

### Description

The HSU3002 is the high cell density trench N-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

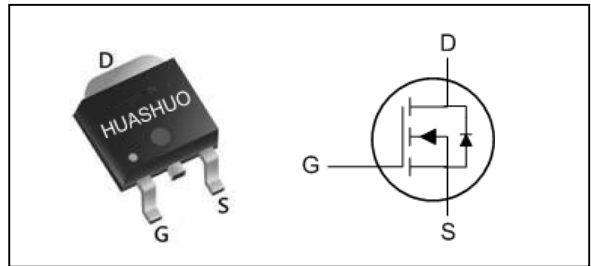
The HSU3002 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

- 100% EAS Guaranteed
- Green Device Available
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Advanced high cell density Trench technology

### Product Summary

|                  |    |            |
|------------------|----|------------|
| $V_{DS}$         | 30 | V          |
| $R_{DS(ON),max}$ | 18 | m $\Omega$ |
| $I_D$            | 30 | A          |

### TO252 Pin Configuration



### Absolute Maximum Ratings

| Symbol                      | Parameter                                  | Rating     | Units            |
|-----------------------------|--------------------------------------------|------------|------------------|
| $V_{DS}$                    | Drain-Source Voltage                       | 30         | V                |
| $V_{GS}$                    | Gate-Source Voltage                        | $\pm 20$   | V                |
| $I_D@T_C=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^1$ | 30         | A                |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^1$ | 18         | A                |
| $I_D@T_A=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^1$ | 8.2        | A                |
| $I_D@T_A=70^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^1$ | 6.5        | A                |
| $I_{DM}$                    | Pulsed Drain Current <sup>2</sup>          | 60         | A                |
| EAS                         | Single Pulse Avalanche Energy <sup>3</sup> | 22.1       | mJ               |
| $I_{AS}$                    | Avalanche Current                          | 21         | A                |
| $P_D@T_C=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>       | 25         | W                |
| $P_D@T_A=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>       | 2          | W                |
| $T_{STG}$                   | Storage Temperature Range                  | -55 to 150 | $^\circ\text{C}$ |
| $T_J$                       | Operating Junction Temperature Range       | -55 to 150 | $^\circ\text{C}$ |

### Thermal Data

| Symbol          | Parameter                                                       | Typ. | Max. | Unit               |
|-----------------|-----------------------------------------------------------------|------|------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient (Steady State) <sup>1</sup> | ---  | 62   | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>                   | ---  | 5    | $^\circ\text{C/W}$ |



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

| Symbol                       | Parameter                                      | Conditions                                                   | Min. | Typ.  | Max.      | Unit                |
|------------------------------|------------------------------------------------|--------------------------------------------------------------|------|-------|-----------|---------------------|
| $BV_{DSS}$                   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=250\mu A$                                 | 30   | ---   | ---       | V                   |
| $\Delta BV_{DSS}/\Delta T_J$ | $BV_{DSS}$ Temperature Coefficient             | Reference to $25^\circ\text{C}$ , $I_D=1mA$                  | ---  | 0.023 | ---       | $V/^\circ\text{C}$  |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V$ , $I_D=15A$                                     | ---  | 15    | 18        | $m\Omega$           |
|                              |                                                | $V_{GS}=4.5V$ , $I_D=10A$                                    | ---  | 22    | 30        |                     |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                             | 1.2  | 1.5   | 2.5       | V                   |
| $\Delta V_{GS(th)}$          | $V_{GS(th)}$ Temperature Coefficient           |                                                              | ---  | -5.2  | ---       | $mV/^\circ\text{C}$ |
| $I_{DSS}$                    | Drain-Source Leakage Current                   | $V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$          | ---  | ---   | 1         | $\mu A$             |
|                              |                                                | $V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=55^\circ\text{C}$          | ---  | ---   | 5         |                     |
| $I_{GSS}$                    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                               | ---  | ---   | $\pm 100$ | nA                  |
| $g_{fs}$                     | Forward Transconductance                       | $V_{DS}=5V$ , $I_D=15A$                                      | ---  | 21.6  | ---       | S                   |
| $R_g$                        | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$                         | ---  | 2.5   | 5         | $\Omega$            |
| $Q_g$                        | Total Gate Charge (4.5V)                       | $V_{DS}=15V$ , $V_{GS}=4.5V$ , $I_D=15A$                     | ---  | 6.2   | 8.7       | nC                  |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                              | ---  | 2.4   | 3.4       |                     |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                              | ---  | 2.5   | 3.5       |                     |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=15V$ , $V_{GS}=10V$ , $R_G=3.3\Omega$ ,<br>$I_D=15A$ | ---  | 3     | 6.0       | ns                  |
| $T_r$                        | Rise Time                                      |                                                              | ---  | 7.6   | 14        |                     |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                              | ---  | 21    | 42        |                     |
| $T_f$                        | Fall Time                                      |                                                              | ---  | 4     | 8         |                     |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=15V$ , $V_{GS}=0V$ , $f=1MHz$                        | ---  | 572   | 801       | pF                  |
| $C_{oss}$                    | Output Capacitance                             |                                                              | ---  | 81    | 113       |                     |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                              | ---  | 65    | 91        |                     |

