



Description

JMTK50P02A

JMT P-channel MOSFET

Features

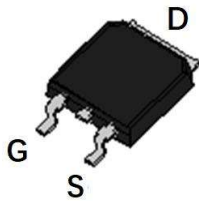
- $V_{DS} = -20V$ ,  $I_D = -60A$   
 $R_{DS(ON)} < 8.5m\Omega$  @  $V_{GS} = -4.5V$   
 $R_{DS(ON)} < 12m\Omega$  @  $V_{GS} = -2.5V$
- High Power and Current Handling Capability
- Lead Free Product is Acquired
- Surface Mount Package

Application

- PWM Applications
- Load Switch



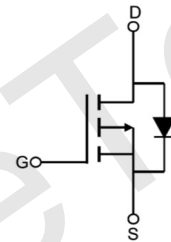
100% UIS TESTED!  
100%  $\Delta V_{ds}$  TESTED!



TO-252(DPAK) top view



Marking and pin Assignment



Schematic Diagram

Package Marking and Ordering Information

| Device Marking | Device     | OUTLINE | Device Package | Reel Size | Reel (PCS) | Per Carton (PCS) |
|----------------|------------|---------|----------------|-----------|------------|------------------|
| JMTK50P02A     | JMTK50P02A | TAPING  | TO-252         | 13inch    | 2500       | 25,000           |

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

| Symbol          | Parameter                               | Max.                | Units        |
|-----------------|---|---------------------|--------------|
| $V_{DSS}$       | Drain-Source Voltage                    | -20                 | V            |
| $V_{GSS}$       | Gate-Source Voltage                     | $\pm 12$            | V            |
| $I_D$           | Continuous Drain Current                | $T_C = 25^\circ C$  | -60          |
|                 |   | $T_C = 100^\circ C$ | -39          |
| $I_{DM}$        | Pulsed Drain Current <sup>note1</sup>   | -240                | A            |
| $P_D$           | Power Dissipation                       | 70                  | W            |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Ambient | 2.1                 | $^\circ C/W$ |
| $T_J, T_{STG}$  | Operating and Storage Temperature Range | -55 to +175         | $^\circ C$   |

TEL: +86-0755-27595155 27595165

FAX: +86-0755-27594792

WEB: <http://www.ChipSourceTek.com>

E-mail: [Tony.Wang@ChipSourceTek.com](mailto:Tony.Wang@ChipSourceTek.com) [InFo@ChipSourceTek.com](mailto:InFo@ChipSourceTek.com)



## Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise specified)

