



## Description

The RD3L140SPTL1 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

$V_{DS} = -60V, I_D = -20A$

$R_{DS(ON)} < 72m\Omega @ V_{GS} = -10V$

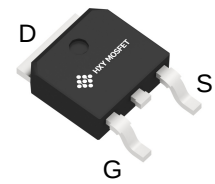
$R_{DS(ON)} < 100m\Omega @ V_{GS} = -4.5V$

## Application

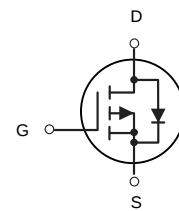
PWM applications

Load switch

Power management



TO-252-2L  
(TO-252)



P-Channel MOSFET

## Package Marking and Ordering Information

| Product ID   | Pack              | Brand      | Qty(PCS) |
|--------------|-------------------|------------|----------|
| RD3L140SPTL1 | TO-252-2L(TO-252) | HXY MOSFET | 2500     |

## Absolute Maximum Ratings( $T_A = 25^\circ C$ unless otherwise noted)

| Symbol            | Parameter                                         | Limit      | Unit         |
|-------------------|---------------------------------------------------|------------|--------------|
| $V_{DS}$          | Drain-Source Voltage                              | -60        | V            |
| $V_{GS}$          | Gate-Source Voltage                               | $\pm 20$   | V            |
| $I_D(25^\circ C)$ | Drain Current-Continuous@ Current-Pulsed (Note 1) | -20        | A            |
| $I_D(70^\circ C)$ |                                                   | -15        | A            |
| $I_{DM}$          |                                                   | -48        | A            |
| $P_D$             | Maximum Power Dissipation                         | 40         | W            |
| $T_J, T_{STG}$    | Operating Junction and Storage Temperature Range  | -55 To 175 | $^\circ C$   |
| $R_{\theta JA}$   | Thermal Resistance, Junction-to-Ambient (Note 2)  | 20         | $^\circ C/W$ |



**ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)**

| Parameter                          | Symbol              | Condition                                                                                | Min | Typ   | Max  | Unit |
|------------------------------------|---------------------|------------------------------------------------------------------------------------------|-----|-------|------|------|
| Drain-Source Breakdown Voltage     | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V I <sub>D</sub> =-250μA                                               | -60 |       |      | V    |
| Zero Gate Voltage Drain Current    | I <sub>DSS</sub>    | V <sub>DS</sub> =-48V, V <sub>GS</sub> =0V                                               |     |       | -1   | μA   |
| Gate-Body Leakage Current          | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                               |     |       | ±100 | nA   |
| Gate Threshold Voltage             | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                | -1  | -1.8  | -2.5 | V    |
| Drain-Source On-State Resistance   | R <sub>DS(on)</sub> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-10A                                              |     | 64    | 72   | mΩ   |
|                                    |                     | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-10A                                             |     | 90    | 100  | mΩ   |
| Forward Transconductance           | g <sub>FS</sub>     | V <sub>DS</sub> =-5V, I <sub>D</sub> =-20A                                               | 5   |       |      | S    |
| Input Capacitance                  | C <sub>iss</sub>    | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V,<br>F=1.0MHz                                  |     | 2460  |      | PF   |
| Output Capacitance                 | C <sub>oss</sub>    |                                                                                          |     | 220   |      | PF   |
| Reverse Transfer Capacitance       | C <sub>rss</sub>    |                                                                                          |     | 155   |      | PF   |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>DS</sub> =-30V, V <sub>GS</sub> =-10V, R <sub>GEN</sub> =3Ω<br>I <sub>D</sub> =1A |     | 14    |      | nS   |
| Turn-on Rise Time                  | t <sub>r</sub>      |                                                                                          |     | 20    |      | nS   |
| Turn-Off Delay Time                | t <sub>d(off)</sub> |                                                                                          |     | 40    |      | nS   |
| Turn-Off Fall Time                 | t <sub>f</sub>      |                                                                                          |     | 19    |      | nS   |
| Total Gate Charge                  | Q <sub>g</sub>      | V <sub>DS</sub> =-30V, I <sub>D</sub> =-20A, V <sub>GS</sub> =-10V                       |     | 48    |      | nC   |
| Gate-Source Charge                 | Q <sub>gs</sub>     |                                                                                          |     | 11    |      | nC   |
| Gate-Drain Charge                  | Q <sub>gd</sub>     |                                                                                          |     | 10    |      | nC   |
| Body Diode Reverse Recovery Time   | T <sub>rr</sub>     | I <sub>F</sub> =-20A, dI/dt=100A/μs                                                      |     | 40    |      | nS   |
| Body Diode Reverse Recovery Charge | Q <sub>rr</sub>     |                                                                                          |     | 56    |      | nC   |
| Diode Forward Voltage (Note 3)     | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =-1A                                                 |     | -0.72 | -1   | V    |

