

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

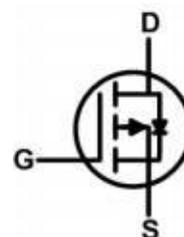
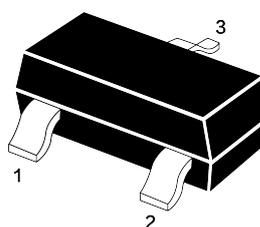
### Description

The JH20P09L is the high cell density trenched P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications. The JH20P09L meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

### Product Summary

| BVDSS | RDSON | ID  |
|-------|-------|-----|
| -20V  | 13mΩ  | -9A |

### SOT-23-3L Pin Configuration



### Absolute Maximum Ratings (T<sub>A</sub> = 25°C, unless otherwise noted)

| Parameter  |                        | Symbol                            | Value      | Unit |
|--|------------------------|-----------------------------------|------------|------|
| Drain-Source Voltage                             |                        | V <sub>DS</sub>                   | -20        | V    |
| Gate-Source Voltage                              |                        | V <sub>GS</sub>                   | ±12        | V    |
| Continuous Drain Current                         | T <sub>A</sub> = 25°C  | I <sub>D</sub>                    | -9         | A    |
|  | T <sub>A</sub> = 100°C |                                   | -4         |      |
| Pulsed Drain Current <sup>1</sup>                |                        | I <sub>DM</sub>                   | -66        | A    |
| Single Pulse Avalanche Energy <sup>2</sup>       |                        | EAS                               | 28.8       | mJ   |
| Total Power Dissipation                          | T <sub>A</sub> = 25°C  | P <sub>D</sub>                    | 30         | W    |
| Operating Junction and Storage Temperature Range |                        | T <sub>J</sub> , T <sub>STG</sub> | -55 to 150 | °C   |

### Thermal Characteristics

| Parameter  | Symbol           | Value | Unit |
|--|------------------|-------|------|
| Thermal Resistance from Junction-to-Ambient <sup>3</sup> | R <sub>θJA</sub> | 41.6  | °C/W |

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

| Parameter                                      | Symbol                 | Test Conditions   | Min. | Typ.  | Max. | Unit |
|--|------------------------|---|------|-------|------|------|
| <b>Static Characteristics</b>                  |                        |   |      |       |      |      |
| Drain-Source Breakdown Voltage                 | V <sub>(BR)DSS</sub>   | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA   | -20  | -     | -    | V    |
| Gate-body Leakage current                      | I <sub>GSS</sub>       | V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±12V  | -    | -     | ±100 | nA   |
| Zero Gate Voltage Drain Current                | T <sub>J</sub> = 25°C  | V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V  | -    | -     | -1   | μA   |
|  | T <sub>J</sub> = 100°C |   | -    | -     | -100 |      |
| Gate-Threshold Voltage                         | V <sub>GS(th)</sub>    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                   | -0.4 | -0.65 | -1   | V    |
| Drain-Source On-Resistance <sup>4</sup>        | R <sub>DS(on)</sub>    | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -8A   | -    | 13.0  | 18   | mΩ   |
|  |                        | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -6A   | -    | 17    | 23   |      |
| Forward Transconductance <sup>4</sup>          | g <sub>fs</sub>        | V <sub>DS</sub> = -4.5V, I <sub>D</sub> = -8A   | -    | 36    | -    | S    |
| <b>Dynamic Characteristics<sup>5</sup></b>     |                        |   |      |       |      |      |
| Input Capacitance                              | C <sub>iss</sub>       | V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V,<br>f = 1MHz                                     | -    | 1630  | -    | pF   |
| Output Capacitance                             | C <sub>oss</sub>       |   | -    | 211   | -    |      |
| Reverse Transfer Capacitance                   | C <sub>rss</sub>       |   | -    | 187   | -    |      |
| Gate Resistance                                | R <sub>g</sub>         | f = 1MHz  | -    | 10    | -    | Ω    |
| <b>Switching Characteristics<sup>5</sup></b>   |                        |   |      |       |      |      |
| Total Gate Charge                              | Q <sub>g</sub>         | V <sub>GS</sub> = -4.5V, V <sub>DS</sub> = -10V,<br>I <sub>D</sub> = -8A                      | -    | 12    | -    | nC   |
| Gate-Source Charge                             | Q <sub>gs</sub>        |   | -    | 1.8   | -    |      |
| Gate-Drain Charge                              | Q <sub>gd</sub>        |   | -    | 3.2   | -    |      |
| Turn-On Delay Time                             | t <sub>d(on)</sub>     | V <sub>GS</sub> = -4.5V, V <sub>DD</sub> = -10V,<br>R <sub>G</sub> = 3Ω, I <sub>D</sub> = -8A | -    | 17    | -    | ns   |
| Rise Time                                      | t <sub>r</sub>         |   | -    | 25.5  | -    |      |
| Turn-Off Delay Time                            | t <sub>d(off)</sub>    |   | -    | 32    | -    |      |
| Fall Time                                      | t <sub>f</sub>         |   | -    | 15    | -    |      |
| <b>Drain-Source Body Diode Characteristics</b> |                        |   |      |       |      |      |
| Diode Forward Voltage <sup>4</sup>             | V <sub>SD</sub>        | I <sub>S</sub> = -8A, V <sub>GS</sub> = 0V  | -    | -     | -1.2 | V    |
| Continuous Source Current                      | I <sub>S</sub>         | T <sub>A</sub> = 25°C   | -    | -     | -40  | A    |

