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

## Product Summary

RoHS

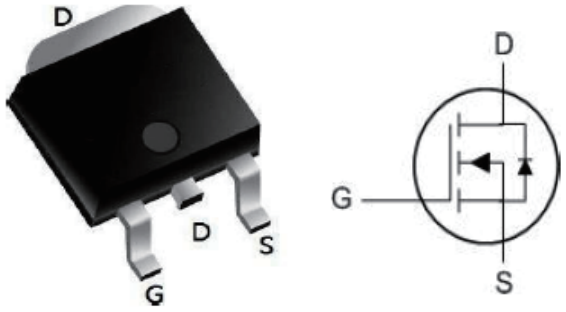
| BVDSS | RDSON | ID |
|---|---|---|
| 30V | 7.6mΩ | 50A |

## Description

The 50N03 is the high cell density trenched N-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The 50N03 meet the RoHS and Green Product, requirement 100% EAS guaranteed with full function reliability approved.

## TO252 Pin Configuration




## Absolute Maximum Ratings

| Symbol | Parameter | Rating | | Units |
|---|---|---|---|---|
| | | 10s | Steady State | |
| $V_{DS}$ | Drain-Source Voltage | 30 | | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | | V |
| $I_D$@$T_C$=25°C | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 50 | | A |
| $I_D$@$T_C$=100°C | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 26 | | A |
| $I_{DM}$ | Pulsed Drain Current[2] | 168 | | A |
| $E_{AS}$ | Single Pulse Avalanche Energy[3] | 33 | | mJ |
| $I_{AS}$ | Avalanche Current | 23.8 | | A |
| $P_D$@$T_C$=25°C | Total Power Dissipation[4] | 30.5 | | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 175 | | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 175 | | ℃ |

## Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance Junction-Case [1] | --- | 5.26 | °C/W |

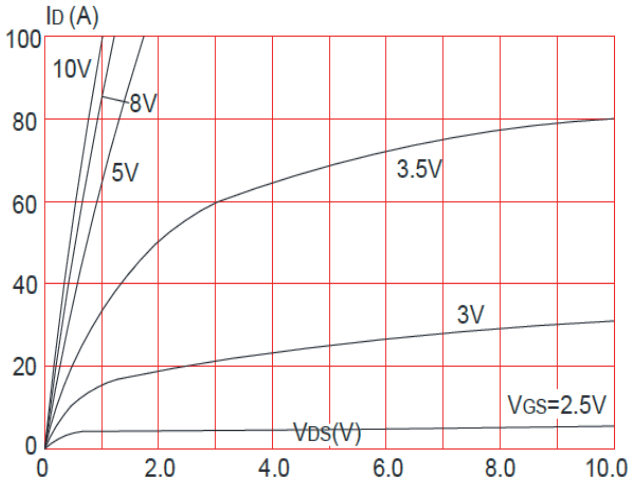
## Electrical Characteristics ($T_J$ =25 °C unless otherwise specified)

| Symbol | Parameter | Test condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **Off Characteristic** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V, $I_D$=250μA | 30 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ =30V, $V_{GS}$=0V, | - | - | 1 | μA |
| $I_{GSS}$ | Gate to Body Leakage Current | $V_{DS}$=0V, $V_{GS}$=±20V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 1 | 1.5 | 2.5 | V |
| $R_{DS(on)}$ | Static Drain-Source on-Resistance note3 | $V_{GS}$=10V, $I_D$=20A | - | 7.6 | 10 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=10A | - | 11.5 | 17 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=15V, $V_{GS}$=0V, f=1.0MHz | - | 1011 | - | pF |
| $C_{oss}$ | Output Capacitance | | - | 142 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 119 | - | pF |
| $Q_g$ | Total Gate Charge | $V_{DS}$=15V, $I_D$=20A, $V_{GS}$=10V | - | 19 | - | nC |
| $Q_{gs}$ | Gate-Source Charge | | - | 6.3 | - | nC |
| $Q_{gd}$ | Gate-Drain("Miller") Charge | | - | 4.5 | - | nC |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DS}$=30V,$I_D$=2A, $R_{GEN}$=3Ω, $V_{GS}$=10V | - | 6 | - | ns |
| $t_r$ | Turn-on Rise Time | | - | 5 | - | ns |
| $t_{d(off)}$ | Turn-off Delay Time | | - | 25 | - | ns |
| $t_f$ | Turn-off Fall Time | | - | 7 | - | ns |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| $I_S$ | Maximum Continuous Drain to Source Diode Forward Current | | - | - | 50 | A |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | 160 | A |
| $V_{SD}$ | Drain to Source Diode Forward Voltage | $V_{GS}$=0V, $I_S$=30A | - | - | 1.2 | V |
| trr | Body Diode Reverse Recovery Time | $I_F$=30A,dI/dt=100A/μs | - | 7 | - | ns |
| Qrr | Body Diode Reverse Recovery Charge | | - | 6.3 | - | nC |

