

## N-Channel Enhancement Mode Power MOSFET

### Description

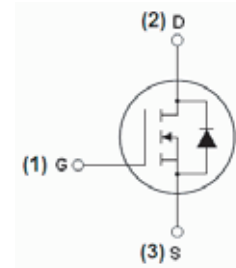
The RM115N65T2 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Feature

- $V_{DS} = 65V, I_D = 115A$   
 $R_{DS(ON)} < 4.7m\Omega @ V_{GS}=10V$   
 $R_{DS(ON)} < 8.0m\Omega @ V_{GS}=4.5V$
- Special process technology for high ESD capability
- High density cell design for ultra low  $R_{dson}$
- Fully characterized Avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation

### Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply
- Halogen-free



Schematic diagram



TO-220-3L top view

**100% UIS TESTED!**  
**100%  $\Delta V_{ds}$  TESTED!**

### Package Marking and Ordering Information

| Device Marking | Device     | Device Package | Reel Size | Tape width | Quantity |
|----------------|------------|----------------|-----------|------------|----------|
| 115N65         | RM115N65T2 | TO-220-3L      | -         | -          | -        |

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

| Parameter                                     | Symbol             | Limit   | Unit |
|---|--------------------|---------|------|
| Drain-Source Voltage                          | $V_{DS}$           | 65      | V    |
| Gate-Source Voltage                           | $V_{GS}$           | +20/-12 | V    |
| Drain Current-Continuous                      | $I_D$              | 115     | A    |
| Drain Current-Continuous( $T_C=100^\circ C$ ) | $I_D(100^\circ C)$ | 72      | A    |
| Pulsed Drain Current                          | $I_{DM}$           | 460     | A    |

|   |                |            |      |
|---|----------------|------------|------|
| Maximum Power Dissipation                         | $P_D$          | 160        | W    |
| Derating factor                                   |                | 1.28       | W/°C |
| Single pulse avalanche energy <sup>(Note 5)</sup> | $E_{AS}$       | 174        | mJ   |
| Operating Junction and Storage Temperature Range  | $T_J, T_{STG}$ | -55 To 150 | °C   |

## Thermal Characteristic

|  |                 |      |      |
|--|-----------------|------|------|
| Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup> | $R_{\theta Jc}$ | 0.78 | °C/W |
|--|-----------------|------|------|

