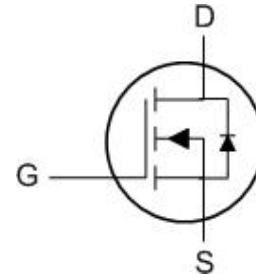




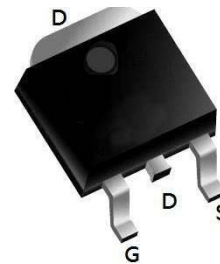
- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology



### Description

The WLU60N04 is the high cell density trenched N-ch MOSFETs, which provide excellent R<sub>DS(on)</sub> and gate charge for most of the synchronous buck converter applications. The WLU60N04 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

### TO252 Pin Configuration



### Product Summary

| BVDSS | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-------|---------------------|----------------|
| 40V   | 7.0mΩ               | 68A            |

### Absolute Maximum Ratings

| Symbol                             | Parameter  | Rating     | Units |
|------------------------------------|--|------------|-------|
| V <sub>DS</sub>                    | Drain-Source Voltage   | 40         | V     |
| V <sub>GS</sub>                    | Gate-Source Voltage  | ±20        | V     |
| I <sub>D@T<sub>C</sub>=25°C</sub>  | Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup> | 68         | A     |
| I <sub>D@T<sub>C</sub>=100°C</sub> | Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup> | 45         | A     |
| I <sub>DM</sub>                    | Pulsed Drain Current <sup>2</sup>                            | 220        | A     |
| EAS                                | Single Pulse Avalanche Energy <sup>3</sup>                   | 416.1      | mJ    |
| I <sub>AS</sub>                    | Avalanche Current  | 39         | A     |
| P <sub>D@T<sub>C</sub>=25°C</sub>  | Total Power Dissipation <sup>4</sup>                         | 64.6       | W     |
| T <sub>STG</sub>                   | Storage Temperature Range                                    | -55 to 150 | °C    |
| T <sub>J</sub>                     | Operating Junction Temperature Range                         | -55 to 150 | °C    |

### Thermal Data

| Symbol           | Parameter   | Typ. | Max. | Unit |
|------------------|---|------|------|------|
| R <sub>θJA</sub> | Thermal Resistance Junction-ambient (Steady State) <sup>1</sup> | ---  | 62   | °C/W |
| R <sub>θJC</sub> | Thermal Resistance Junction-Case <sup>1</sup>                   | ---  | 2.8  | °C/W |



### Thermal Characteristic

|  |                 |     |               |
|--|-----------------|-----|---------------|
| Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup> | $R_{\theta JC}$ | 2.3 | $^{\circ}C/W$ |
|--|-----------------|-----|---------------|

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

| Parameter  | Symbol       | Condition  | Min | Typ  | Max       | Unit       |
|--|--------------|--|-----|------|-----------|------------|
| <b>Off Characteristics</b>                           |              |  |     |      |           |            |
| Drain-Source Breakdown Voltage                       | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$  | 40  | 45   | -         | V          |
| Zero Gate Voltage Drain Current                      | $I_{DSS}$    | $V_{DS}=40V, V_{GS}=0V$  | -   | -    | 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                               | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$  | 1.2 | 1.6  | 2.0       | V          |
| Drain-Source On-State Resistance                     | $R_{DS(on)}$ | $V_{GS}=10V, I_D=20A$  | -   | 7.0  | 8.5       | m $\Omega$ |
|  |              | $V_{GS}=4.5V, I_D=20A$   |     | 15   | 18        |            |
| Forward Transconductance                             | $g_{FS}$     | $V_{DS}=10V, I_D=20A$  | 15  | -    | -         | S          |
| <b>Dynamic Characteristics</b> <sup>(Note 4)</sup>   |              |  |     |      |           |            |
| Input Capacitance                                    | $C_{iss}$    | $V_{DS}=20V, V_{GS}=0V,$<br>$F=1.0MHz$                                     | -   | 1800 | -         | PF         |
| Output Capacitance                                   | $C_{oss}$    |  | -   | 280  | -         | PF         |
| Reverse Transfer Capacitance                         | $C_{rss}$    |  | -   | 190  | -         | PF         |
| <b>Switching Characteristics</b> <sup>(Note 4)</sup> |              |  |     |      |           |            |
| Turn-on Delay Time                                   | $t_{d(on)}$  | $V_{DD}=20V, I_D=2A, R_L=1\Omega$<br>$V_{GS}=10V, R_G=3\Omega$             | -   | 6.4  | -         | nS         |
| Turn-on Rise Time                                    | $t_r$        |  | -   | 17.2 | -         | nS         |
| Turn-Off Delay Time                                  | $t_{d(off)}$ |  | -   | 29.6 | -         | nS         |
| Turn-Off Fall Time                                   | $t_f$        |  | -   | 16.8 | -         | nS         |
| Total Gate Charge                                    | $Q_g$        | $V_{DS}=20V, I_D=20A,$<br>$V_{GS}=10V$                                     | -   | 29   |           | nC         |
| Gate-Source Charge                                   | $Q_{gs}$     |  | -   | 4.5  |           | nC         |
| Gate-Drain Charge                                    | $Q_{gd}$     |  | -   | 6.4  |           | nC         |
| <b>Drain-Source Diode Characteristics</b>            |              |  |     |      |           |            |
| Diode Forward Voltage <sup>(Note 3)</sup>            | $V_{SD}$     | $V_{GS}=0V, I_S=10A$   | -   |      | 1.2       | V          |
| Diode Forward Current <sup>(Note 2)</sup>            | $I_S$        |  | -   | -    | 68        | A          |
| Reverse Recovery Time                                | $t_{rr}$     | $T_J = 25^{\circ}C, I_F = 20A$<br>$di/dt = 100A/\mu s$ <sup>(Note 3)</sup> | -   | 29   | -         | nS         |
| Reverse Recovery Charge                              | $Q_{rr}$     |  | -   | 26   | -         | nC         |
| Forward Turn-On Time                                 | $t_{on}$     | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)       |     |      |           |            |