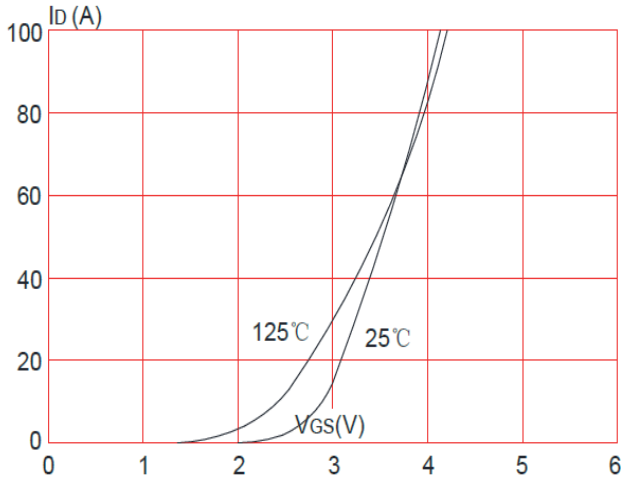
Note :
1.Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2.EAS condition: $T_J$=25°C, $V_{DD}$=15V, $V_G$=10V, $R_G$=25Ω, L=0.5mH, $I_{AS}$=11.5A
3.Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

## Typical Performance Characteristics

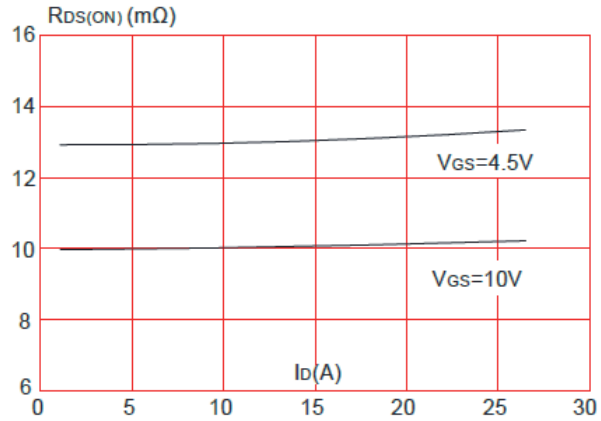
### Figure1: Output Characteristics



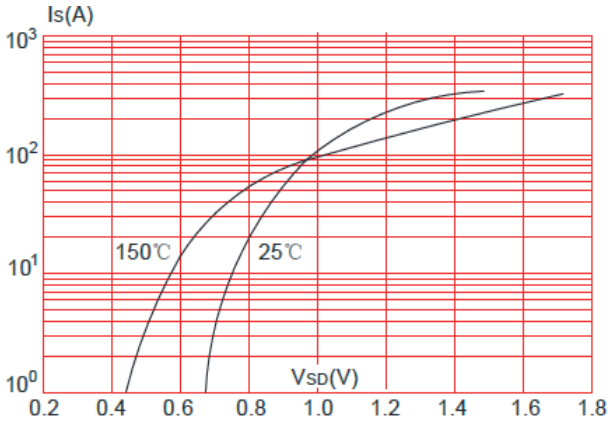

### Figure 2: Typical Transfer Characteristics



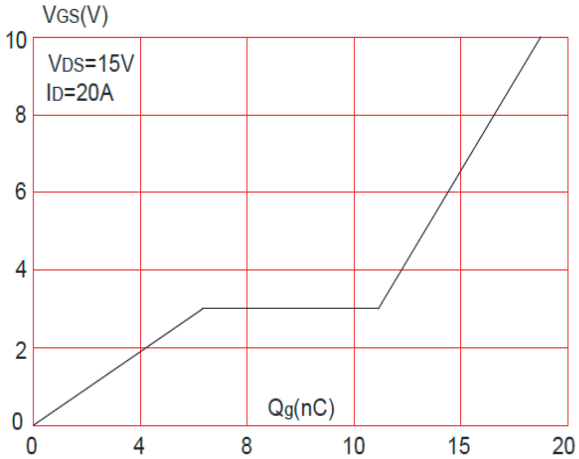

