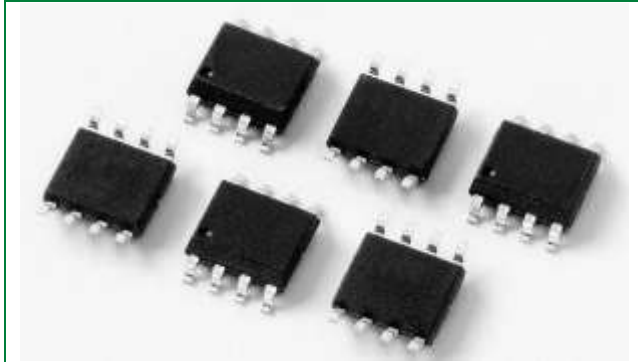


STP802U2SRP

1.5 A Sensitive Dual SCRs

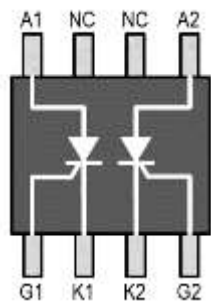


Agency Approvals and Environmental

Environmental Approvals



Circuit Diagram



STP Type

Product Summary

| Characteristic | Value | Unit |
|-----------------------|-------|---------|
| I_{TRMS} | 1.5 | A |
| V_{DRM} / V_{RRM}^1 | 800 | V |
| I_{GT} | 100 | μA |

Note 1: V_{DRM} , V_{RRM} , V_{DSM} , V_{RSM} are defined for A1-K1 with G1 open, and A2-K2 with G2 open.

Product Description

This 1.5 A Dual SCR part offers a high static dv/dt with a low turn off (t_q) time. It is specifically designed for Ground Fault Circuit Interrupter (GFCI) and Arc Fault Circuit Interrupter (AFCI), Residual Current Device (RCD) and Residual Current Circuit Breaker with Overload Protection (RCBO) applications.

Features

- Glass-passivated junctions
- Surge capability up to 20 A
- Non-repetitive forward direction peak off-state voltage, V_{DSM} , up to 1150 V
- Non-repetitive reverse blocking voltage, V_{RSM} , up to 900 V
- High dv/dt noise immunity
- Sensitive gate for direct microprocessor interface
- Halogen-free and RoHS compliant

Applications

- GFCI
- AFCI
- Circuit breaker

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1. Maximum Ratings

| Symbol | Characteristic | Conditions | Value | Unit |
|--------------|--|--|------------|------------------------|
| $I_{T(RMS)}$ | RMS On-state Current (Full Sine Wave) | Single SCR, $T_C = 53^\circ\text{C}$ | 1.5 | A |
| | | Dual SCR, $T_C = 53^\circ\text{C}$ | 0.6 | |
| I_{TSM} | Non-repetitive Surge Peak On-state Current (Full Cycle, T_J Initial = 25°C) | $f = 50\text{ Hz}$, $t = 20\text{ ms}$ | 20 | A |
| | | $f = 60\text{ Hz}$, $t = 16.7\text{ ms}$ | 24 | |
| I^2t | I^2t Value for Fusing | $t_p = 8.3\text{ ms}$ | 2 | A^2s |
| di/dt | Critical Rate of Rise of On-state Current | $f = 60\text{ Hz}$, $T_J = 125^\circ\text{C}$ | 80 | $\text{A}/\mu\text{s}$ |
| I_{GTM} | Peak Gate Trigger Current | $t_p = 20\text{ }\mu\text{s}$, $T_J = 125^\circ\text{C}$ | 0.5 | A |
| $P_{G(AV)}$ | Average Gate Power Dissipation | $T_J = 125^\circ\text{C}$ | 0.2 | W |
| T_{STG} | Storage Temperature | - | -40 to 150 | $^\circ\text{C}$ |
| T_J | Operating Junction Temperature | - | -40 to 125 | $^\circ\text{C}$ |
| V_{DSM} | Non-repetitive Peak Off-state Voltage | $T_J = 25^\circ\text{C}$, $R_{GK} = 1\text{ k}\Omega$, K1 to A1 and K2 to A2 | 1150 | V |
| V_{RSM} | Non-repetitive Reverse Blocking Voltage | $T_J = 25^\circ\text{C}$, $R_{GK} = 1\text{ k}\Omega$, K1 to A1 and K2 to A2 | 900 | V |
| V_{ISO} | Isolation Voltage | SCR1 to SCR2 | 800 | V |

