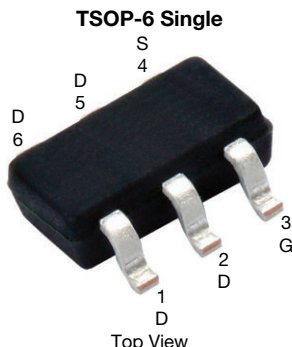


Automotive N-Channel 60 V (D-S) 175 °C MOSFET

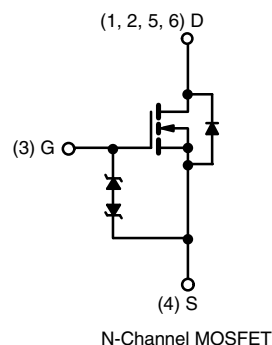


FEATURES

- TrenchFET® power MOSFET
- Typical ESD protection 800 V HBM
- AEC-Q101 qualified
- 100 % R_g and UIS tested
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE



PRODUCT SUMMARY

| | |
|--|--------|
| V _{DS} (V) | 60 |
| R _{DS(on)} (Ω) at V _{GS} = 10 V | 0.042 |
| R _{DS(on)} (Ω) at V _{GS} = 4.5 V | 0.063 |
| I _D (A) | 7 |
| Configuration | Single |

Marking Code: 91XXX

ORDERING INFORMATION

| | |
|---------------------------------|--|
| Package | TSOP-6 |
| Lead (Pb)-free and halogen-free | SQ3426CEEV (for detailed order number please see www.vishay.com/doc?79771) |

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

| PARAMETER | SYMBOL | LIMIT | UNIT |
|--|-----------------------------------|-------------------------|------|
| Drain-source voltage | V _{DS} | 60 | V |
| Gate-source voltage | V _{GS} | ± 20 | |
| Continuous drain current | I _D | T _C = 25 °C | 7 |
| | | T _C = 125 °C | 4 |
| Continuous source current (diode conduction) | I _S | 4.6 | A |
| Pulsed drain current ^a | I _{DM} | 29 | |
| Single pulse avalanche current | I _{AS} | 10 | |
| Single pulse avalanche energy | E _{AS} | 5 | mJ |
| Maximum power dissipation | P _D | T _C = 25 °C | 5 |
| | | T _C = 125 °C | 1.6 |
| Operating junction and storage temperature range | T _J , T _{stg} | - 55 to +175 | °C |

THERMAL RESISTANCE RATINGS

| PARAMETER | SYMBOL | LIMIT | UNIT |
|--------------------------|-------------------|-------|------|
| Junction-to-ambient | R _{thJA} | 110 | °C/W |
| Junction-to-foot (drain) | R _{thJF} | 30 | |

Notes

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
b. When mounted on 1" square PCB (FR4 material)