**NOTES:**

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



## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

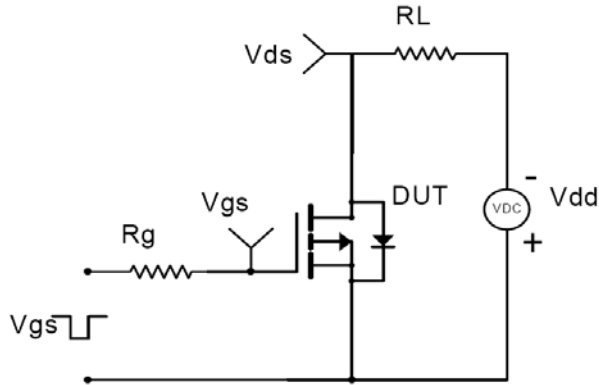


Figure 1: Switching Test Circuit

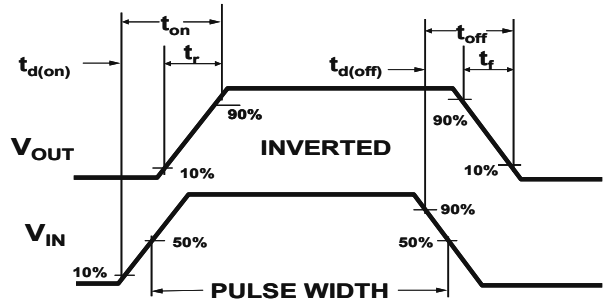