### 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.  $E_{AS}$  condition :  $T_J=25^{\circ}C, V_{DD}=20V, V_G=10V, L=1mH, R_g=25\Omega$ ,



### Typical Electrical and Thermal Characteristics (Curves)

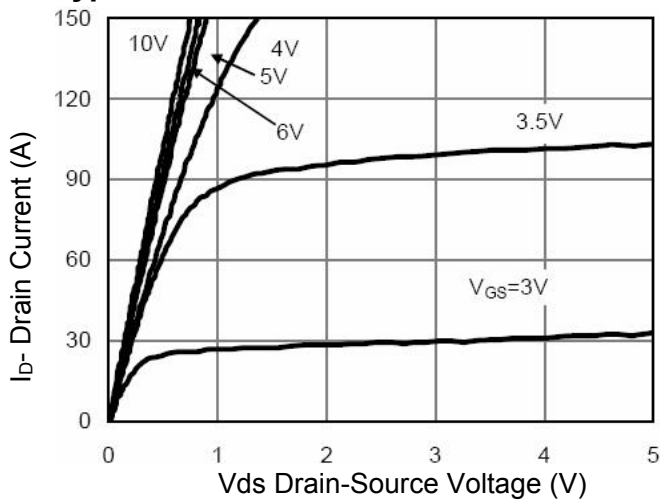