**Diode Characteristics**

| Symbol   | Parameter                                | Conditions                                                 | Min. | Typ. | Max. | Unit |
|----------|------------------------------------------|------------------------------------------------------------|------|------|------|------|
| $I_S$    | Continuous Source Current <sup>1,5</sup> | $V_G=V_D=0V$ , Force Current                               | ---  | ---  | 30   | A    |
| $I_{SM}$ | Pulsed Source Current <sup>2,5</sup>     |                                                            | ---  | ---  | 60   | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup>       | $V_{GS}=0V$ , $I_S=1A$ , $T_J=25^\circ\text{C}$            | ---  | ---  | 1.2  | V    |
| $t_{rr}$ | Reverse Recovery Time                    | $I_F=15A$ , $dI/dt=100A/\mu s$ ,<br>$T_J=25^\circ\text{C}$ | ---  | 17   | ---  | nS   |
| $Q_{rr}$ | Reverse Recovery Charge                  |                                                            | ---  | 3    | ---  | nC   |

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- 2.The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is  $V_{DD}=25V$ ,  $V_{GS}=10V$ ,  $L=0.1mH$ ,  $I_{AS}=21A$
- 4.The power dissipation is limited by  $150^\circ\text{C}$  junction temperature
- 5.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.



### Typical Characteristics

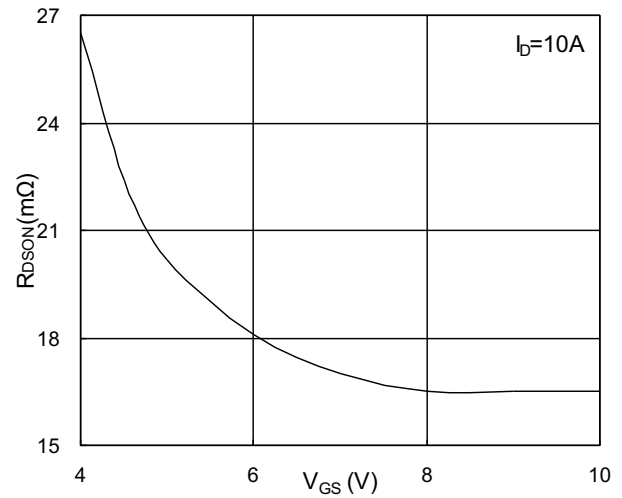
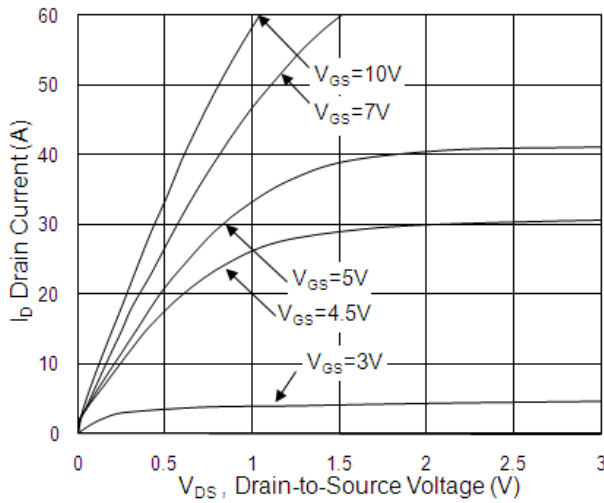


