

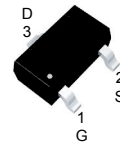
## Features

- 20V/0.8A,  
 $R_{DS(ON)} = 0.41\Omega(\text{typ.}) @ V_{GS} = 4.5V$   
 $R_{DS(ON)} = 0.53\Omega(\text{typ.}) @ V_{GS} = 2.5V$
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)
- ESD protection

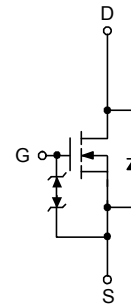
## Applications

- High Speed and Analog Switching Applications
- Low voltage drive (2.5V drive)

## Pin Description



Top View of SOT-523



N-Channel MOSFET

## Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Symbol                        | Parameter                              |                      | Rating     | Unit |
|-------------------------------|----------------------------------------|----------------------|------------|------|
| Common Ratings                |                                        |                      |            |      |
| V <sub>DSS</sub>              | Drain-Source Voltage                   |                      | 20         | V    |
| V <sub>GSS</sub>              | Gate-Source Voltage                    |                      | ±10        |      |
| T <sub>J</sub>                | Maximum Junction Temperature           |                      | 150        | °C   |
| T <sub>STG</sub>              | Storage Temperature Range              |                      | -55 to 150 |      |
| I <sub>S</sub>                | Diode Continuous Forward Current       | T <sub>A</sub> =25°C | 0.8        | A    |
| I <sub>D</sub>                | Continuous Drain Current               | T <sub>A</sub> =25°C | 0.8        |      |
|                               |                                        | T <sub>A</sub> =70°C | 0.6        |      |
| I <sub>DM</sub> <sup>a</sup>  | Pulsed Drain Current                   | T <sub>A</sub> =25°C | 2.4        |      |
| P <sub>D</sub> <sup>b</sup>   | Maximum Power Dissipation              | T <sub>A</sub> =25°C | 0.81       | W    |
|                               |                                        | T <sub>A</sub> =70°C | 0.5        |      |
| R <sub>θJA</sub> <sup>b</sup> | Thermal Resistance-Junction to Ambient | t ≤ 10s              | 120        | °C/W |
|                               |                                        | Steady State         | 155        |      |
| I <sub>AS</sub> <sup>c</sup>  | Avalanche Current, Single pulse        | L=0.1mH              | 0.5        | A    |
| E <sub>AS</sub> <sup>c</sup>  | Avalanche Energy, Single pulse         | L=0.1mH              | 0.012      | mJ   |

Note a : Pulse width is limited by maximum junction temperature.

Note b :  $R_{\theta JA}$  steady state  $t = 999\text{s}$ .

Note c : UIS tested and pulse width limited by maximum junction temperature (initial temperature  $T_J = 25^\circ\text{C}$ ).