Figure 2: Switching Waveforms

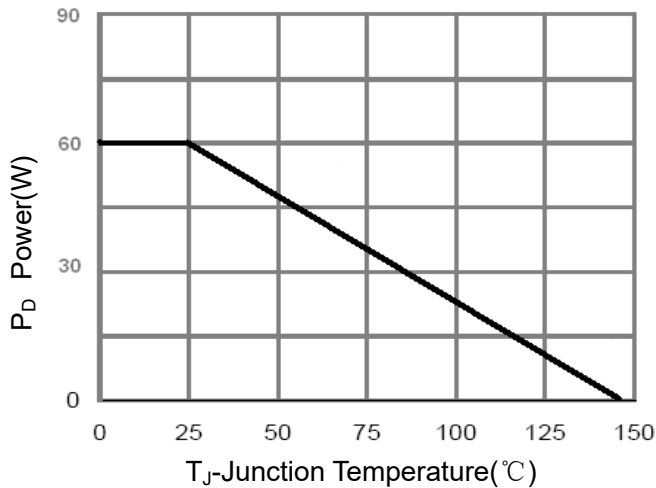


Figure 3 Power Dissipation

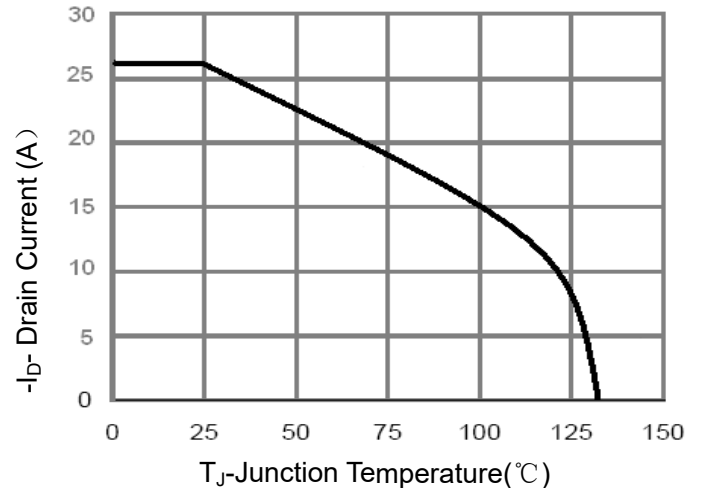


Figure 4 Drain Current

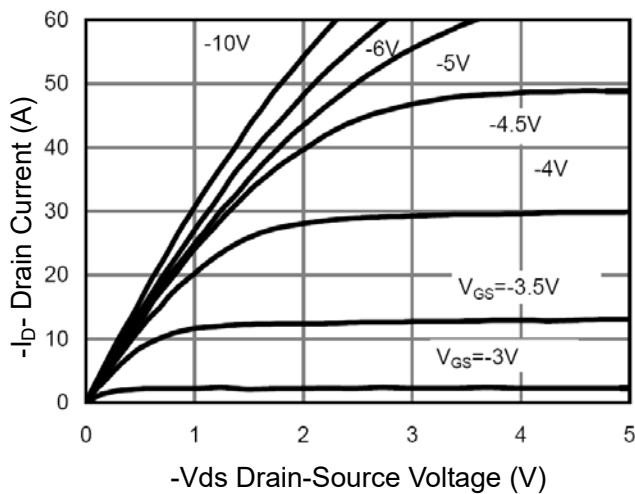


Figure 5 Output CHARACTERISTICS

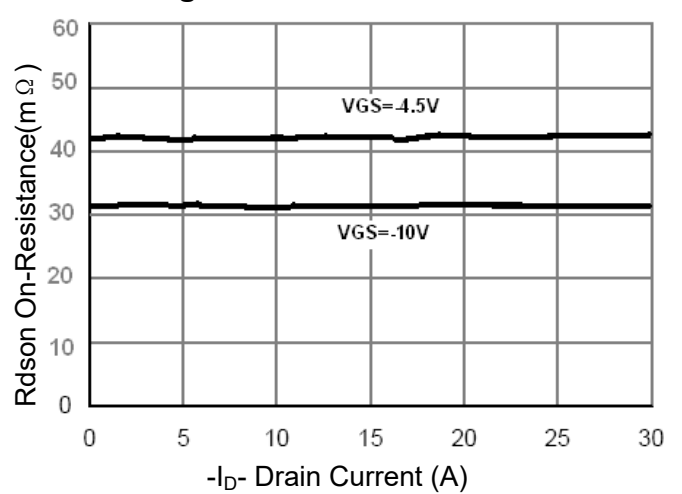