Figure 1 Output Characteristics

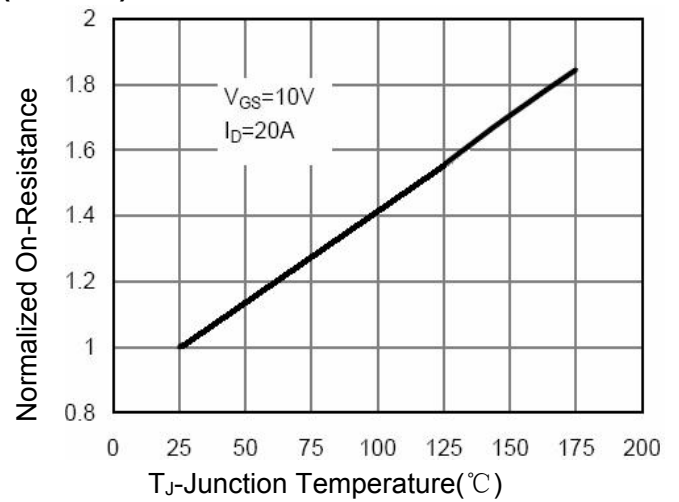


Figure 4  $R_{DS(on)}$ -Junction Temperature

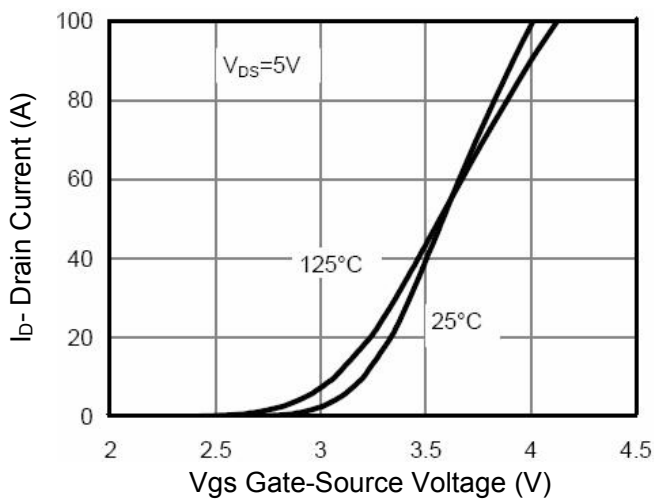


Figure 2 Transfer Characteristics

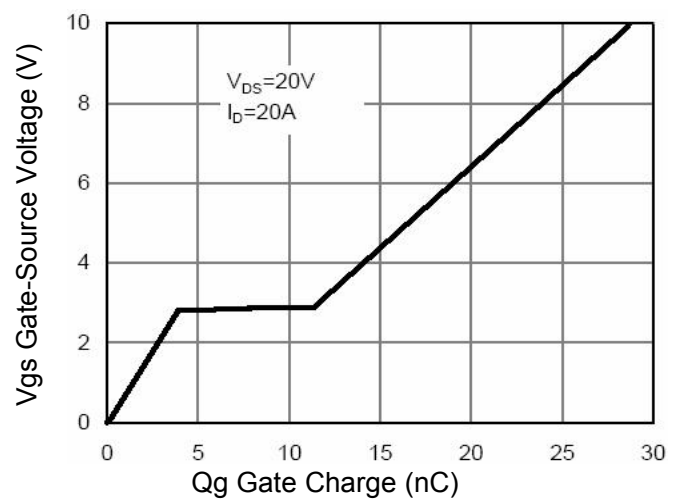


Figure 5 Gate Charge