## Electrical Characteristics (T<sub>A</sub> = 25°C unless otherwise noted)

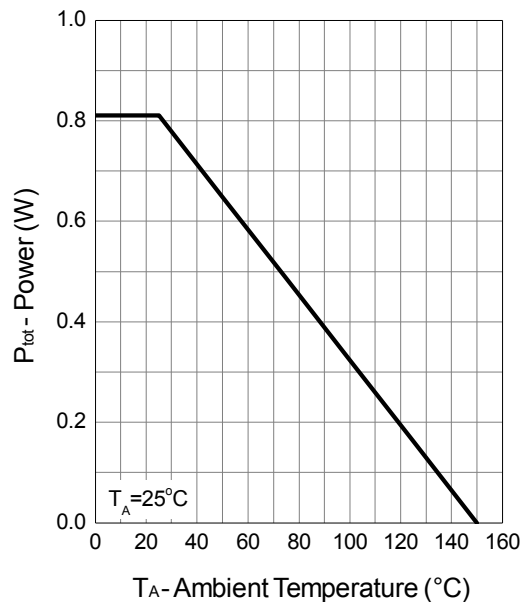
| Symbol                                   | Parameter                        | Test Conditions                                                                                                 | Min. | Typ.         | Max.        | Unit |
|------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------|------|--------------|-------------|------|
| Static Characteristics                   |                                  |                                                                                                                 |      |              |             |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA                                                                     | 20   | -            | -           | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =16V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =85°C                                               | -    | -            | 1<br>30     | μA   |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA                                                       | 0.8  | 1.1          | 1.5         | V    |
| I <sub>GSS</sub>                         | Gate Leakage Current             | V <sub>GS</sub> =±10V, V <sub>DS</sub> =0V                                                                      | -    | -            | ±10         | uA   |
| R <sub>DS(ON)</sub> <sup>d</sup>         | Drain-Source On-state Resistance | V <sub>GS</sub> =4.5V, I <sub>DS</sub> =0.3A<br>V <sub>GS</sub> =2.5V, I <sub>DS</sub> =0.2A                    | -    | 0.41<br>0.53 | 0.7<br>0.85 | Ω    |
| Gfs                                      | Forward Transconductance         | V <sub>DS</sub> =3 , I <sub>D</sub> =10mA                                                                       | -    | 0.9          | -           | S    |
| Diode Characteristics                    |                                  |                                                                                                                 |      |              |             |      |
| V <sub>SD</sub> <sup>d</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =0.4A, V <sub>GS</sub> =0V                                                                      | -    | 0.85         | 1.1         | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | I <sub>sd</sub> =1A, dI <sub>SD</sub> /dt=100A/μs                                                               | -    | 8.6          | -           | ns   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                                                 | -    | 2.7          | -           | nC   |
| Dynamic Characteristics <sup>e</sup>     |                                  |                                                                                                                 |      |              |             |      |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,<br>V <sub>DS</sub> =15V,<br>Frequency=1.0MHz                                               | -    | 23           | -           | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                                                 | -    | 5            | -           |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                                                 | -    | 2            | -           |      |
| t <sub>d(ON)</sub>                       | Turn-on Delay Time               | V <sub>DD</sub> =10V, R <sub>L</sub> =10Ω,<br>I <sub>DS</sub> =1A, V <sub>GEN</sub> =10V,<br>R <sub>G</sub> =6Ω | -    | 1.4          | -           | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                 | -    | 11.8         | -           |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                                                 | -    | 8            | -           |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                 | -    | 2            | -           |      |
| Gate Charge Characteristics <sup>e</sup> |                                  |                                                                                                                 |      |              |             |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =15V, V <sub>GS</sub> =10V,<br>I <sub>DS</sub> =1A                                              | -    | 1.6          | -           | nC   |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V,<br>I <sub>DS</sub> =1A                                             | -    | 0.7          | -           |      |
| Q <sub>gth</sub>                         | Threshold Gate Charge            |                                                                                                                 | -    | 0.2          | -           |      |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                                                 | -    | 0.54         | -           |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                                                 | -    | 0.03         | -           |      |

Note d : Pulse test; pulse width≤300μs, duty cycle≤2%.

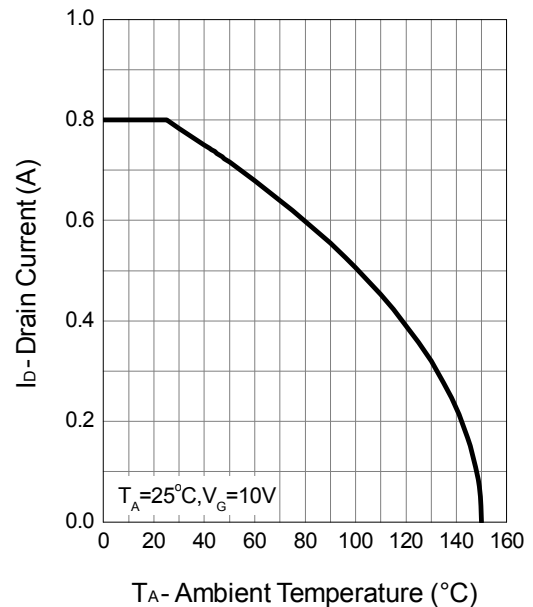
Note e : Guaranteed by design, not subject to production testing.