### Figure 3:On-resistance vs. Drain Current



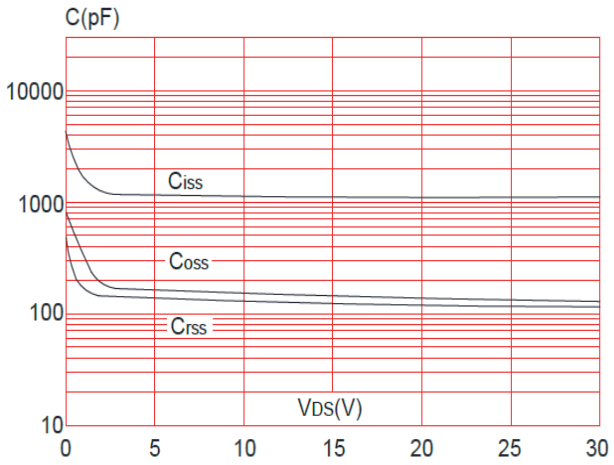

### Figure 4: Body Diode Characteristics




### Figure 5: Gate Charge Characteristics

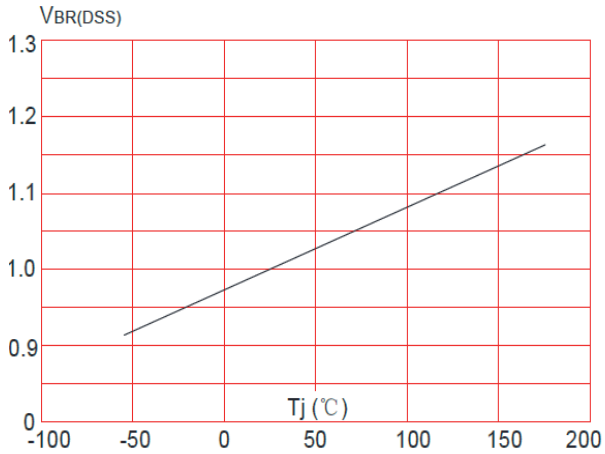



### Figure 6: Capacitance Characteristics

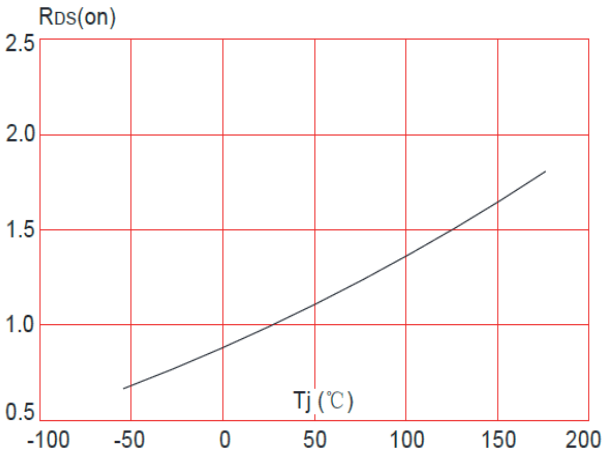


## Typical Performance Characteristics

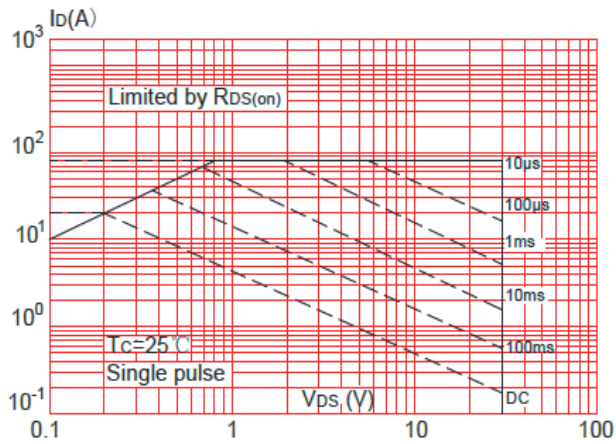
### Figure 7: Normalized Breakdown Voltage