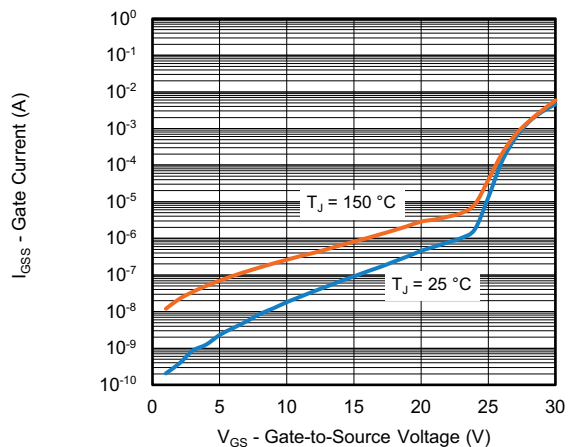
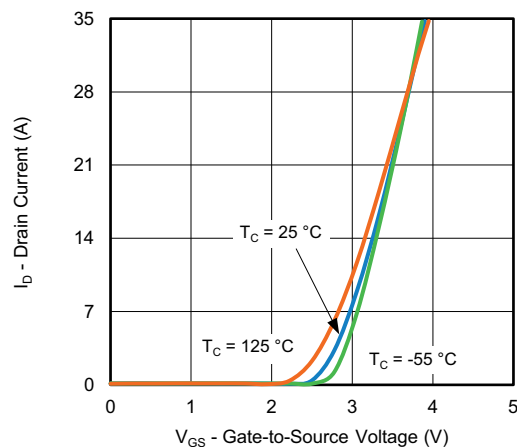
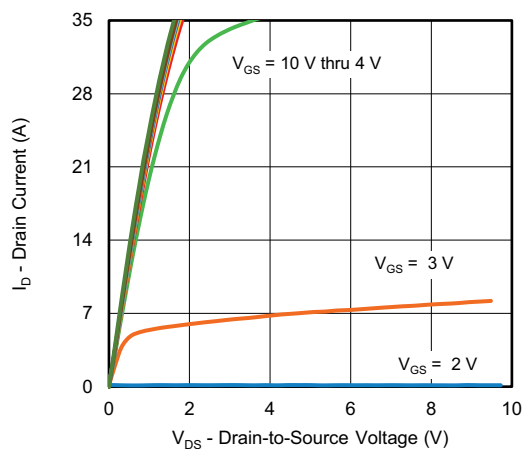
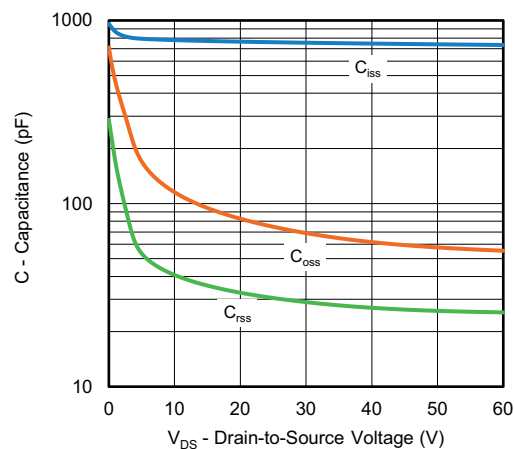
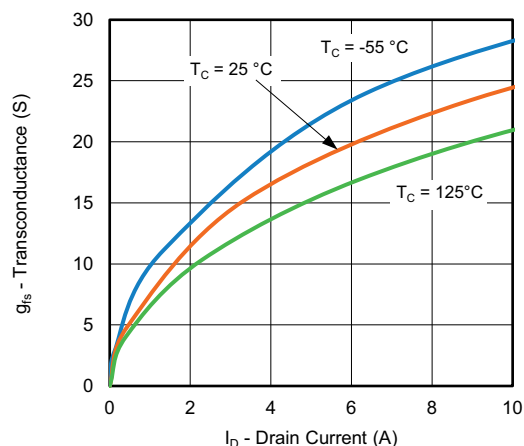
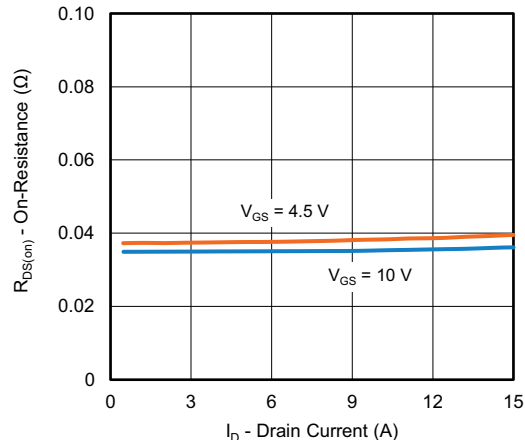


