



# STB3015L STP3015L

## N-CHANNEL 30V - 0.013 $\Omega$ - 40A D<sup>2</sup>PAK/TO-220 STripFET™ POWER MOSFET

PRELIMINARY DATA

| TYPE     | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|----------|------------------|---------------------|----------------|
| STB3015L | 30 V             | <0.0155 $\Omega$    | 40 A           |
| STP3015L | 30 V             | <0.0155 $\Omega$    | 40 A           |

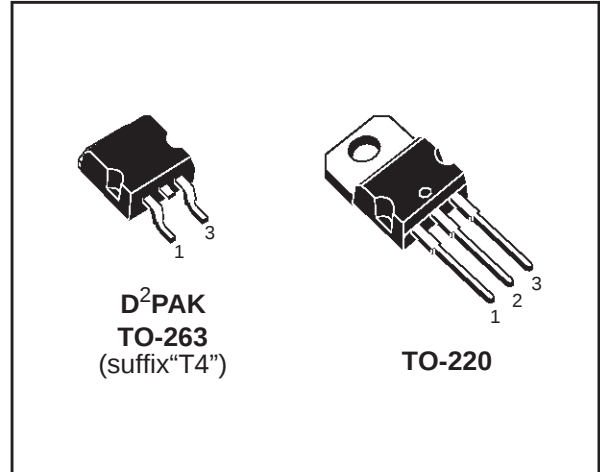
- TYPICAL R<sub>DS(on)</sub> = 0.013  $\Omega$
- EXCEPTIONAL dv/dt CAPABILITY
- LOW GATE CHARGE A 100 °C
- APPLICATION ORIENTED CHARACTERIZATION
- FOR THROUGH-HOLE VERSION CONTACT SALES OFFICE

### DESCRIPTION

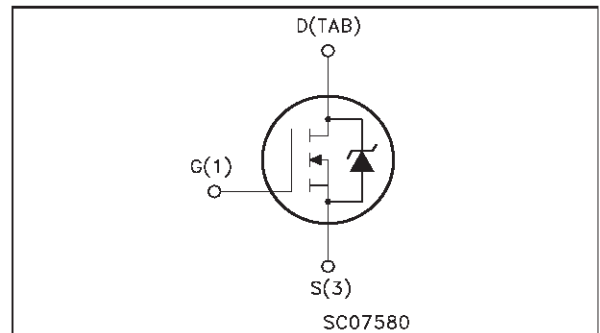
This Power Mosfet is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

### APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING SOLENOID AND RELAY DRIVERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS IN HIGH PERFORMANCE VRMS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, etc.)



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                             | Value      | Unit |
|---------------------|-------------------------------------------------------|------------|------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)            | 30         | V    |
| V <sub>DGR</sub>    | Drain-gate Voltage (R <sub>GS</sub> = 20 k $\Omega$ ) | 30         | V    |
| V <sub>GS</sub>     | Gate- source Voltage                                  | ±20        | V    |
| I <sub>D</sub>      | Drain Current (continuos) at T <sub>C</sub> = 25°C    | 40         | A    |
| I <sub>D</sub>      | Drain Current (continuos) at T <sub>C</sub> = 100°C   | 28         | A    |
| I <sub>DM</sub> (•) | Drain Current (pulsed)                                | 160        | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>C</sub> = 25°C            | 80         | W    |
|                     | Derating Factor                                       | 0.53       | W/°C |
| dv/dt (1)           | Peak Diode Recovery voltage slope                     | 7          | V/ns |
| T <sub>stg</sub>    | Storage Temperature                                   | -65 to 175 | °C   |
| T <sub>j</sub>      | Max. Operating Junction Temperature                   | 175        | °C   |

(•)Pulse width limited by safe operating area

(1)I<sub>SD</sub> [ 40 A, di/dt m200A/ms, V<sub>DD</sub> [ V<sub>(BR)DSS</sub>, T<sub>j</sub> [ T<sub>JMA</sub>

