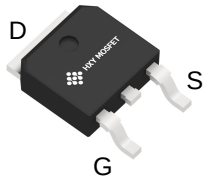
# IPD90N03S4L-03

N-Channel Enhancement Mode MOSFET

## Description

The IPD90N03S4L-03 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.

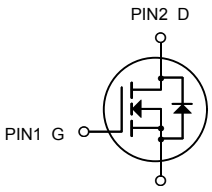



**TO-252-2L**

## General Features

$V_{DS}$ = 30V $I_D$ =160A

$R_{DS(ON)}$ < 2.3 mΩ@ $V_{GS}$=10V




N-Channel MOSFET

## Application

Battery protection

Load switch

Uninterruptible power supply

## Package Marking and Ordering Information

| Product ID | Pack | Brand | Qty(PCS) |
|---|---|---|---|
| IPD90N03S4L-03 | TO-252-2L | HXY MOSFET | 2500 |

## Absolute Maximum Ratings ($T_C$=25 ℃unless otherwise noted)

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 30 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 160 | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 80 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | 450 | A |
| EAS | Single Pulse Avalanche Energy[3] | 580 | mJ |
| $I_{AS}$ | Avalanche Current | 60 | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[4] | 87 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |
| RθJA | Thermal Resistance Junction-Ambient 1 | 62 | ℃/W |
| RθJC | Thermal Resistance Junction-Case1 | 2.1 | ℃/W |

**Electrical characteristic** ( $T_J$ = 25°C unless otherwise specified )

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain to source breakdown voltage | $V_{GS}$=0V, $I_D$=250uA | 30 | | | V |
| $\Delta BV_{DSS}$ / $\Delta T_J$ | Breakdown voltage temperature coefficient | $I_D$=250uA, referenced to 25°C | | 0.02 | | V/°C |
| $I_{DSS}$ | Drain to source leakage current | $V_{DS}$=30V, $V_{GS}$=0V | | | 1 | uA |
| | | $V_{DS}$=24V, $T_J$=125°C | | | 50 | uA |
| $I_{GSS}$ | Gate to source leakage current, forward | $V_{GS}$=20V, $V_{DS}$=0V | | | 100 | nA |
| | Gate to source leakage current, reverse | $V_{GS}$=-20V, $V_{DS}$=0V | | | -100 | nA |
| $V_{GS(TH)}$ | Gate threshold voltage | $V_{DS}$=$V_{GS}$, $I_D$=250uA | 1.2 | | 2.4 | V |
| $R_{DS(ON)}$ | Drain to source on state resistance | $V_{GS}$=4.5V, $I_D$=30A,$T_J$=25°C | | 2.2 | 4.8 | mΩ |
| | | $V_{GS}$=10V, $I_D$=30A,$T_J$=25°C | | 1.6 | 2.3 | mΩ |
| | | $V_{GS}$=10V, $I_D$=30A,$T_J$=125°C | | 2.5 | | mΩ |
| $G_{fs}$ | Forward transconductance | $V_{DS}$=5V, $I_D$=30A | | 73 | | S |
| $C_{iss}$ | Input capacitance | $V_{GS}$=0V, $V_{DS}$=15V, f=1MHz | | 6272 | | pF |
| $C_{oss}$ | Output capacitance | | | 1022 | | |
| $C_{rss}$ | Reverse transfer capacitance | | | 718 | | |
| $t_{d(on)}$ | Turn on delay time | $V_{DS}$=15V, $I_D$=30A, $R_G$=4.7Ω, $V_{GS}$=10V (note 4,5) | | 20 | | ns |
| $t_r$ | Rising time | | | 58 | | |
| $t_{d(off)}$ | Turn off delay time | | | 158 | | |
| $t_f$ | Fall time | | | 77 | | |
| $Q_g$ | Total gate charge | $V_{DS}$=24V, $V_{GS}$=10V, $I_D$=30A , $I_G$=5mA (note 4,5) | | 143 | | nC |
| $Q_{gs}$ | Gate-source charge | | | 17 | | |
| $Q_{gd}$ | Gate-drain charge | | | 43 | | |
| $R_g$ | Gate resistance | $V_{DS}$=0V, Scan F mode | | 4.2 | | Ω |
| $I_S$ | Continuous source current | Integral reverse p-n Junction diode in the MOSFET | | | 110 | A |
| $I_{SM}$ | Pulsed source current | | | | 440 | A |
| $V_{SD}$ | Diode forward voltage drop. | $I_S$=45A, $V_{GS}$=0V | | | 1.4 | V |
| $t_{rr}$ | Reverse recovery time | $I_S$=30A, $V_{GS}$=0V, $dI_F/dt$=100A/us | | 26 | | ns |
| $Q_{rr}$ | Reverse recovery charge | | | 10 | | nC |