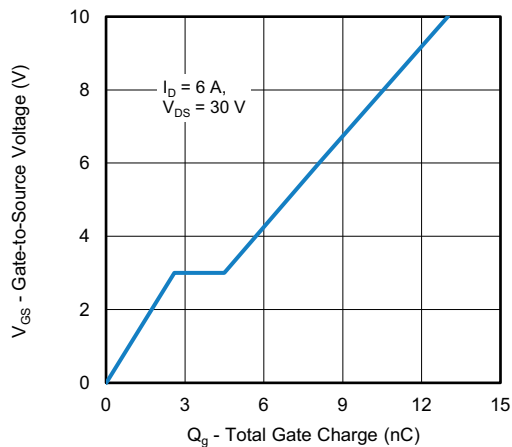
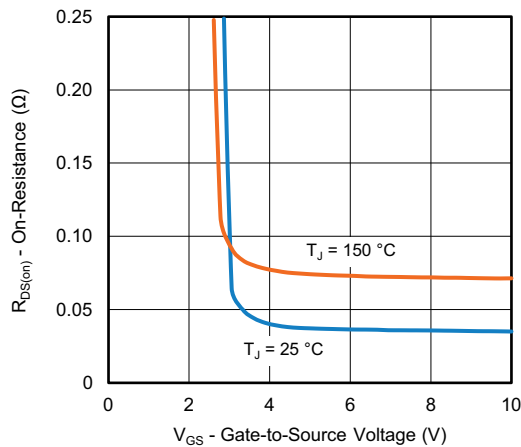
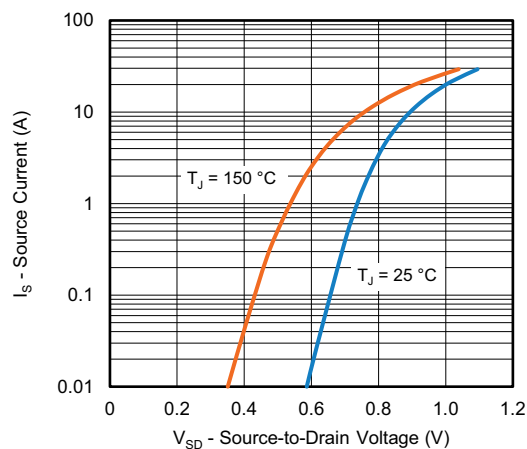
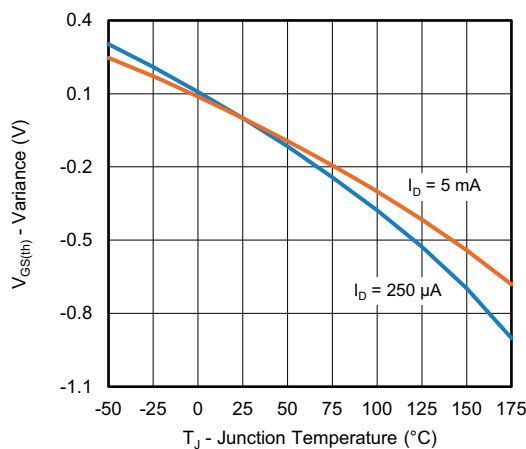
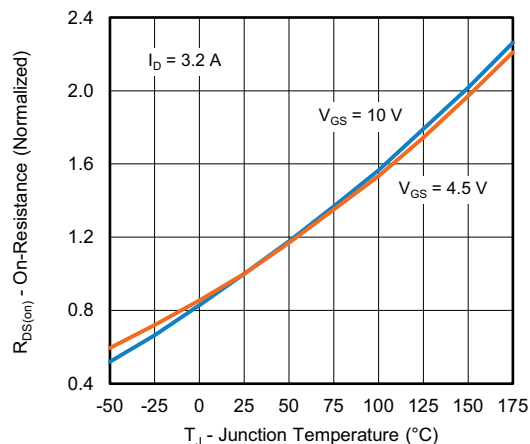
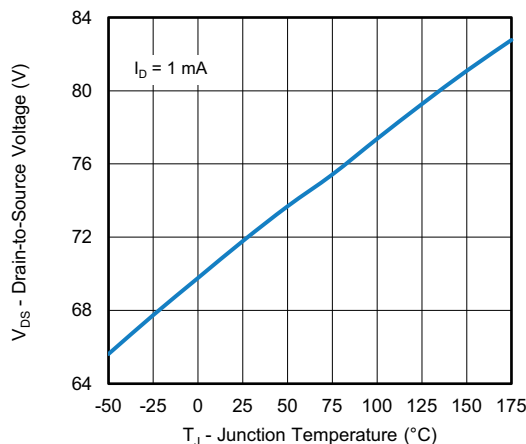
| SPECIFICATIONS (T _C = 25 °C, unless otherwise noted) | | | | | | | |
|---|----------------------|---|---|------|--------|-------|------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
| Static | | | | | | | |
| Drain-source breakdown voltage | V _{DS} | V _{GS} = 0, I _D = 250 μA | | 60 | - | - | V |
| Gate-source threshold voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | | 1.5 | 2.0 | 2.5 | |
| Gate-source leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 12 V | | - | - | ± 500 | nA |
| | | V _{DS} = 0 V, V _{GS} = ± 20 V | | - | - | ± 1 | mA |
| Zero gate voltage drain current | I _{DSS} | V _{GS} = 0 V | V _{DS} = 60 V | - | - | 1 | μA |
| | | V _{GS} = 0 V | V _{DS} = 60 V, T _J = 125 °C | - | - | 50 | |
| | | V _{GS} = 0 V | V _{DS} = 60 V, T _J = 175 °C | - | - | 150 | |
| On-state drain current ^a | I _{D(on)} | V _{GS} = 10 V | V _{DS} ≥ 5 V | 10 | - | - | A |
| Drain-source on-state resistance ^a | R _{DS(on)} | V _{GS} = 10 V | I _D = 5 A | - | 0.0351 | 0.042 | Ω |
| | | V _{GS} = 10 V | I _D = 5 A, T _J = 125 °C | - | 0.0627 | - | |
| | | V _{GS} = 10 V | I _D = 5 A, T _J = 175 °C | - | 0.0793 | - | |
| | | V _{GS} = 4.5 V | I _D = 4 A | - | 0.038 | 0.063 | |