**THERMAL DATA**

|                |                                                |     |      |      |
|----------------|------------------------------------------------|-----|------|------|
| $R_{thj-case}$ | Thermal Resistance Junction-case               | Max | 1.88 | °C/W |
| $R_{thj-amb}$  | Thermal Resistance Junction-ambient            | Max | 62.5 | °C/W |
| $R_{thc-sink}$ | Thermal Resistance Junction-ambient            | Typ | 0.5  | °C/W |
| $T_j$          | Maximum Lead Temperature For Soldering Purpose |     | 300  | °C   |

**AVALANCHE CHARACTERISTICS**

| Symbol   | Parameter                                                                                                | Max Value | Unit |
|----------|----------------------------------------------------------------------------------------------------------|-----------|------|
| $I_{AR}$ | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max)                       | 40        | A    |
| $E_{AS}$ | Single Pulse Avalanche Energy (starting $T_j = 25\text{ °C}$ , $I_D = I_{AR}$ , $V_{DD} = 15\text{ V}$ ) | 200       | mJ   |

**ELECTRICAL CHARACTERISTICS** ( $T_{case} = 25\text{ °C}$  unless otherwise specified)

**OFF**

| Symbol        | Parameter                                        | Test Conditions                                                                      | Min. | Typ. | Max.      | Unit                           |
|---------------|--------------------------------------------------|--------------------------------------------------------------------------------------|------|------|-----------|--------------------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage                   | $I_D = 250\text{ }\mu\text{A}$ $V_{GS} = 0$                                          | 30   |      |           | V                              |
| $I_{DSS}$     | Zero Gate Voltage Drain Current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max Rating}$<br>$V_{DS} = \text{Max Rating}$ , $T_C = 125\text{ °C}$ |      |      | 1<br>10   | $\mu\text{A}$<br>$\mu\text{A}$ |
| $I_{GSS}$     | Gate-body Leakage Current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 20\text{ V}$                                                           |      |      | $\pm 100$ | nA                             |

**ON (\*)**

| Symbol       | Parameter                         | Test Conditions                                                                         | Min. | Typ.  | Max.            | Unit                 |
|--------------|-----------------------------------|-----------------------------------------------------------------------------------------|------|-------|-----------------|----------------------|
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{DS} = V_{GS}$ $I_D = 250\text{ }\mu\text{A}$                                        | 1    |       | 2.5             | V                    |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10\text{ V}$ $I_D = 20\text{ A}$<br>$V_{GS} = 5\text{ V}$ $I_D = 20\text{ A}$ |      | 0.013 | 0.0155<br>0.022 | $\Omega$<br>$\Omega$ |
| $I_{D(on)}$  | On State Drain Current            | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$V_{GS} = 10\text{ V}$                     | 40   |       |                 | A                    |

**DYNAMIC**

| Symbol                              | Parameter                                                                | Test Conditions                                                  | Min. | Typ. | Max.                | Unit           |
|-------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------|------|------|---------------------|----------------|
| $g_{fs}^{(*)}$                      | Forward Transconductance                                                 | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$I_D = 20\text{ A}$ | 15   | 20   |                     | S              |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitances | $V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$           |      |      | 2500<br>1200<br>400 | pF<br>pF<br>pF |

**ELECTRICAL CHARACTERISTICS** (continued)**SWITCHING ON**

| Symbol               | Parameter                       | Test Conditions                                                                                                         | Min. | Typ.      | Max. | Unit     |
|----------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|------|-----------|------|----------|
| $t_{d(on)}$<br>$t_r$ | Turn-on Delay Time<br>Rise Time | $V_{DD} = 15\text{ V}$ $I_D = 20\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$<br>(see test circuit, Figure 3) |      | 25<br>160 |      | ns<br>ns |
| $Q_g$                | Total Gate Charge               | $V_{DD} = 24\text{ V}$ $I_D = 40\text{ A}$ $V_{GS} = 5\text{ V}$                                                        |      |           | 40   | nC       |