Notes:

1. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C.
2. The EAS data shows Max. rating . The test condition is V<sub>DD</sub>= -25V, V<sub>GS</sub>= -10V, L= 0.1mH, I<sub>AS</sub>= -24A
3. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
5. This value is guaranteed by design hence it is not included in the production test..

## Typical Characteristics

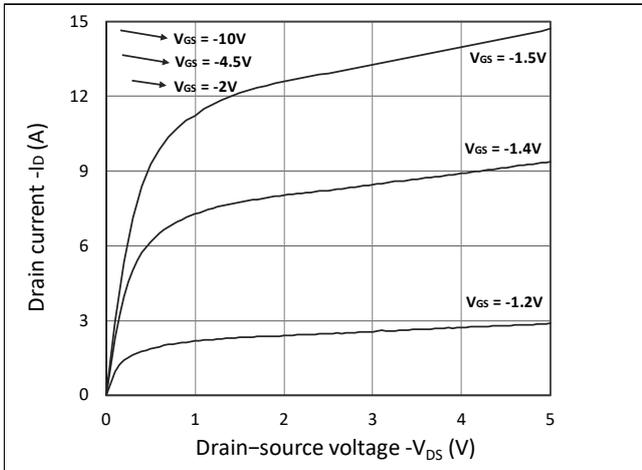


Figure 1. Output Characteristics

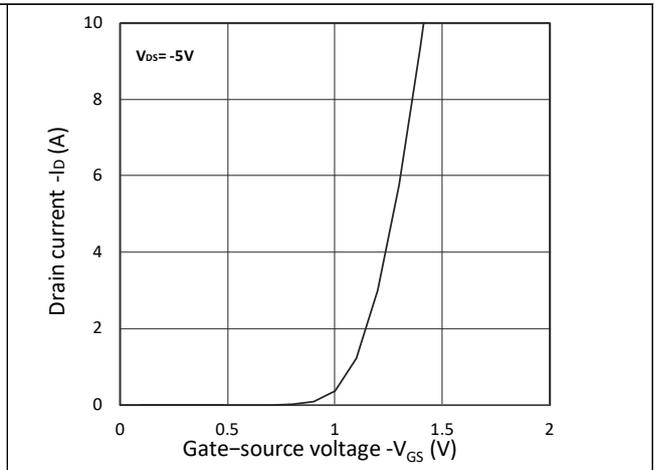


Figure 2. Transfer Characteristics

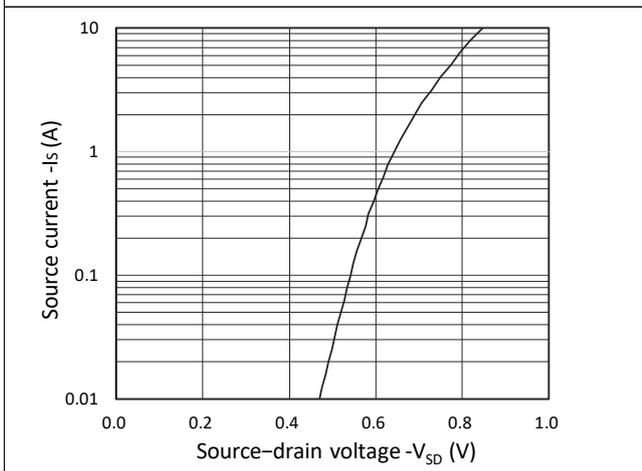


Figure 3. Forward Characteristics of Reverse

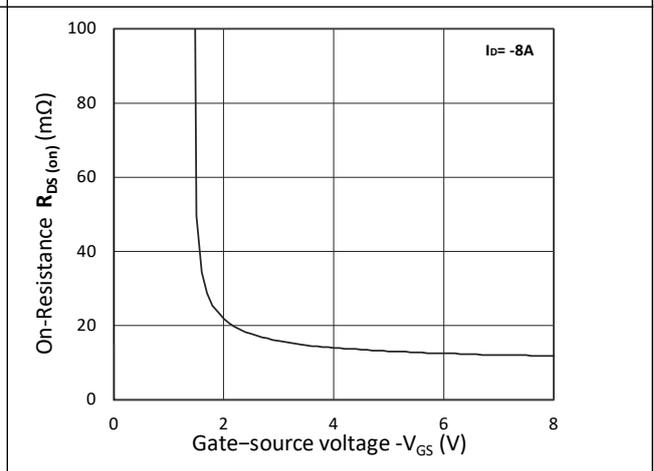


Figure 4.  $R_{DS(ON)}$  vs.  $V_{GS}$