## JMTK50P02A

| Symbol  | Parameter   | Test Condition   | Min.  | Typ.  | Max. | Units |
|---|---|--|-------|-------|------|-------|
| <b>Off Characteristic</b>                                     |   |  |       |       |      |       |
| V <sub>(BR)DSS</sub>  | Drain-Source Breakdown Voltage                            | V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA   | -20   | -     | -    | V     |
| I <sub>DSS</sub>  | Zero Gate Voltage Drain Current                           | V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V,  | -     | -     | -1   | μA    |
| I <sub>GSS</sub>  | Gate to Body Leakage Current                              | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±12V  | -     | -     | ±100 | nA    |
| <b>On Characteristics</b>                                     |   |  |       |       |      |       |
| V <sub>GS(th)</sub>   | Gate Threshold Voltage                                    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                      | -0.35 | -0.65 | -1.0 | V     |
| R <sub>DS(on)</sub>   | Static Drain-Source on-Resistance<br><small>note3</small> | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-15A   | -     | 6.6   | 8.5  | mΩ    |
|   |   | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-12A   | -     | 8     | 12   |       |
| <b>Dynamic Characteristics</b>                                |   |  |       |       |      |       |
| C <sub>iss</sub>  | Input Capacitance   | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V,<br>f = 1.0MHz  | -     | 4590  | -    | pF    |
| C <sub>oss</sub>  | Output Capacitance  |  | -     | 505   | -    | pF    |
| C <sub>rss</sub>  | Reverse Transfer Capacitance                              |  | -     | 440   | -    | pF    |
| Q <sub>g</sub>  | Total Gate Charge   | V <sub>DS</sub> =-10V, I <sub>D</sub> =-15A,<br>V <sub>GS</sub> =-4.5V                           | -     | 46    | -    | nC    |
| Q <sub>gs</sub>   | Gate-Source Charge  |  | -     | 7.3   | -    | nC    |
| Q <sub>gd</sub>   | Gate-Drain("Miller") Charge                               |  | -     | 10    | -    | nC    |
| <b>Switching Characteristics</b>                              |   |  |       |       |      |       |
| t <sub>d(on)</sub>  | Turn-on Delay Time  | V <sub>DD</sub> =-10V, I <sub>D</sub> =-14A,<br>R <sub>GEN</sub> =2.7Ω,<br>V <sub>GS</sub> =-10V | -     | 8     | -    | ns    |
| t <sub>r</sub>  | Turn-on Rise Time   |  | -     | 59    | -    | ns    |
| t <sub>d(off)</sub>   | Turn-off Delay Time                                       |  | -     | 111   | -    | ns    |
| t <sub>f</sub>  | Turn-off Fall Time  |  | -     | 43    | -    | ns    |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b> |   |  |       |       |      |       |
| I <sub>S</sub>  | Maximum Continuous Drain to Source Diode Forward Current  |  | -     | -     | -60  | A     |
| I <sub>SM</sub>   | Maximum Pulsed Drain to Source Diode Forward Current      |  | -     | -     | -240 | A     |
| V <sub>SD</sub>   | Drain to Source Diode Forward Voltage                     | V <sub>GS</sub> = 0V, I <sub>S</sub> =-20A   | -     | -     | -1.2 | V     |
| trr   | Reverse Recovery Time                                     | T <sub>J</sub> =25°C, I <sub>SD</sub> =-15A,   | -     | 18    | -    | ns    |
| Qrr   | Reverse Recovery Charge                                   | V <sub>GS</sub> =0V<br>di/dt=-100A/μs  | -     | 7.7   | -    | nC    |

- Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature  
 2. EAS condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=-10V, V<sub>G</sub>=-10V, R<sub>G</sub>=5.9Ω, L=0.5mh, I<sub>AS</sub>=-13.2A  
 3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%



