



**P-Channel Enhancement Mode Power MOSFET**

**Description**

The PE3415F uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. It can be used in a wide variety of applications.

**General Features**

- $V_{DS} = -20V$ ,  $I_D = -5A$

$R_{DS(ON)} < 40m\Omega @ V_{GS} = -4.5V$

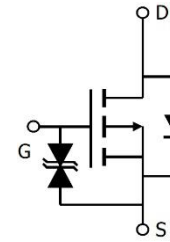
$R_{DS(ON)} < 60m\Omega @ V_{GS} = -2.5V$

EAS Rating:  $\geq 4000V$  HBM

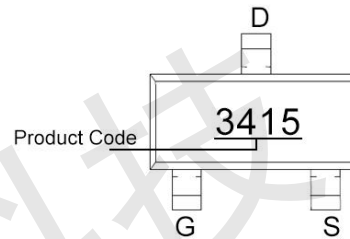
- High Power and current handing capability
- Lead free product is acquired
- Surface Mount Package

**Application**

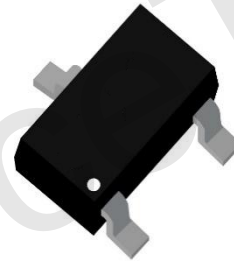
- PWM applications
- Load switch
- Power management



**Schematic diagram**



**Marking and pin assignment**



**SOT-23**

**Absolute Maximum Ratings (TA=25°C unless otherwise noted)**

| Parameter  | Symbol         | Rating     | Unit |
|--|----------------|------------|------|
| Drain-Source Voltage                             | $V_{DS}$       | -20        | V    |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 12$   | V    |
| Drain Current-Continuous                         | $I_D$          | -5         | A    |
| Pulsed Drain Current (Note 1)                    | $I_{DM}$       | -25        | A    |
| Maximum Power Dissipation                        | $P_D$          | 1.4        | W    |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 To 150 | °C   |

**Thermal Characteristic**

|  |                 |    |      |
|--|-----------------|----|------|
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 89 | °C/W |
|--|-----------------|----|------|



Electrical Characteristics (TA=25°C unless otherwise noted)

| Parameter                                 | Symbol       | Condition  | Min  | Typ  | Max       | Unit       |
|---|--------------|--|------|------|-----------|------------|
| <b>Off Characteristics</b>                |              |  |      |      |           |            |
| Drain-Source Breakdown Voltage            | $BV_{DSS}$   | $V_{GS}=0V, I_D=-250\mu A$                                 | -20  | -    | -         | V          |
| Zero Gate Voltage Drain Current           | $I_{DSS}$    | $V_{DS}=-20V, V_{GS}=0V$                                   | -    | -    | -1        | $\mu A$    |
| Gate-Body Leakage Current                 | $I_{GSS}$    | $V_{GS}=\pm 10V, V_{DS}=0V$                                | -    | -    | $\pm 100$ | nA         |
| <b>On Characteristics</b> (Note 3)        |              |  |      |      |           |            |
| Gate Threshold Voltage                    | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=-250\mu A$                             | -0.4 | -0.7 | -1        | V          |
| Drain-Source On-State Resistance          | $R_{DS(on)}$ | $V_{GS}=-4.5V, I_D=-4A$                                    | -    | 30   | 40        | m $\Omega$ |
|   |              | $V_{GS}=-2.5V, I_D=-2A$                                    | -    | 35   | 60        | m $\Omega$ |
| Forward Transconductance                  | $g_{FS}$     | $V_{DS}=-5V, I_D=-4A$                                      | -    | 20   | -         | S          |
| <b>Dynamic Characteristics</b> (Note 4)   |              |  |      |      |           |            |
| Input Capacitance                         | $C_{iss}$    | $V_{DS}=-10V, V_{GS}=0V,$<br>$F=1.0MHz$                    | -    | 490  | -         | pF         |
| Output Capacitance                        | $C_{oss}$    |  | -    | 130  | -         | pF         |
| Reverse Transfer Capacitance (Note 4)     | $C_{rss}$    |  | -    | 60   | -         | pF         |
| Gate Resistance                           | $R_g$        | $V_{DS}=0V, V_{GS}=0V,$<br>$F=1.0MHz$                      | -    | 7    | -         | k $\Omega$ |
| <b>Switching Characteristics</b>          |              |  |      |      |           |            |
| Turn-on Delay Time                        | $t_{d(on)}$  | $V_{DD}=-10V, R_L=1\Omega,$<br>$V_{GS}=-4.5V, R_G=3\Omega$ | -    | 13   | -         | nS         |
| Turn-on Rise Time                         | $t_r$        |  | -    | 11   | -         | nS         |
| Turn-Off Delay Time                       | $t_{d(off)}$ |  | -    | 20   | -         | nS         |
| Turn-Off Fall Time                        | $t_f$        |  | -    | 31   | -         | nS         |
| Total Gate Charge                         | $Q_g$        | $V_{DS}=-10V, I_D=-4A,$<br>$V_{GS}=-4.5V$                  | -    | 10   | -         | nC         |
| Gate-Source Charge                        | $Q_{gs}$     |  | -    | 1.1  | -         | nC         |
| Gate-Drain Charge                         | $Q_{gd}$     |  | -    | 2.4  | -         | nC         |
| <b>Drain-Source Diode Characteristics</b> |              |  |      |      |           |            |
| Diode Forward Voltage (Note 3)            | $V_{SD}$     | $V_{GS}=0V, I_S=-1A$                                       | -    | -    | -1.2      | V          |
| Diode Forward Current (Note 2)            | $I_S$        |  | -    | -    | -2        | A          |