| Forward transconductance ^a | g _{fs} | V _{DS} = 15 V, I _D = 4 A | | - | 16 | - | S |
| Dynamic ^b | | | | | | | |
| Input capacitance | C _{iss} | V _{GS} = 0 V | V _{DS} = 30 V, f = 1 MHz | - | 756 | 1100 | pF |
| Output capacitance | C _{oss} | | | - | 69 | 100 | |
| Reverse transfer capacitance | C _{rss} | | | - | 29 | 55 | |
| Total gate charge ^c | Q _g | V _{GS} = 10 V | V _{DS} = 30 V, I _D = 6 A | - | 13 | 19.5 | nC |
| Gate-source charge ^c | Q _{gs} | | | - | 2.6 | - | |
| Gate-drain charge ^c | Q _{gd} | | | - | 1.9 | - | |
| Gate resistance | R _g | f = 1 MHz | | 1.9 | 3.83 | 5.7 | Ω |
| Turn-on delay time ^c | t _{d(on)} | V _{DD} = 30 V, R _L = 7.5 Ω I _D ≅ 4 A, V _{GEN} = 10 V, R _g = 1 Ω | | - | 7 | 10 | ns |
| Rise time ^c | t _r | | | - | 4 | 14 | |
| Turn-off delay time ^c | t _{d(off)} | | | - | 18 | 25 | |
| Fall time ^c | t _f | | | - | 4 | 6 | |
| Source-Drain Diode Ratings and Characteristics ^b | | | | | | | |
| Pulsed current ^a | I _{SM} | | | - | - | 29 | A |
| Forward voltage | V _{SD} | I _F = 1.6 A, V _{GS} = 0 | | - | 0.76 | 1.2 | V |
| Body diode reverse recovery time | t _{rr} | I _F = 1.7 A, di/dt = 100 A/μs | | - | 18 | 36 | ns |
| Body diode reverse recovery charge | Q _{rr} | | | - | 14 | 28 | nC |
| Reverse recovery fall time | t _a | | | - | 14 | - | ns |
| Reverse recovery rise time | t _b | | | - | 4 | - | |
| Body diode peak reverse recovery current | I _{RM(REC)} | | | - | -1.76 | - | A |

