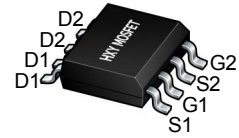




Description

The SI9945BDY-T1 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.



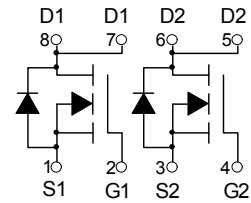
SOP-8

General Features

$V_{DS} = 60V$ $I_D = 6.5A$
 $R_{DS(ON)} < 36m\Omega @ V_{GS}=10V$
 $R_{DS(ON)} < 48m\Omega @ V_{GS}=4.5V$

Application

Battery protection
 Load switch
 Uninterruptible power supply



Dual N-Channel MOSFET

Package Marking and Ordering Information

| Product ID | Pack | Marking | Qty(PCS) |
|--------------|-------|---------------|----------|
| SI9945BDY-T1 | SOP-8 | 4828 XXX YYYY | 3000 |

Absolute Maximum Ratings@ $T_J=25^\circ C$ (unless otherwise specified)

| Symbol | Parameter | Rating | Units |
|------------------------|---|------------|--------------|
| V_{DS} | Drain-Source Voltage | 60 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| $I_D @ T_A=25^\circ C$ | Drain Current, $V_{GS} @ 4.5V^3$ | 6.5 | A |
| $I_D @ T_A=70^\circ C$ | Drain Current, $V_{GS} @ 4.5V^3$ | 5 | A |
| I_{DM} | Pulsed Drain Current ¹ | 30 | A |
| $P_D @ T_A=25^\circ C$ | Total Power Dissipation | 2.1 | W |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ C$ |
| T_J | Operating Junction Temperature Range | -55 to 150 | $^\circ C$ |
| R_{thj-a} | Maximum Thermal Resistance, Junction-ambient ³ | 60 | $^\circ C/W$ |



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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit | |
|---|---------------------|--|-----|------|------|------|----|
| Off Characteristics | | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V, I _D =250μA | 60 | 69 | - | V | |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =60V, V _{GS} =0V | - | - | 1 | μA | |
| Gate-Body Leakage Current | I _{GSS} | V _{GS} =±20V, V _{DS} =0V | - | - | ±100 | nA | |
| On Characteristics (Note 3) | | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =250μA | 1.0 | 1.4 | 2.0 | V | |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V, I _D =6A | | 32 | 36 | mΩ | |
| | | V _{GS} =4.5V, I _D =4A | | 34 | 48 | mΩ | |
| Forward Transconductance | g _{FS} | V _{DS} =5V, I _D =6A | | 20 | - | S | |
| Dynamic Characteristics (Note 4) | | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =25V, V _{GS} =0V, F=1.0MHz | | 1920 | | PF | |
| Output Capacitance | C _{oss} | | | | 155 | | PF |
| Reverse Transfer Capacitance | C _{rss} | | | | 116 | | PF |
| Switching Characteristics (Note 4) | | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DS} =30V, R _L =4.7Ω V _{GS} =10V, R _{GEN} =3Ω | - | 8 | - | nS | |
| Turn-on Rise Time | t _r | | - | 5 | - | nS | |
| Turn-Off Delay Time | t _{d(off)} | | - | 29 | - | nS | |
| Turn-Off Fall Time | t _f | | - | 6 | - | nS | |
| Total Gate Charge | Q _g | V _{DS} =30V, I _D =6A, V _{GS} =10V | - | 50 | - | nC | |
| Gate-Source Charge | Q _{gs} | | - | 8 | - | nC | |
| Gate-Drain Charge | Q _{gd} | | - | 16 | - | nC | |
| Drain-Source Diode Characteristics | | | | | | | |
| Diode Forward Voltage (Note 3) | V _{SD} | V _{GS} =0V, I _S =6A | - | - | 1.2 | V | |
| Diode Forward Current (Note 2) | I _S | | - | - | 7 | A | |
| Reverse Recovery Time | t _{rr} | T _J = 25°C, I _F =7A di/dt = 100A/μs (Note 3) | - | 35 | - | nS | |
| Reverse Recovery Charge | Q _{rr} | | - | 43 | - | nC | |
| Forward Turn-On Time | t _{on} | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | | |

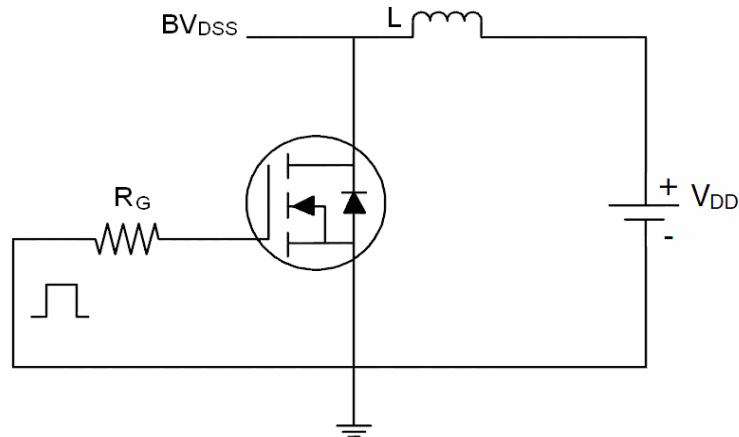
Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

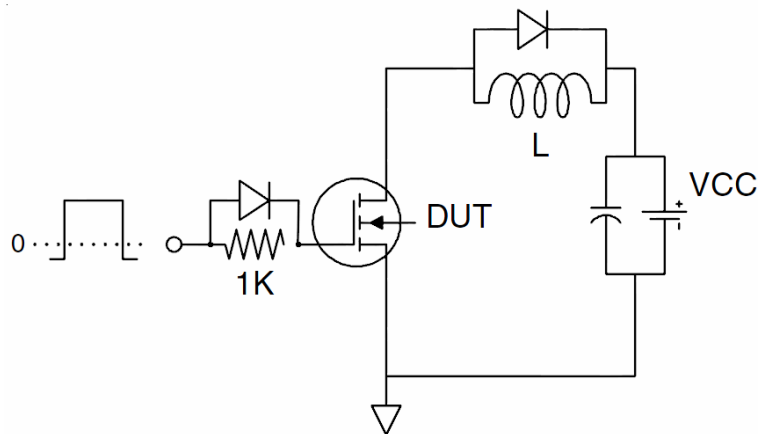


Test Circuit

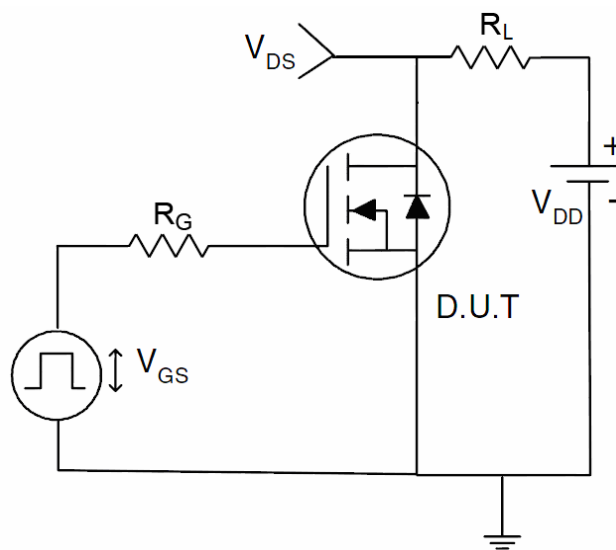
1) E_{AS} test Circuits



2) Gate charge test Circuit



3) Switch Time Test Circuit





Typical Electrical and Thermal Characteristics (Curves)