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to product.



Typical Electrical and Thermal Characteristics

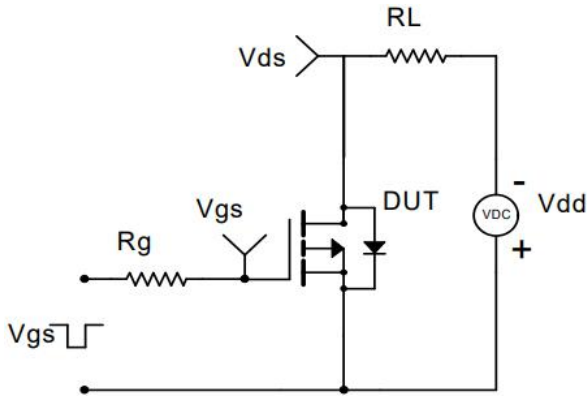


Figure 1 Switching Test Circuit

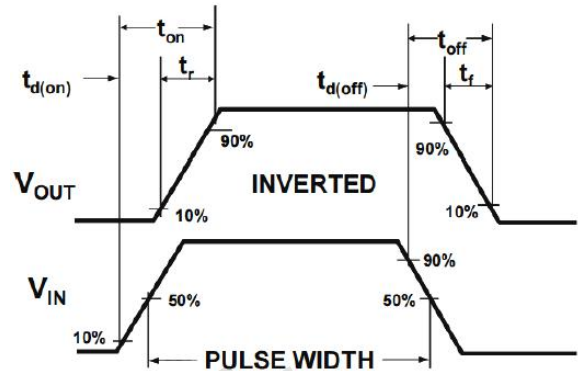


Figure 2 Switching Waveform

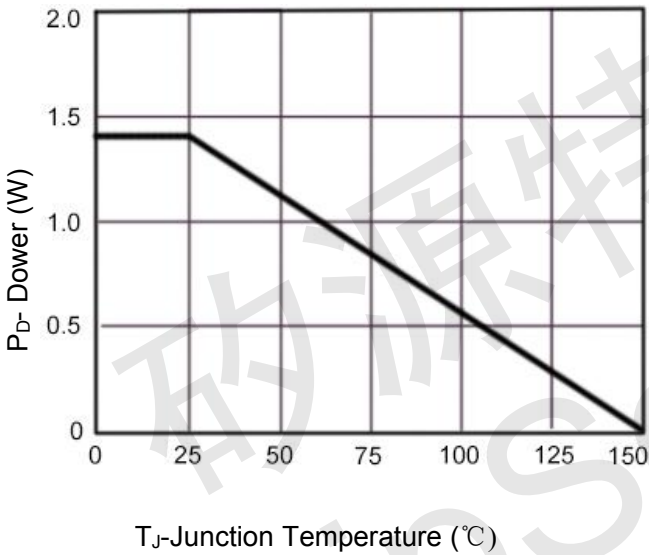


Figure 3 Power De-rating

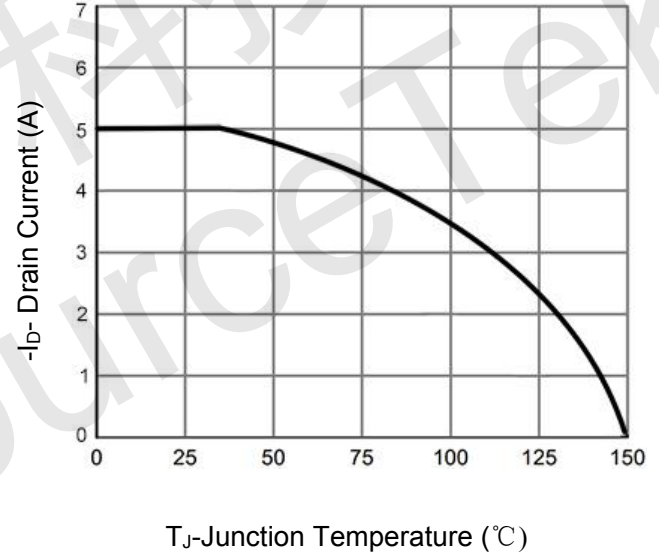


Figure 4 Drain Current