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
c. Independent of operating temperature

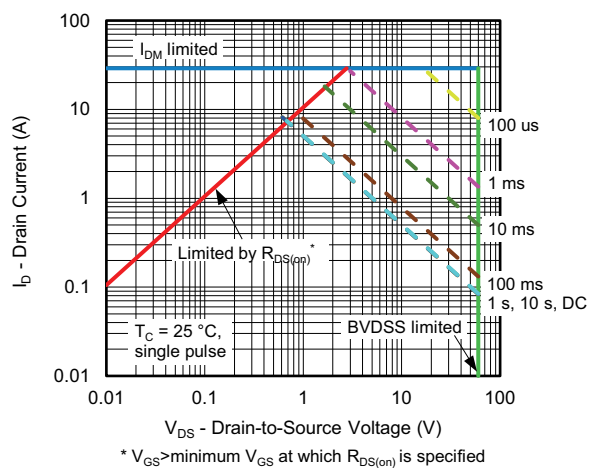
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Gate Current vs. Gate-Source Voltage

Transfer Characteristics

Output Characteristics

Capacitance

Transconductance

On-Resistance vs. Drain Current

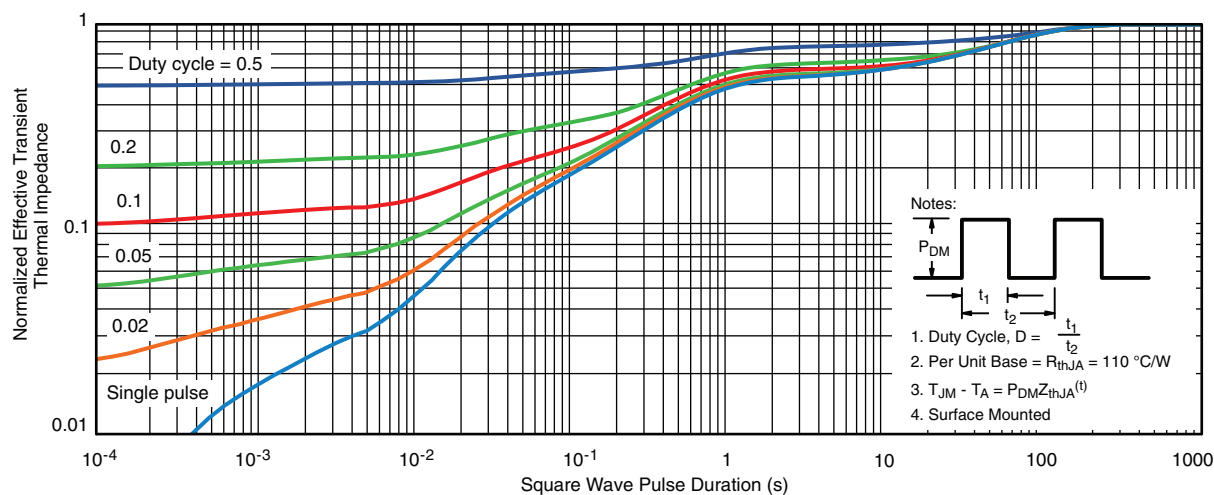
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Gate Charge