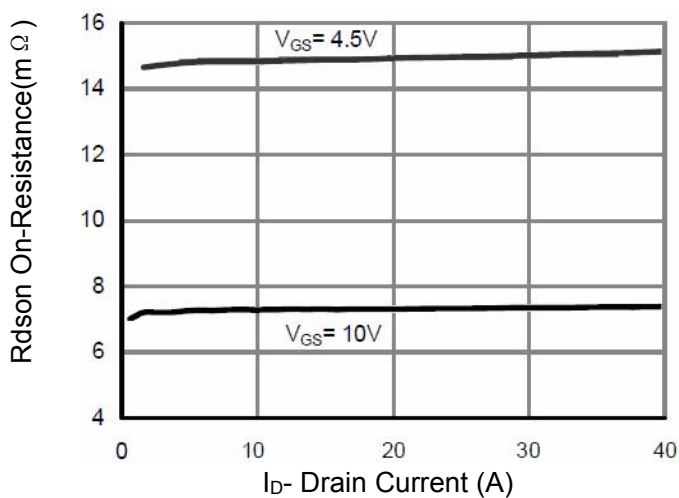


Figure 3  $R_{DS(on)}$ - Drain Current

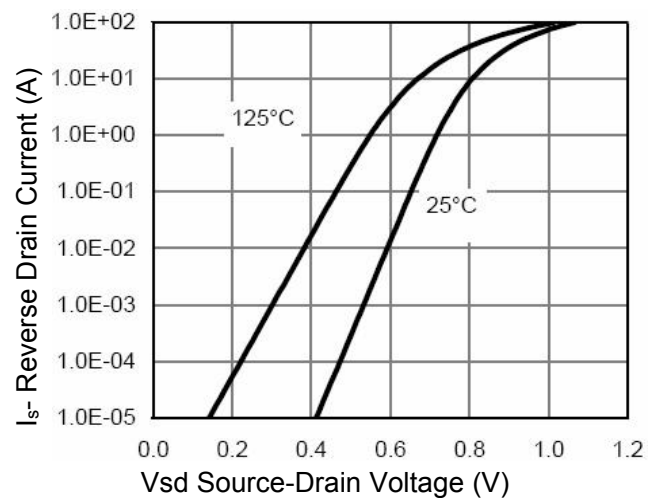


Figure 6 Source- Drain Diode Forward

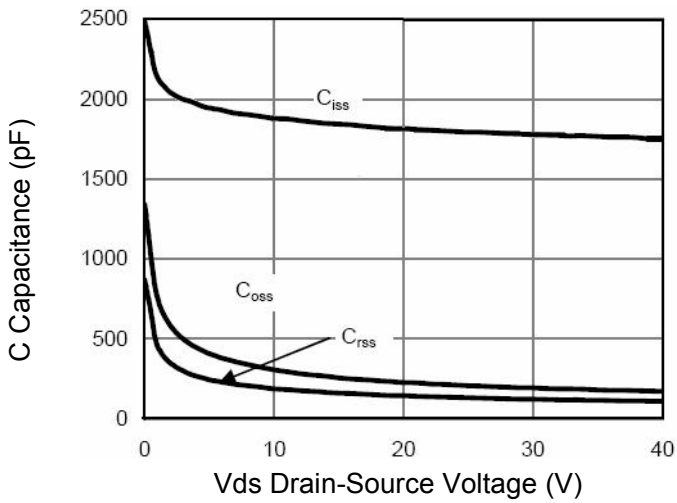


Figure 7 Capacitance vs Vds

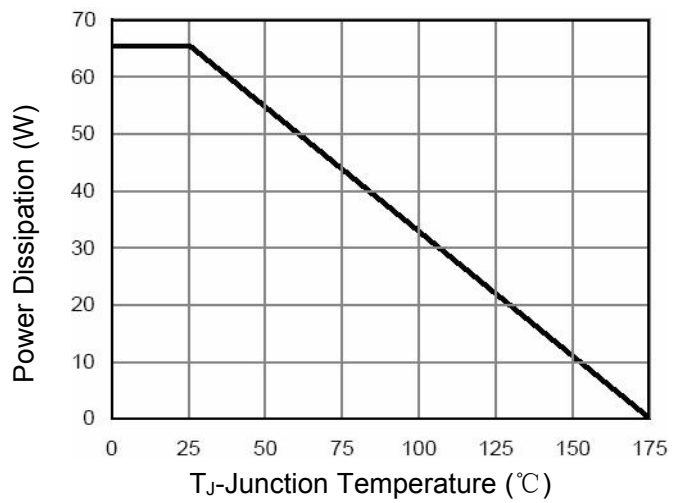