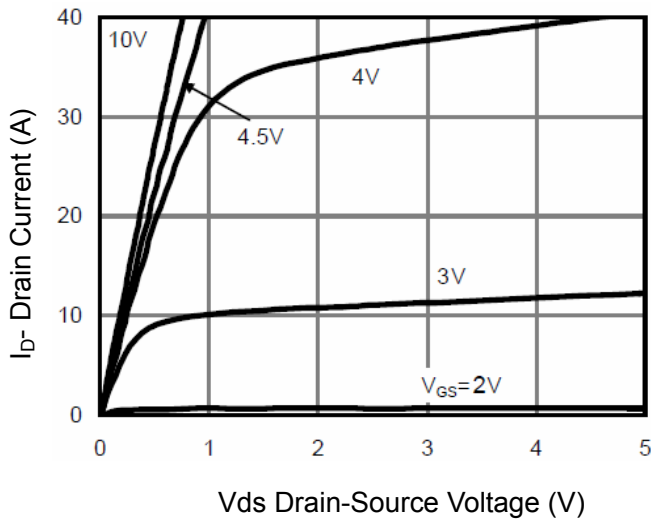


Figure 1 Output Characteristics

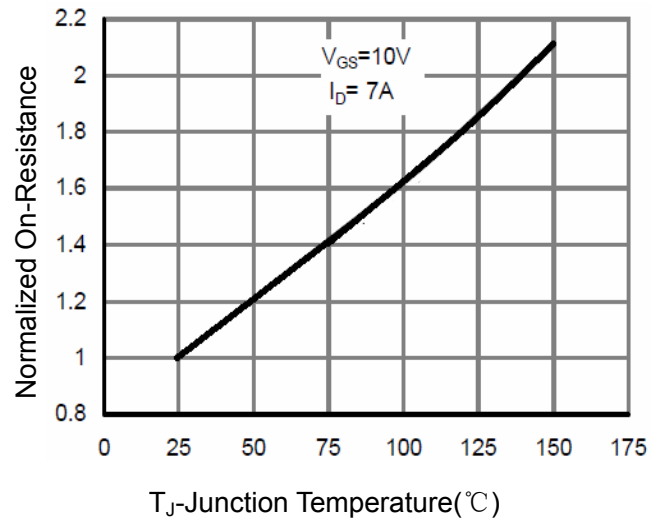


Figure 4 Rdson-Junction Temperature

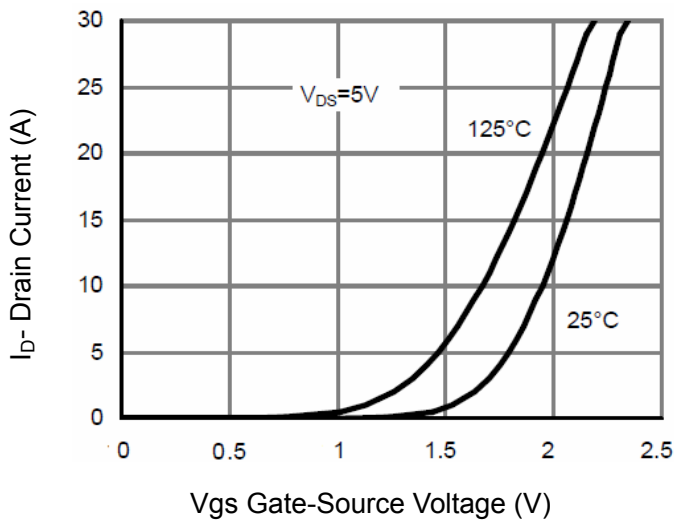


Figure 2 Transfer Characteristics

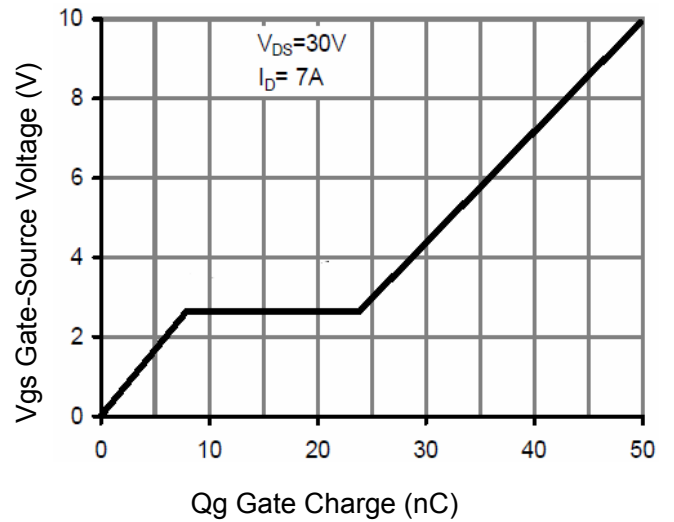


Figure 5 Gate Charge

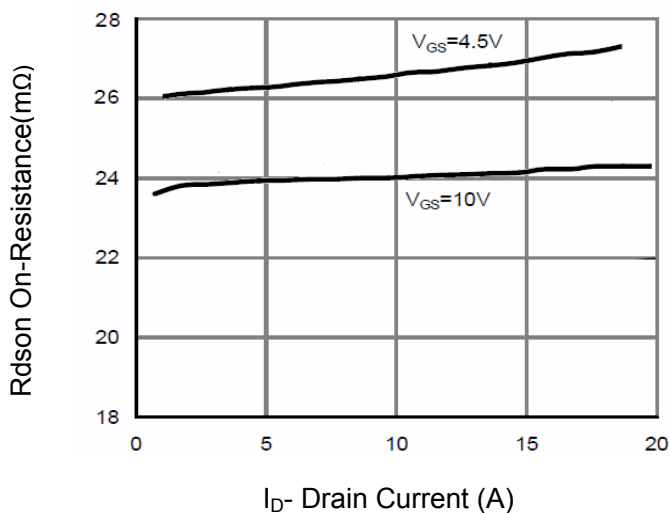


Figure 3 Rdson- Drain Current

