



60V 9.9mΩ N-Ch Power MOSFET

Features

- Low $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested, 100% R_g Tested
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant

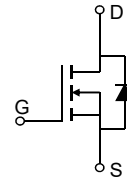
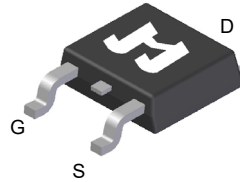
Product Summary

| Parameter | Value | Unit |
|--|-------|------|
| V_{DS} | 60 | V |
| $V_{GS(th_Typ)}$ | 1.6 | V |
| I_D (@ $V_{GS} = 10V$) ⁽¹⁾ | 52 | A |
| $R_{DS(ON_Typ)}$ (@ $V_{GS} = 10V$) | 9.9 | mΩ |
| $R_{DS(ON_Typ)}$ (@ $V_{GS} = 4.5V$) | 12.6 | mΩ |

Applications

- Power Management in Computing, CE, IE 4.0, Communications
- Current Switching in DC/DC & AC/DC (SR) Sub-systems
- Load Switching, Quick/Wireless Charging, Motor Driving

TO-252-3L Top View

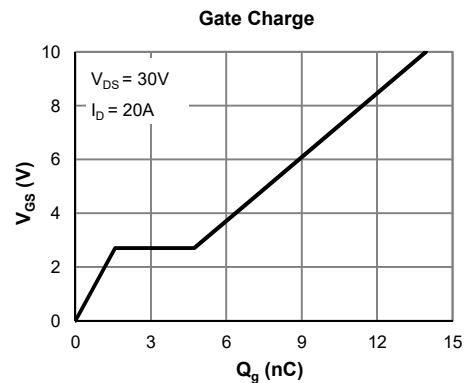
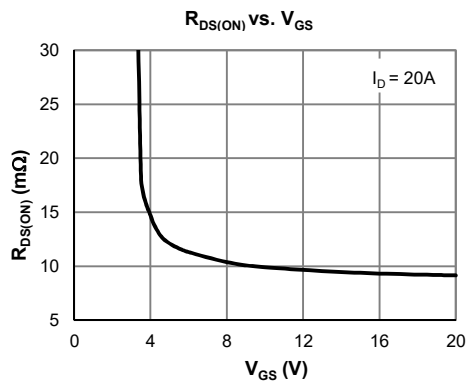


Ordering Information

| Device | Package | # of Pins | Marking | MSL | T_J (°C) | Media | Quantity (pcs) |
|---------------|-----------|-----------|---------|-----|------------|--------------|----------------|
| JMSL0612AK-13 | TO-252-3L | 3 | SL0612A | 1 | -55 to 150 | 13-inch Reel | 2500 |

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

| Parameter | Symbol | Value | Unit |
|---|----------------|---------------------|------|
| Drain-to-Source Voltage | V_{DS} | 60 | V |
| Gate-to-Source Voltage | V_{GS} | ±20 | V |
| Continuous Drain Current ⁽¹⁾ | I_D | $T_C = 25^\circ C$ | 52 |
| | | $T_C = 100^\circ C$ | 33 |
| Pulsed Drain Current ⁽²⁾ | I_{DM} | 207 | A |
| Avalanche Current ⁽³⁾ | I_{AS} | 20 | A |
| Avalanche Energy ⁽³⁾ | E_{AS} | 20 | mJ |
| Power Dissipation ⁽⁴⁾ | P_D | $T_C = 25^\circ C$ | 57 |
| | | $T_C = 100^\circ C$ | 23 |
| Junction & Storage Temperature Range | T_J, T_{STG} | -55 to 150 | °C |



