



# STP75N15 STW75N15 - STB75N15

N-CHANNEL 150V - 0.02Ω - 75A TO-220/D<sup>2</sup>PAK/TO-247  
LOW GATE CHARGE STripFET™ MOSFET

TARGET SPECIFICATION

**Table 1: General Features**

| TYPE       | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> | P <sub>w</sub> |
|------------|------------------|---------------------|----------------|----------------|
| STP75N15   | 150 V            | < 0.023 Ω           | 75 A           | 300 W          |
| STB75N15T4 | 150 V            | < 0.023 Ω           | 75 A           | 300 W          |
| STW75N15   | 150 V            | < 0.023 Ω           | 75 A           | 350 W          |

- TYPICAL R<sub>DS(on)</sub> = 20 mΩ
- GATE CHARGE MINIMIZED
- VERY LOW INTRINSIC CAPACITANCES
- VERY GOOD MANUFACTURING REPEATIBILITY
- EXCELLENT FIGURE OF MERIT (R<sub>DS</sub>\*Q<sub>g</sub>)
- 100% AVALANCHE TESTED

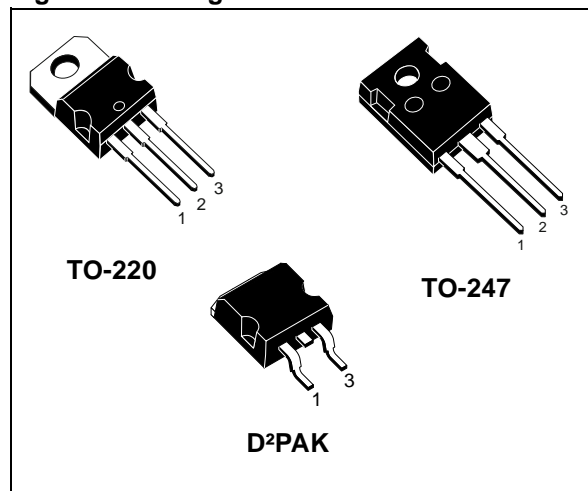
## DESCRIPTION

This MOSFET series realized with STMicroelectronics unique STripFET process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced high-efficiency isolated DC-DC converters.

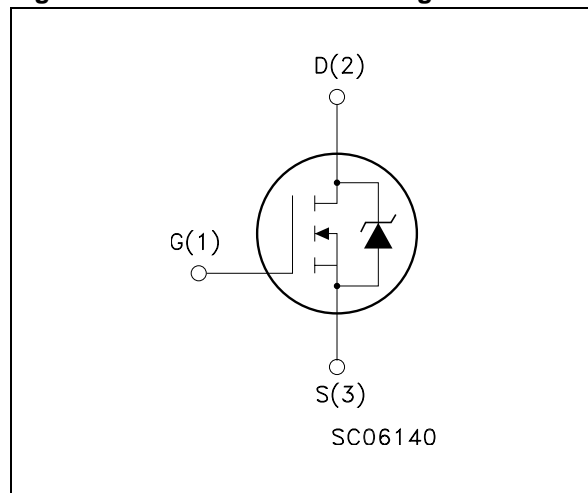
## APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- UPS

**Figure 1: Package**



**Figure 2: Internal Schematic Diagram**



**Table 2: Order Codes**

| SALES TYPE | MARKING | PACKAGE            | PACKAGING   |
|------------|---------|--------------------|-------------|
| STP75N15   | P75N15  | TO-220             | TUBE        |
| STB75N15T4 | B75N15  | D <sup>2</sup> PAK | TAPE & REEL |
| STW75N15   | W75N15  | TO-247             | TUBE        |