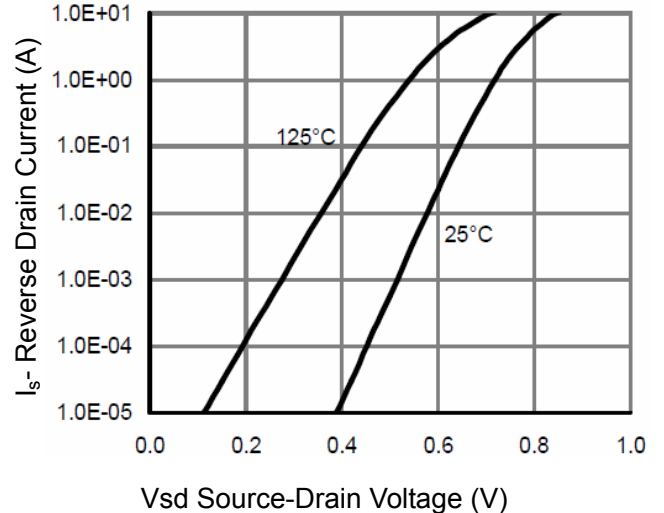


Figure 6 Source- Drain Diode Forward

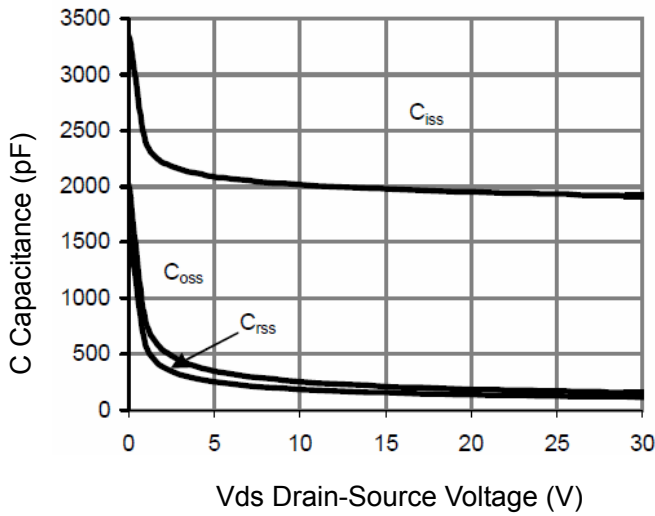


Figure 7 Capacitance vs Vds

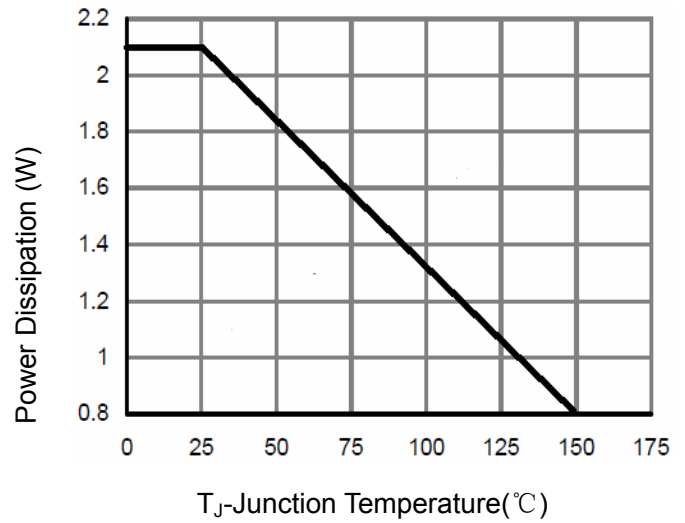


Figure 9 Power De-rating

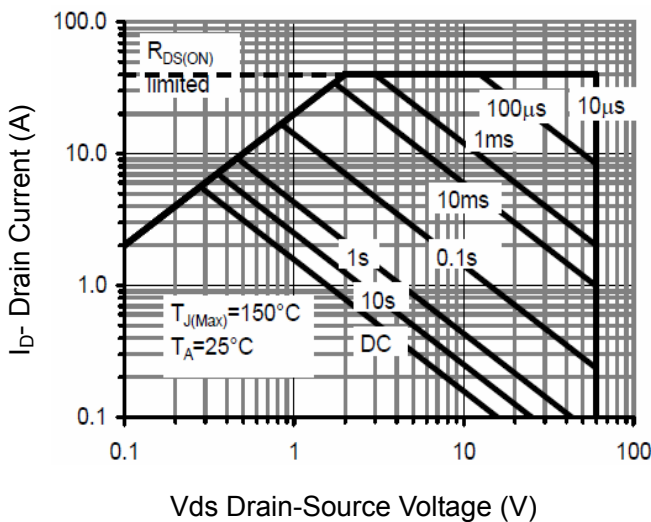


Figure 8 Safe Operation Area

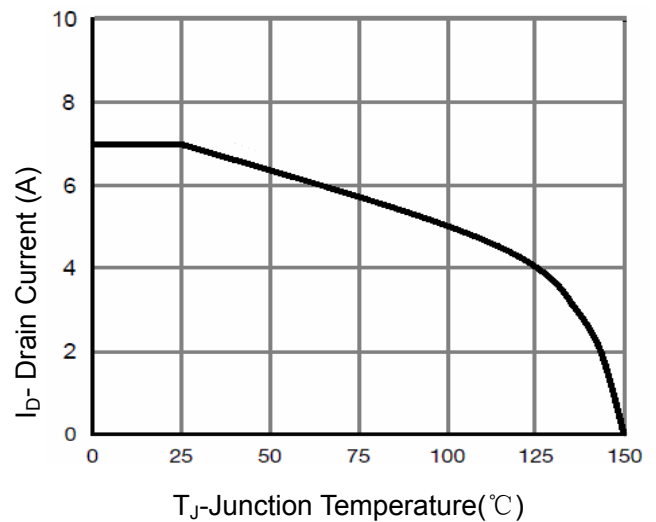