2. Thermal Characteristics

| Symbol | Characteristic | Value | Unit |
|--------------|--|-------|---------------------------|
| $R_{th(JC)}$ | Thermal Resistance, junction-to-case, $I_T = 1\text{ A}$, Single SCR | 45 | $^\circ\text{C}/\text{W}$ |
| $R_{th(JA)}$ | Thermal Resistance, junction-to-ambient, $I_T = 1\text{ A}$, Single SCR | 120 | $^\circ\text{C}/\text{W}$ |

3. Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise specified)

| Symbol | Description | Conditions | Value | | | Unit | |
|-----------|--|---|---------------------------|-----|-----|---------------|------------------------|
| | | | Min | Typ | Max | | |
| I_{GT} | DC Gate Trigger Current | $V_D = 6\text{ V}$, $R_L = 100\text{ }\Omega$ | 20 | - | 100 | μA | |
| V_{GT} | DC Gate Trigger Voltage | $V_D = 6\text{ V}$, $R_L = 100\text{ }\Omega$ | - | - | 0.8 | V | |
| V_{GRM} | Peak Reverse Gate Voltage | $I_{RG} = 10\text{ }\mu\text{A}$ | 8 | - | - | V | |
| I_H | Holding Current | $R_{GK} = 1\text{ k}\Omega$, $I_T = 20\text{ mA}$ | - | - | 3 | mA | |
| dv/dt | Critical Rate-of-rise of Off-stage Voltage | $V_D = 2/3 V_{DRM}$, $T_J = 125^\circ\text{C}$ | $RGK = 1\text{ k}\Omega$ | 40 | - | - | $\text{V}/\mu\text{s}$ |
| | | | $RGK = 220\text{ }\Omega$ | 250 | - | - | |
| V_{GD} | Gate Non-trigger Voltage | $V_D = V_{DRM}$, $R_L = 3.3\text{ k}\Omega$, $T_J = 125^\circ\text{C}$ | 0.2 | - | - | V | |
| t_q | Turn-off Time | $I_T = 0.5\text{ A}$ | - | - | 35 | μs | |
| t_{gt} | Turn-on Time | $I_G = 2 \times I_{GT}$, $P_W = 15\text{ }\mu\text{s}$, $I_T = 1.6\text{ A}_{(PK)}$ | - | 3 | - | μs | |

4. Static Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise specified)

| Symbol | Description | Conditions | Maximum Value | Unit |
|-------------------|------------------------------------|--|---------------|------------------|
| V_{TM} | Peak On-state Voltage | $I_{TM} = 4\text{ A}$, $t_p = 380\text{ }\mu\text{s}$ | 1.8 | V |
| V_{T0} | Threshold Voltage | - | 1.1 | V |
| RD | Dynamic Resistance | - | 133 | $\text{m}\Omega$ |
| I_{DRM}/I_{RRM} | Off-state Current, Peak Repetitive | $T_J = 25^\circ\text{C}$ | 3 | μA |
| | | $T_J = 125^\circ\text{C}$ | 500 | μA |