Fig.1 Typical Output Characteristics

Fig.2 On-Resistance v.s Gate-Source

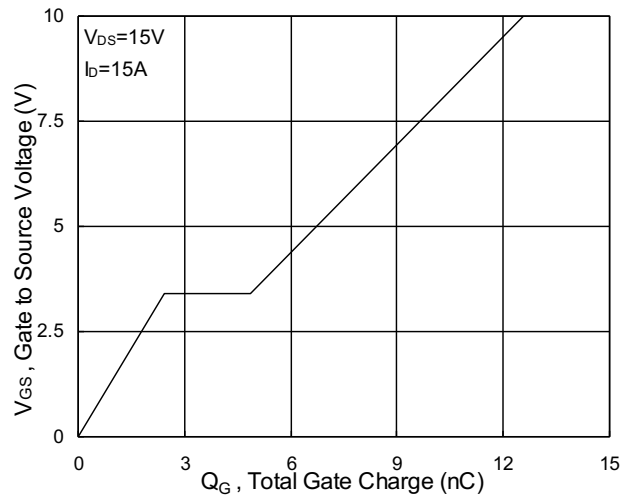
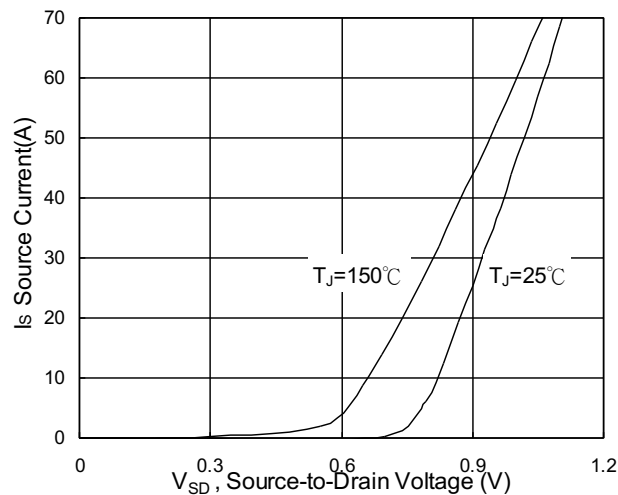


Fig.3 Forward Characteristics Of Reverse

Fig.4 Gate-Charge Characteristics

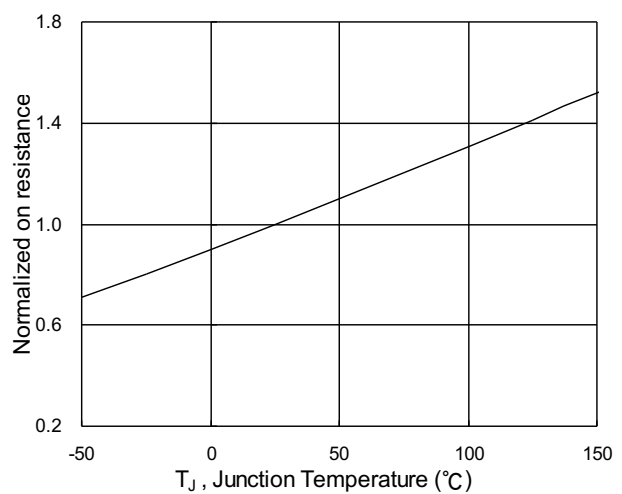
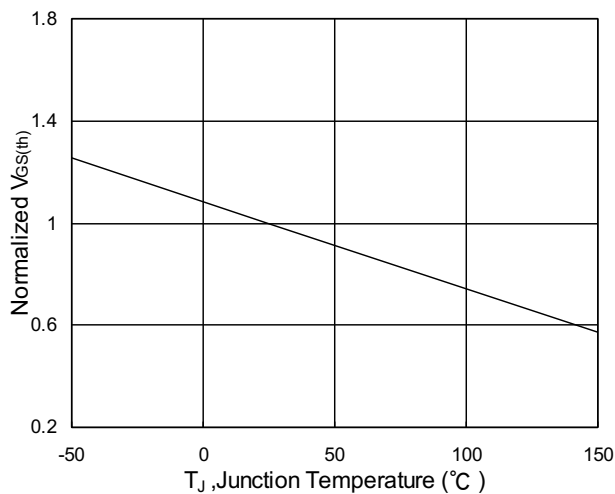


Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$

Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$

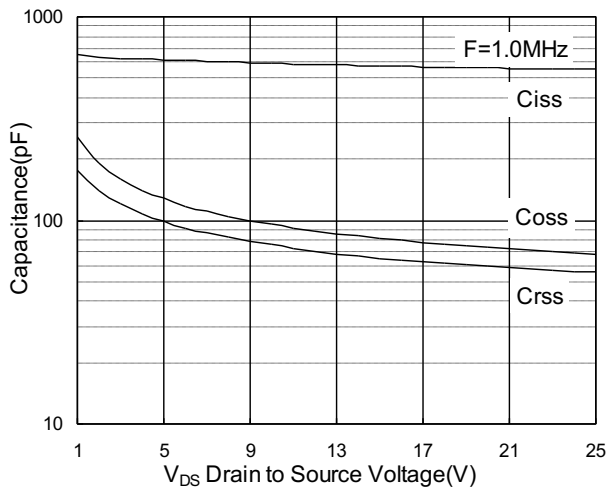


Fig.7 Capacitance

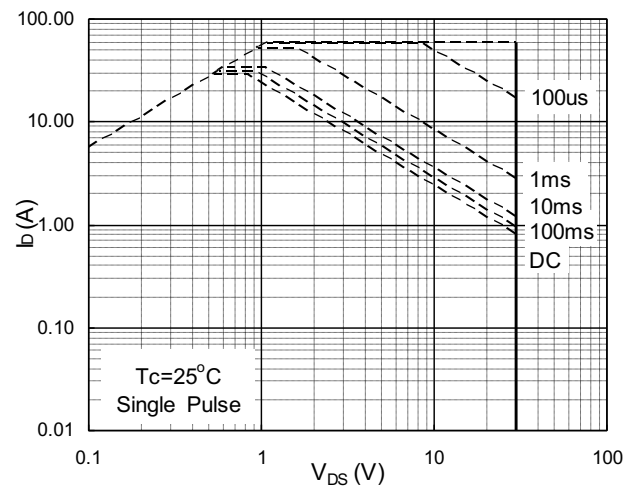


Fig.8 Safe Operating Area

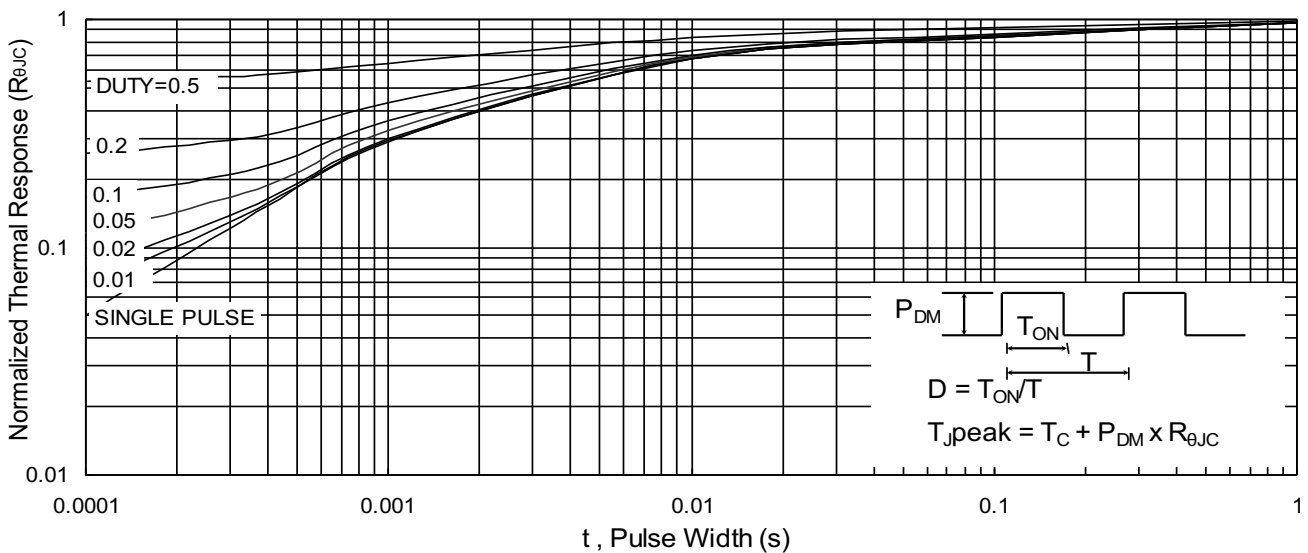


Fig.9 Normalized Maximum Transient Thermal Impedance

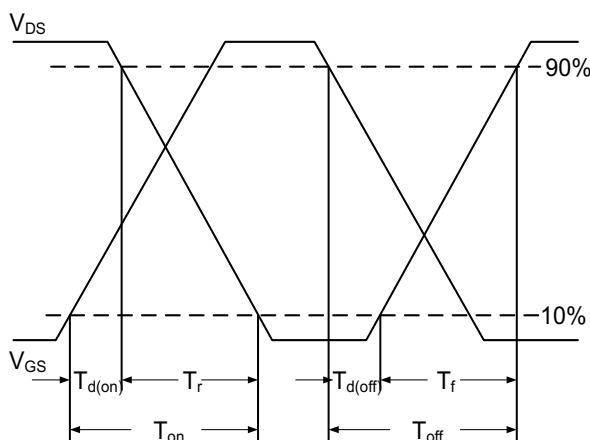


Fig.10 Switching Time Waveform

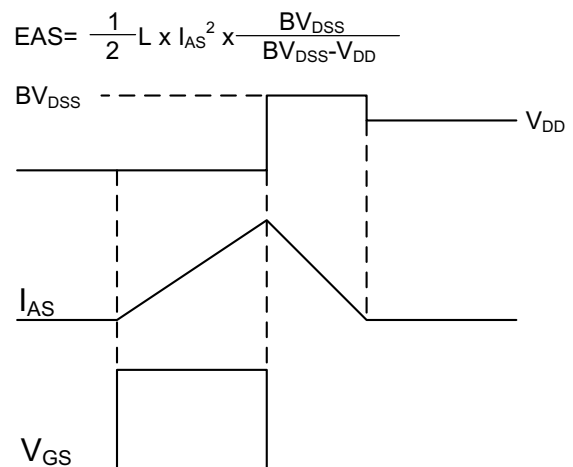
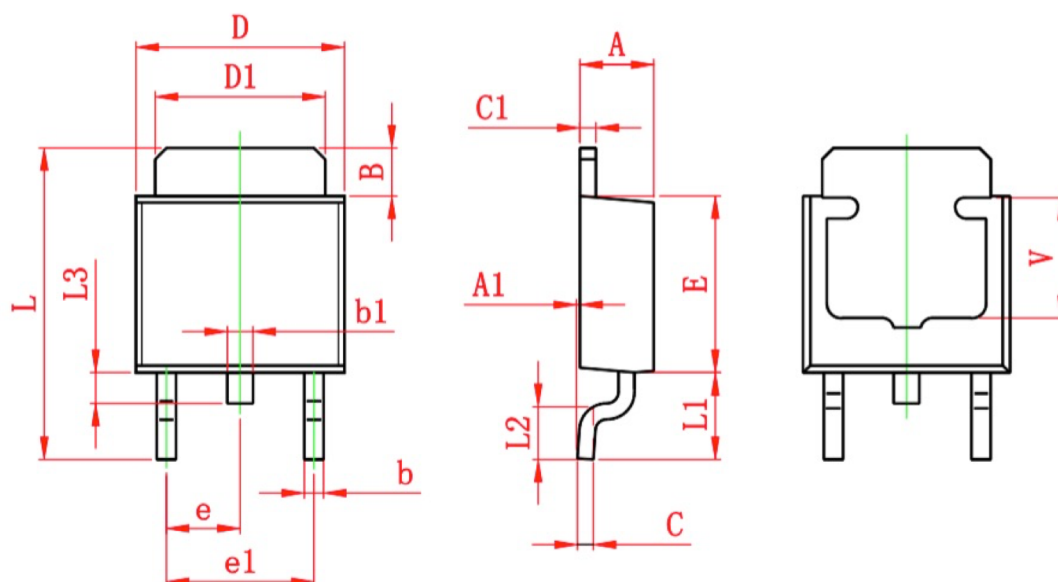


Fig.11 Unclamped Inductive Switching

## Ordering Information

| Part Number | Package code | Packaging      |
|-------------|--------------|----------------|
| HSU3002     | TO252-2      | 2500/Tape&Reel |



| 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      | 1.350                     | 1.650 | 0.053                | 0.065 |
| b      | 0.500                     | 0.700 | 0.020                | 0.028 |
| b1     | 0.700                     | 0.900 | 0.028                | 0.035 |
| c      | 0.430                     | 0.580 | 0.017                | 0.023 |
| c1     | 0.430                     | 0.580 | 0.017                | 0.023 |
| D      | 6.350                     | 6.650 | 0.250                | 0.262 |
| D1     | 5.200                     | 5.400 | 0.205                | 0.213 |
| E      | 5.400                     | 5.700 | 0.213                | 0.224 |
| e      | 2.300 TYP.                |       | 0.091 TYP.           |       |
| e1     | 4.500                     | 4.700 | 0.177                | 0.185 |
| L      | 9.500                     | 9.900 | 0.374                | 0.390 |
| L1     | 2.550                     | 2.900 | 0.100                | 0.114 |
| L2     | 1.400                     | 1.780 | 0.055                | 0.070 |
| L3     | 0.600                     | 0.900 | 0.024                | 0.035 |
| V      | 3.800 REF.                |       | 0.150 REF.           |       |