※. Notes
1. Repeatitive rating : pulse width limited by junction temperature.
2. L =0.5mH, $I_{AS}$ =48A, $V_{DD}$=30V, $R_G$=25Ω, Starting $T_J$ = 25°C
3. $I_{SD}$ ≤30A, di/dt = 100A/us, $V_{DD}$ ≤ $BV_{DSS}$, Staring $T_J$ =25°C
4. Pulse Test : Pulse Width ≤ 300us, duty cycle ≤ 2%.

## Typical Characteristics

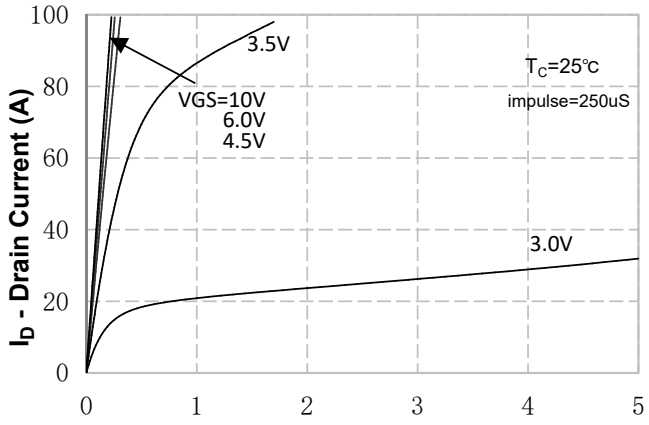