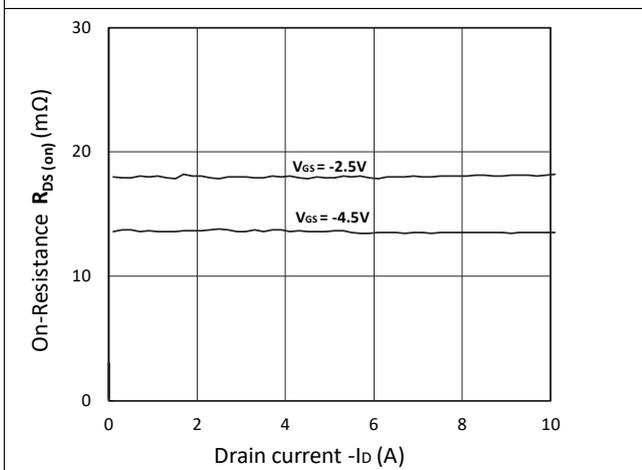


Figure 5.  $R_{DS(ON)}$  vs.  $I_D$

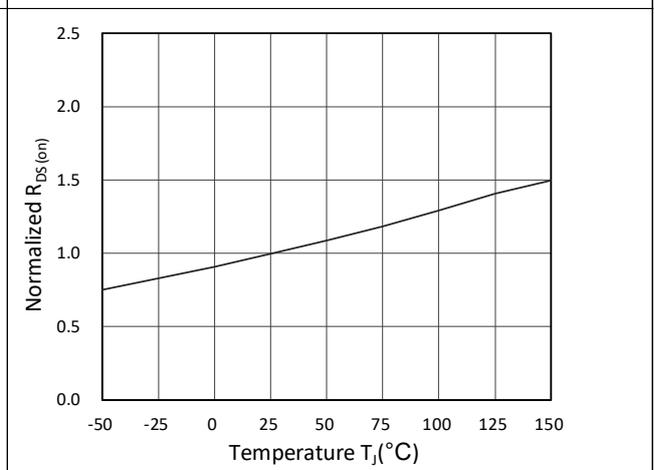


Figure 6. Normalized  $R_{DS(ON)}$  vs. Temperature

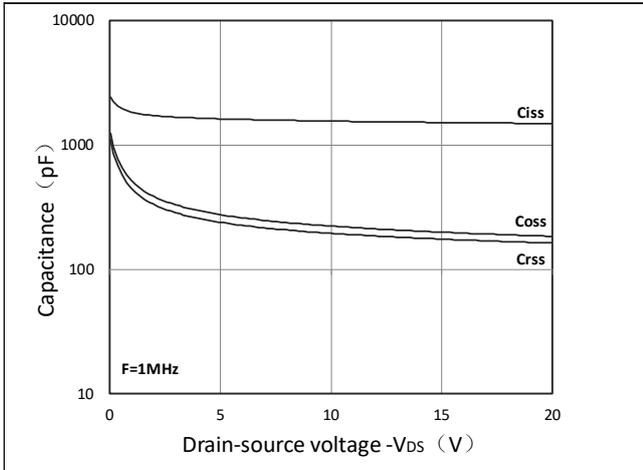


Figure 7. Capacitance Characteristics

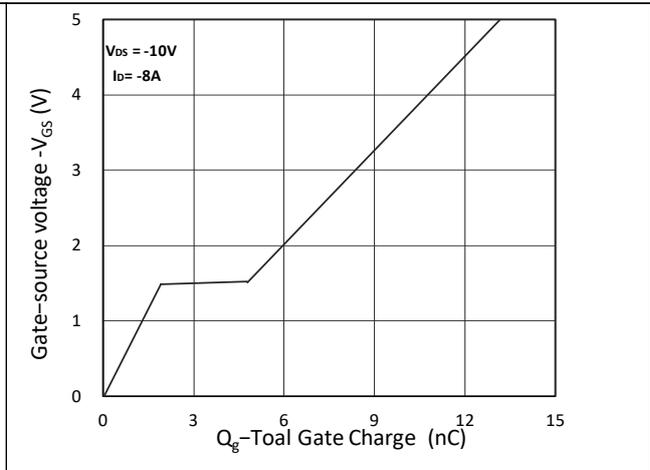


Figure 8. Gate Charge Characteristics