## Electrical Characteristics ( $T_C=25^\circ\text{C}$ unless otherwise noted)

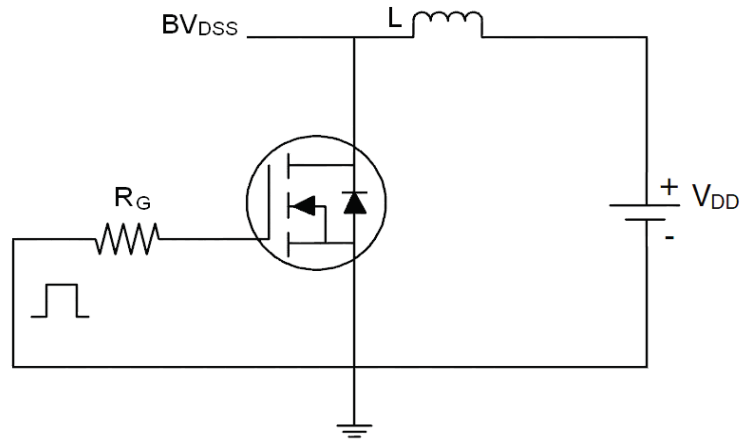
| Parameter  | Symbol       | Condition   | Min | Typ  | Max       | Unit       |
|--|--------------|---|-----|------|-----------|------------|
| <b>Off Characteristics</b>                           |              |   |     |      |           |            |
| Drain-Source Breakdown Voltage                       | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                             | 65  | -    | -         | V          |
| Zero Gate Voltage Drain Current                      | $I_{DSS}$    | $V_{DS}=60V, V_{GS}=0V$                               | -   | -    | 1         | $\mu A$    |
| Gate-Body Leakage Current                            | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$                           | -   | -    | $\pm 100$ | nA         |
| <b>On Characteristics</b> <sup>(Note 3)</sup>        |              |   |     |      |           |            |
| Gate Threshold Voltage                               | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                         | 1   | 1.5  | 2.5       | V          |
| Drain-Source On-State Resistance                     | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=15A$                                 | -   | 3.9  | 4.7       | m $\Omega$ |
|  |              | $V_{GS}=4.5V, I_D=8A$                                 | -   | 6.2  | 8.0       |            |
| Forward Transconductance                             | $g_{FS}$     | $V_{DS}=10V, I_D=3A$                                  | -   | 12   | -         | S          |
| <b>Dynamic Characteristics</b> <sup>(Note 4)</sup>   |              |   |     |      |           |            |
| Input Capacitance                                    | $C_{iss}$    | $V_{DS}=30V, V_{GS}=0V,$<br>$F=1.0\text{MHz}$         | -   | 2940 | 5900      | PF         |
| Output Capacitance                                   | $C_{oss}$    |   | -   | 850  | 1700      | PF         |
| Reverse Transfer Capacitance                         | $C_{rss}$    |   | -   | 15   | 30        | PF         |
| <b>Switching Characteristics</b> <sup>(Note 4)</sup> |              |   |     |      |           |            |
| Turn-on Delay Time                                   | $t_{d(on)}$  | $V_{DD}=30V, I_D=1A$<br>$V_{GS}=10V, R_{GEN}=6\Omega$ | -   | 10.6 | 21        | nS         |
| Turn-on Rise Time                                    | $t_r$        |   | -   | 16.5 | 33        | nS         |
| Turn-Off Delay Time                                  | $t_{d(off)}$ |   | -   | 48   | 96        | nS         |
| Turn-Off Fall Time                                   | $t_f$        |   | -   | 78   | 150       | nS         |
| Total Gate Charge                                    | $Q_g$        | $V_{DS}=48V, I_D=5A,$<br>$V_{GS}=10V$                 | -   | 54   | 108       | nC         |
| Gate-Source Charge                                   | $Q_{gs}$     |   | -   | 5.2  | 10.4      | nC         |
| Gate-Drain Charge                                    | $Q_{gd}$     |   | -   | 16.1 | 32.2      | nC         |
| <b>Drain-Source Diode Characteristics</b>            |              |   |     |      |           |            |
| Diode Forward Voltage <sup>(Note 3)</sup>            | $V_{SD}$     | $V_{GS}=0V, I_S=20A$                                  | -   | -    | 1.0       | V          |
| Diode Forward Current <sup>(Note 2)</sup>            | $I_S$        | -   | -   | -    | 115       | A          |

## Notes:

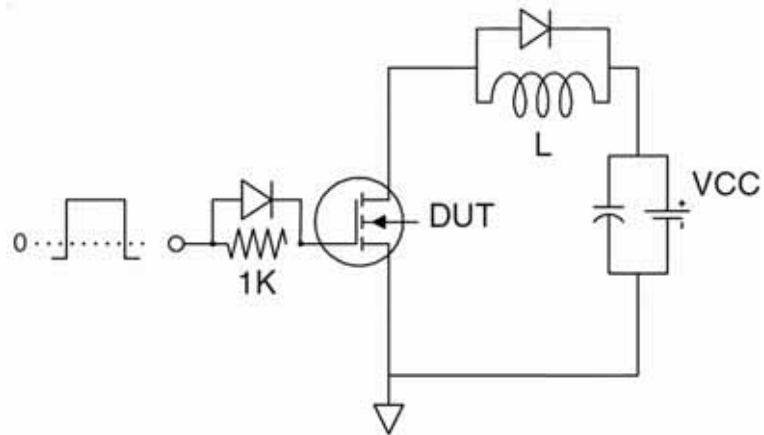
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition:  $T_J=25^\circ\text{C}, V_{DD}=30V, V_{GS}=10V, L=0.5\text{mH}, R_g=25\Omega$