5. Performance Curves

Figure 1. Normalized DC Gate Trigger Current vs. Junction Temperature

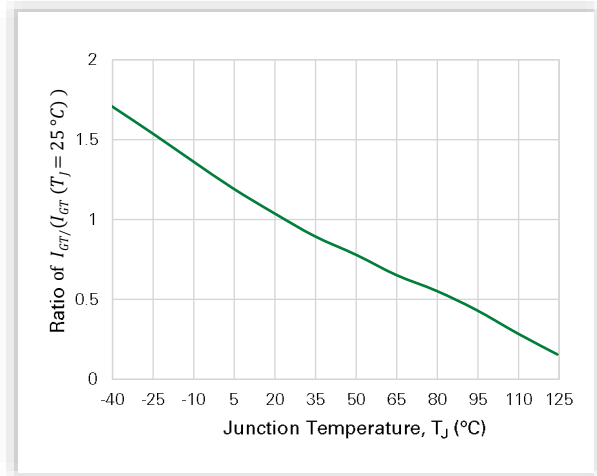


Figure 2. Normalized DC Holding Current vs. Junction Temperature

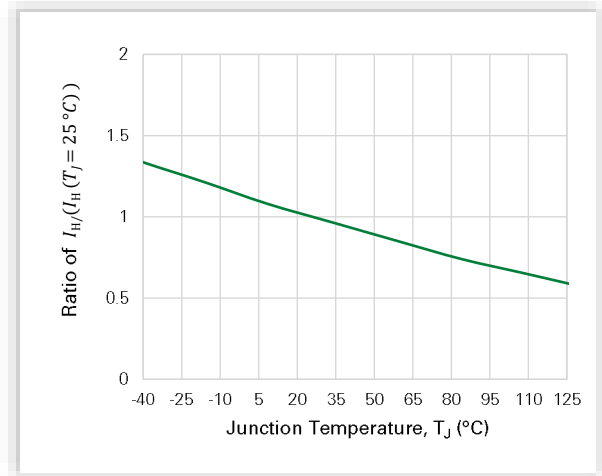


Figure 3. Normalized DC Gate Trigger Voltage vs. Junction Temperature

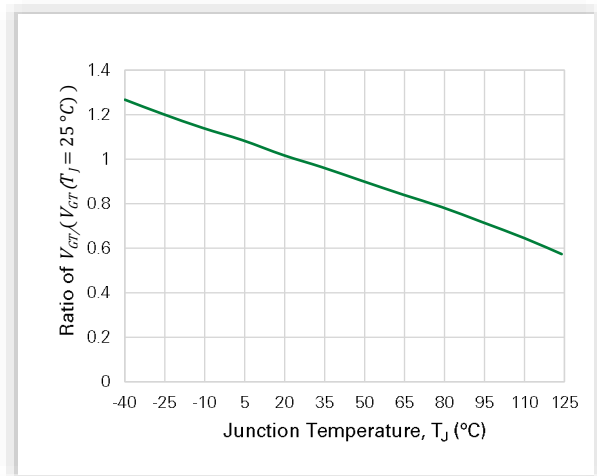


Figure 4. On-state Current vs. Typical On-state Voltage

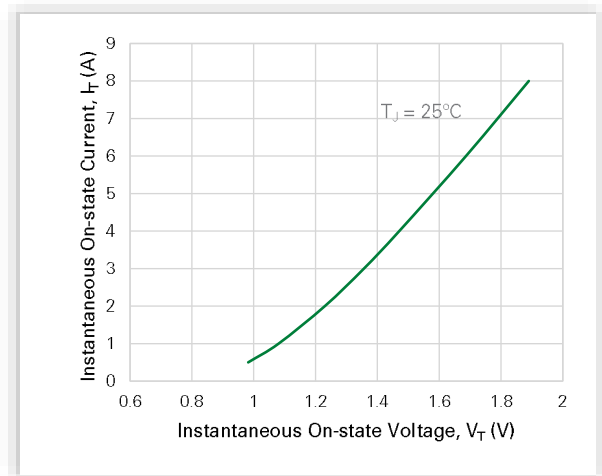