## Typical Performance Characteristics

## JMTK50P02A

Figure 1: Output Characteristics

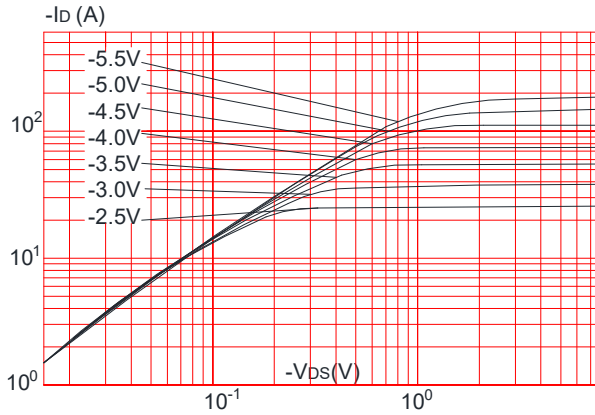


Figure 2: Typical Transfer Characteristics

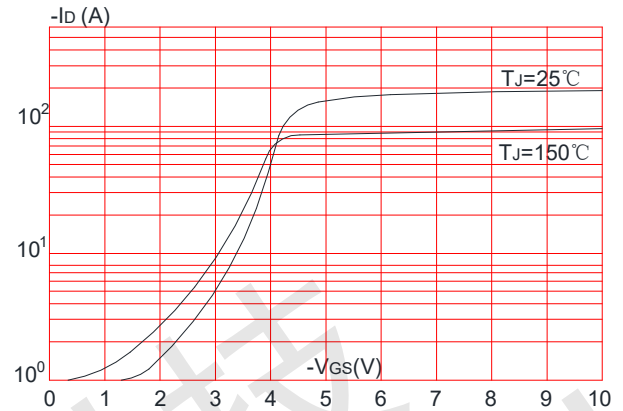


Figure 3: On-resistance vs. Drain Current

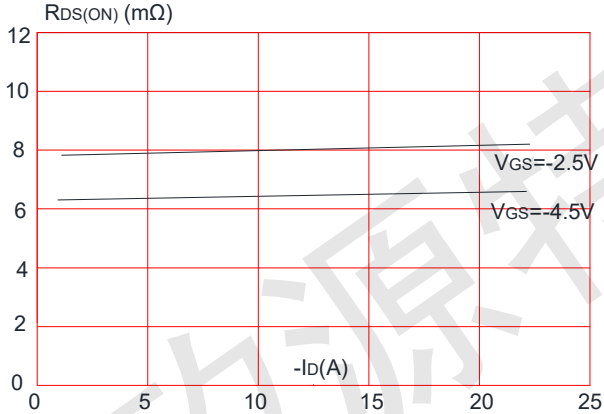


Figure 4: Body Diode Characteristics

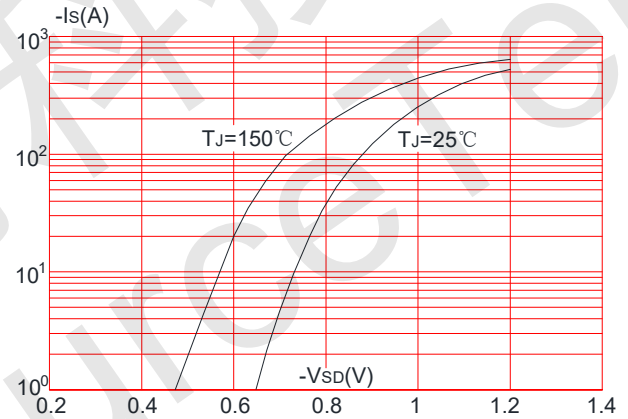


Figure 5: Gate Charge Characteristics

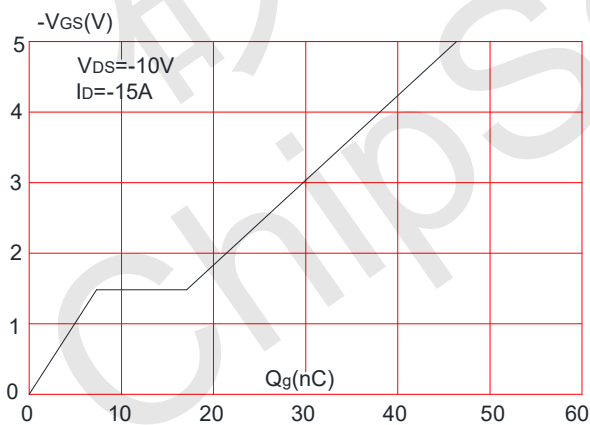
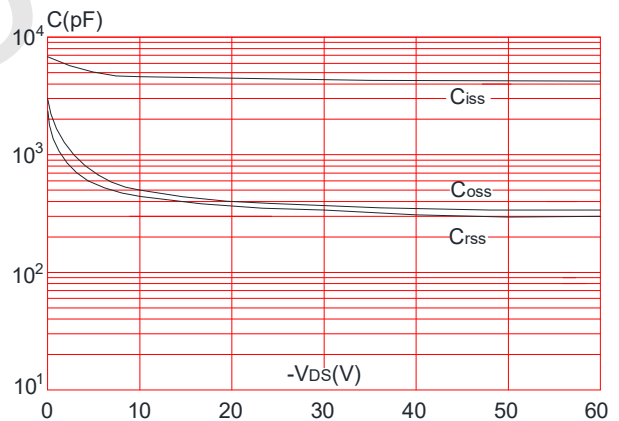
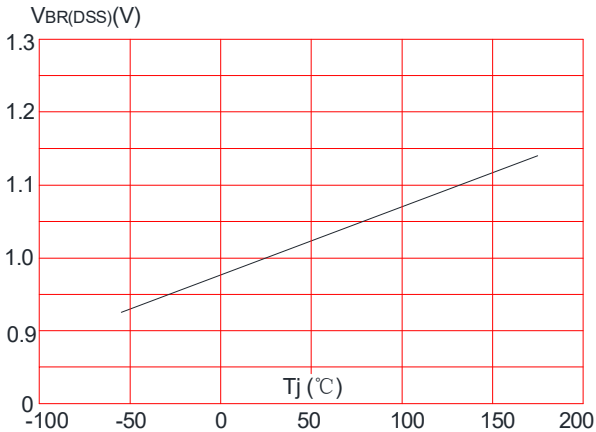