Figure 1. On-Region Characteristics

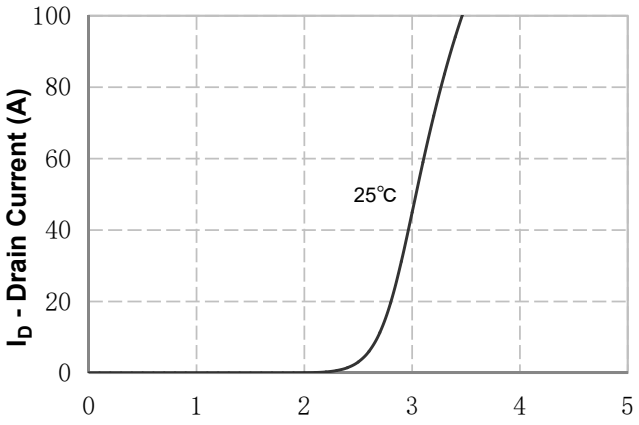



Figure 2. Transfer Characteristics

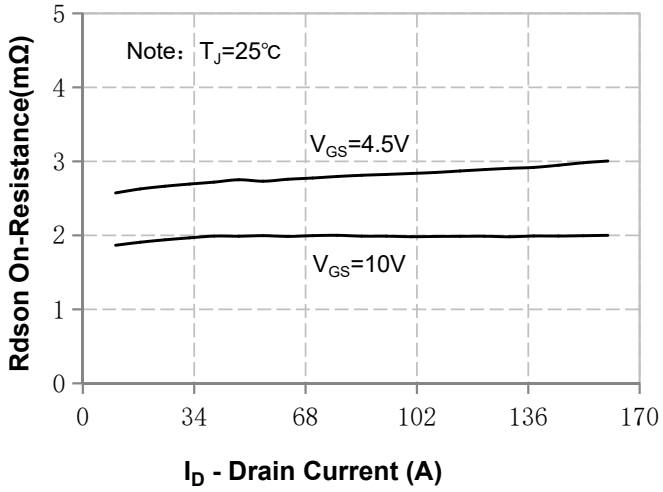



Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

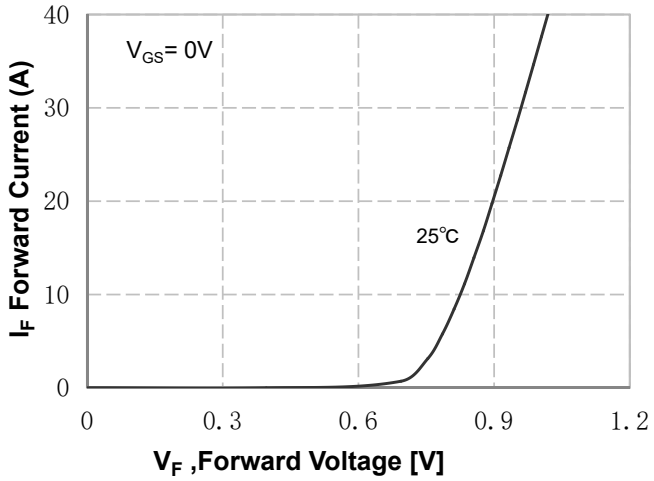



Figure 4. Body Diode Forward Voltage Variation vs Source Current