Figure 9 Power De-rating

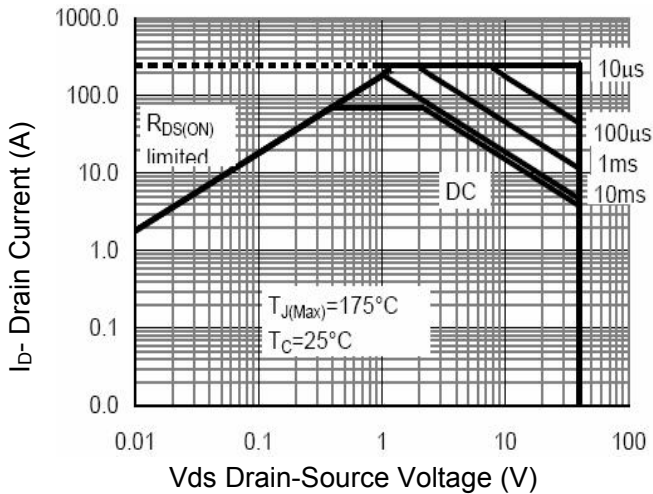


Figure 8 Safe Operation Area

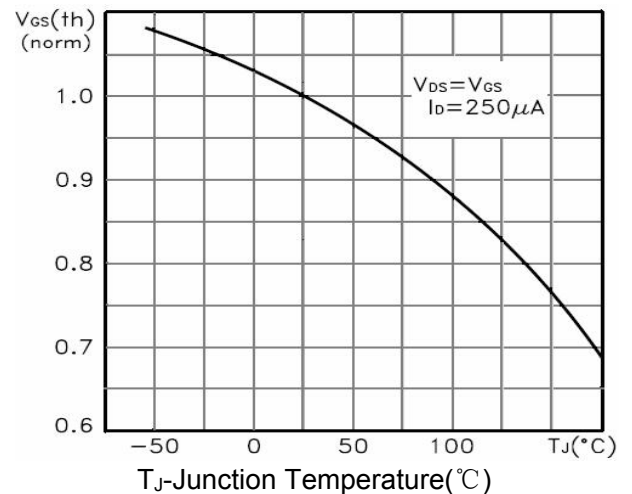


Figure 10  $V_{GS(th)}$  vs Junction Temperature

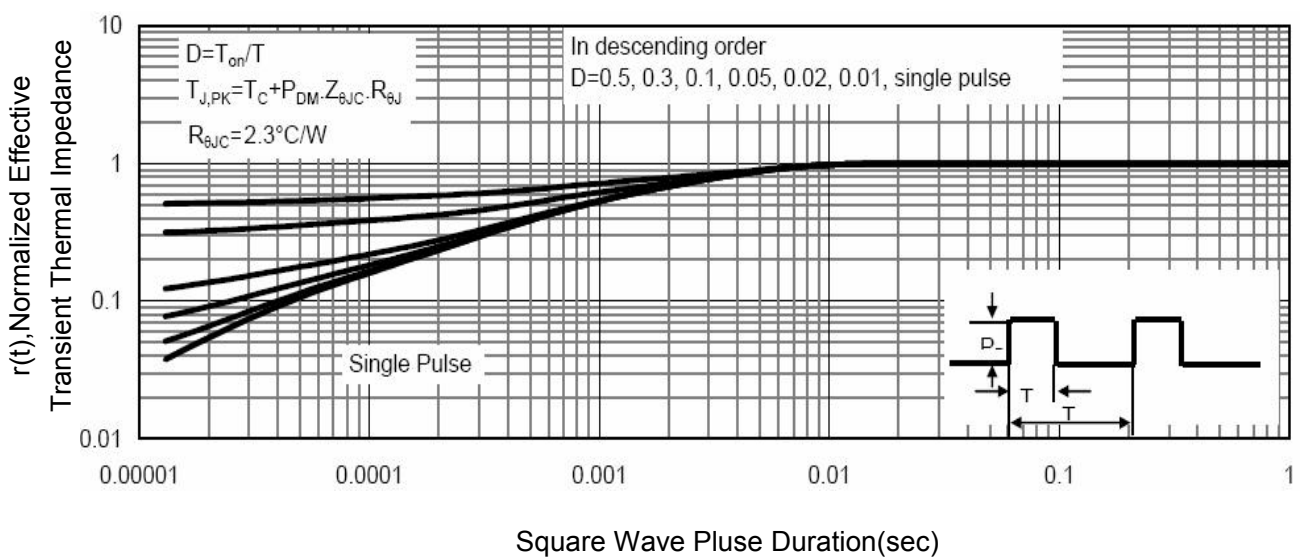
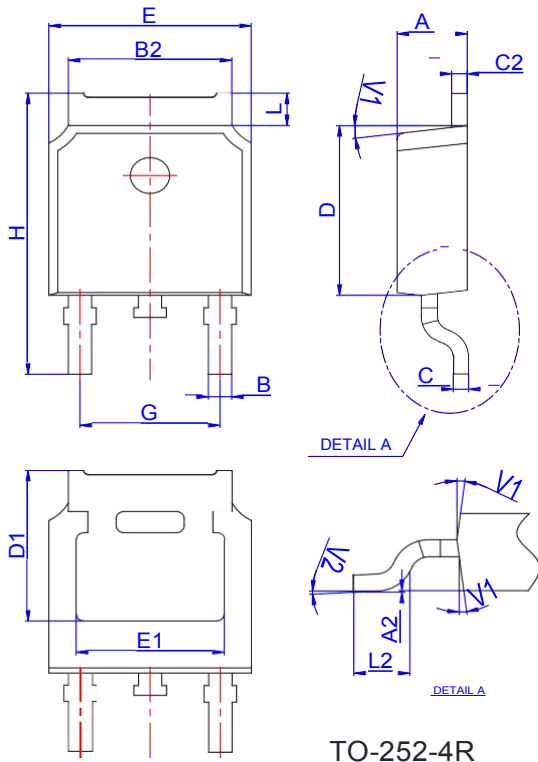