**SWITCHING OFF**

| Symbol                          | Parameter                                             | Test Conditions                                                                                                            | Min. | Typ.             | Max. | Unit           |
|---------------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|------|------------------|------|----------------|
| $t_{d(Voff)}$<br>$t_f$<br>$t_c$ | Off-voltage Rise Time<br>Fall Time<br>Cross-over Time | $V_{clamp} = 24\text{ V}$ $I_D = 40\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$<br>(see test circuit, Figure 5) |      | 25<br>120<br>155 |      | ns<br>ns<br>ns |

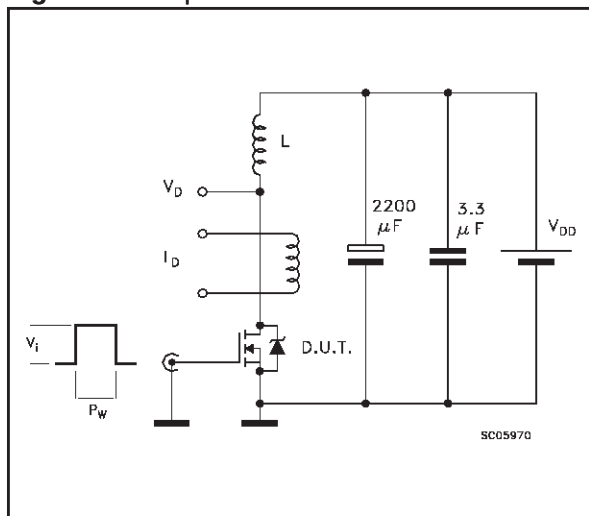
**SOURCE DRAIN DIODE**

| Symbol                            | Parameter                                                                    | Test Conditions                                                                                                                                       | Min. | Typ.             | Max.      | Unit          |
|-----------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|-----------|---------------|
| $I_{SD}$<br>$I_{SDM}(\bullet)$    | Source-drain Current<br>Source-drain Current (pulsed)                        |                                                                                                                                                       |      |                  | 40<br>160 | A<br>A        |
| $V_{SD} (*)$                      | Forward On Voltage                                                           | $I_{SD} = 40\text{ A}$ $V_{GS} = 0$                                                                                                                   |      |                  | 1.5       | V             |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD} = 40\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 20\text{ V}$ $T_J = 150\text{ }^\circ\text{C}$<br>(see test circuit, Figure 5) |      | 50<br>0.9<br>3.5 |           | ns<br>nC<br>A |

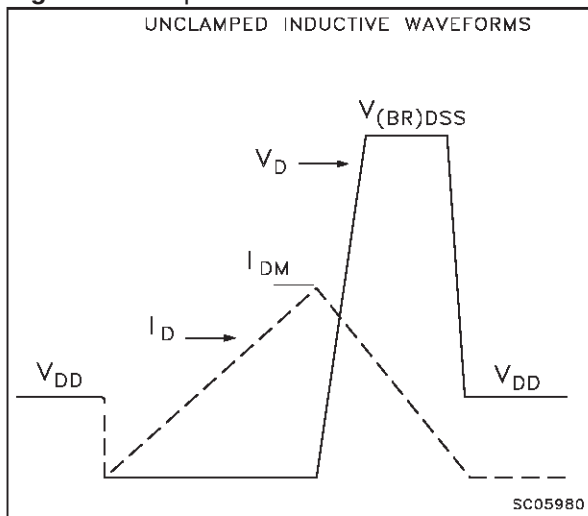
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.

(\bullet) Pulse width limited by safe operating area.

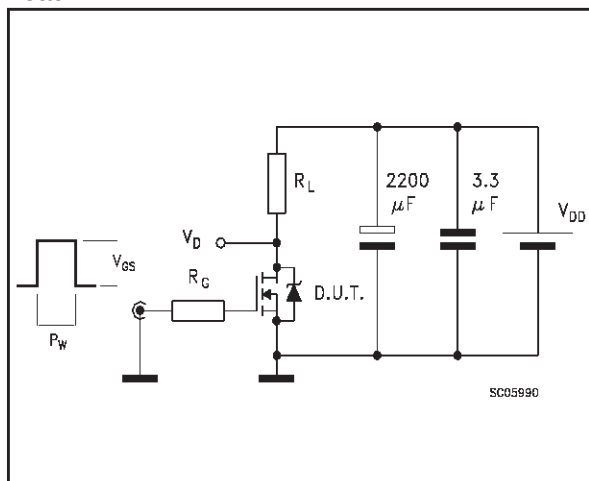
**Fig. 1: Unclamped Inductive Load Test Circuit**