Rev. 1

**Table 3: Absolute Maximum ratings**

| Symbol                             | Parameter   | Value                     |        | Unit |
|------------------------------------|---|---------------------------|--------|------|
|                                    |   | TO-220/D <sup>2</sup> PAK | TO-247 |      |
| V <sub>DS</sub>                    | Drain-source Voltage (V <sub>GS</sub> = 0)            | 150                       |        | V    |
| V <sub>DGR</sub>                   | Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)          | 150                       |        | V    |
| V <sub>GS</sub>                    | Gate- source Voltage                                  | ± 26                      |        | V    |
| I <sub>D</sub>                     | Drain Current (continuous) at T <sub>C</sub> = 25°C   | 75                        |        | A    |
| I <sub>D</sub>                     | Drain Current (continuous) at T <sub>C</sub> = 100°C  | 48                        |        | A    |
| I <sub>DM</sub> (●)                | Drain Current (pulsed)                                | 300                       |        | A    |
| P <sub>TOT</sub>                   | Total Dissipation at T <sub>C</sub> = 25°C            | 300                       | 350    | W    |
|                                    | Derating Factor                                       | 2                         | 2.38   | W/°C |
| dv/dt (1)                          | Peak Diode Recovery voltage slope                     | TBD                       |        | V/ns |
| T <sub>j</sub><br>T <sub>stg</sub> | Operating Junction Temperature<br>Storage Temperature | -55 to 150                |        | °C   |

(●) Pulse width limited by safe operating area

(1) I<sub>SD</sub> ≤ 75A, di/dt ≤ 100A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>.

**Table 4: Thermal Data**

|                       |  | TO-220/D <sup>2</sup> PAK | TO-247 | Unit |
|-----------------------|--|---------------------------|--------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-case Max           | 0.5                       | 0.42   | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-ambient Max        | 62.5                      |        | °C/W |
| T <sub>l</sub>        | Maximum Lead Temperature For Soldering Purpose | 300                       |        | °C   |

**Table 5: Avalanche Characteristics**

| Symbol          | Parameter  | Max Value | Unit |
|-----------------|--|-----------|------|
| I <sub>AR</sub> | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T <sub>j</sub> max)                                | TBD       | A    |
| E <sub>AS</sub> | Single Pulse Avalanche Energy (starting T <sub>j</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 50 V) | TBD       | mJ   |

**ELECTRICAL CHARACTERISTICS** ( $T_{CASE} = 25^{\circ}C$  UNLESS OTHERWISE SPECIFIED)**Table 6: On/Off**

| Symbol        | Parameter  | Test Conditions  | Min. | Typ. | Max.      | Unit               |
|---------------|--|--|------|------|-----------|--------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage                   | $I_D = 250 \mu A, V_{GS} = 0$  | 150  |      |           | V                  |
| $I_{DSS}$     | Zero Gate Voltage Drain Current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max Rating}$<br>$V_{DS} = \text{Max Rating}, T_C = 125^{\circ}C$ |      |      | 1<br>10   | $\mu A$<br>$\mu A$ |
| $I_{GSS}$     | Gate-body Leakage Current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 26V$   |      |      | $\pm 100$ | nA                 |
| $V_{GS(th)}$  | Gate Threshold Voltage                           | $V_{DS} = V_{GS}, I_D = 250 \mu A$   | 2    | 3    | 4         | V                  |
| $R_{DS(on)}$  | Static Drain-source On Resistance                | $V_{GS} = 10V, I_D = 37.5 A$   |      |      | 0.023     | $\Omega$           |

**Table 7: Dynamic**

| Symbol  | Parameter   | Test Conditions   | Min. | Typ.                     | Max. | Unit                 |
|---|---|---|------|--------------------------|------|----------------------|
| $g_{fs} (1)$                                  | Forward Transconductance  | $V_{DS} = 75 V, I_D = 37.5 A$   |      | TBD                      |      | S                    |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$           | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS} = 25V, f = 1 \text{ MHz}, V_{GS} = 0$   |      | 4500<br>TBD<br>TBD       |      | pF<br>pF<br>pF       |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$ | Turn-on Delay Time<br>Rise Time<br>Turn-off Delay Time<br>Fall Time     | $V_{DD} = 75V, I_D = 37.5 A,$<br>$R_G = 4.7 \Omega, V_{GS} = 10 V$<br>( see Figure 4) |      | TBD<br>TBD<br>TBD<br>TBD |      | ns<br>ns<br>ns<br>ns |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$                 | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge            | $V_{DD} = 126V, I_D = 75 A,$<br>$V_{GS} = 10V$<br>(Figure 7)                          |      | 110<br>TBD<br>TBD        | TBD  | nC<br>nC<br>nC       |