## Test circuit

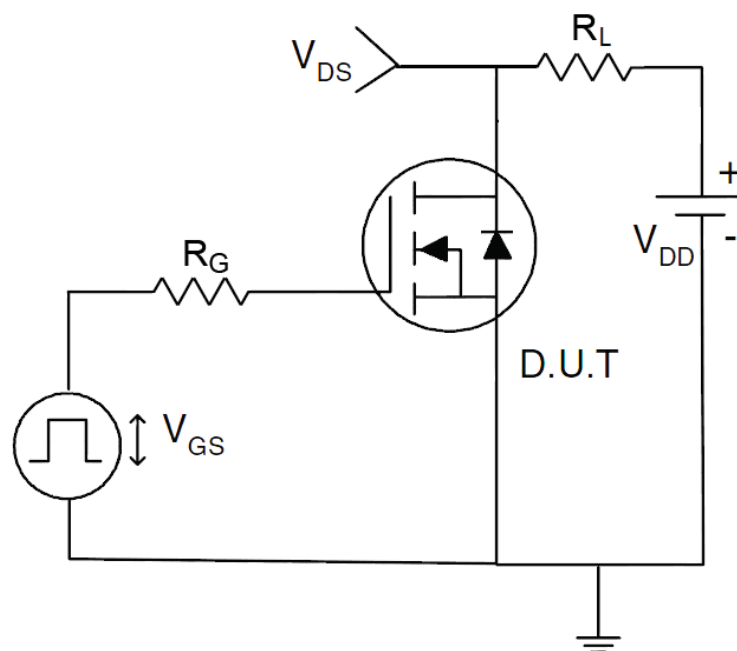
### 1) $E_{AS}$ test Circuits



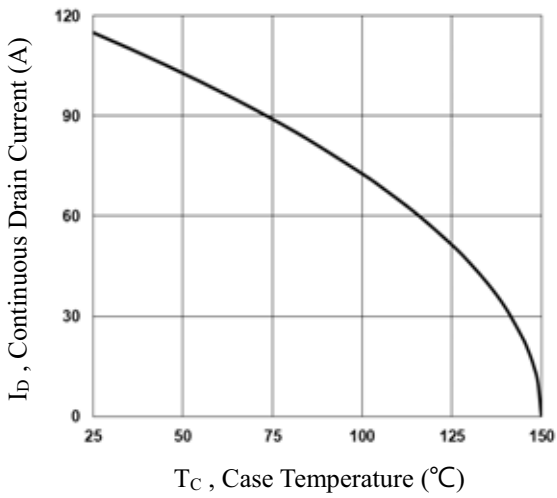
### 2) Gate charge test Circuit:



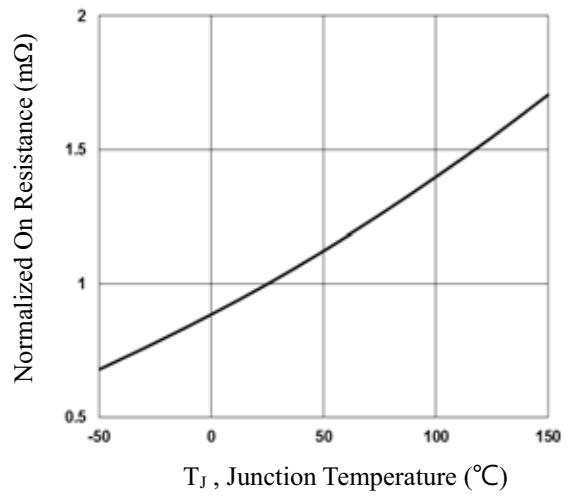
### 3) Switch Time Test Circuit:



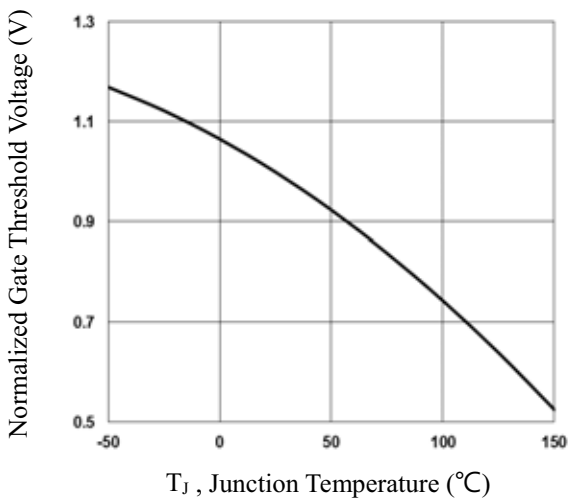
## RATING AND CHARACTERISTICS CURVES (RM115N65T2)