Figure 5. Typical Power Dissipation vs. RMS On-state Current

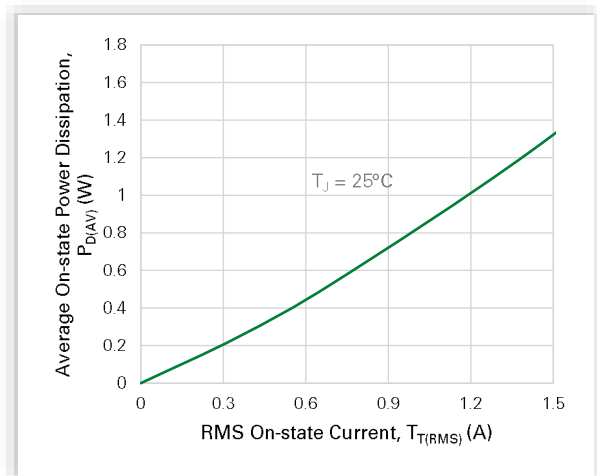


Figure 6. Maximum Allowable Case Temperature vs. On-state Current

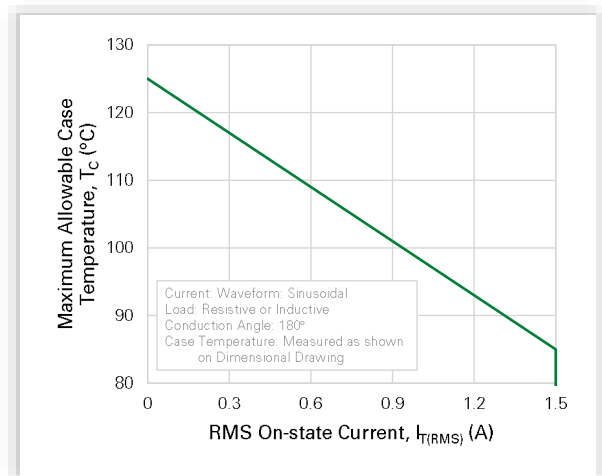
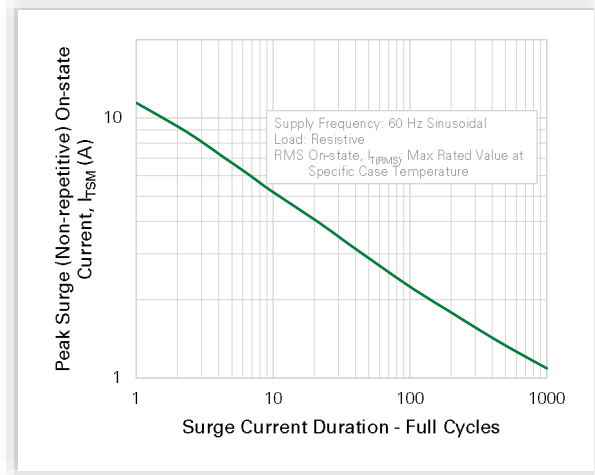


Figure 7. Surge Peak On-state Current vs. Number of Cycles



Notes:

1. Gate control may be lost during and immediately following surge current interval.
2. Overload may not be repeated until junction temperature has returned to steady-state rated value.