On-Resistance vs. Gate-Source Voltage

Source-Drain Diode Forward Voltage

Threshold Voltage

On-Resistance vs. Junction Temperature

Drain-Source Breakdown vs. Junction Temperature



THERMAL RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



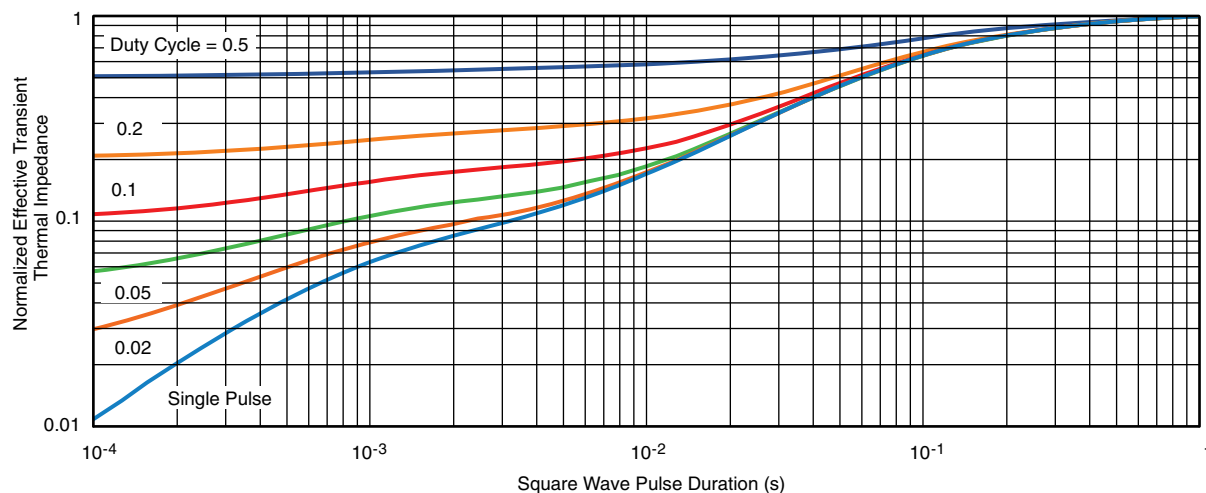
Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient



THERMAL RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



Normalized thermal Transient Impedance, Junction-to-Foot

Note

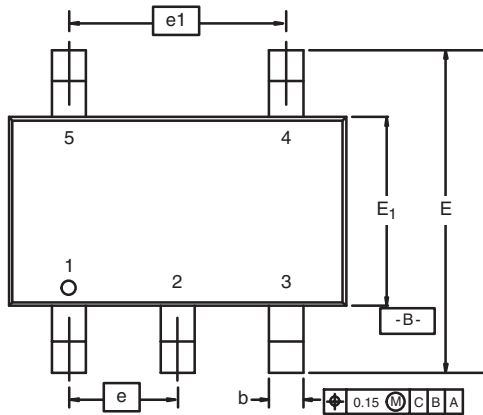
- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction-to-Ambient ($25\text{ }^{\circ}\text{C}$)
 - Normalized Transient Thermal Impedance Junction-to-Foot ($25\text{ }^{\circ}\text{C}$)are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

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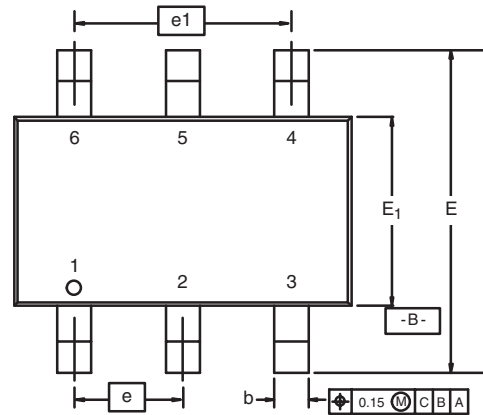