**Table 8: Source Drain Diode**

| Symbol                            | Parameter  | Test Conditions  | Min. | Typ.              | Max.      | Unit               |
|-----------------------------------|--|--|------|-------------------|-----------|--------------------|
| $I_{SD}$<br>$I_{SDM} (2)$         | Source-drain Current<br>Source-drain Current (pulsed)                        |  |      |                   | 75<br>300 | A<br>A             |
| $V_{SD} (1)$                      | Forward On Voltage   | $I_{SD} = 75 A, V_{GS} = 0$  |      |                   | 1.5       | V                  |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD} = 37.5 A, di/dt = 100A/\mu s$<br>$V_{DD} = 75 V, T_j = 25^{\circ}C$<br>(see test circuit, Figure 5)  |      | TBD<br>TBD<br>TBD |           | ns<br>$\mu C$<br>A |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD} = 37.5 A, di/dt = 100A/\mu s$<br>$V_{DD} = 75 V, T_j = 150^{\circ}C$<br>(see test circuit, Figure 5) |      | TBD<br>TBD<br>TBD |           | ns<br>$\mu C$<br>A |

(1) Pulsed: Pulse duration = 300  $\mu s$ , duty cycle 1.5 %.

(2) Pulse width limited by safe operating area.

Figure 3: Unclamped Inductive Load Test Circuit

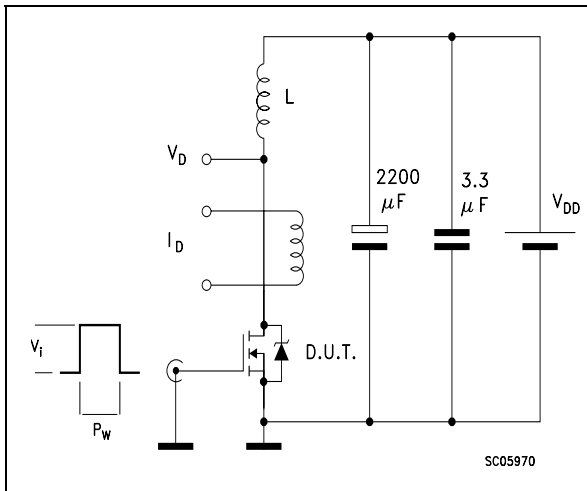


Figure 4: Switching Times Test Circuit For Resistive Load

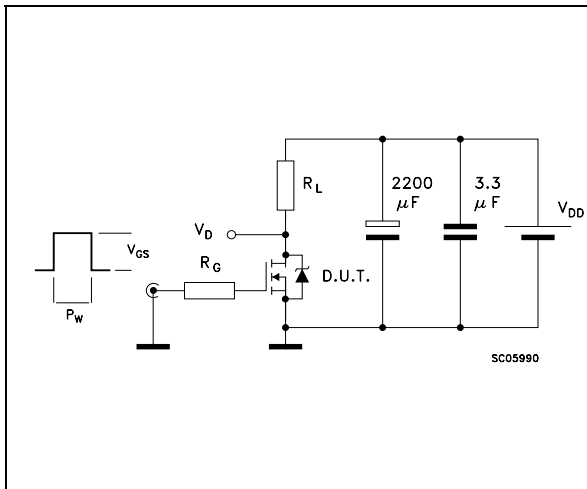


Figure 5: Test Circuit For Inductive Load Switching and Diode Recovery Times

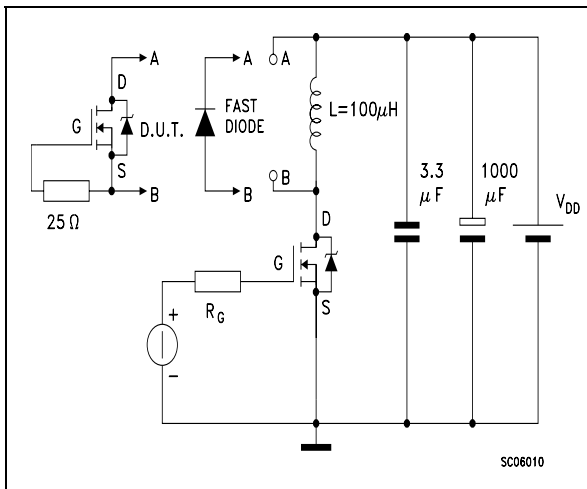


Figure 6: Unclamped Inductive Waferform

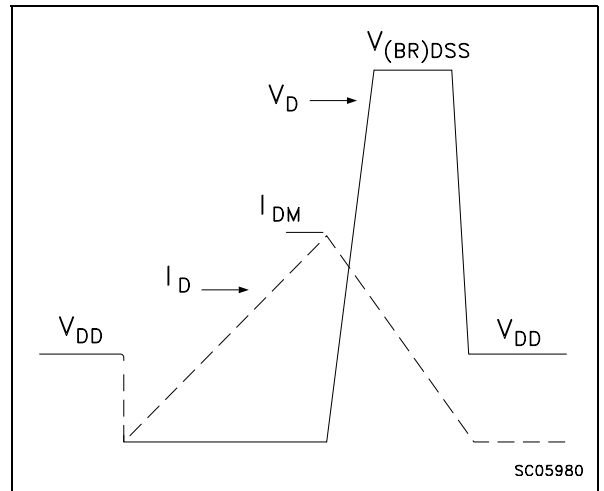
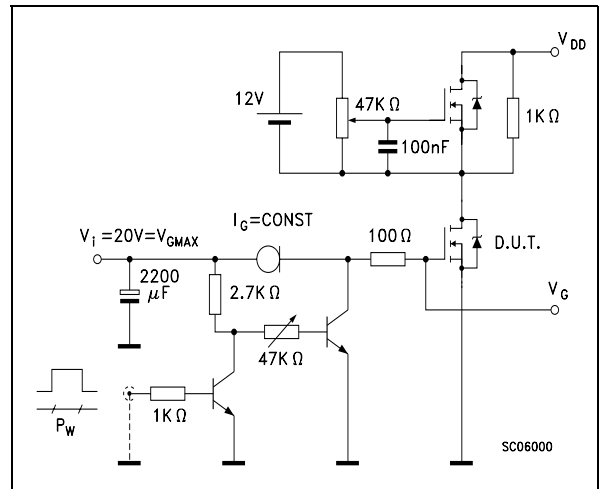
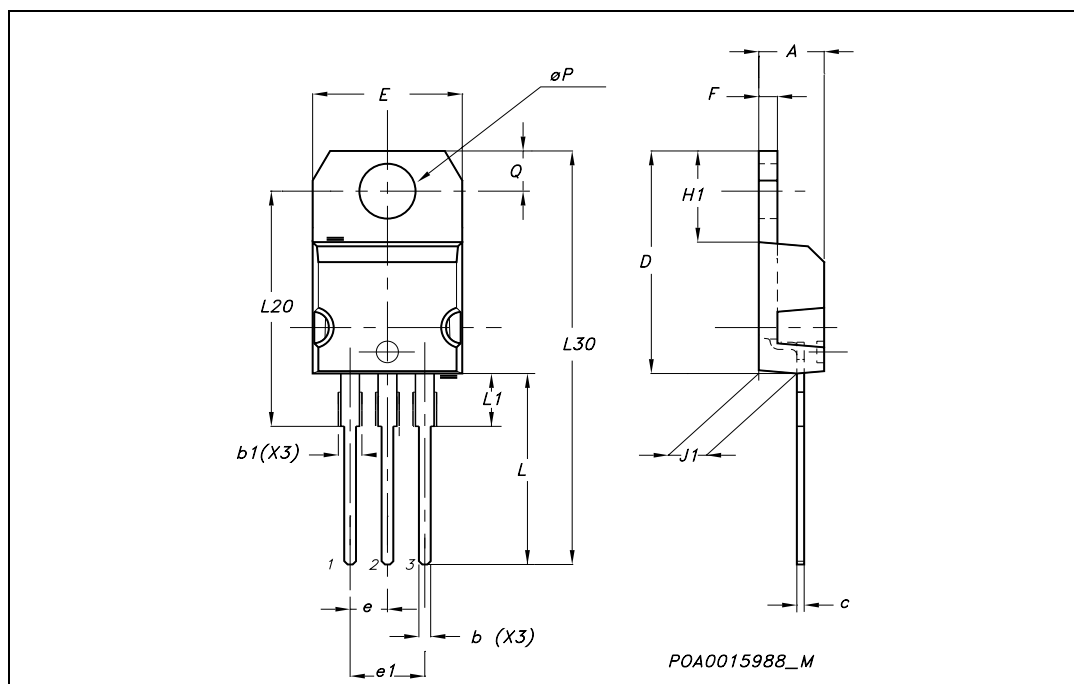