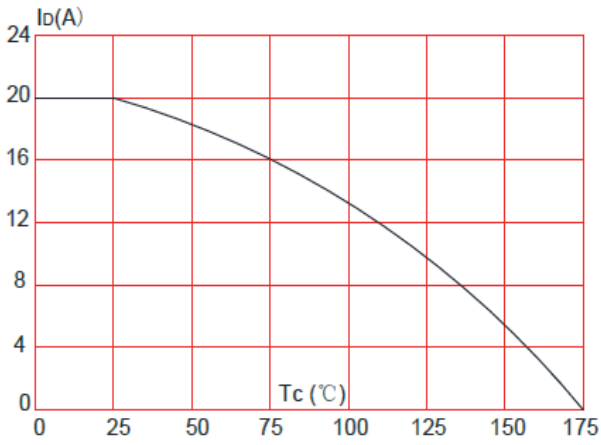

### Figure 8: Normalized on Resistance vs. Ju



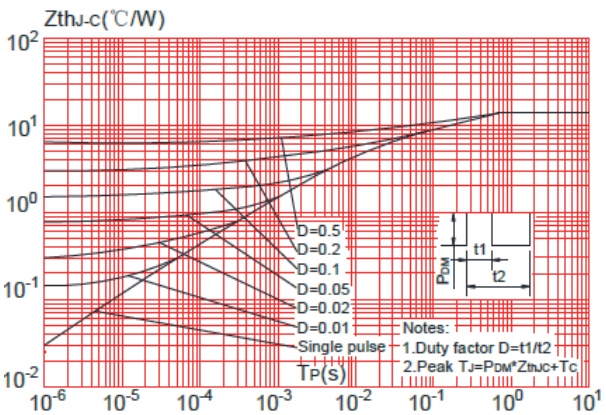

### Figure 9: Maximum Safe Operating Area




### FFigure 10: Maximum Continuous Drain C




### Figure.11: Maximum Effective Transient T



## Test