Figure 6: Capacitance Characteristics

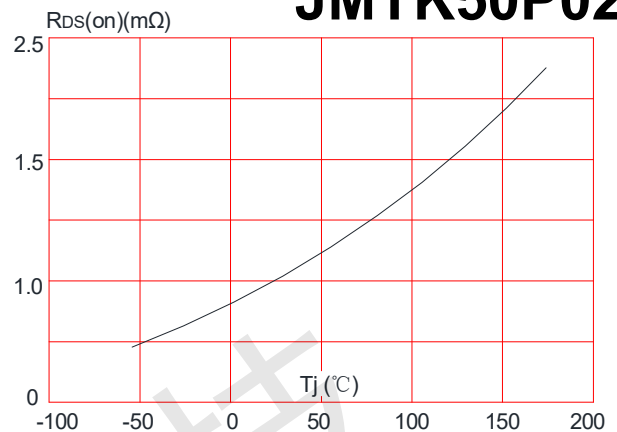




**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature

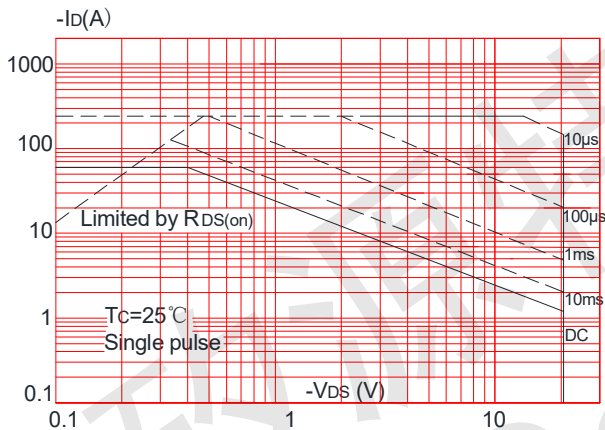


**Figure 8:** Normalized on Resistance vs. Junction Temperature

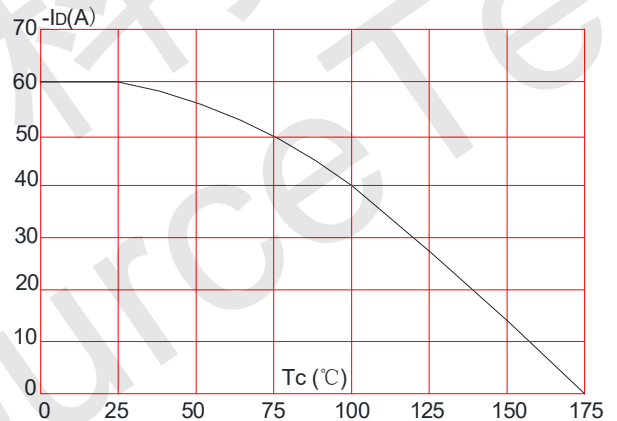


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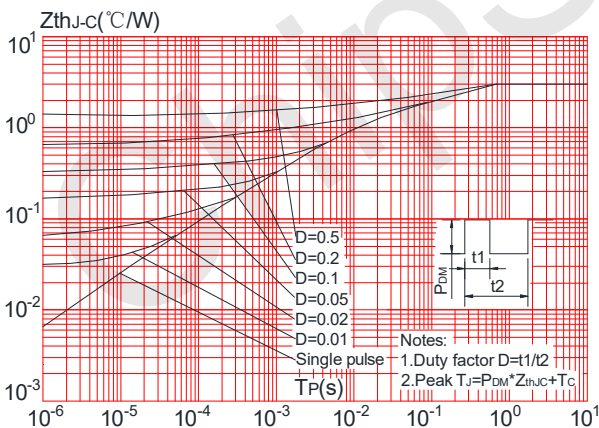
**Figure 9:** Maximum Safe Operating Area