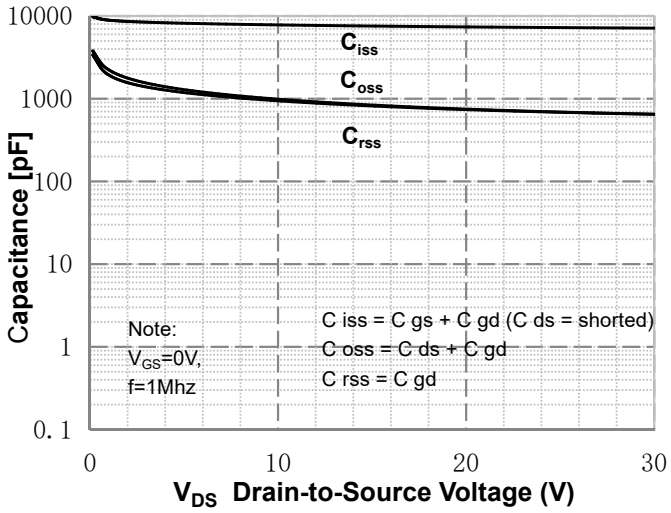



Figure 5. Capacitance Characteristics

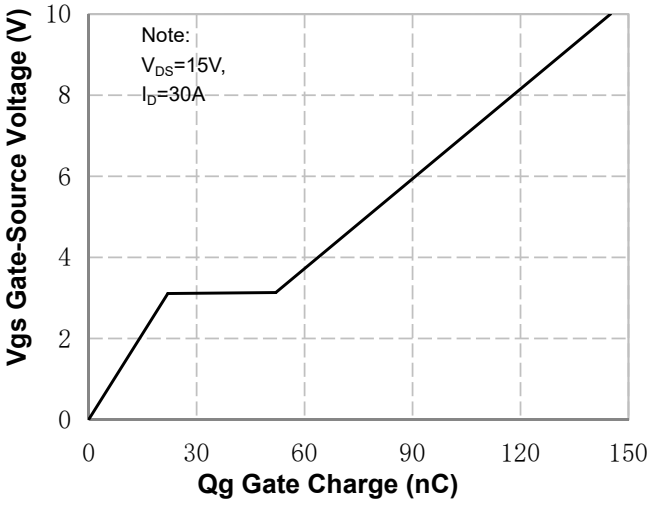



Figure 6. Gate Charge Characteristics

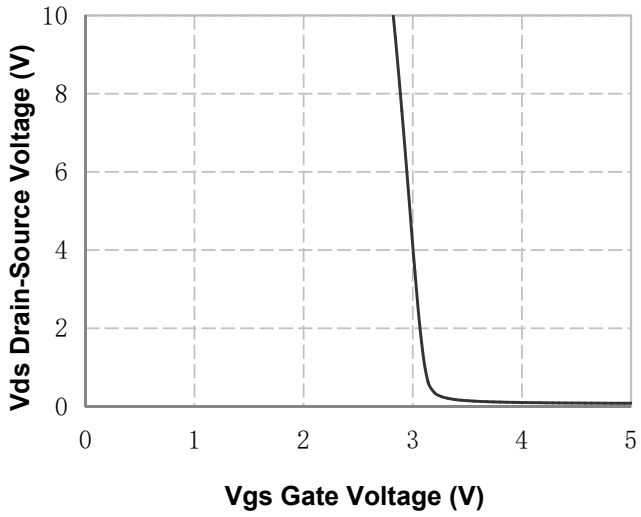



Figure 7. Vds Drain-Source Voltage vs Gate Voltage

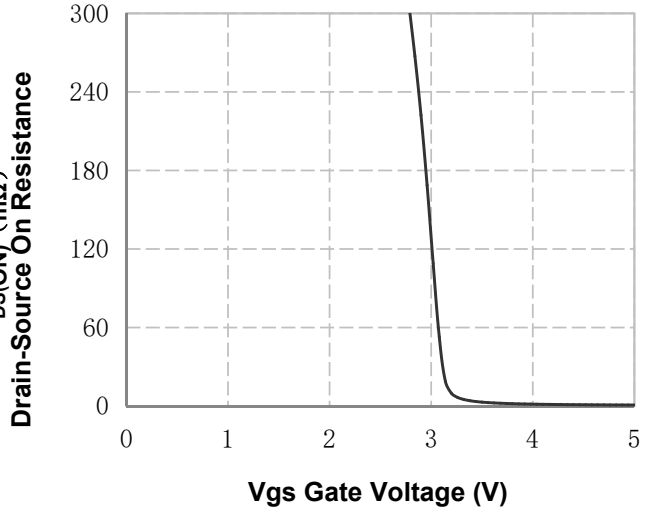