TSOP: 5/6-LEAD

JEDEC Part Number: MO-193C



5-LEAD TSOP

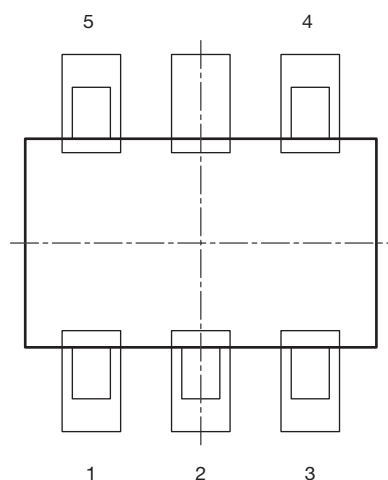


6-LEAD TSOP

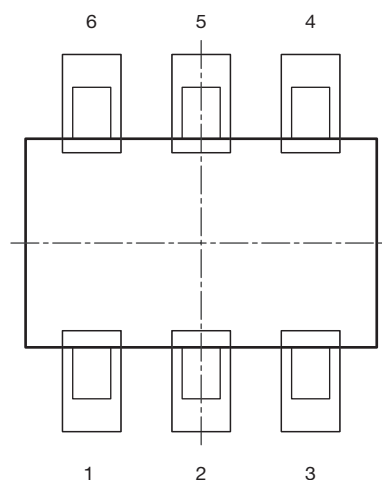


| Dim | MILLIMETERS | | | INCHES | | |
|--------------------------------|-------------|------|------|------------|-------|-------|
| | Min | Nom | Max | Min | Nom | Max |
| A | 0.91 | - | 1.10 | 0.036 | - | 0.043 |
| A ₁ | 0.01 | - | 0.10 | 0.0004 | - | 0.004 |
| A ₂ | 0.90 | - | 1.00 | 0.035 | 0.038 | 0.039 |
| b | 0.30 | 0.32 | 0.45 | 0.012 | 0.013 | 0.018 |
| c | 0.10 | 0.15 | 0.20 | 0.004 | 0.006 | 0.008 |
| D | 2.95 | 3.05 | 3.10 | 0.116 | 0.120 | 0.122 |
| E | 2.70 | 2.85 | 2.98 | 0.106 | 0.112 | 0.117 |
| E ₁ | 1.55 | 1.65 | 1.70 | 0.061 | 0.065 | 0.067 |
| e | 0.95 BSC | | | 0.0374 BSC | | |
| e ₁ | 1.80 | 1.90 | 2.00 | 0.071 | 0.075 | 0.079 |
| L | 0.32 | - | 0.50 | 0.012 | - | 0.020 |
| L ₁ | 0.60 Ref | | | 0.024 Ref | | |
| L ₂ | 0.25 BSC | | | 0.010 BSC | | |
| R | 0.10 | - | - | 0.004 | - | - |
| θ | 0° | 4° | 8° | 0° | 4° | 8° |
| θ ₁ | 7° Nom | | | 7° Nom | | |
| ECN: C-06593-Rev. I, 18-Dec-06 | | | | | | |
| DWG: 5540 | | | | | | |

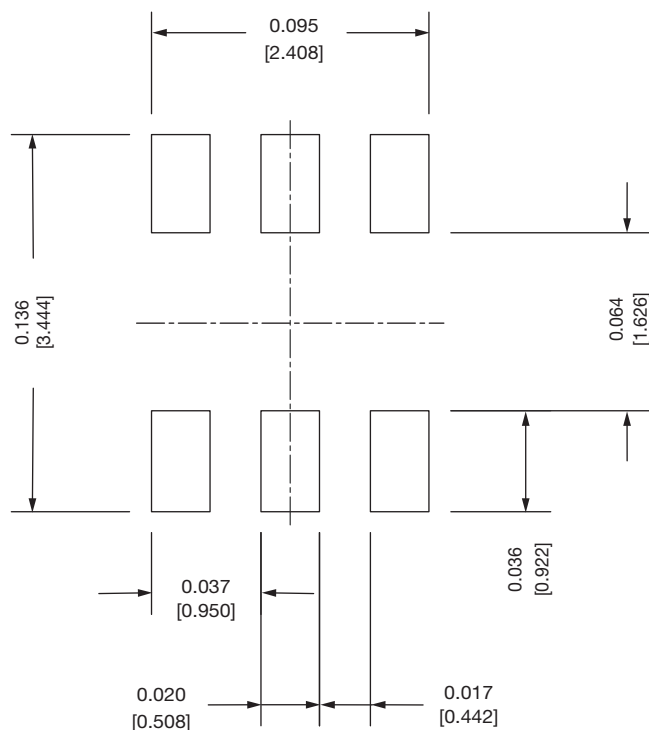
Recommended Land Pattern For TSOP-5L / TSOP-6L



TSOP 5L



TSOP 6L



Note

- All dimensions are in inches (millimeter)

ECN: C22-0860-Rev. B, 24-Oct-2022
DWG: 3010



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