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

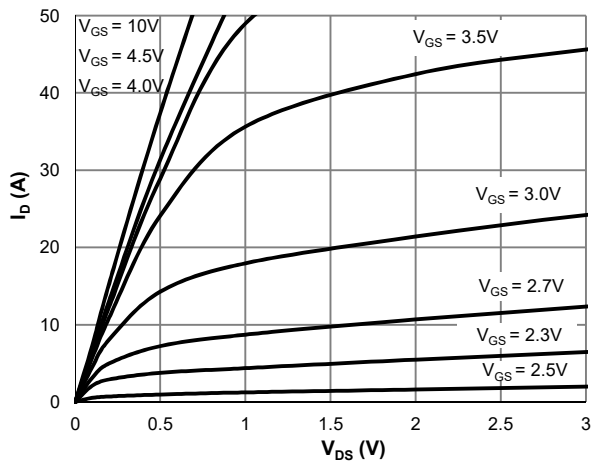
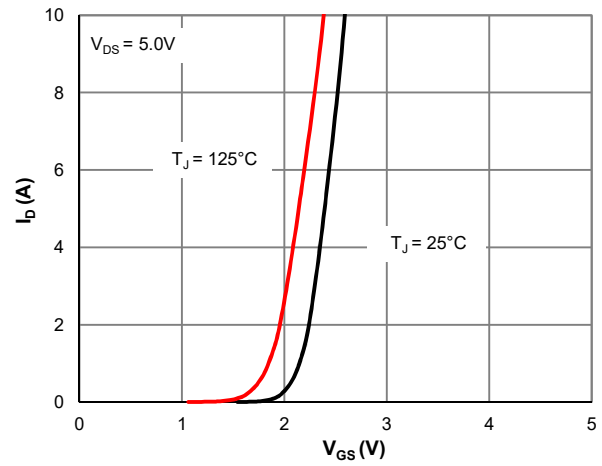
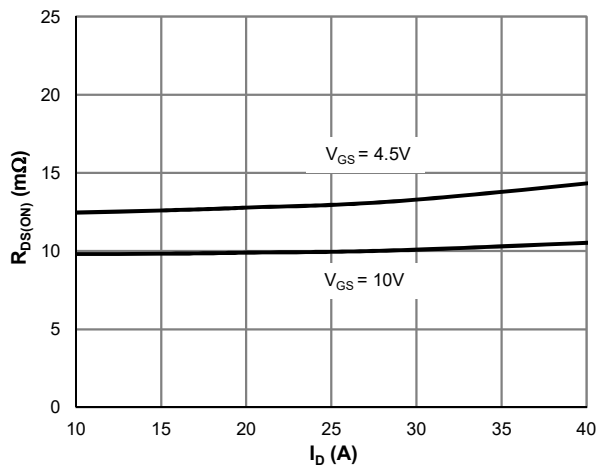
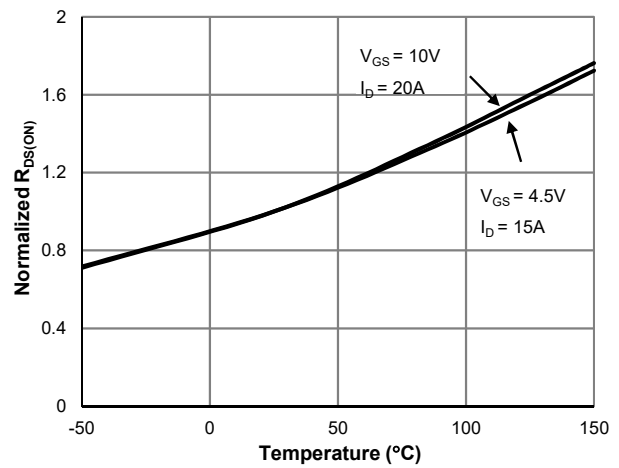
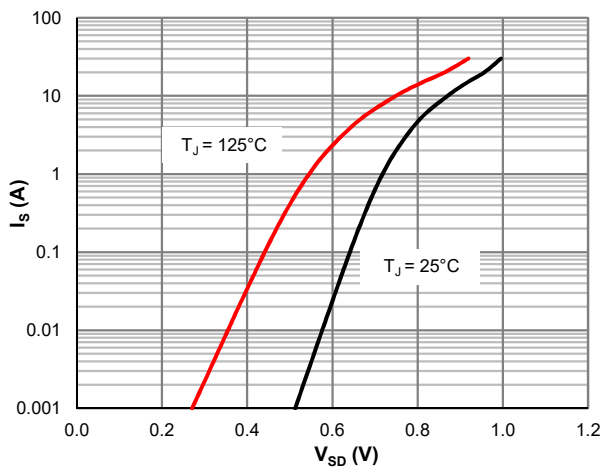
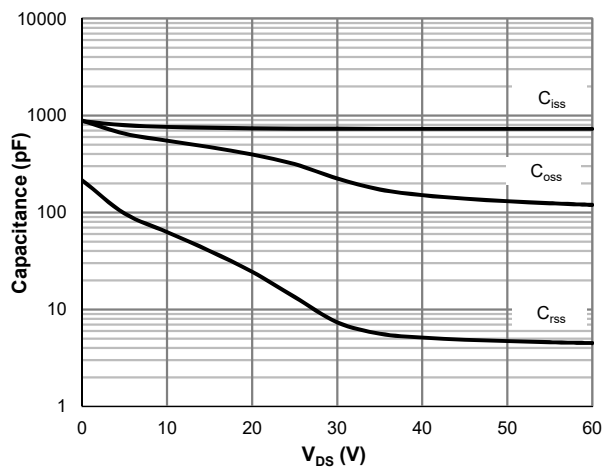
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---------------|--|---|------|------------|------------------|
| STATIC PARAMETERS | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$ | 60 | | | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 48\text{V}, V_{GS} = 0\text{V}$ $T_J = 55^\circ\text{C}$ | | | 1.0 5.0 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$ | | | ± 100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ | 1.2 | 1.6 | 2.5 | V |
| Static Drain-Source ON-Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{V}, I_D = 20\text{A}$ | | 9.9 | 12.0 | $\text{m}\Omega$ |
| | | $V_{GS} = 4.5\text{V}, I_D = 15\text{A}$ | | 12.6 | 16.0 | $\text{m}\Omega$ |
| Forward Transconductance | g_{FS} | $V_{DS} = 5\text{V}, I_D = 20\text{A}$ | | 81 | | S |
| Diode Forward Voltage | V_{SD} | $I_S = 1\text{A}, V_{GS} = 0\text{V}$ | | 0.69 | 1.0 | V |
| Diode Continuous Current | I_S | $T_C = 25^\circ\text{C}$ | | | 57 | A |