Figure 7: Gate Charge Test Circuit



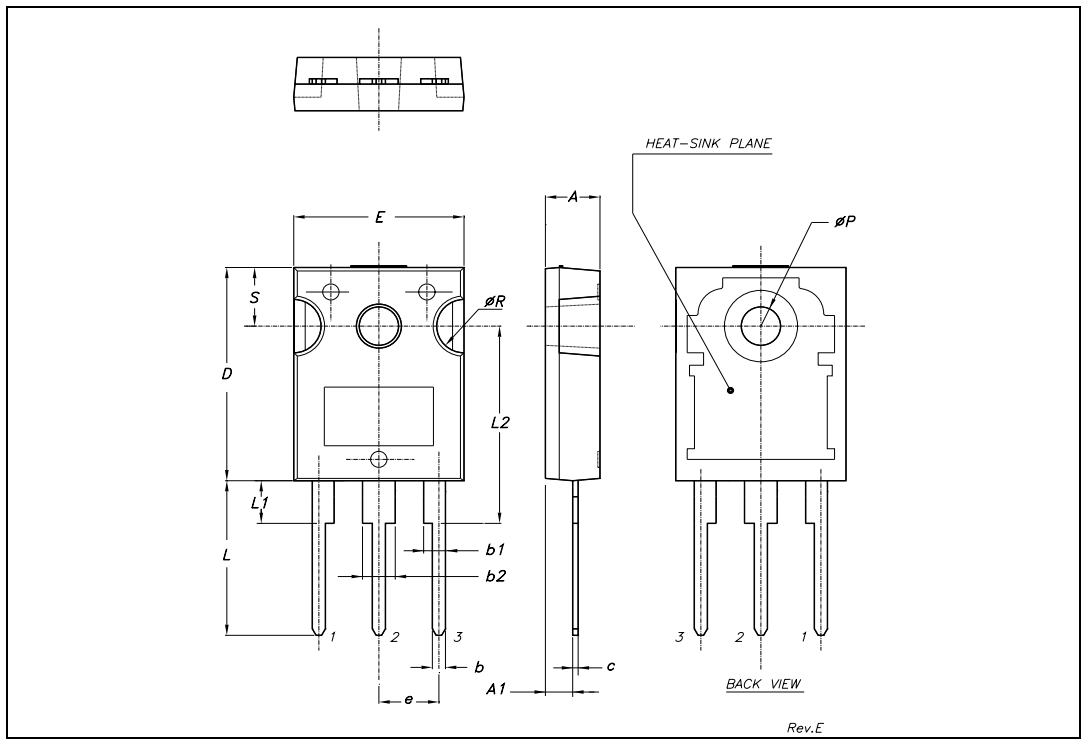
## TO-220 MECHANICAL DATA

| DIM.     | mm.   |       |       | inch  |       |       |
|----------|-------|-------|-------|-------|-------|-------|
|          | MIN.  | TYP   | MAX.  | MIN.  | TYP.  | MAX.  |
| A        | 4.40  |       | 4.60  | 0.173 |       | 0.181 |
| b        | 0.61  |       | 0.88  | 0.024 |       | 0.034 |
| b1       | 1.15  |       | 1.70  | 0.045 |       | 0.066 |
| c        | 0.49  |       | 0.70  | 0.019 |       | 0.027 |
| D        | 15.25 |       | 15.75 | 0.60  |       | 0.620 |
| E        | 10    |       | 10.40 | 0.393 |       | 0.409 |
| e        | 2.40  |       | 2.70  | 0.094 |       | 0.106 |
| e1       | 4.95  |       | 5.15  | 0.194 |       | 0.202 |
| F        | 1.23  |       | 1.32  | 0.048 |       | 0.052 |
| H1       | 6.20  |       | 6.60  | 0.244 |       | 0.256 |
| J1       | 2.40  |       | 2.72  | 0.094 |       | 0.107 |
| L        | 13    |       | 14    | 0.511 |       | 0.551 |
| L1       | 3.50  |       | 3.93  | 0.137 |       | 0.154 |
| L20      |       | 16.40 |       |       | 0.645 |       |
| L30      |       | 28.90 |       |       | 1.137 |       |