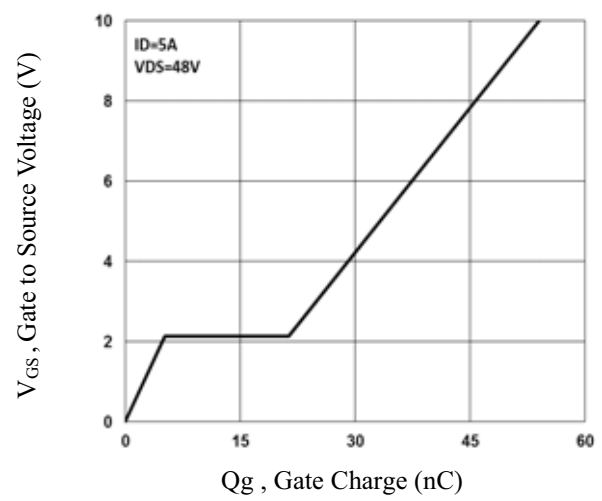
**Fig.1 Continuous Drain Current vs.  $T_C$**



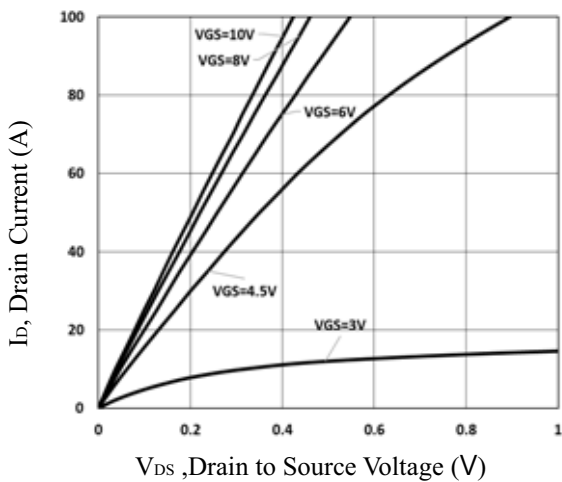
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$**



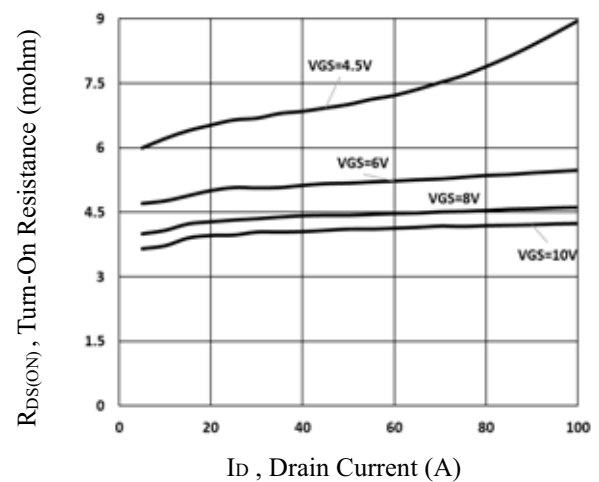
**Fig.3 Normalized  $V_{th}$  vs.  $T_J$**