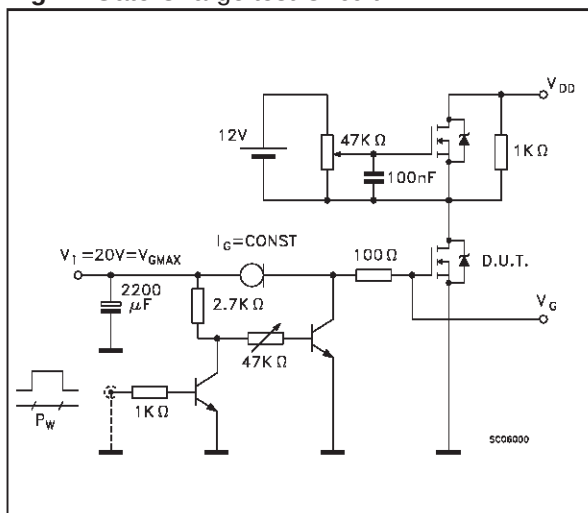
**Fig. 2: Unclamped Inductive Waveform**



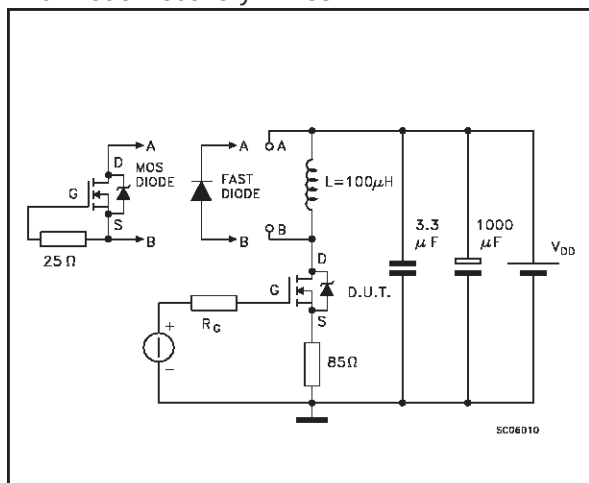
**Fig. 3: Switching Times Test Circuits For Resistive Load**