Figure 8. Typical Static dv/dt vs. R_{GK} vs. Junction Temperature

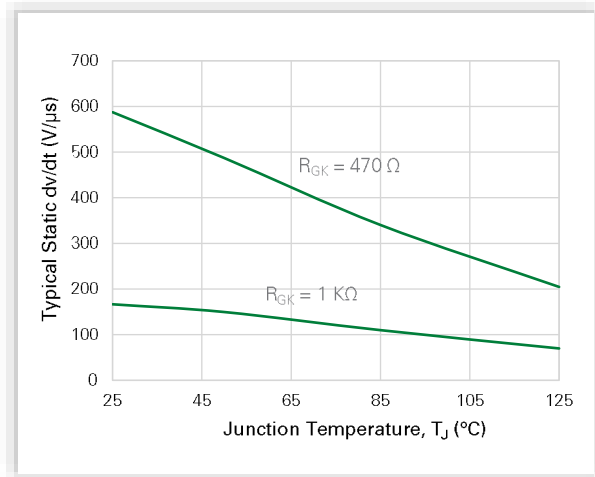


Figure 9. Typical Static dv/dt vs. C_{GK}

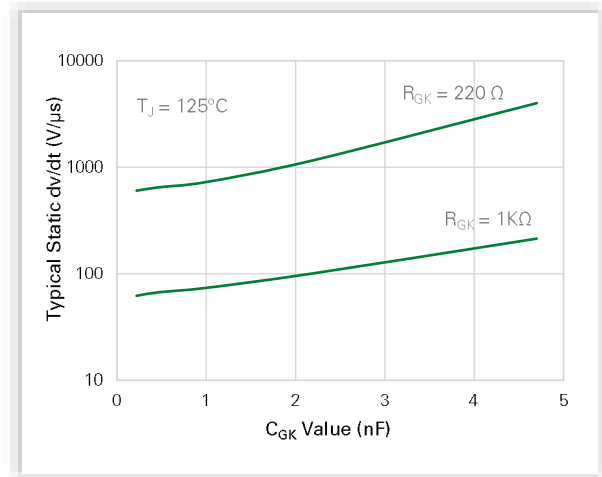


Figure 10. Typical Turn-off Time vs. R_{GK}

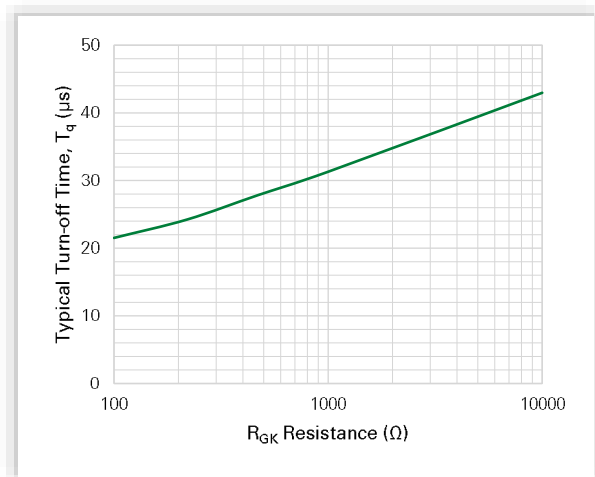
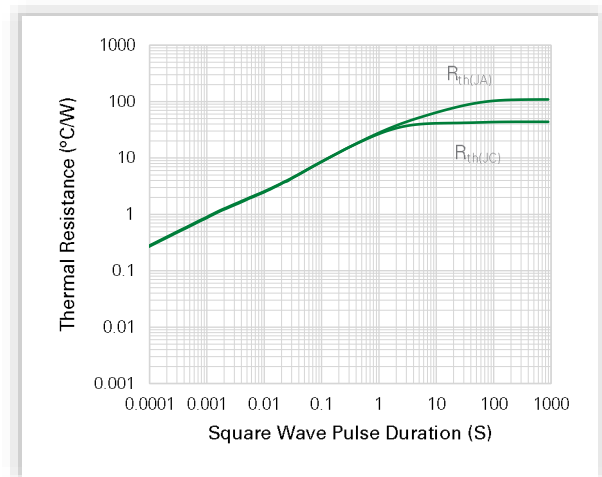
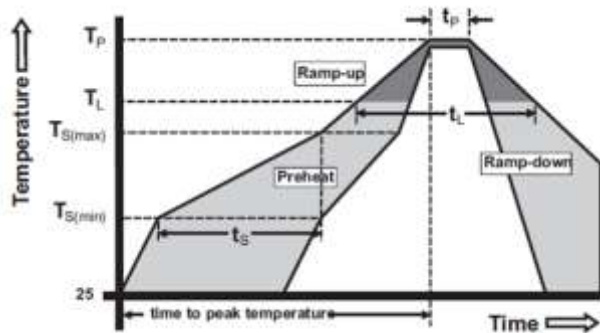


Figure 11. Thermal Resistance (°C/W) vs. Square Wave Pulse Duration (S)



6. Soldering Parameters



| Parameter | Value | |
|--|--------------------------------------|-------------|
| Reflow Condition | Pc-free Assembly | |
| Pre-Heat | Temperature Min, $T_{S(\text{Min})}$ | 150 °C |
| | Temperature Max, $T_{S(\text{Max})}$ | 200 °C |
| | Time (Min to Max), t_s | 60 to 120 s |
| Average Ramp-up Rate Liquidus Temp., T_L to peak | 3 °C/s (Max) | |
| $T_{S(\text{Max})}$ to T_L Ramp-up Rate | 3 °C/s (Max) | |
| Reflow | Temperature, T_L Liquidus | 217 °C |
| | Time, t_L | 60 to 150 s |
| Peak Temperature, T_P | 260 °C (± 5 °C) | |
| Time within 5 °C of Actual Peak Temperature, t_p | 30 seconds (Max) | |
| Ramp-down Rate | 6 °C/s (Max) | |
| Time 25 °C to Peak Temperature, T_P | 8 minutes (Max) | |
| Do Not Exceed | 260 °C | |