Figure 11 Normalized Maximum Transient Thermal Impedance

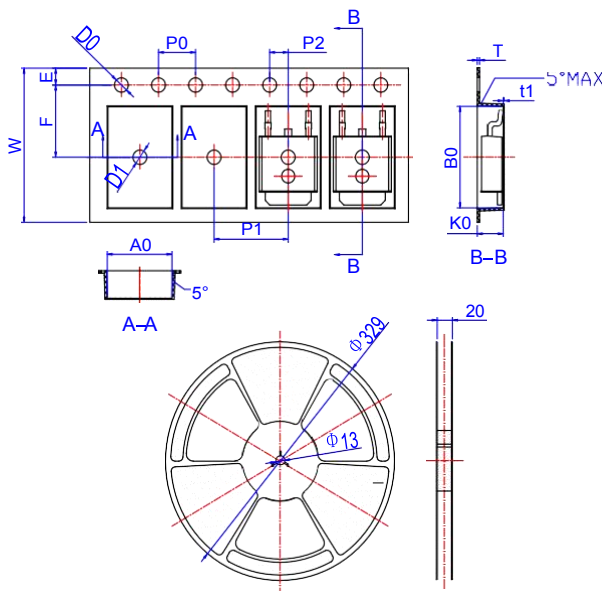


Package Mechanical Data-TO-252



| Ref. | Dimensions  |      |       |          |      |       |
|------|-------------|------|-------|----------|------|-------|
|      | Millimeters |      |       | Inches   |      |       |
|      | Min.        | Typ. | Max.  | Min.     | Typ. | Max.  |
| A    | 2.10        |      | 2.50  | 0.083    |      | 0.098 |
| A2   | 0           |      | 0.10  | 0        |      | 0.004 |
| B    | 0.66        |      | 0.86  | 0.026    |      | 0.034 |
| B2   | 5.18        |      | 5.48  | 0.202    |      | 0.216 |
| C    | 0.40        |      | 0.60  | 0.016    |      | 0.024 |
| C2   | 0.44        |      | 0.58  | 0.017    |      | 0.023 |
| D    | 5.90        |      | 6.30  | 0.232    |      | 0.248 |
| D1   | 5.30REF     |      |       | 0.209REF |      |       |
| E    | 6.40        |      | 6.80  | 0.252    |      | 0.268 |
| E1   | 4.63        |      |       | 0.182    |      |       |
| G    | 4.47        |      | 4.67  | 0.176    |      | 0.184 |
| H    | 9.50        |      | 10.70 | 0.374    |      | 0.421 |
| L    | 1.09        |      | 1.21  | 0.043    |      | 0.048 |
| L2   | 1.35        |      | 1.65  | 0.053    |      | 0.065 |
| V1   |             | 7°   |       |          | 7°   |       |
| V2   | 0°          |      | 6°    | 0°       |      | 6°    |

Reel Specification-TO-252



| Ref. | Dimensions  |       |       |        |       |       |
|------|-------------|-------|-------|--------|-------|-------|
|      | Millimeters |       |       | Inches |       |       |
|      | Min.        | Typ.  | Max.  | Min.   | Typ.  | Max.  |
| W    | 15.90       | 16.00 | 16.10 | 0.626  | 0.630 | 0.634 |
| E    | 1.65        | 1.75  | 1.85  | 0.065  | 0.069 | 0.073 |
| F    | 7.40        | 7.50  | 7.60  | 0.291  | 0.295 | 0.299 |
| D0   | 1.40        | 1.50  | 1.60  | 0.055  | 0.059 | 0.063 |
| D1   | 1.40        | 1.50  | 1.60  | 0.055  | 0.059 | 0.063 |
| P0   | 3.90        | 4.00  | 4.10  | 0.154  | 0.157 | 0.161 |
| P1   | 7.90        | 8.00  | 8.10  | 0.311  | 0.315 | 0.319 |
| P2   | 1.90        | 2.00  | 2.10  | 0.075  | 0.079 | 0.083 |
| A0   | 6.85        | 6.90  | 7.00  | 0.270  | 0.271 | 0.276 |
| B0   | 10.45       | 10.50 | 10.60 | 0.411  | 0.413 | 0.417 |
| K0   | 2.68        | 2.78  | 2.88  | 0.105  | 0.109 | 0.113 |
| T    | 0.24        |       | 0.27  | 0.009  |       | 0.011 |
| t1   | 0.10        |       |       | 0.004  |       |       |
| 10P0 | 39.80       | 40.00 | 40.20 | 1.567  | 1.575 | 1.583 |



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