Figure 10 Current De-rating

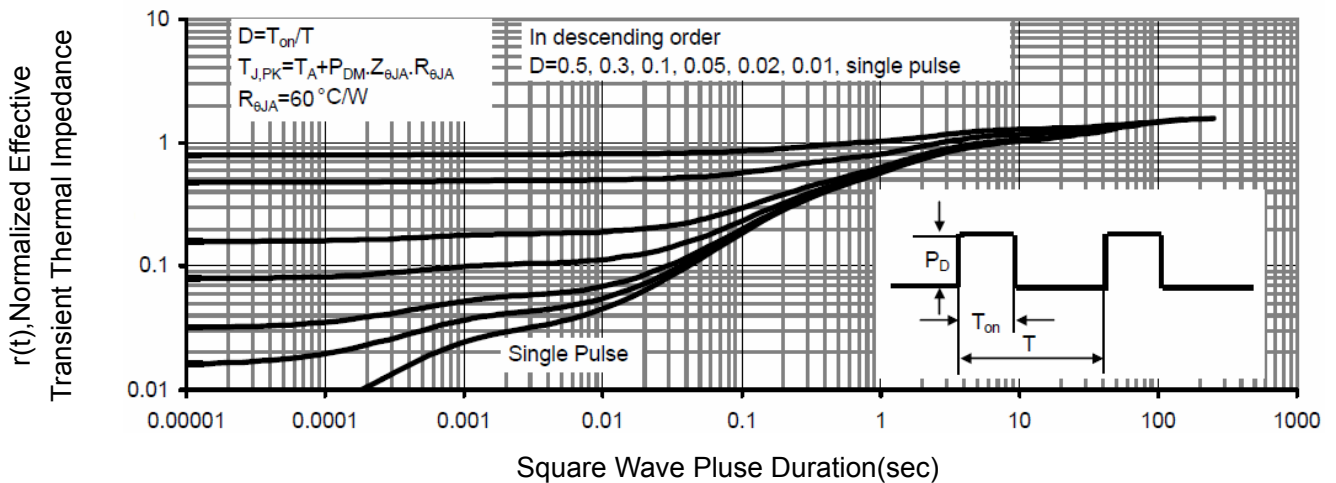
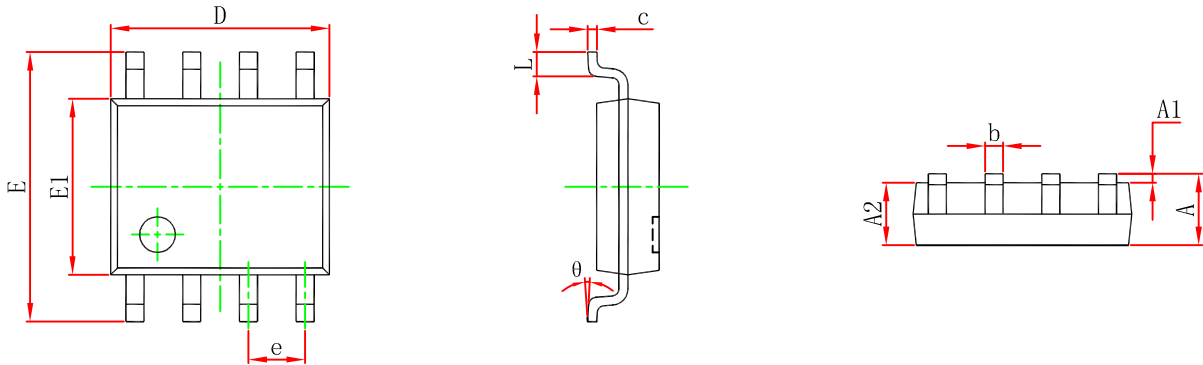


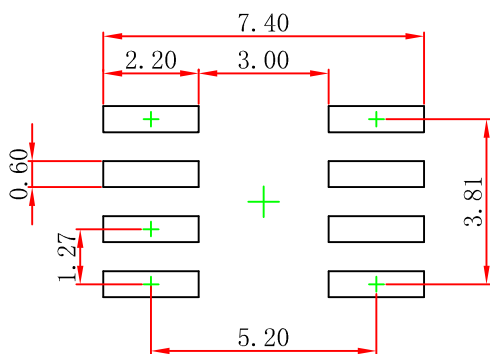
Figure 11 Normalized Maximum Transient Thermal Impedance



SOP-8 Package Outline Dimensions



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.007 | 0.010 |
| D | 4.800 | 5.000 | 0.189 | 0.197 |
| e | 1.270 (BSC) | | 0.050 (BSC) | |
| E | 5.800 | 6.200 | 0.228 | 0.244 |
| E1 | 3.800 | 4.000 | 0.150 | 0.157 |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |



- Note:
1. Controlling dimension: in millimeters.
 2. General tolerance: $\pm 0.05\text{mm}$.
 3. The pad layout is for reference purposes only.



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