| $\phi P$ | 3.75  |       | 3.85  | 0.147 |       | 0.151 |
| Q        | 2.65  |       | 2.95  | 0.104 |       | 0.116 |



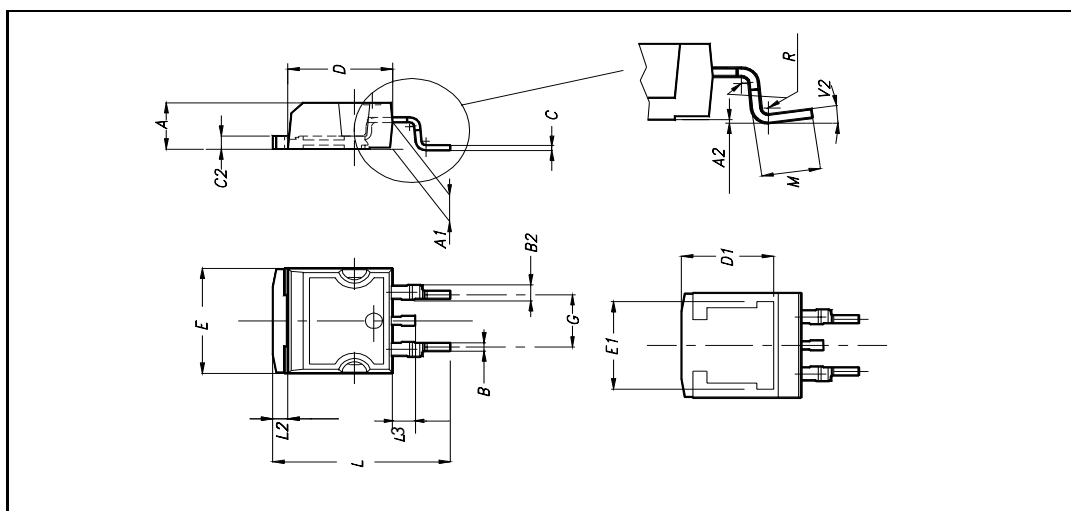
**TO-247 MECHANICAL DATA**

| DIM. | mm.   |       |       | inch  |       |       |
|------|-------|-------|-------|-------|-------|-------|
|      | MIN.  | TYP   | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.85  |       | 5.15  | 0.19  |       | 0.20  |
| A1   | 2.20  |       | 2.60  | 0.086 |       | 0.102 |
| b    | 1.0   |       | 1.40  | 0.039 |       | 0.055 |
| b1   | 2.0   |       | 2.40  | 0.079 |       | 0.094 |
| b2   | 3.0   |       | 3.40  | 0.118 |       | 0.134 |
| c    | 0.40  |       | 0.80  | 0.015 |       | 0.03  |
| D    | 19.85 |       | 20.15 | 0.781 |       | 0.793 |
| E    | 15.45 |       | 15.75 | 0.608 |       | 0.620 |
| e    |       | 5.45  |       |       | 0.214 |       |
| L    | 14.20 |       | 14.80 | 0.560 |       | 0.582 |
| L1   | 3.70  |       | 4.30  | 0.14  |       | 0.17  |
| L2   |       | 18.50 |       |       | 0.728 |       |
| øP   | 3.55  |       | 3.65  | 0.140 |       | 0.143 |
| øR   | 4.50  |       | 5.50  | 0.177 |       | 0.216 |
| S    |       | 5.50  |       |       | 0.216 |       |