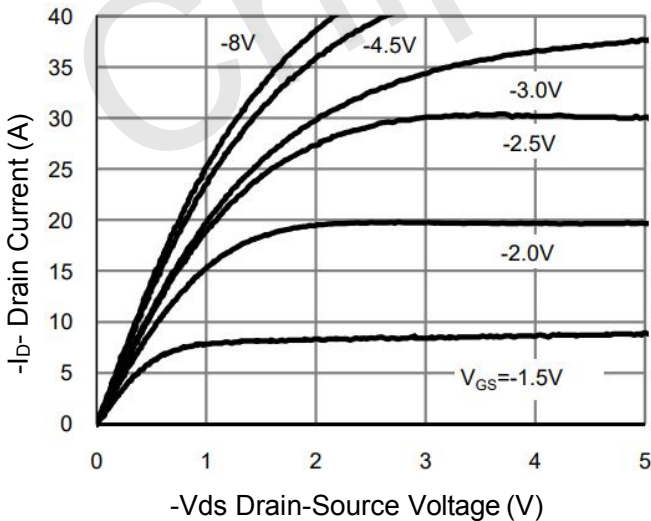


Figure 5 Output Characteristics

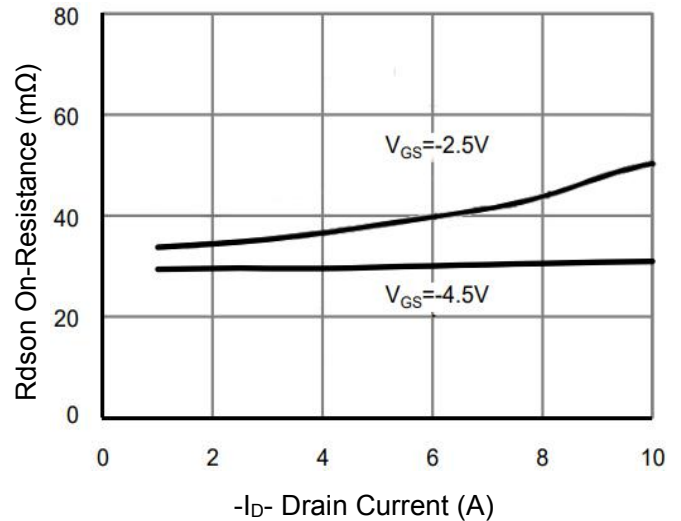


Figure 6 Rdson vs Drain Current

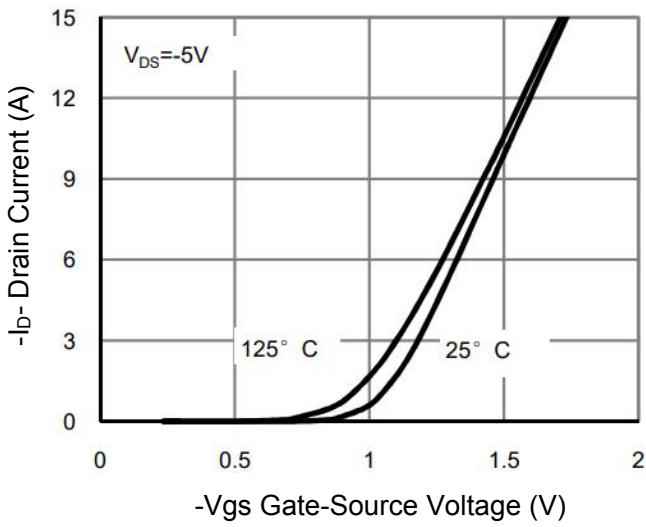


Figure 7 Transfer Characteristics

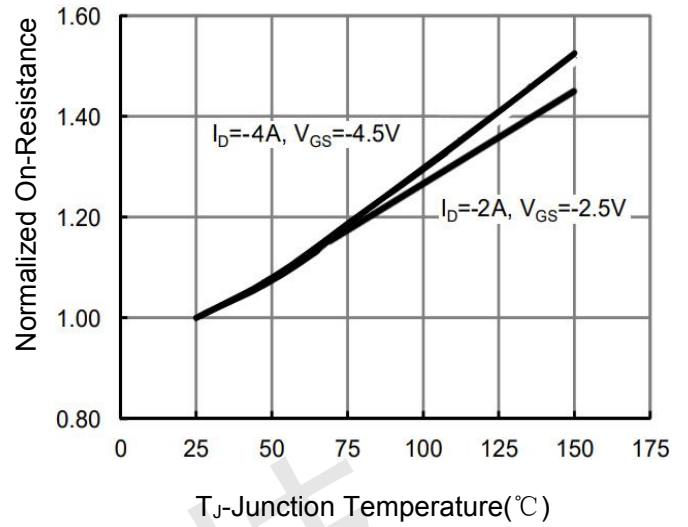


Figure 8 Rdson vs Junction Temperature

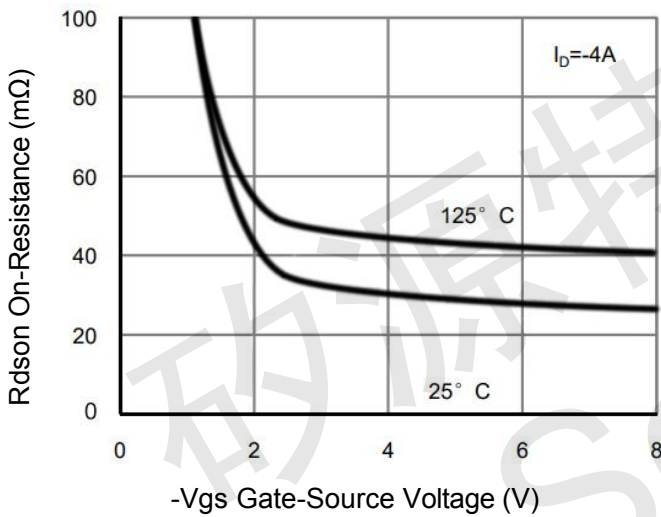


Figure 9 Rdson vs Vgs

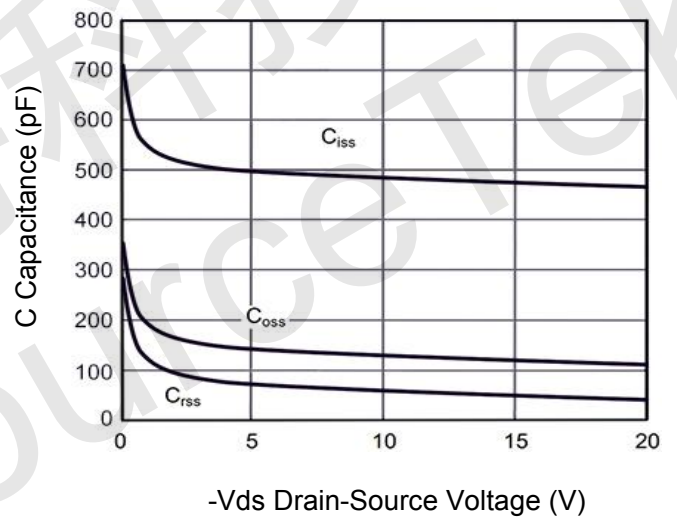