**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature



**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case



## Test Circuit

TEL: +86-0755-27595155 27595165

FAX: +86-0755-27594792

WEB: [Http://www.ChipSourceTek.com](http://www.ChipSourceTek.com)

E-mail: [Tony.Wang@ChipSourceTek.com](mailto:Tony.Wang@ChipSourceTek.com) [InFo@ChipSourceTek.com](mailto:InFo@ChipSourceTek.com)



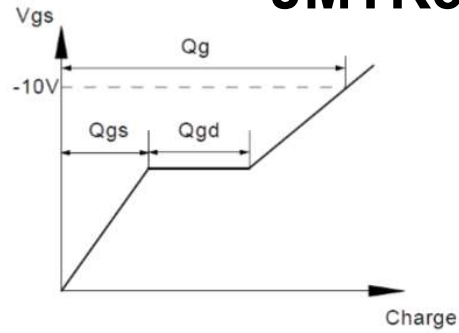
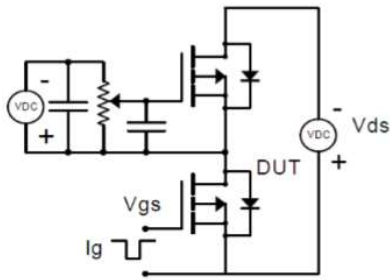
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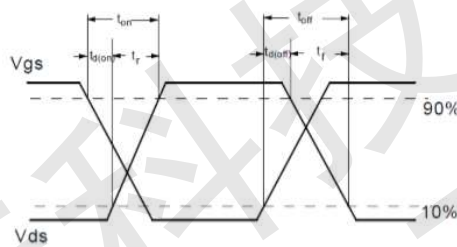
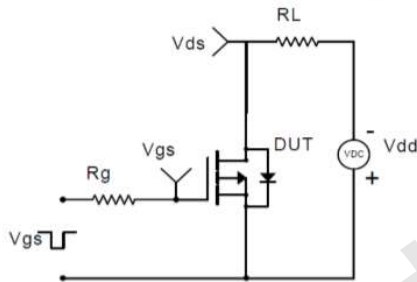
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Gate Charge Test Circuit & Waveform

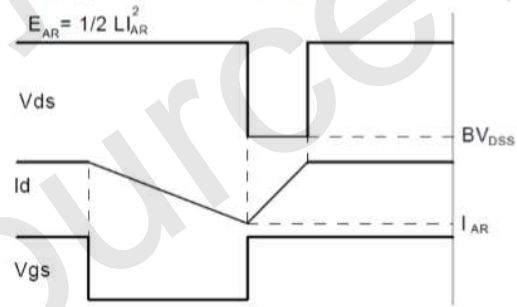
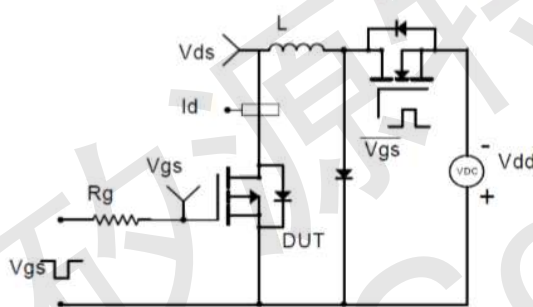
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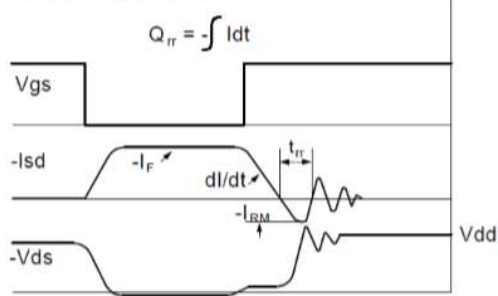
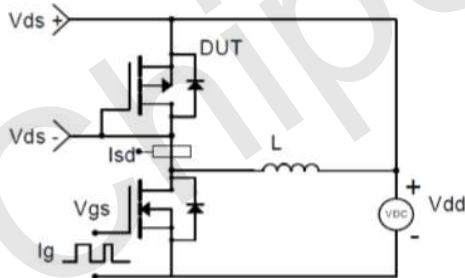
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## Package Mechanical Data