### Typical Operating Characteristics

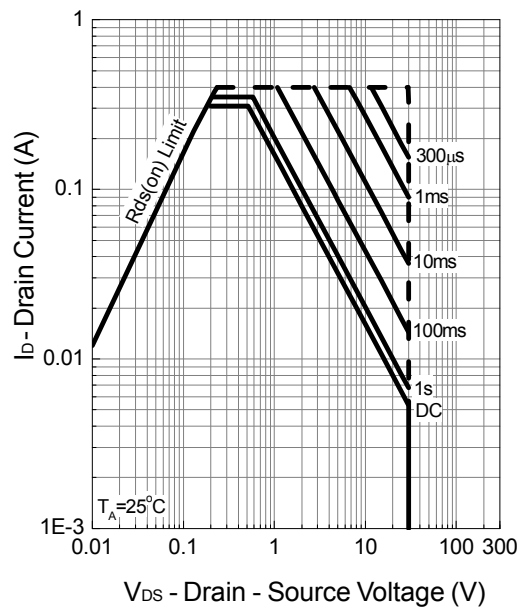
**Power Dissipation**



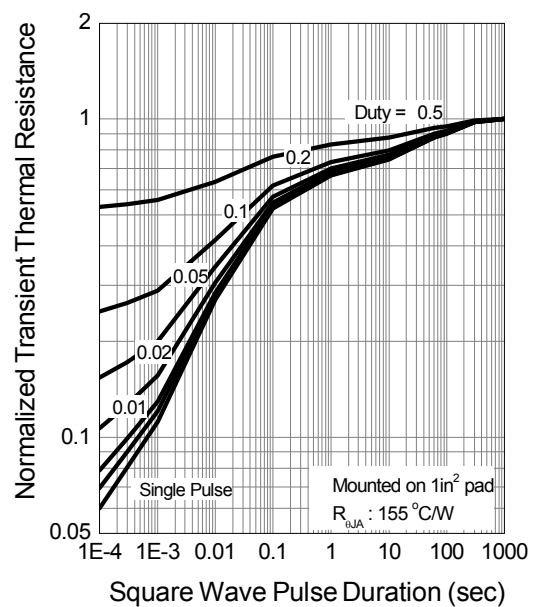
**Drain Current**