| DYNAMIC PARAMETERS ⁽⁵⁾ | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0\text{V}, V_{DS} = 30\text{V}, f = 1\text{MHz}$ | | 731 | | pF |
| Output Capacitance | C_{oss} | | | 224 | | pF |
| Reverse Transfer Capacitance | C_{rss} | | | 7.4 | | pF |
| Gate Resistance | R_g | $V_{GS} = 0\text{V}, V_{DS} = 0\text{V}, f = 1\text{MHz}$ | | 1.7 | | Ω |
| SWITCHING PARAMETERS ⁽⁵⁾ | | | | | | |
| Total Gate Charge (@ $V_{GS} = 10\text{V}$) | Q_g | $V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 30\text{V}, I_D = 20\text{A}$ | | 13.9 | | nC |
| Total Gate Charge (@ $V_{GS} = 4.5\text{V}$) | Q_g | | | 7.0 | | nC |
| Gate Source Charge | Q_{gs} | | | 1.6 | | nC |
| Gate Drain Charge | Q_{gd} | | | 3.1 | | nC |
| Turn-On Delay Time | $t_{D(on)}$ | $V_{GS} = 10\text{V}, V_{DS} = 30\text{V}$ $R_L = 1.5\Omega, R_{GEN} = 6\Omega$ | | 3.7 | | ns |
| Turn-On Rise Time | t_r | | | 4.3 | | ns |
| Turn-Off Delay Time | $t_{D(off)}$ | | | 16 | | ns |
| Turn-Off Fall Time | t_f | | | 6.5 | | ns |
| Body Diode Reverse Recovery Time | t_{rr} | | $I_F = 15\text{A}, di_F/dt = 100\text{A}/\mu\text{S}$ | | 24 | |
| Body Diode Reverse Recovery Charge | Q_{rr} | $I_F = 15\text{A}, di_F/dt = 100\text{A}/\mu\text{S}$ | | 9.3 | | nC |