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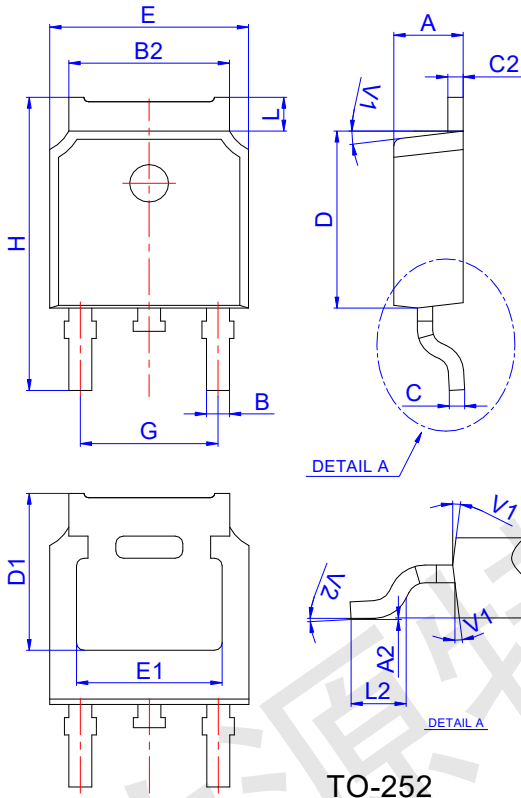
FAX: +86-0755-27594792

WEB: [Http://www.ChipSourceTek.com](http://www.ChipSourceTek.com)

E-mail: [Tony.Wang@ChipSourceTek.com](mailto:Tony.Wang@ChipSourceTek.com) [InFo@ChipSourceTek.com](mailto:InFo@ChipSourceTek.com)

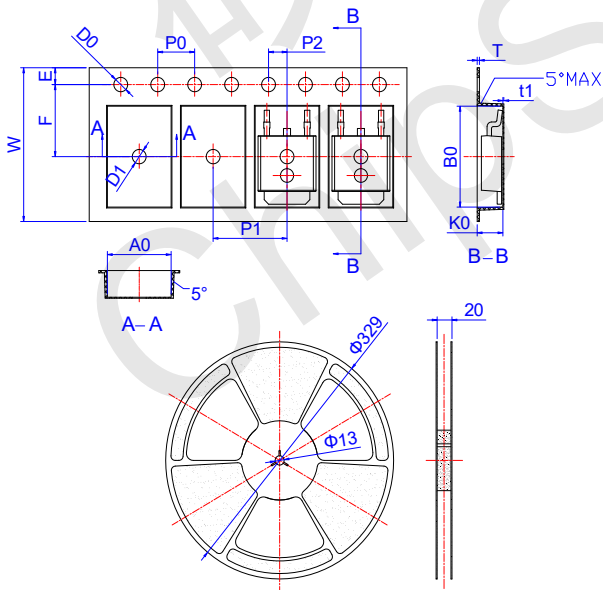


# JMTK50P02A



| 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 |





深圳市矽源特科技有限公司

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TEL: +86-0755-27595155 27595165

FAX: +86-0755-27594792

WEB: [Http://www.ChipSourceTek.com](http://www.ChipSourceTek.com)

E-mail: [Tony.Wang@ChipSourceTek.com](mailto:Tony.Wang@ChipSourceTek.com) [InFo@ChipSourceTek.com](mailto:InFo@ChipSourceTek.com)