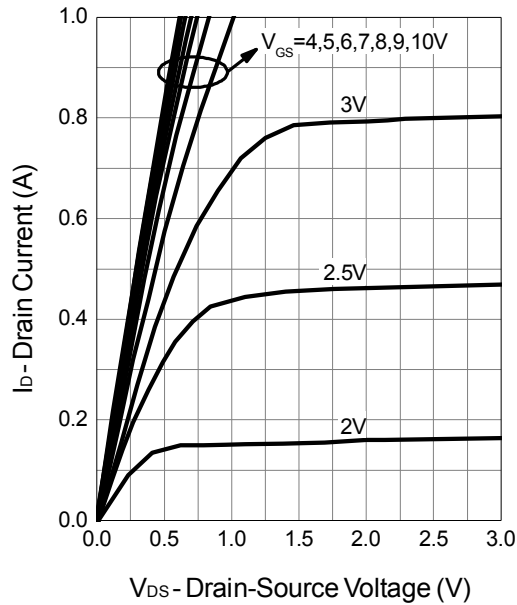
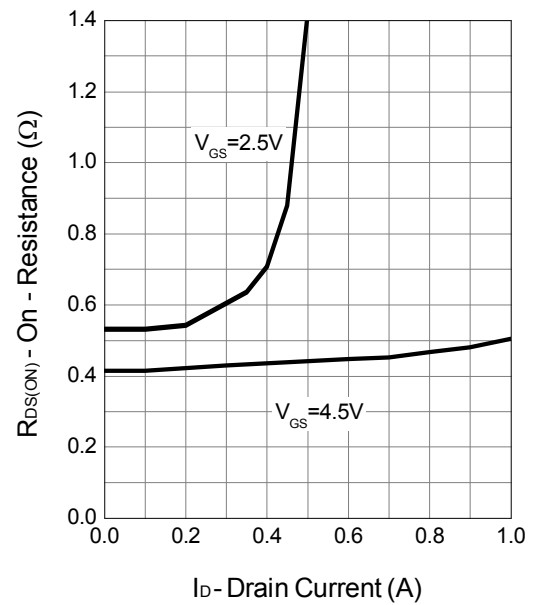
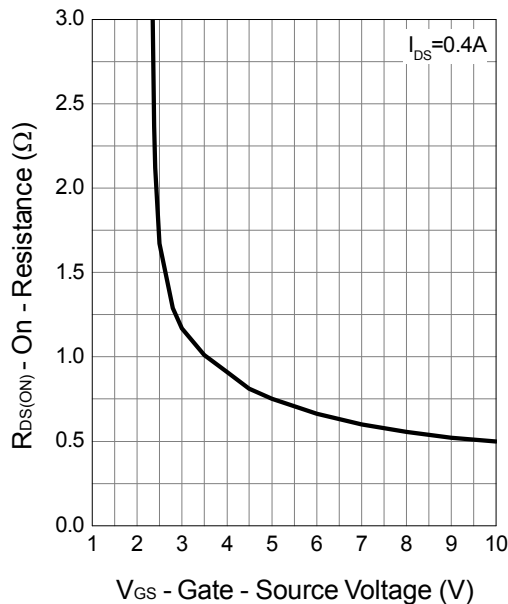
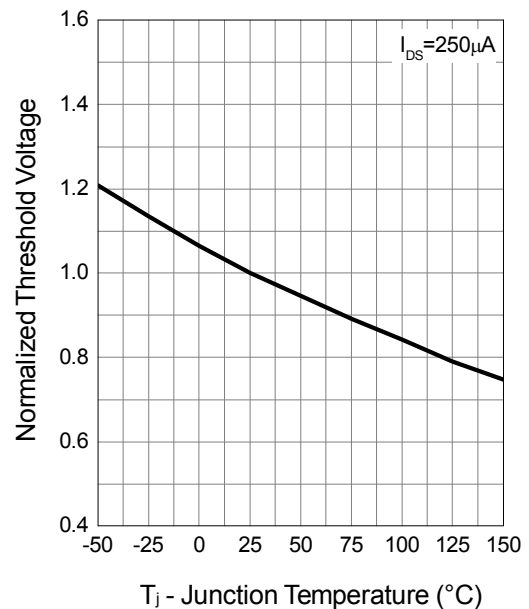
**Safe Operation Area**