Thermal Performance

| Parameter | Symbol | Typ. | Max. | Unit |
|---|-----------------|------|------|---------------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 40 | 50 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 1.8 | 2.2 | $^\circ\text{C}/\text{W}$ |

Notes:

1. Computed continuous current assumes the condition of T_{J_Max} while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under $T_{J_Max} = 150^\circ\text{C}$.
3. This single-pulse measurement was taken under the following condition [$L = 100\mu\text{H}, V_{GS} = 10\text{V}, V_{DS} = 30\text{V}$] while its value is limited by $T_{J_Max} = 150^\circ\text{C}$.
4. The power dissipation P_D is based on $T_{J_Max} = 150^\circ\text{C}$.
5. This value is guaranteed by design hence it is not included in the production test.

Typical Electrical & Thermal Characteristics

Figure 1: Saturation Characteristics

Figure 2: Transfer Characteristics

Figure 3: $R_{DS(ON)}$ vs. Drain Current

Figure 4: $R_{DS(ON)}$ vs. Junction Temperature

Figure 5: Body-Diode Characteristics

Figure 6: Capacitance Characteristics

Typical Electrical & Thermal Characteristics

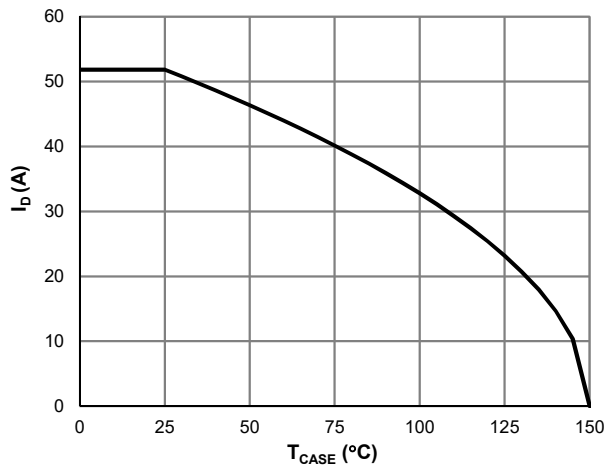


Figure 7: Current De-rating

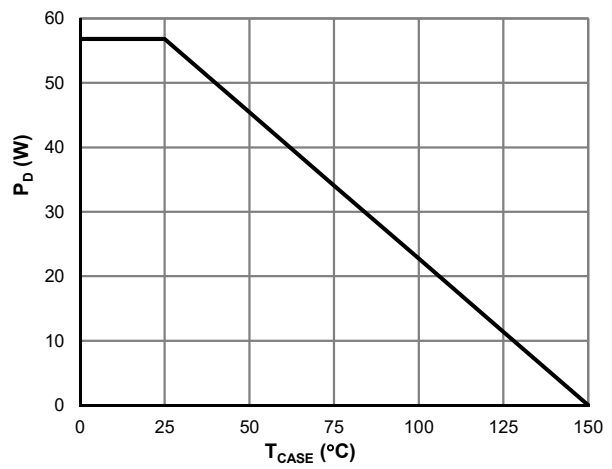


Figure 8: Power De-rating

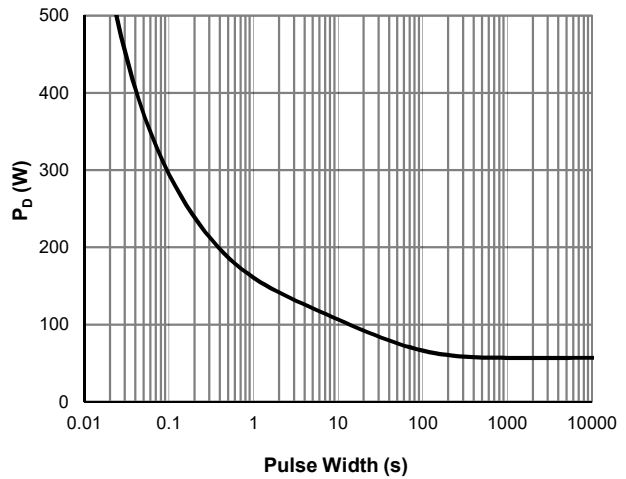
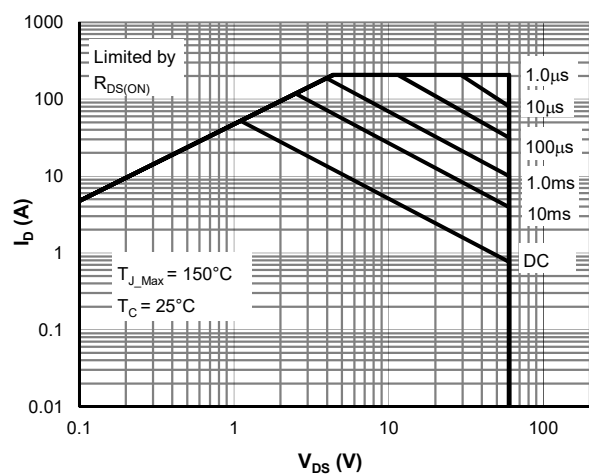


Figure 10: Single Pulse Power Rating, Junction-to-Case

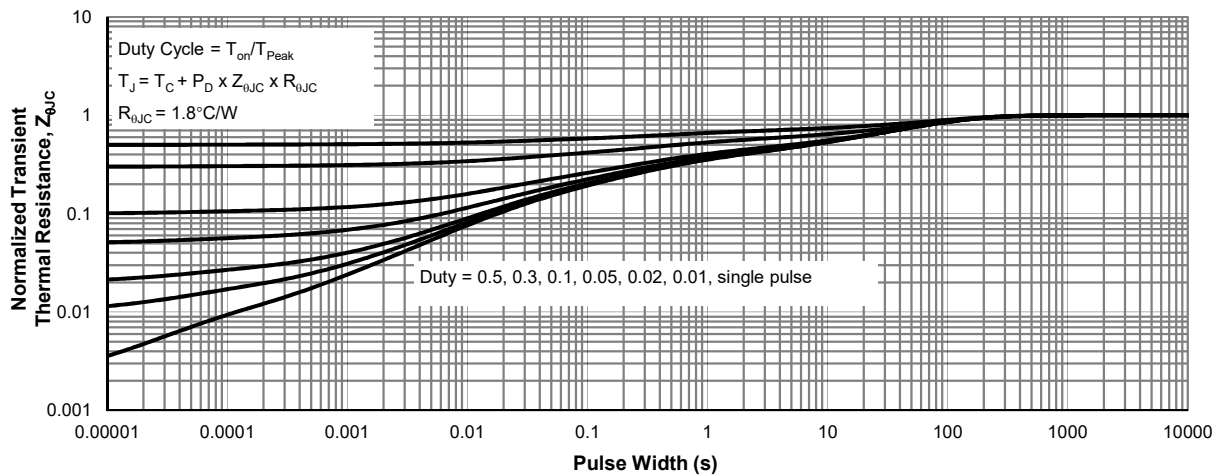
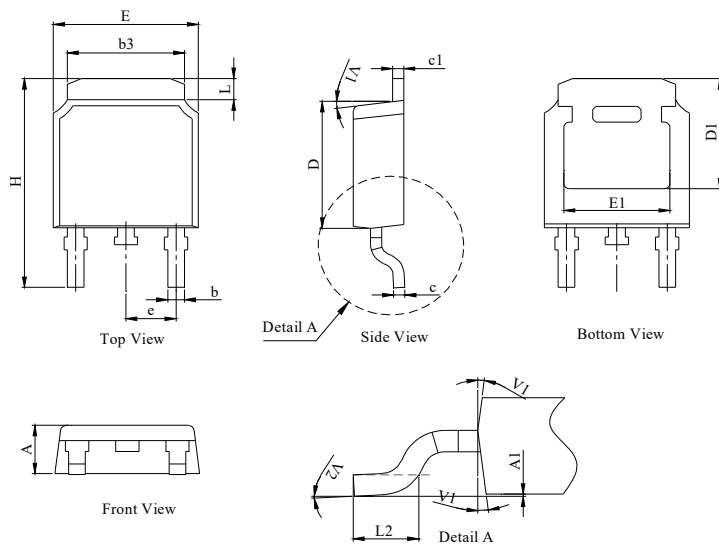
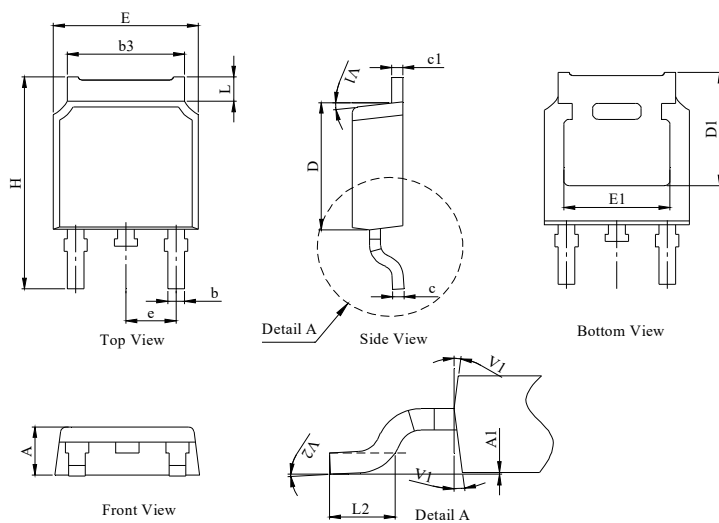