Figure 10 Capacitance vs Vds

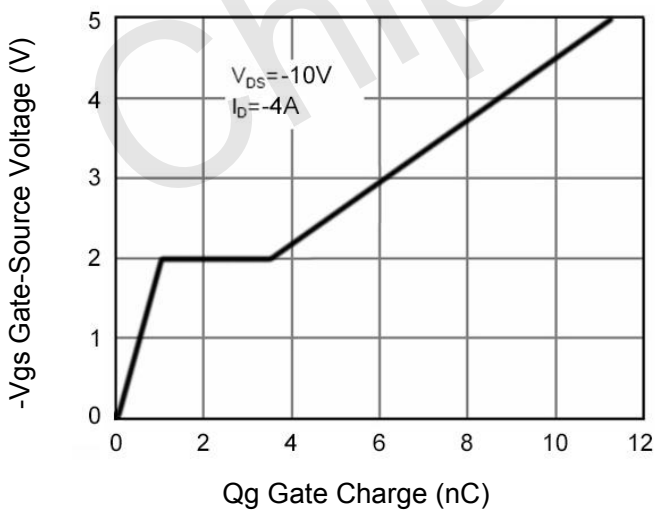


Figure 11 Gate Charge

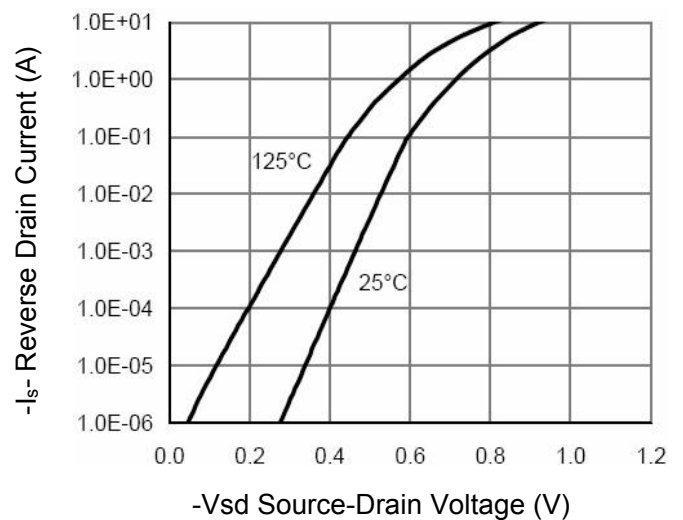


Figure 12 Source- Drain Diode Forward

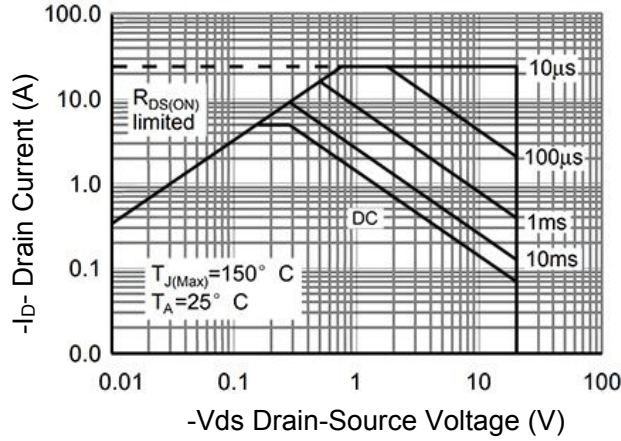


Figure 13 Safe Operation Area

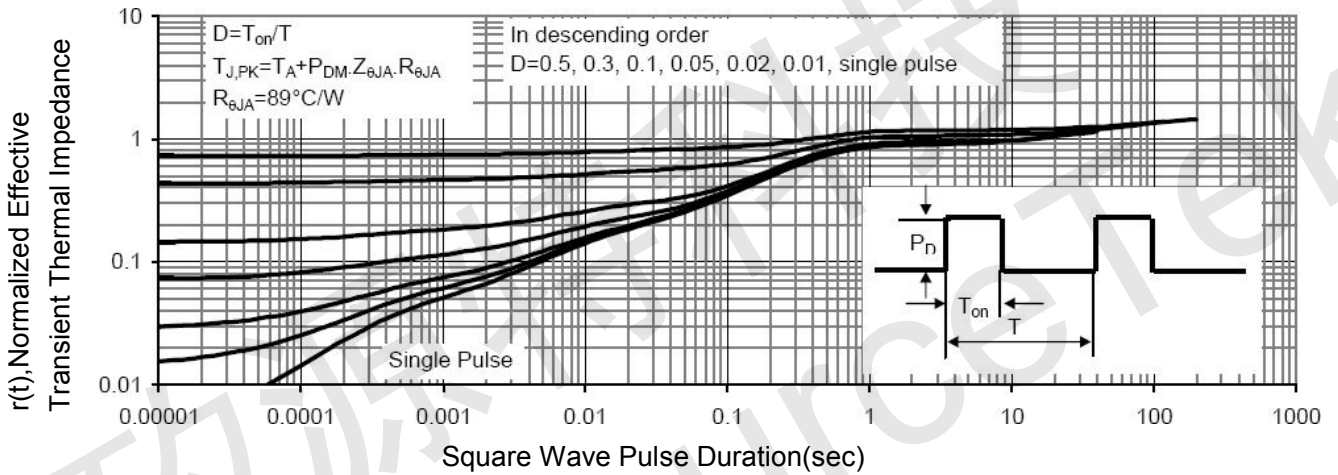
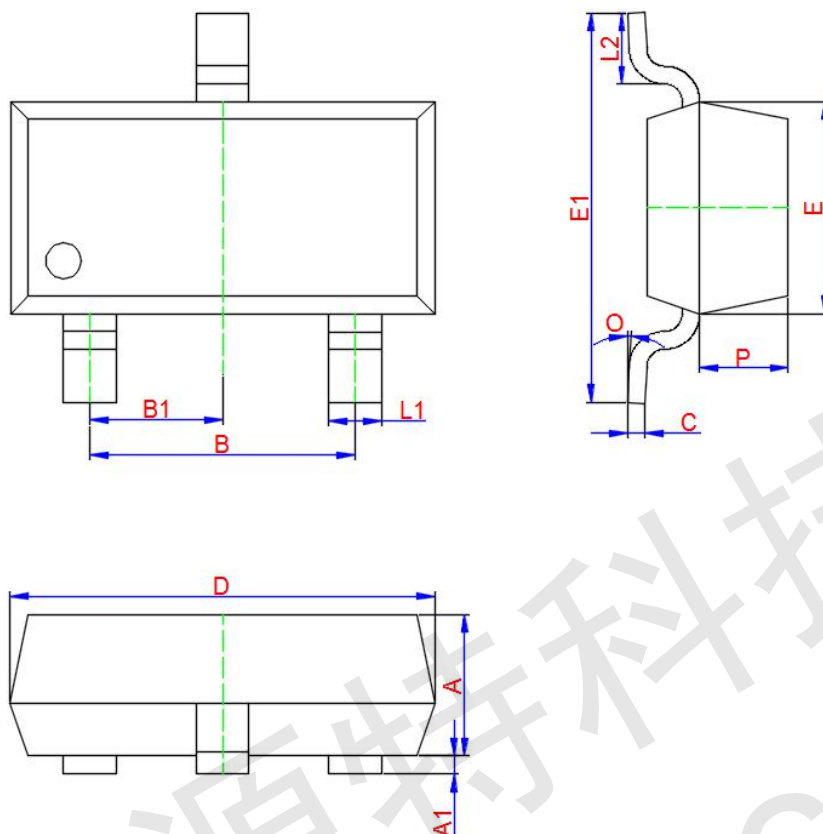


Figure 14 Normalized Maximum Transient Thermal Impedance



### SOT-23 Package Information



| Symbol | Dimensions In Millimeters |       |       |
|--------|---------------------------|-------|-------|
|        | Min.                      | Typ.  | Max.  |
| A      | 0.900                     | 1.000 | 1.100 |
| A1     | 0.000                     | 0.050 | 0.100 |
| L1     | 0.300                     | 0.400 | 0.500 |
| C      | 0.100                     | 0.110 | 0.120 |
| D      | 2.800                     | 2.900 | 3.000 |
| E      | 1.250                     | 1.300 | 1.350 |
| E1     | 2.250                     | 2.400 | 2.550 |
| B      | 1.800                     | 1.900 | 2.000 |
| B1     | 0.950 TYP.                |       |       |
| L2     | 0.200                     | 0.350 | 0.450 |
| P      | 0.550                     | 0.575 | 0.600 |
| O      | 0°                        | 4°    | 8°    |