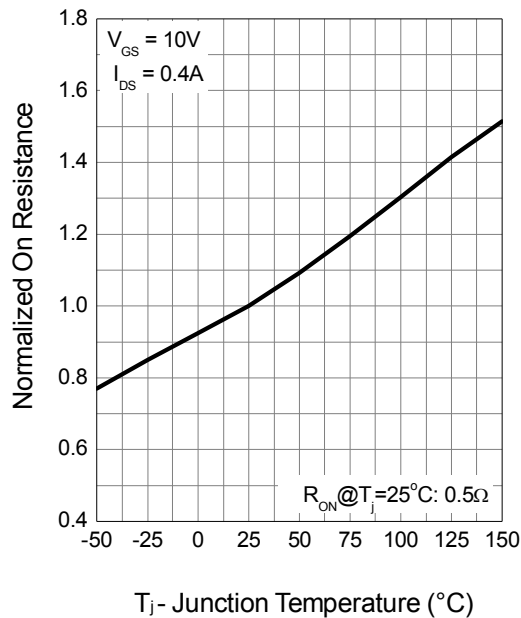
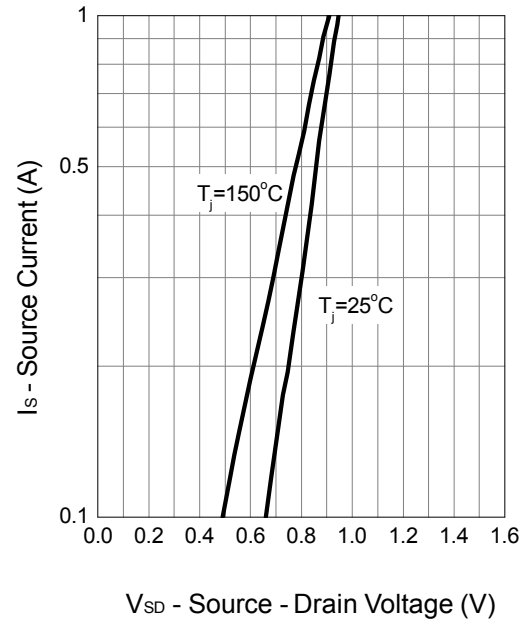
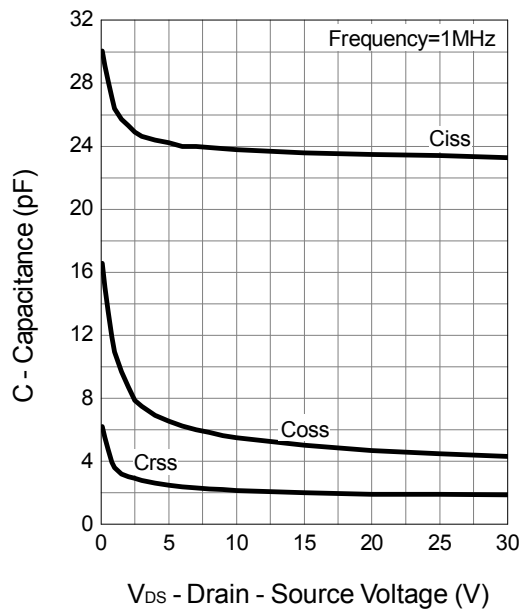
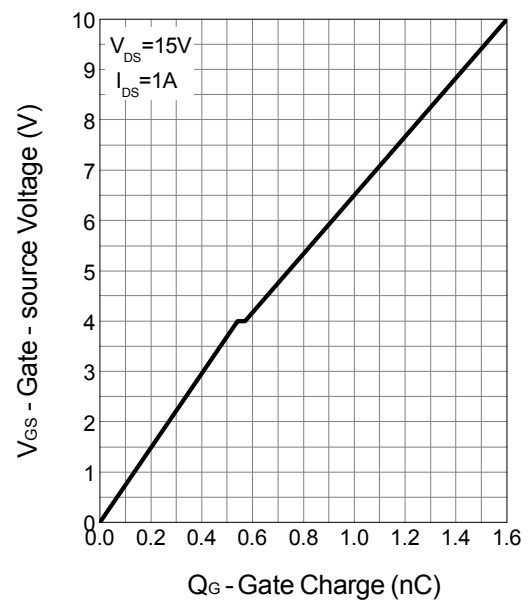
**Thermal Transient Impedance**



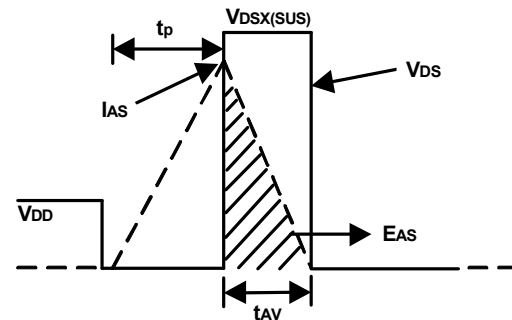
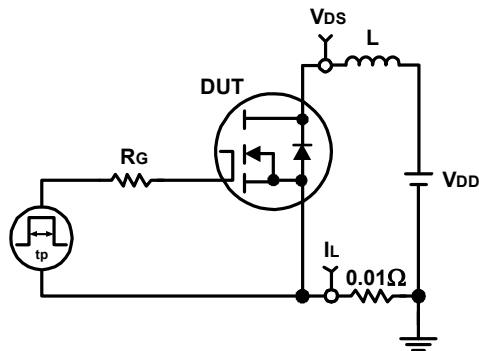
## Typical Operating Characteristics (Cont.)

