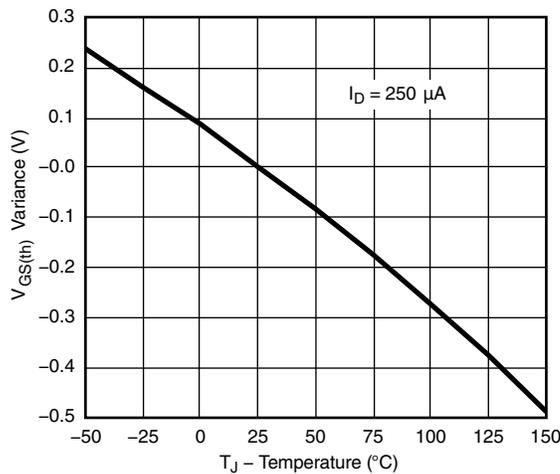
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



**Source-Drain Diode Forward Voltage**

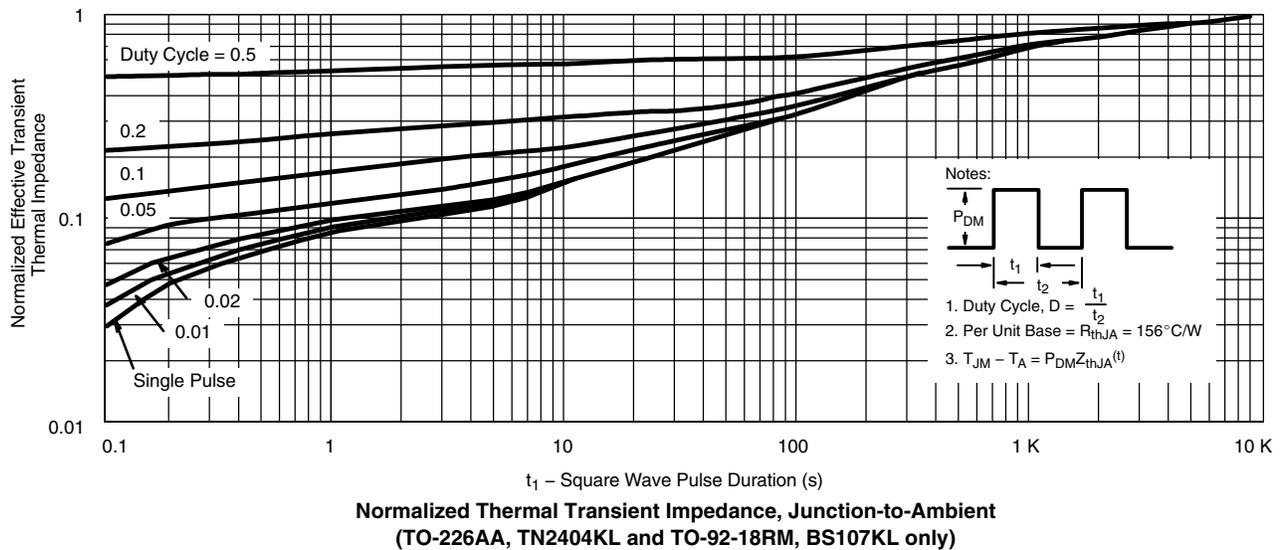
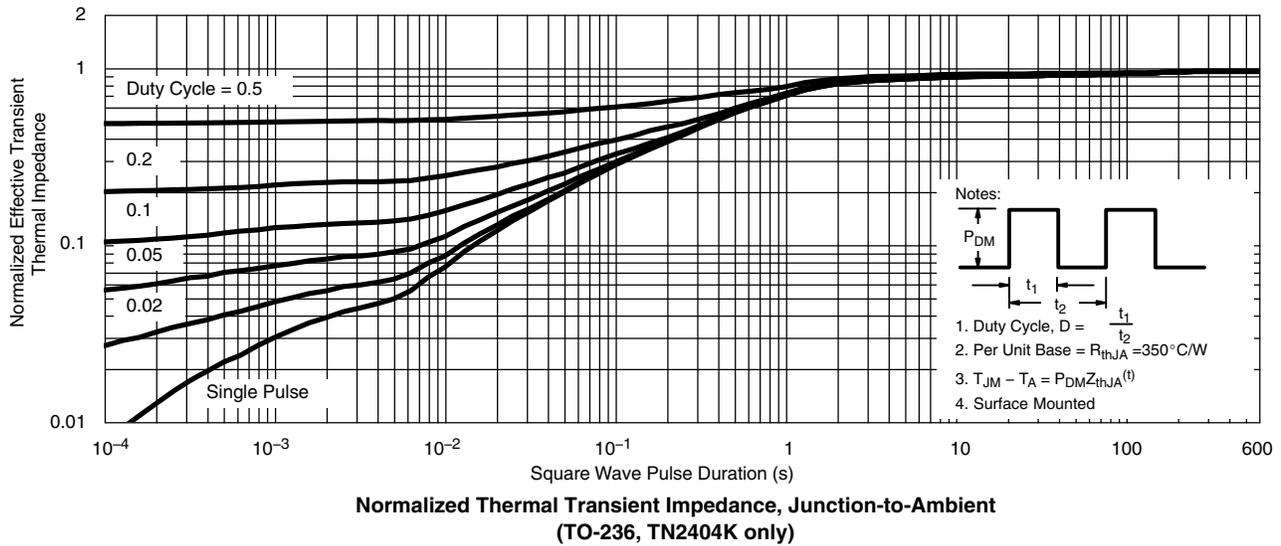