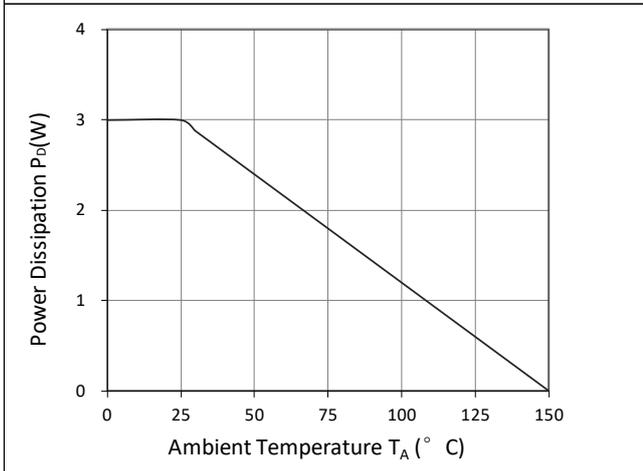


Figure 9. Power Dissipation

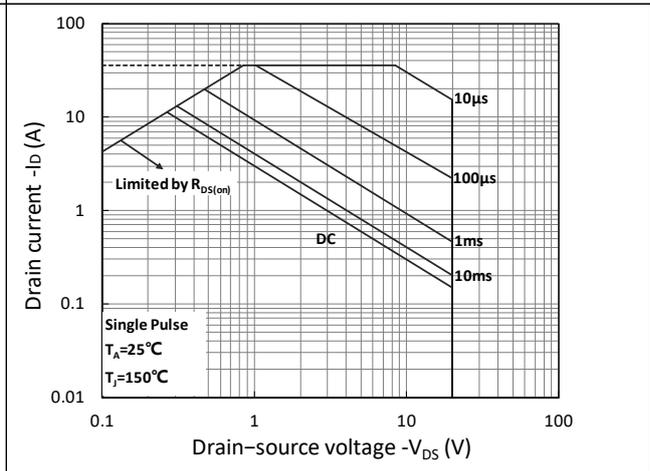


Figure 10. Safe Operating Area

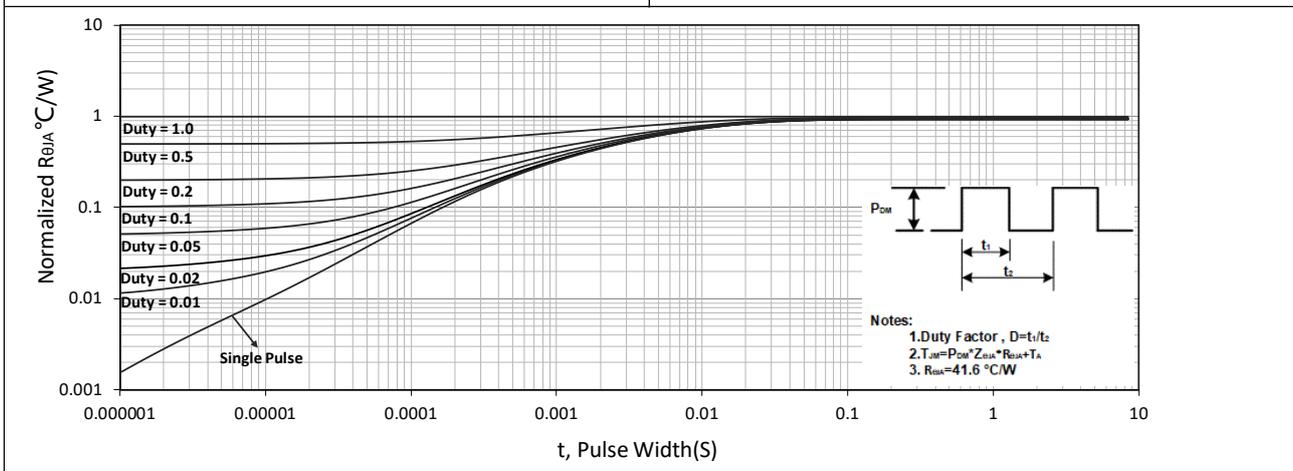
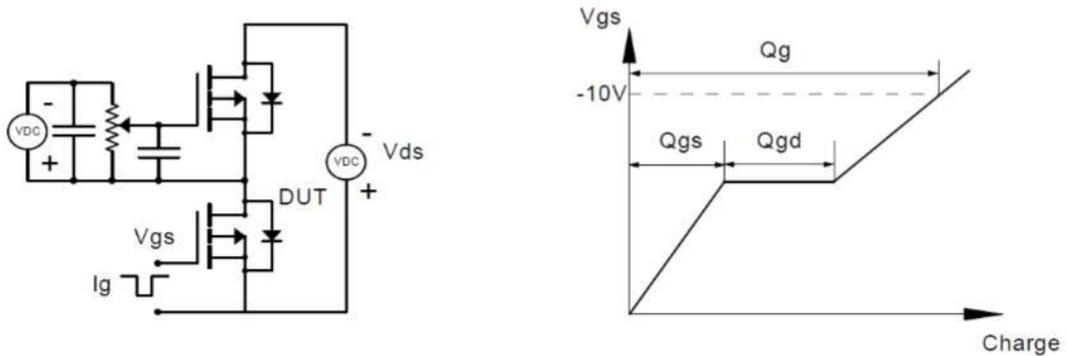


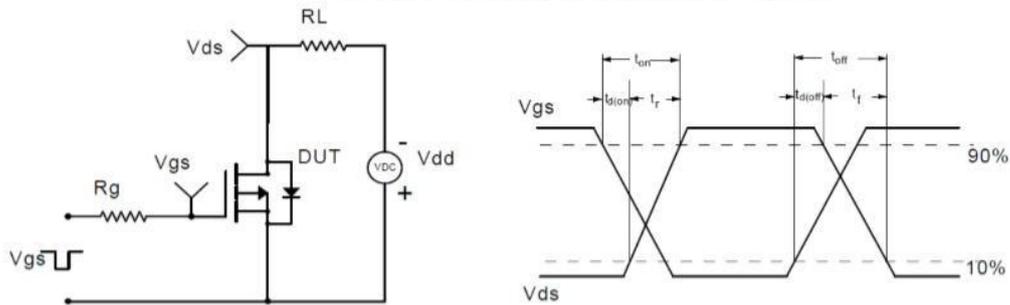
Figure 11. Normalized Maximum Transient Thermal Impedance