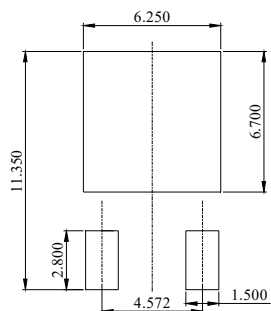
Figure 11: Normalized Maximum Transient Thermal Impedance

TO-252-3L Package Information
Package Outline Type-A


| DIM. | MILLIMETER | | |
|------|------------|-------|-------|
| | MIN. | NOM. | MAX. |
| A | 2.18 | 2.30 | 2.39 |
| A1 | 0 | -- | 0.13 |
| b | 0.64 | 0.76 | 0.89 |
| c | 0.40 | 0.50 | 0.61 |
| c1 | 0.46 | 0.50 | 0.58 |
| D | 5.97 | 6.10 | 6.23 |
| D1 | 5.05 | -- | -- |
| E | 6.35 | 6.60 | 6.73 |
| E1 | 4.32 | -- | -- |
| b3 | 5.21 | 5.38 | 5.55 |
| e | 2.29 BSC | | |
| H | 9.40 | 10.00 | 10.40 |
| L | 0.89 | -- | 1.27 |
| L2 | 1.40 | -- | 1.78 |
| V1 | 7° REF | | |
| V2 | 0° | -- | 6° |

Package Outline Type-B


| DIM. | MILLIMETER | | |
|------|------------|-------|-------|
| | MIN. | NOM. | MAX. |
| A | 2.10 | 2.30 | 2.40 |
| A1 | 0 | -- | 0.13 |
| b | 0.66 | 0.76 | 0.86 |
| b3 | 5.21 | 5.38 | 5.55 |
| c | 0.40 | 0.50 | 0.60 |
| c1 | 0.44 | 0.50 | 0.58 |
| D | 5.90 | 6.10 | 6.30 |
| D1 | 5.30REF | | |
| E | 6.40 | 6.60 | 6.80 |
| E1 | 4.63 | - | - |
| e | 2.29 BSC | | |
| H | 9.50 | 10.00 | 10.70 |
| L | 1.09 | -- | 1.21 |
| L2 | 1.35 | -- | 1.65 |
| V1 | 7° REF | | |
| V2 | 0° | -- | 6° |

Recommended Soldering Footprint


DIMENSIONS: MILLIMETERS