**Fig.4 Gate Charge Characteristics**

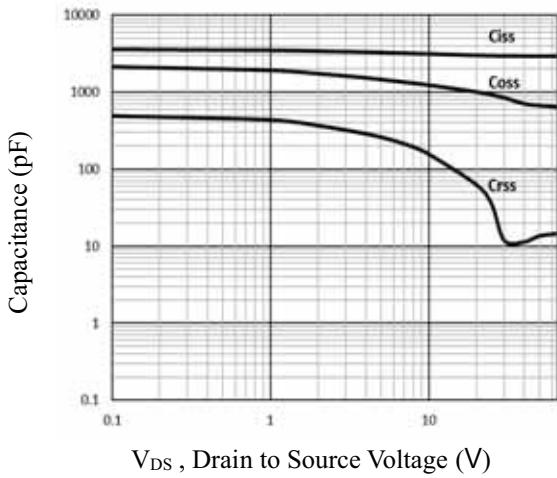


**Fig.5 Typical Output Characteristics**

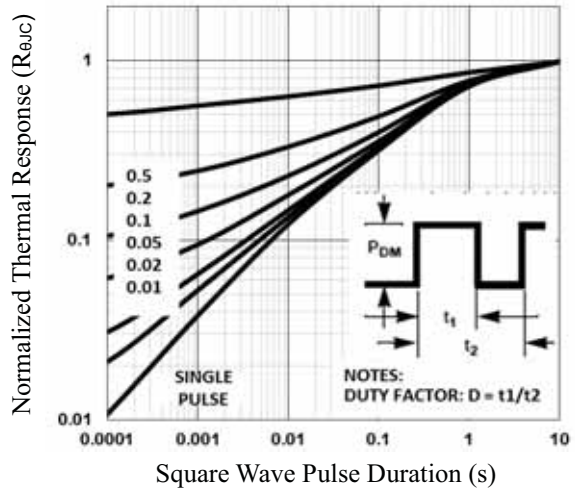


**Fig.6 Turn-On Resistance vs.  $I_D$**

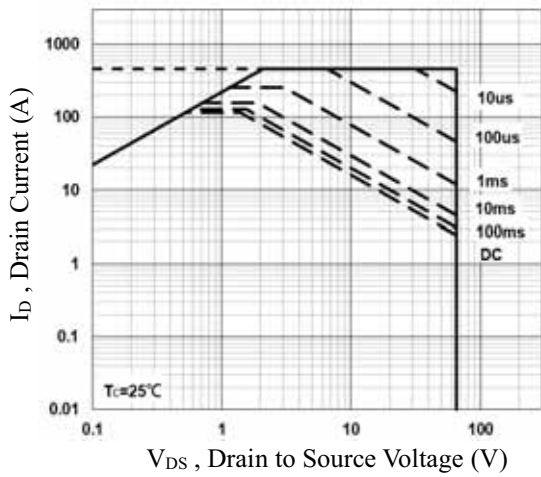
# RATING AND CHARACTERISTICS CURVES (RM115N65T2)



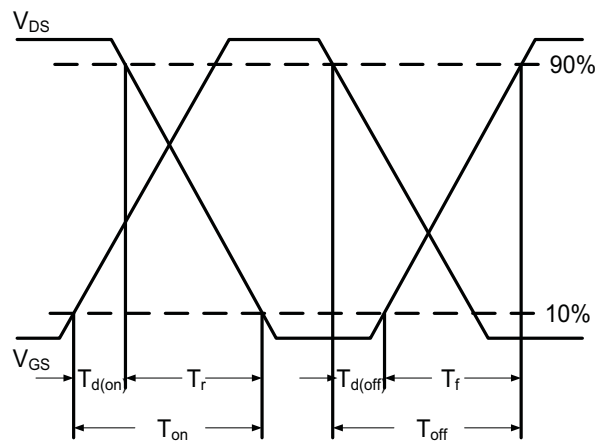
**Fig.7 Capacitance Characteristics**



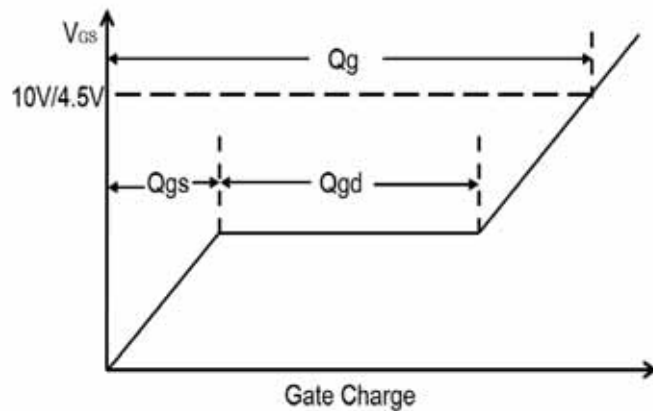
**Fig.8 Normalized Transient Impedance**