Figure 8. On-Resistance vs Gate Voltage

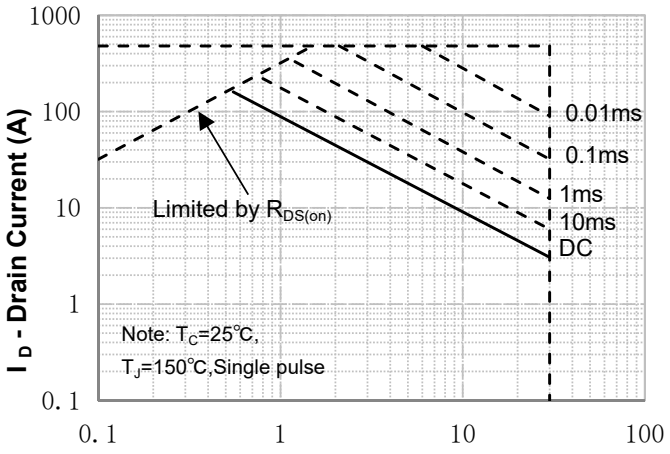



Figure 9. Maximum Safe Operating Area

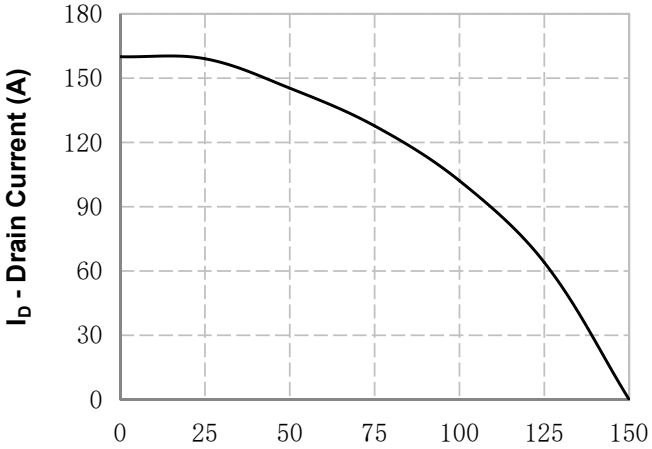



Figure 10. Maximum Continuous Drain Current vs Temperature

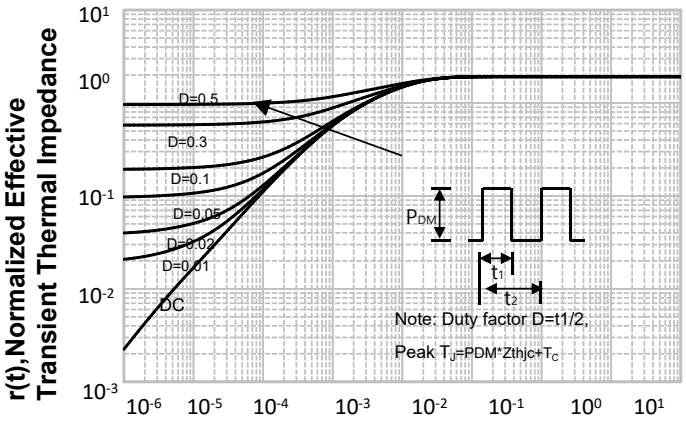
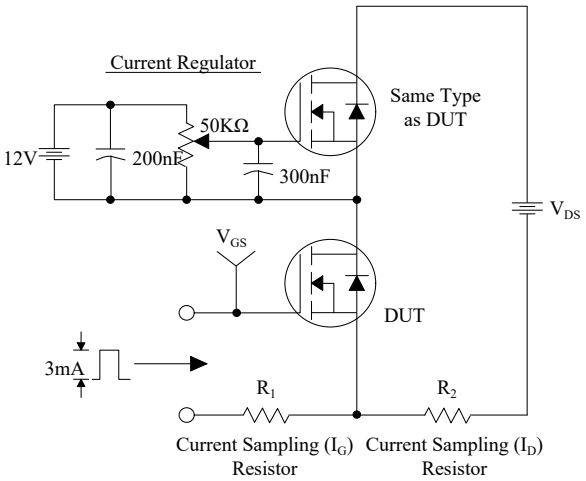
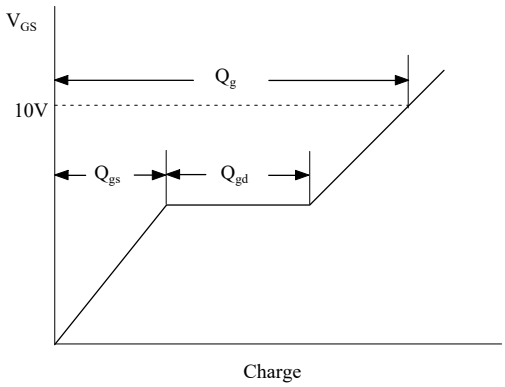