**Fig. 4: Gate Charge test Circuit**

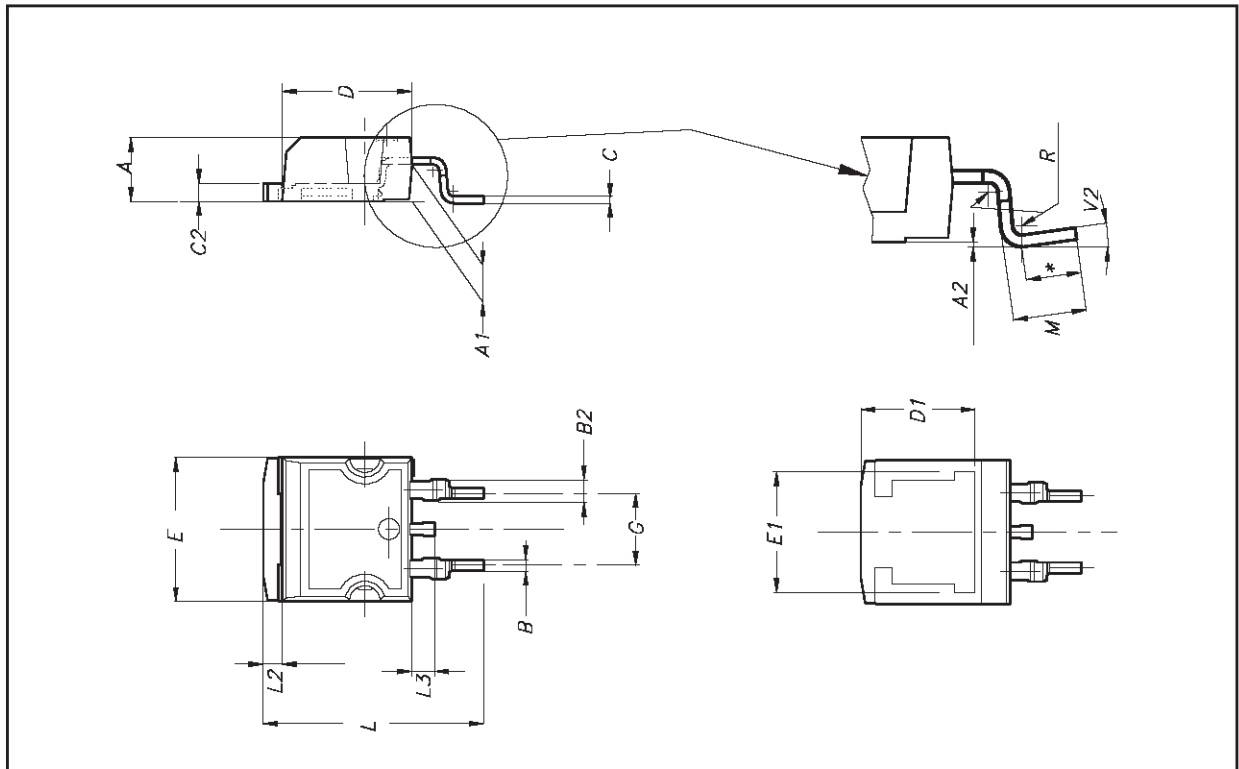


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



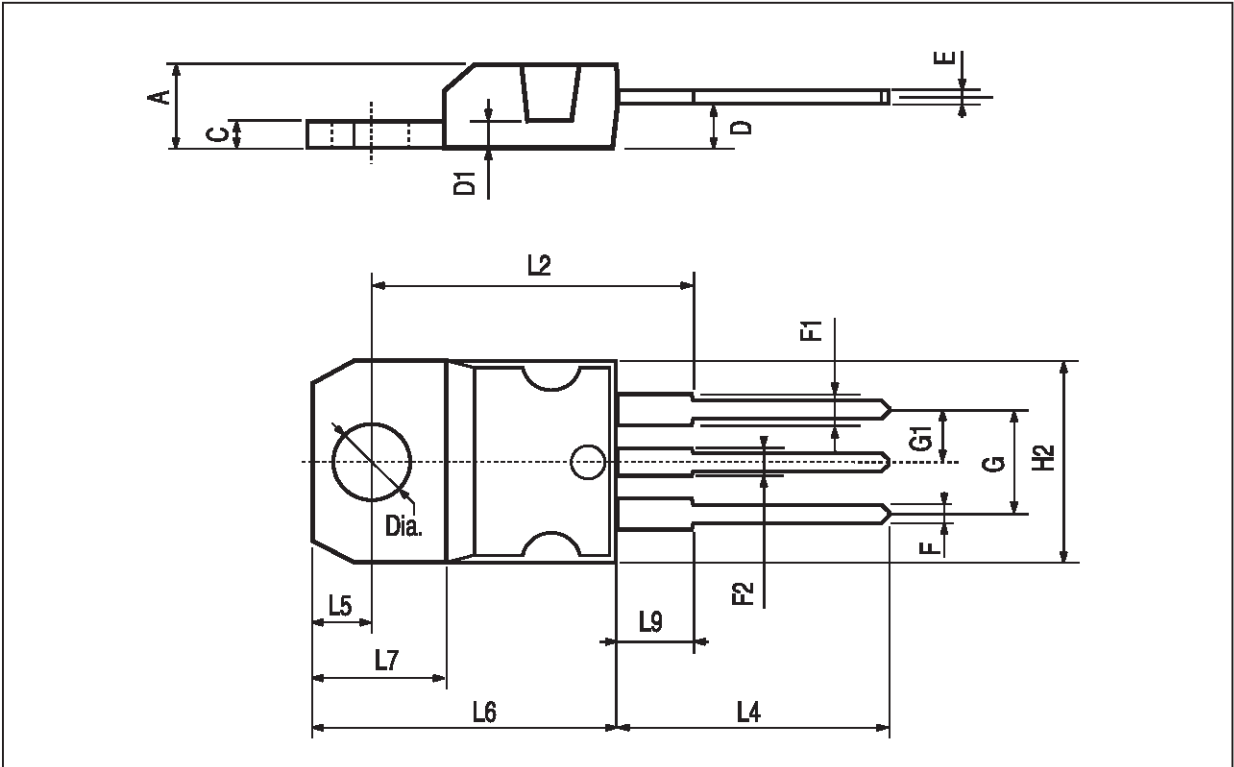
D<sup>2</sup>PAK MECHANICAL DATA

| DIM. | mm.  |     |       | inch  |       |       |
|------|------|-----|-------|-------|-------|-------|
|      | MIN. | TYP | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.4  |     | 4.6   | 0.173 |       | 0.181 |
| A1   | 2.49 |     | 2.69  | 0.098 |       | 0.106 |
| A2   | 0.03 |     | 0.23  | 0.001 |       | 0.009 |
| B    | 0.7  |     | 0.93  | 0.027 |       | 0.036 |
| B2   | 1.14 |     | 1.7   | 0.044 |       | 0.067 |
| C    | 0.45 |     | 0.6   | 0.017 |       | 0.023 |
| C2   | 1.23 |     | 1.36  | 0.048 |       | 0.053 |
| D    | 8.95 |     | 9.35  | 0.352 |       | 0.368 |
| D1   |      | 8   |       |       | 0.315 |       |
| E    | 10   |     | 10.4  | 0.393 |       |       |
| E1   |      | 8.5 |       |       | 0.334 |       |
| G    | 4.88 |     | 5.28  | 0.192 |       | 0.208 |
| L    | 15   |     | 15.85 | 0.590 |       | 0.625 |
| L2   | 1.27 |     | 1.4   | 0.050 |       | 0.055 |
| L3   | 1.4  |     | 1.75  | 0.055 |       | 0.068 |
| M    | 2.4  |     | 3.2   | 0.094 |       | 0.126 |
| R    |      | 0.4 |       |       | 0.015 |       |