7. Physical Specifications

| Device Feature | Detail |
|-------------------|--|
| Terminal Finish | 100% Matte Tin-plated with 150°C 1 hr annealing |
| Body Material | UL Recognized Compound Meeting Flammability Rating V-0 |
| Terminal Material | Copper Alloy |

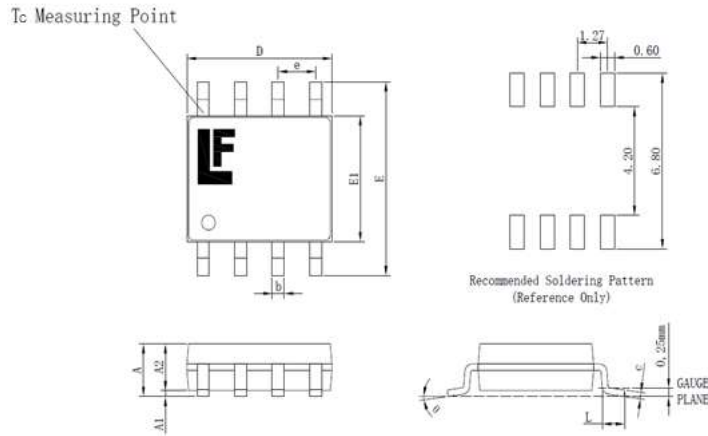
9. Design Considerations

Careful selection of the correct component for the application’s operating parameters and environment will go a long way toward extending the operating life of the Thyristor. Good design practice should limit the maximum continuous current through the main terminals to 75% of the component rating. Other ways to ensure long life for a power discrete semiconductor are proper heat sinking and selection of voltage ratings for worst case conditions. Overheating, overvoltage (including dv/dt), and surge currents are the main killers of semiconductors. Correct mounting, soldering, and forming of the leads also help protect against component damage.

8. Environmental Specifications

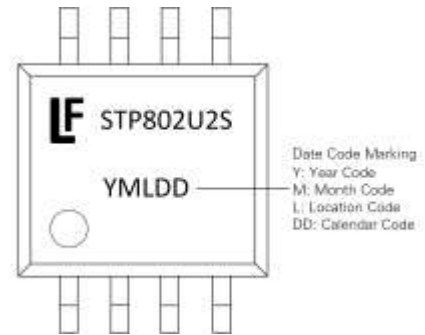
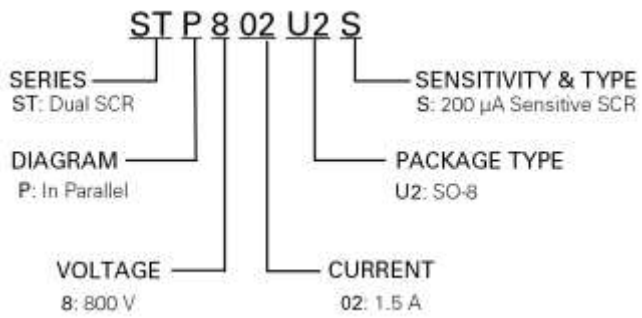
| Test | Specifications and Conditions |
|----------------------------|--|
| AC Blocking | MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 125°C for 1008 hours |
| Temperature Cycling | MIL-STD-750, M-1051, 1000 cycles; -40°C to +150°C; 15 min dwell time |
| Temperature/Humidity | EIA / JEDEC, JESD22-A101 1008 hours; 320V - DC: 85°C; 85% rel humidity |
| High-temp Storage | MIL-STD-750, M-1031, 1008 hours; 150°C |
| Low-temp Storage | 1008 hours; -40°C |
| Resistance to Solder Heat | MIL-STD-750 Method 2031 |
| Solderability | ANSI/J-STD-002, category 3, Test A |
| Lead Bend | MIL-STD-750, M-2036 Cond E |
| Moisture Sensitivity Level | Level 1, JEDEC-J-STD-020D |