Figure 11. Transient Thermal Response Curve

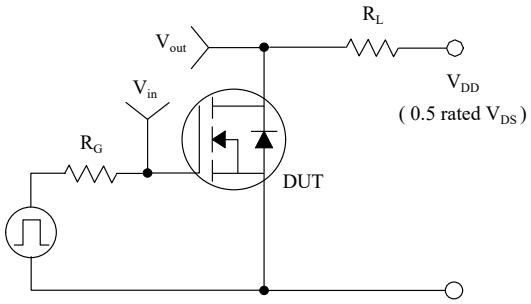
## TestCircuit

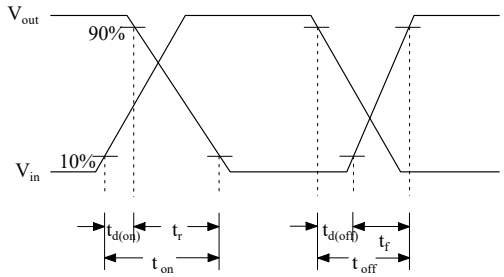
### Gate Charge Test Circuit & Waveform



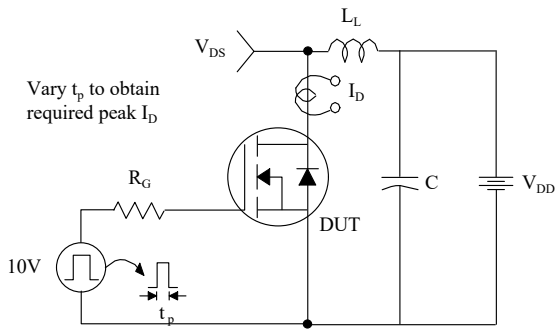




### Resistive Switching Test Circuit & Waveforms

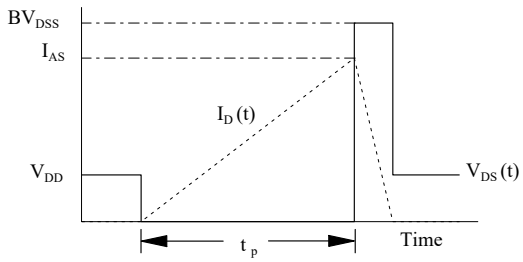


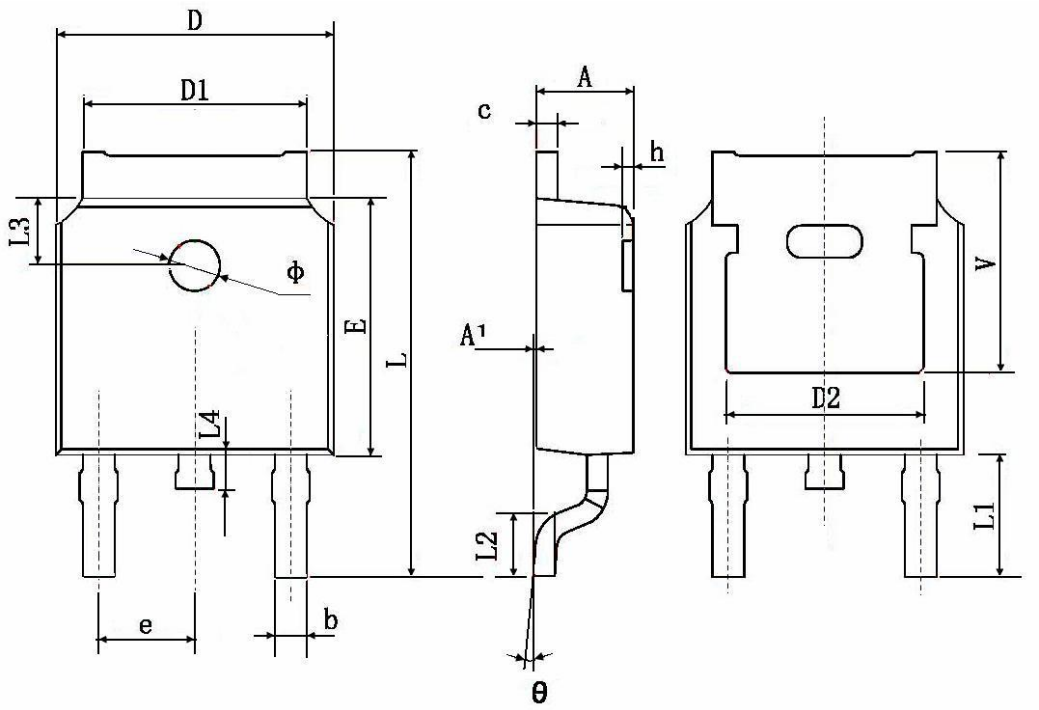

### Unclamped Inductive Switching Test Circuit & Waveforms




$$E_{AS} = \frac{1}{2} L_L I_{AS}^2$$



## TO-252-2L 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 | 0.483 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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