**Output Characteristics**

**Drain-Source On Resistance**

**Gate-Source On Resistance**

**Gate Threshold Voltage**


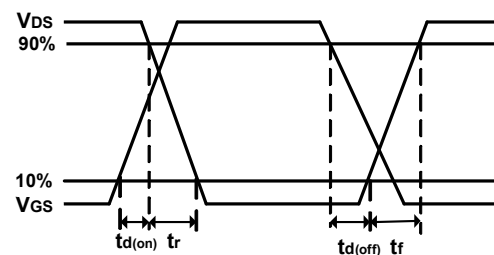
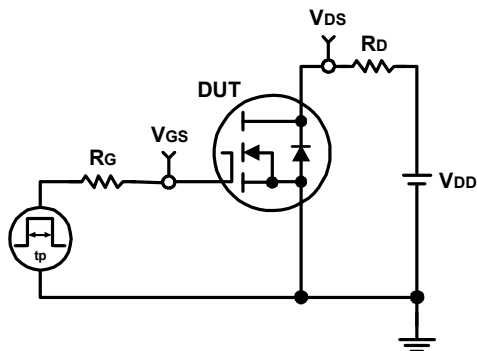
## Typical Operating Characteristics (Cont.)

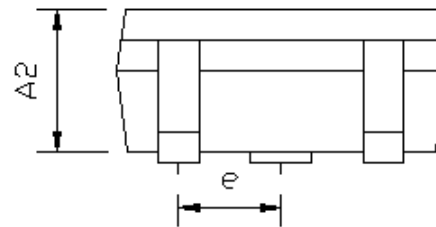
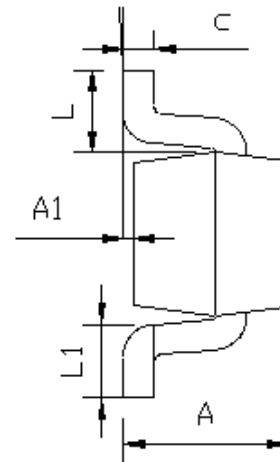
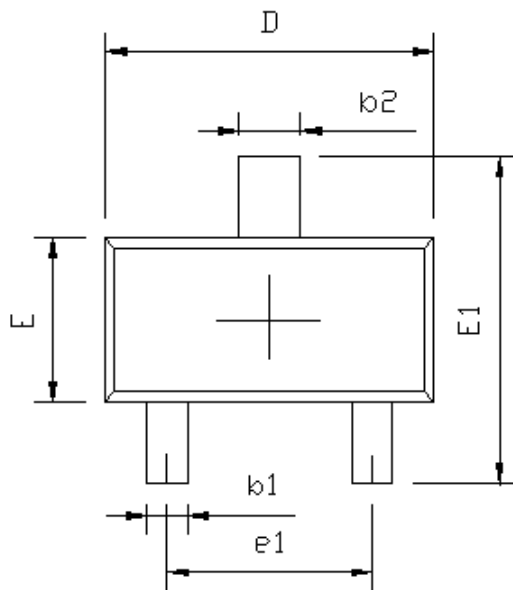
**Drain-Source On Resistance**

**Source-Drain Diode Forward**

**Capacitance**

**Gate Charge**


## Avalanche Test Circuit and Waveforms



## Switching Time Test Circuit and Waveforms





| SYMBOLS  | SOT-523     |       |            |       |
|----------|-------------|-------|------------|-------|
|          | MILLIMETERS |       | INCHES     |       |
|          | MIN.        | MAX.  | MIN.       | MAX.  |
| A        | 0.700       | 0.900 | 0.028      | 0.035 |
| A1       | 0.000       | 0.100 | 0.000      | 0.004 |
| A2       | 0.700       | 0.800 | 0.028      | 0.031 |
| b1       | 0.150       | 0.250 | 0.006      | 0.010 |
| b2       | 0.250       | 0.350 | 0.010      | 0.014 |
| c        | 0.100       | 0.200 | 0.004      | 0.008 |
| D        | 1.500       | 1.700 | 0.059      | 0.067 |
| E        | 0.700       | 0.900 | 0.028      | 0.035 |
| E1       | 1.450       | 1.750 | 0.057      | 0.069 |
| e        | 0.500 TYP.  |       | 0.020 TYP. |       |
| e1       | 0.900       | 1.100 | 0.035      | 0.043 |
| L        | 0.400 REF.  |       | 0.016 REF. |       |
| L1       | 0.260       | 0.460 | 0.010      | 0.018 |
| $\theta$ | 0°          | 8°    | 0°         | 8°    |

**RECOMMENDED LAND PATTERN**