10. Package Dimensions



| Package | SOIC | | | |
|---------|-------------|------|-----------|-------|
| Pins | 8 | | | |
| JEDEC | MS-012 | | | |
| | Millimeters | | Inches | |
| | Min | Max | Min | Max |
| A | 1.35 | 1.75 | 0.053 | 0.069 |
| A1 | 0.10 | 0.25 | 0.004 | 0.010 |
| A2 | 1.25 | 1.65 | 0.050 | 0.065 |
| b | 0.31 | 0.51 | 0.012 | 0.020 |
| c | 0.17 | 0.25 | 0.007 | 0.010 |
| D | 4.80 | 5.00 | 0.189 | 0.197 |
| E | 5.80 | 6.20 | 0.228 | 0.244 |
| E1 | 3.80 | 4.00 | 0.150 | 0.157 |
| e | 1.27 BSC | | 0.050 BSC | |
| L | 0.40 | 1.27 | 0.016 | 0.050 |

11. Part Numbering and Marking

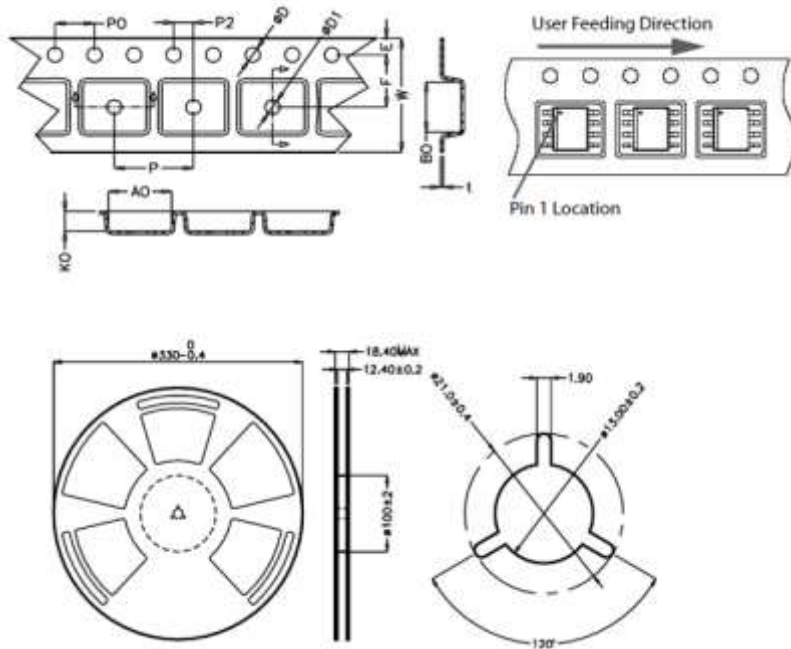


12. Packing Options

| Part Number | Marking | Weight | Packing Mode | M.O.Q |
|-------------|-----------|--------|--------------|-------|
| STP802U2SRP | STP802U2S | 0.08 g | Tape & Reel | 2500 |

13. Packing Specifications

Embossed Carrier Tape & Reel Specification – SOIC Package



| | Millimeters | | Inches | |
|------|-------------|------|---------------|-------|
| | Min | Max | Min | Max |
| E | 1.65 | 1.85 | 0.065 | 0.073 |
| F | 5.4 | 5.6 | 0.213 | 0.22 |
| P2 | 1.95 | 2.05 | 0.077 | 0.081 |
| D | 1.5 | 1.6 | 0.059 | 0.063 |
| D1 | 1.50 Min | | 0.059 Min | |
| P0 | 3.9 | 4.1 | 0.154 | 0.161 |
| 10P0 | 40.0 ± 0.20 | | 1.574 ± 0.008 | |
| W | 11.9 | 12.1 | 0.468 | 0.476 |
| P | 7.9 | 8.1 | 0.311 | 0.319 |
| A0 | 6.3 | 6.5 | 0.248 | 0.256 |
| B0 | 5.1 | 5.3 | 0.2 | 0.209 |
| K0 | 2 | 2.2 | 0.079 | 0.087 |
| t | 0.30 ± 0.05 | | 0.012 ± 0.002 | |

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