## Test Circuit

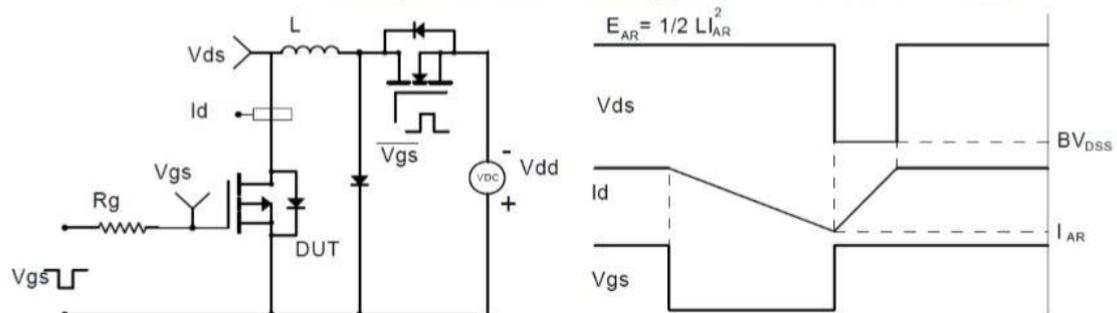
### Gate Charge Test Circuit & Waveform



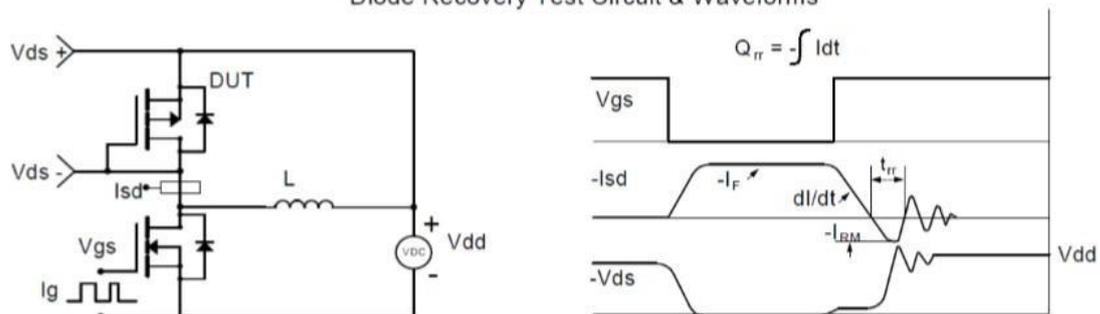
### Resistive Switching Test Circuit & Waveforms



### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

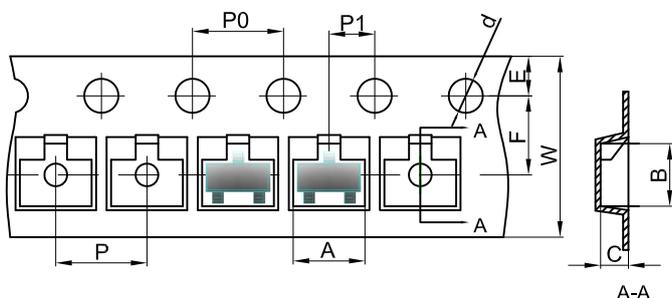


### Diode Recovery Test Circuit & Waveforms



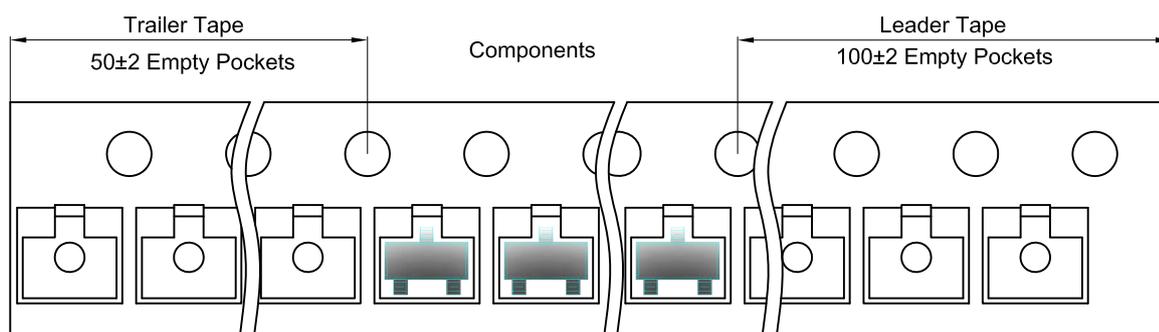
## SOT-23-3L Tape and Reel

### SOT-23-3L Embossed Carrier Tape

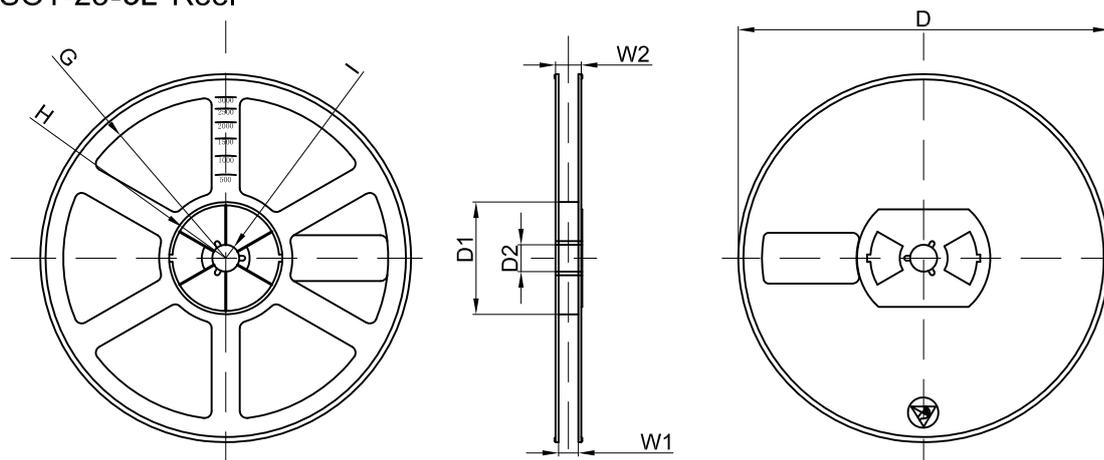


| Dimensions are in millimeter |      |      |      |       |      |      |      |      |      |      |
|------------------------------|------|------|------|-------|------|------|------|------|------|------|
| Pkg type                     | A    | B    | C    | d     | E    | F    | P0   | P    | P1   | W    |
| SOT-23                       | 3.15 | 2.77 | 1.22 | Ø1.50 | 1.75 | 3.50 | 4.00 | 4.00 | 2.00 | 8.00 |