**On-Resistance vs. Gate-to-Source Voltage**



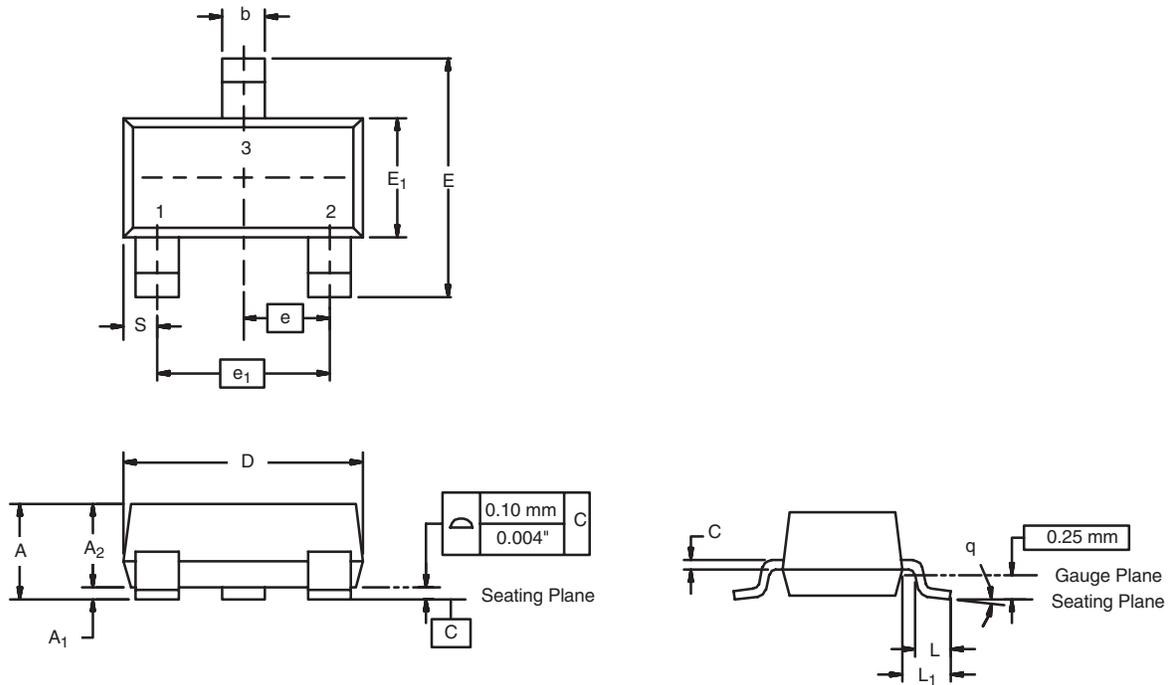
**Threshold Voltage**

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



Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see [www.vishay.com/ppg?72225](http://www.vishay.com/ppg?72225).

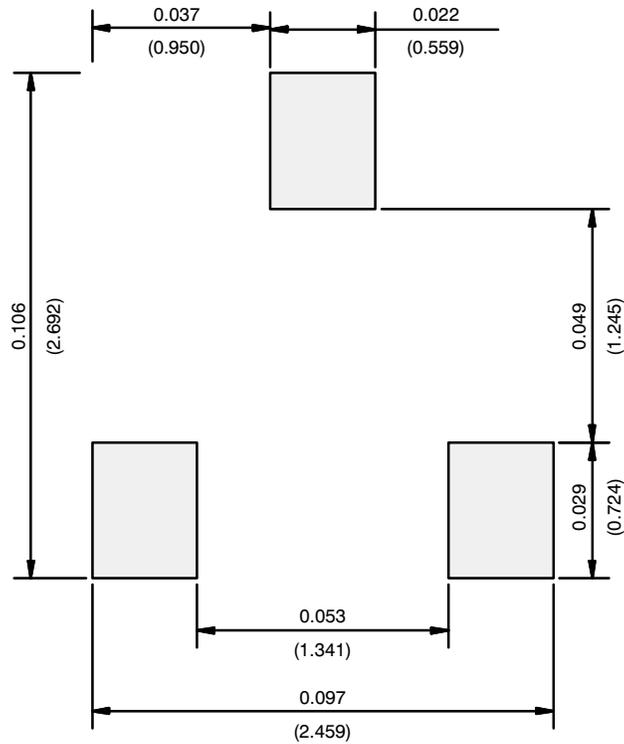
## SOT-23 (TO-236): 3-LEAD



| Dim            | MILLIMETERS |      | INCHES     |       |
|----------------|-------------|------|------------|-------|
|                | Min         | Max  | Min        | Max   |
| A              | 0.89        | 1.12 | 0.035      | 0.044 |
| A <sub>1</sub> | 0.01        | 0.10 | 0.0004     | 0.004 |
| A <sub>2</sub> | 0.88        | 1.02 | 0.0346     | 0.040 |
| b              | 0.35        | 0.50 | 0.014      | 0.020 |
| c              | 0.085       | 0.18 | 0.003      | 0.007 |
| D              | 2.80        | 3.04 | 0.110      | 0.120 |
| E              | 2.10        | 2.64 | 0.083      | 0.104 |
| E <sub>1</sub> | 1.20        | 1.40 | 0.047      | 0.055 |
| e              | 0.95 BSC    |      | 0.0374 Ref |       |
| e <sub>1</sub> | 1.90 BSC    |      | 0.0748 Ref |       |
| L              | 0.40        | 0.60 | 0.016      | 0.024 |
| L <sub>1</sub> | 0.64 Ref    |      | 0.025 Ref  |       |
| S              | 0.50 Ref    |      | 0.020 Ref  |       |
| q              | 3°          | 8°   | 3°         | 8°    |

ECN: S-03946-Rev. K, 09-Jul-01  
 DWG: 5479

## RECOMMENDED MINIMUM PADS FOR SOT-23



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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