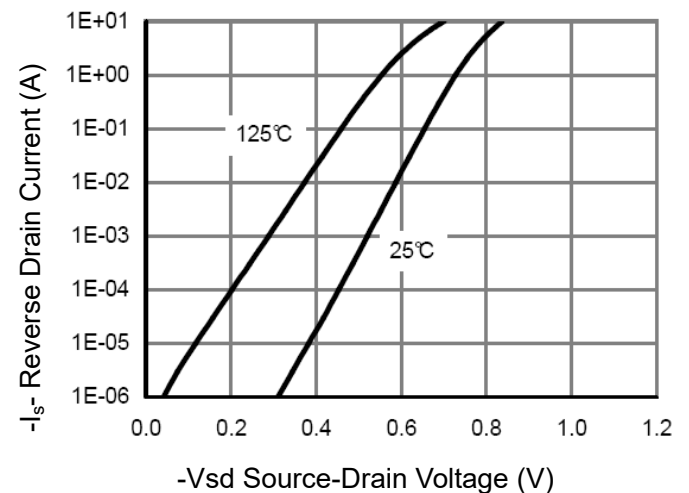
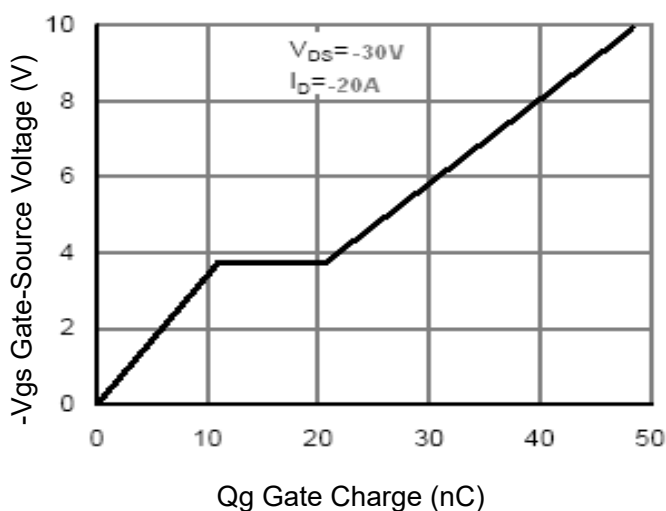
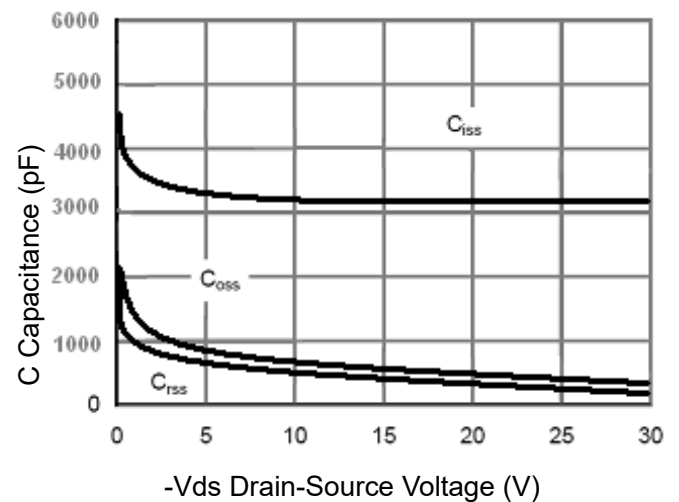
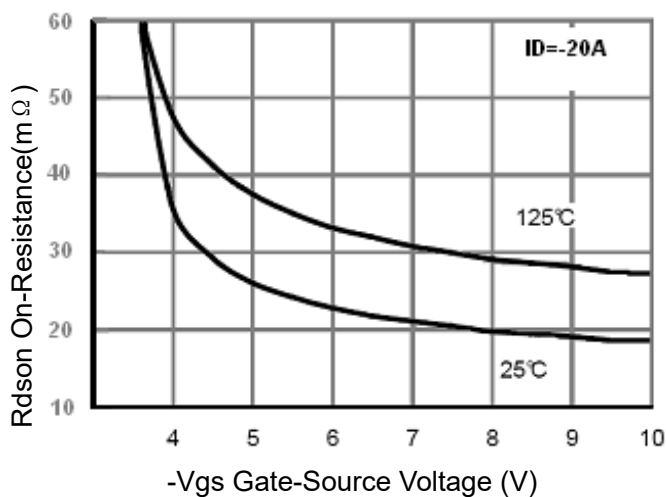
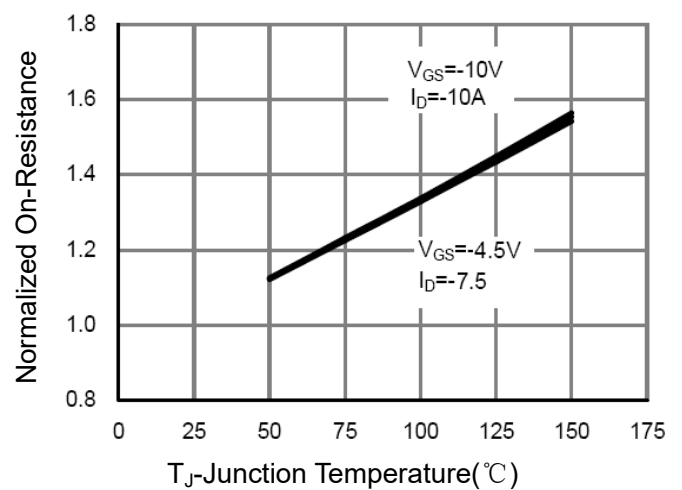
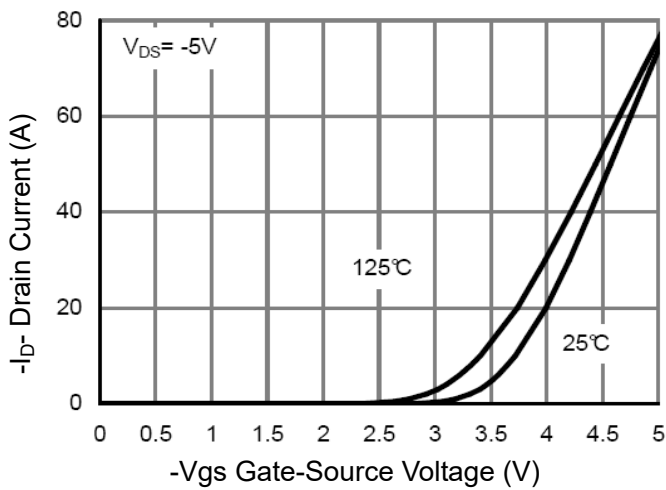