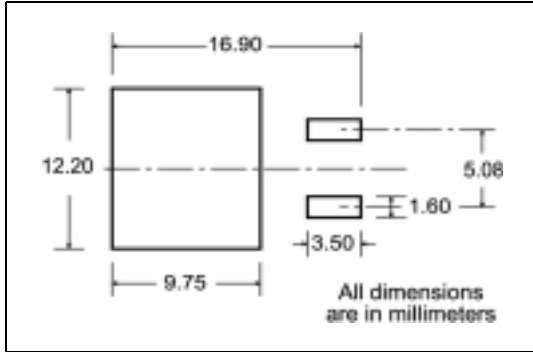


D<sup>2</sup>PAK MECHANICAL DATA

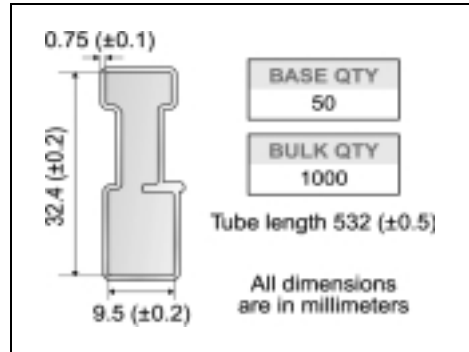
| DIM. | mm.  |      |       | inch  |       |       |
|------|------|------|-------|-------|-------|-------|
|      | MIN. | TYP. | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.4  |      | 4.6   | 0.173 |       | 0.181 |
| A1   | 2.49 |      | 2.69  | 0.098 |       | 0.106 |
| A2   | 0.03 |      | 0.23  | 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°   |      | 4°    |       |       |       |



**D<sup>2</sup>PAK FOOTPRINT**



**TUBE SHIPMENT (no suffix)\***



**TAPE AND REEL SHIPMENT (suffix "T4")\***

**TAPE MECHANICAL DATA**

| DIM. | mm   |      | inch   |        |
|------|------|------|--------|--------|
|      | MIN. | MAX. | MIN.   | MAX.   |
| A0   | 10.5 | 10.7 | 0.413  | 0.421  |
| B0   | 15.7 | 15.9 | 0.618  | 0.626  |
| D    | 1.5  | 1.6  | 0.059  | 0.063  |
| D1   | 1.59 | 1.61 | 0.062  | 0.063  |
| E    | 1.65 | 1.85 | 0.065  | 0.073  |
| F    | 11.4 | 11.6 | 0.449  | 0.456  |
| K0   | 4.8  | 5.0  | 0.189  | 0.197  |
| P0   | 3.9  | 4.1  | 0.153  | 0.161  |
| P1   | 11.9 | 12.1 | 0.468  | 0.476  |
| P2   | 1.9  | 2.1  | 0.075  | 0.082  |
| R    | 50   |      | 1.574  |        |
| T    | 0.25 | 0.35 | 0.0098 | 0.0137 |
| W    | 23.7 | 24.3 | 0.933  | 0.956  |

**REEL MECHANICAL DATA**

| DIM. | mm   |      | inch  |        |
|------|------|------|-------|--------|
|      | MIN. | MAX. | MIN.  | MAX.   |
| A    |      | 330  |       | 12.992 |
| B    | 1.5  |      | 0.059 |        |
| C    | 12.8 | 13.2 | 0.504 | 0.520  |
| D    | 20.2 |      | 0.795 |        |
| G    | 24.4 | 26.4 | 0.960 | 1.039  |
| N    | 100  |      | 3.937 |        |
| T    |      | 30.4 |       | 1.197  |

| BASE QTY | BULK QTY |
|----------|----------|
| 1000     | 1000     |

\* on sales type



Table 9: Revision History

| Date        | Revision | Description of Changes |
|-------------|----------|------------------------|
| 08-Nov-2004 | 1        | First Release.         |

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