| V2   | 0°   |     | 8°    |       |       |       |



TO-220 MECHANICAL DATA

| DIM. | mm.   |      |       | inch  |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | MIN.  | TYP  | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.40  |      | 4.60  | 0.173 |       | 0.181 |
| C    | 1.23  |      | 1.32  | 0.048 |       | 0.051 |
| D    | 2.40  |      | 2.72  | 0.094 |       | 0.107 |
| D1   |       | 1.27 |       |       | 0.050 |       |
| E    | 0.49  |      | 0.70  | 0.019 |       | 0.027 |
| F    | 0.61  |      | 0.88  | 0.024 |       | 0.034 |
| F1   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| F2   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| G    | 4.65  |      | 5.15  | 0.194 |       | 0.203 |
| G1   | 2.4   |      | 2.7   | 0.094 |       | 0.106 |
| H2   | 10.0  |      | 10.40 | 0.393 |       | 0.409 |
| L2   |       | 16.4 |       |       | 0.645 |       |
| L4   | 13.0  |      | 14.0  | 0.511 |       | 0.551 |
| L5   | 2.65  |      | 2.95  | 0.104 |       | 0.116 |
| L6   | 15.25 |      | 15.75 | 0.600 |       | 0.620 |
| L7   | 6.2   |      | 6.6   | 0.244 |       | 0.260 |
| L9   | 3.5   |      | 3.93  | 0.137 |       | 0.154 |
| DIA  | 3.75  |      | 3.85  | 0.147 |       | 0.151 |



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