**Fig.9 Maximum Safe Operation Area**

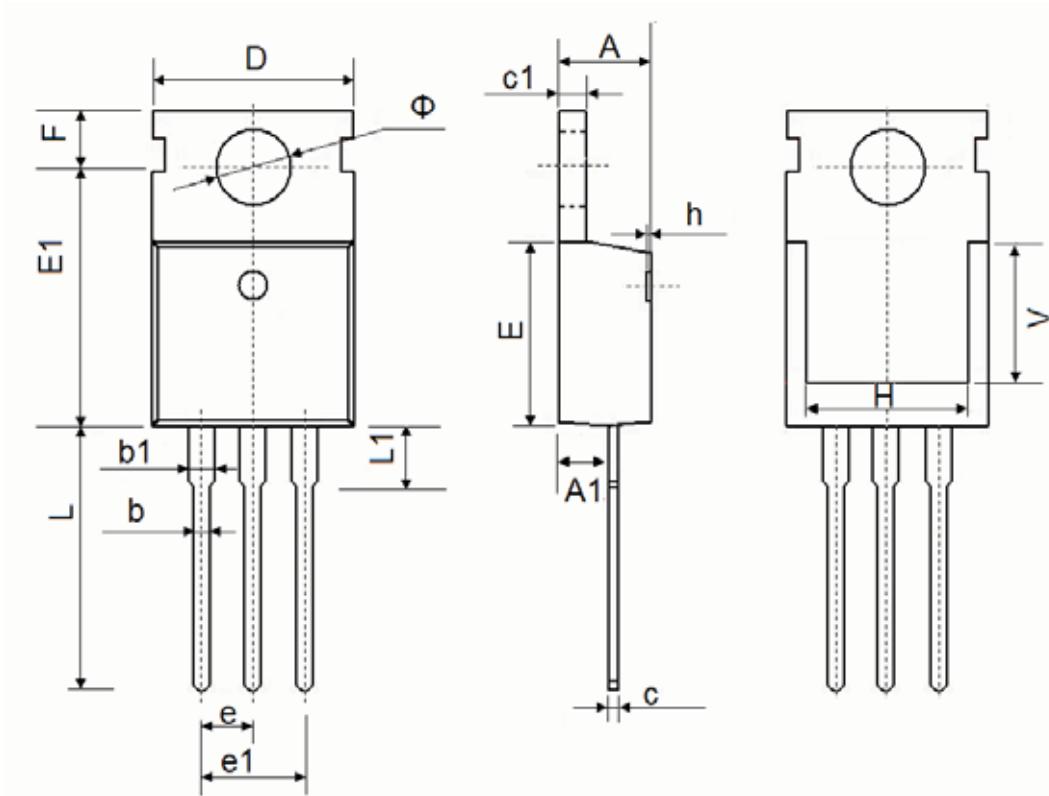


**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**

## TO-220-3L Package Information



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 4.400                     | 4.600  | 0.173                | 0.181 |
| A1     | 2.250                     | 2.550  | 0.089                | 0.100 |
| b      | 0.710                     | 0.910  | 0.028                | 0.036 |
| b1     | 1.170                     | 1.370  | 0.046                | 0.054 |
| c      | 0.330                     | 0.650  | 0.013                | 0.026 |
| c1     | 1.200                     | 1.400  | 0.047                | 0.055 |
| D      | 9.910                     | 10.250 | 0.390                | 0.404 |
| E      | 8.9500                    | 9.750  | 0.352                | 0.384 |
| E1     | 12.650                    | 12.950 | 0.498                | 0.510 |
| e      | 2.540 TYP.                |        | 0.100 TYP.           |       |
| e1     | 4.980                     | 5.180  | 0.196                | 0.204 |
| F      | 2.650                     | 2.950  | 0.104                | 0.116 |
| H      | 7.900                     | 8.100  | 0.311                | 0.319 |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| L      | 12.900                    | 13.400 | 0.508                | 0.528 |
| L1     | 2.850                     | 3.250  | 0.112                | 0.128 |
| V      | 7.500 REF.                |        | 0.295 REF.           |       |
| $\Phi$ | 3.400                     | 3.800  | 0.134                | 0.150 |

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