Circuit

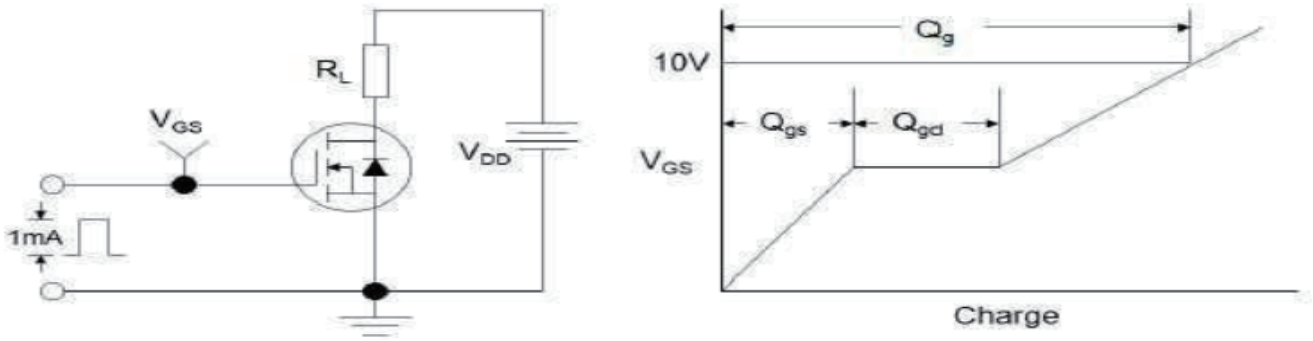



**Figure1:Gate Charge Test Circuit & Waveform**

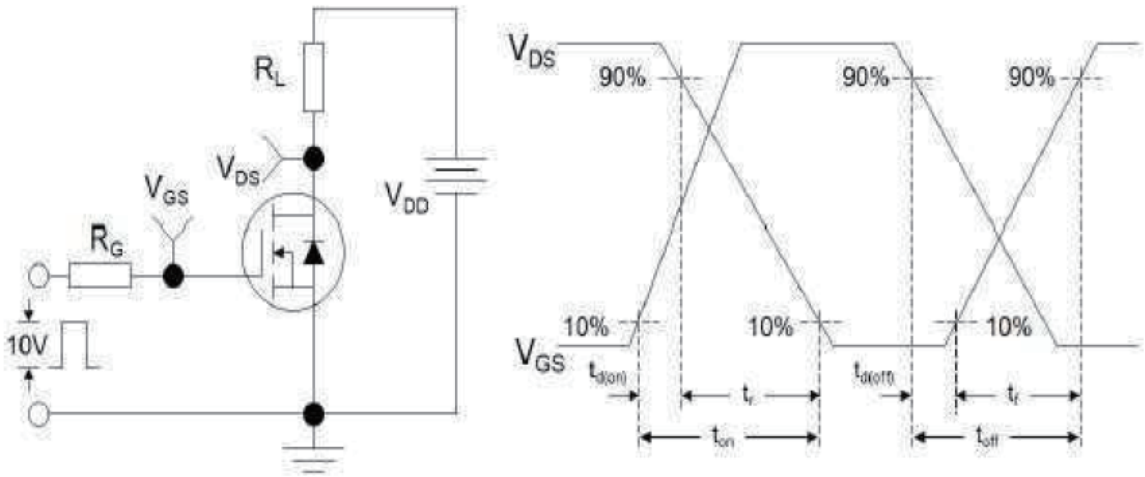



**Figure 2: Resistive Switching Test Circuit & Waveforms**

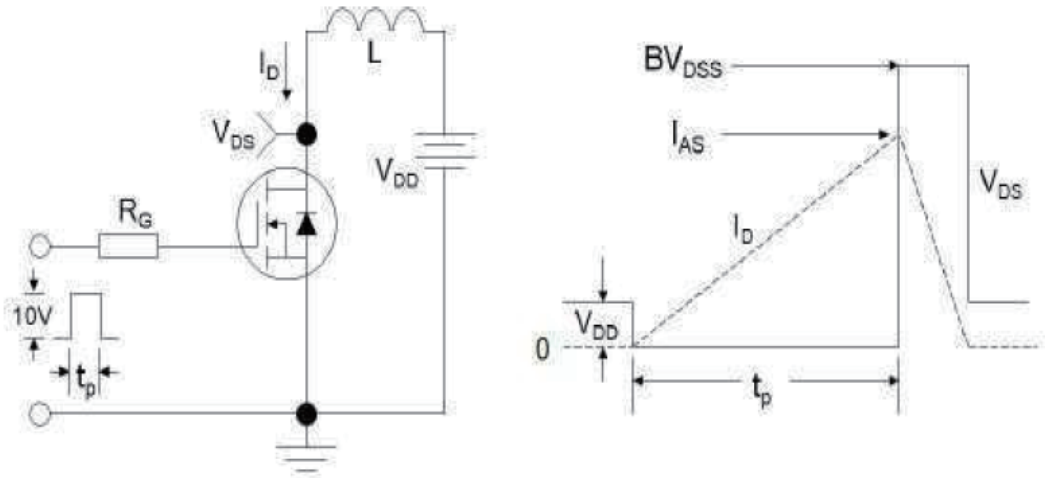
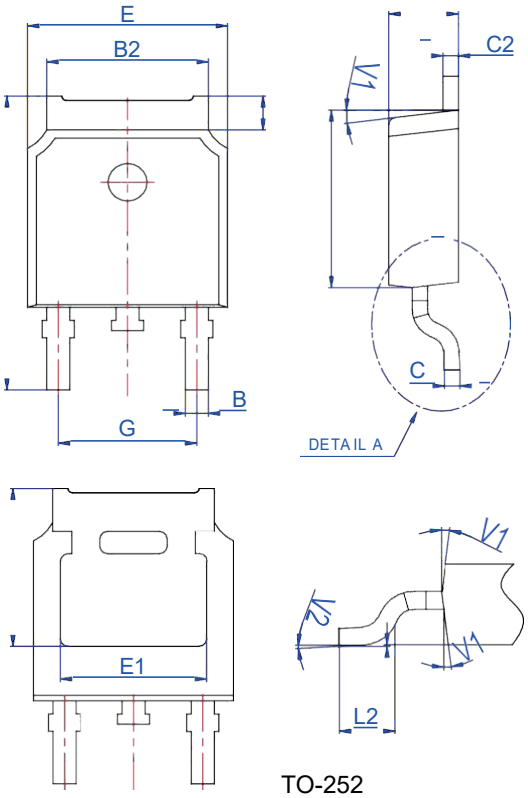



**Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms**

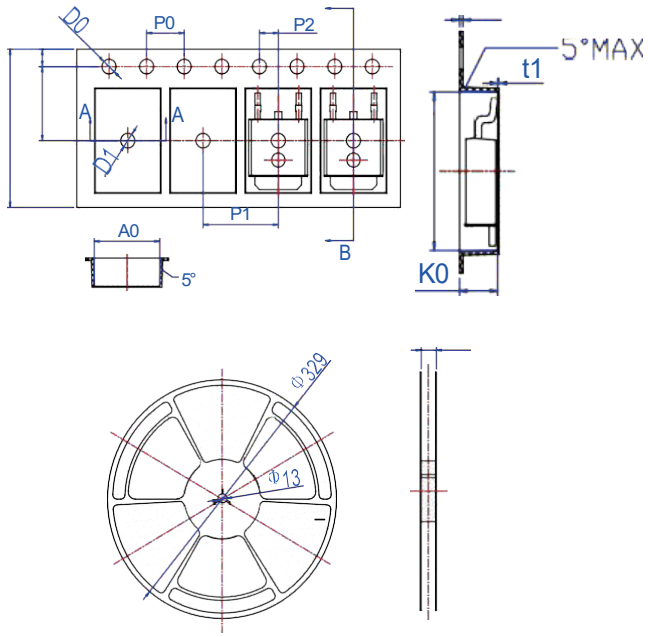
## Package Mechanical Data-TO-252-4R




TO-252

| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.1 | | 2.5 | 0.083 | | 0.098 |
| A2 | 0 | | 0.1 | 0 | | 0.004 |
| B | 0.66 | | 0.86 | 0.026 | | 0.034 |
| B2 | 5.18 | | 5.48 | 0.202 | | 0.216 |
| C | 0.4 | | 0.6 | 0.016 | | 0.024 |
| C2 | 0.44 | | 0.58 | 0.017 | | 0.023 |
| D | 5.9 | | 6.3 | 0.232 | | 0.248 |
| D1 | 5.30REF | | | 0.209REF | | |
| E | 6.4 | | 6.8 | 0.252 | | 0.268 |
| E1 | 4.63 | | | 0.182 | | |
| G | 4.47 | | 4.67 | 0.176 | | 0.184 |
| H | 9.5 | | 10.7 | 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 Spectification-TO-252-4R




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| W | 15.9 | 16 | 16.1 | 0.626 | 0.63 | 0.634 |
| E | 1.65 | 1.75 | 1.85 | 0.065 | 0.069 | 0.073 |
| F | 7.4 | 7.5 | 7.6 | 0.291 | 0.295 | 0.299 |
| D0 | 1.4 | 1.5 | 1.6 | 0.055 | 0.059 | 0.063 |
| D1 | 1.4 | 1.5 | 1.6 | 0.055 | 0.059 | 0.063 |
| P0 | 3.9 | 4 | 4.1 | 0.154 | 0.157 | 0.161 |
| P1 | 7.9 | 8 | 8.1 | 0.311 | 0.315 | 0.319 |
| P2 | 1.9 | 2 | 2.1 | 0.075 | 0.079 | 0.083 |
| A0 | 6.85 | 6.9 | 7 | 0.27 | 0.271 | 0.276 |
| B0 | 10.45 | 10.5 | 10.6 | 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 | 0.1 | | | 0.004 | | |
| 10P0 | 39.8 | 40 | 40.2 | 1.567 | 1.575 | 1.583 |

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