Figure 6 Drain-Source On-Resistance



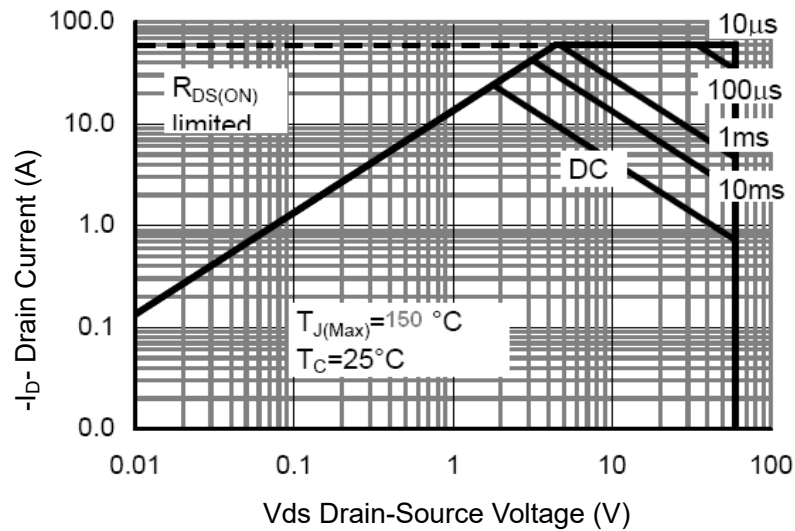


Figure 13 Safe Operation Area

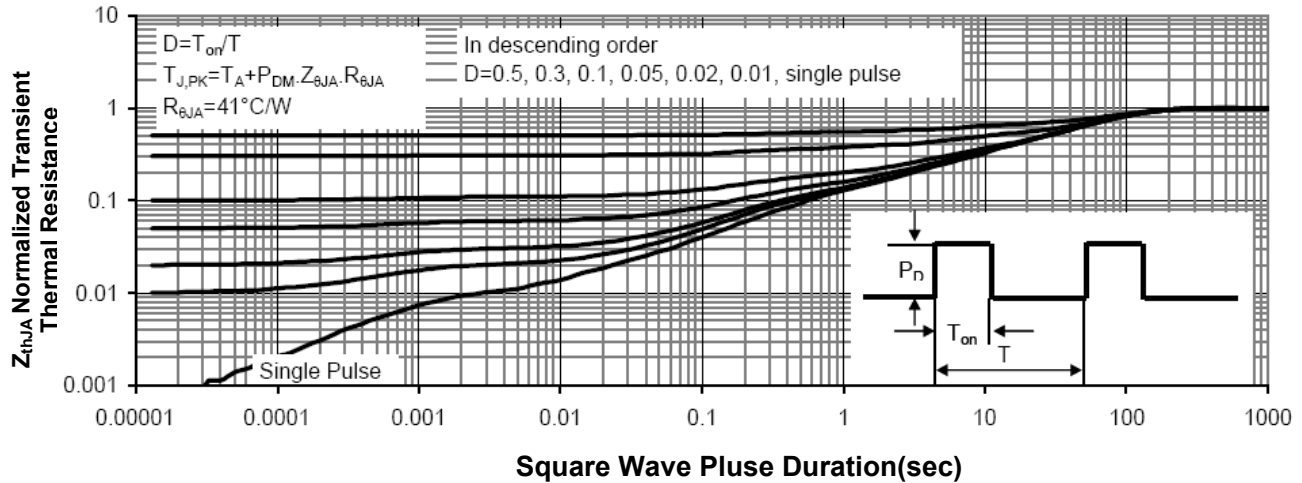
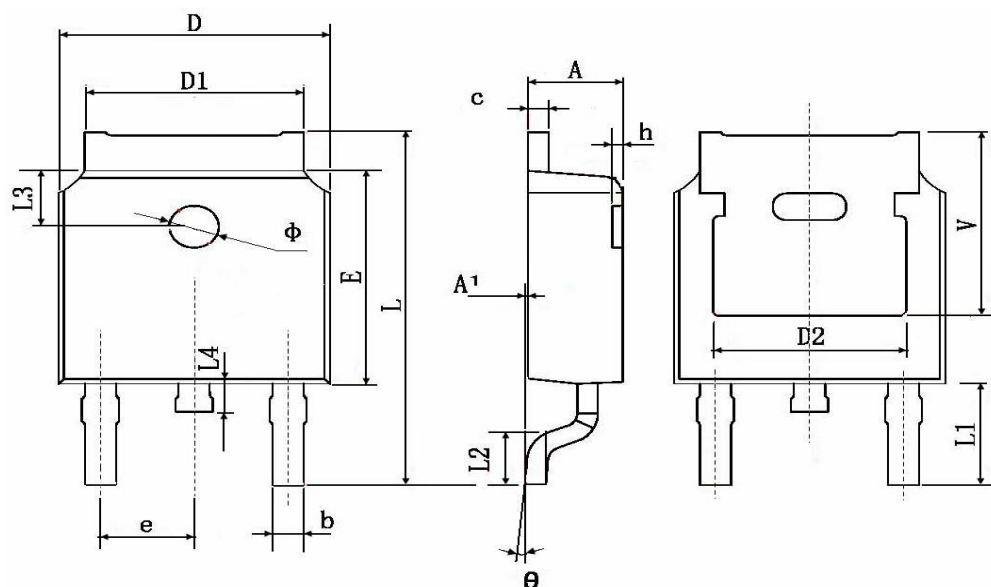


Figure 14 Normalized Maximum Transient Thermal Impedance



## TO252-2L(TO-252) Package Information



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 2.200                     | 2.400  | 0.087                | 0.094 |
| A1     | 0.000                     | 0.127  | 0.000                | 0.005 |
| b      | 0.660                     | 0.860  | 0.026                | 0.034 |
| c      | 0.460                     | 0.580  | 0.018                | 0.023 |
| D      | 6.500                     | 6.700  | 0.256                | 0.264 |
| D1     | 5.100                     | 5.460  | 0.201                | 0.215 |
| D2     | 4.830 TYP.                |        | 0.190 TYP.           |       |
| E      | 6.000                     | 6.200  | 0.236                | 0.244 |
| e      | 2.186                     | 2.386  | 0.086                | 0.094 |
| L      | 9.800                     | 10.400 | 0.386                | 0.409 |
| L1     | 2.900 TYP.                |        | 0.114 TYP.           |       |
| L2     | 1.400                     | 1.700  | 0.055                | 0.067 |
| L3     | 1.600 TYP.                |        | 0.063 TYP.           |       |
| L4     | 0.600                     | 1.000  | 0.024                | 0.039 |
| Φ      | 1.100                     | 1.300  | 0.043                | 0.051 |
| θ      | 0°                        | 8°     | 0°                   | 8°    |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| V      | 5.350 TYP.                |        | 0.211 TYP.           |       |



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