### SOT-23-3L Tape Leader and Trailer

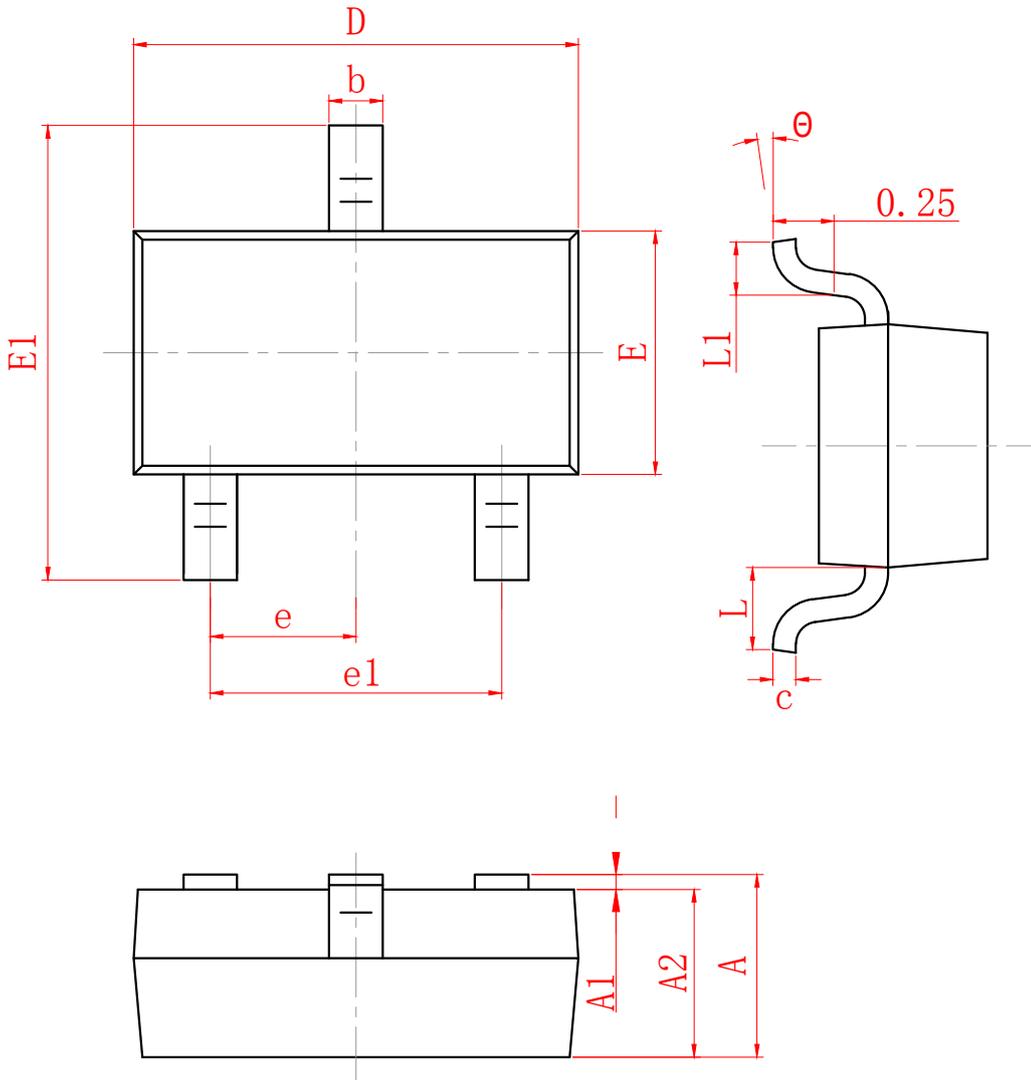


### SOT-23-3L Reel



| Dimensions are in millimeter |         |       |       |        |        |       |      |       |
|------------------------------|---------|-------|-------|--------|--------|-------|------|-------|
| Reel Option                  | D       | D1    | D2    | G      | H      | I     | W1   | W2    |
| 7" Dia                       | Ø178.00 | 54.40 | 13.00 | R78.00 | R25.60 | R6.50 | 9.50 | 12.30 |

| REEL     | Reel Size | Box        | Box Size(mm) | Carton      | Carton Size(mm) | G.W.(kg) |
|----------|-----------|------------|--------------|-------------|-----------------|----------|
| 3000 pcs | 7 inch    | 45,000 pcs | 203×203×195  | 180,000 pcs | 438×438×220     |          |



| SYMBOL   | MILLIMETER |       |
|----------|------------|-------|
|          | MIN        | MAX   |
| A        | 0.900      | 1.150 |
| A1       | 0.000      | 0.100 |
| A2       | 0.900      | 1.050 |
| b        | 0.300      | 0.500 |
| c        | 0.080      | 0.150 |
| D        | 2.800      | 3.000 |
| E        | 1.200      | 1.400 |
| E1       | 2.250      | 2.550 |
| e        | 0.950 TYP  |       |
| e1       | 1.800      | 2.000 |
| L        | 0.550 REF  |       |
| L1       | 0.300      | 0.500 |
| $\theta$ | 0°         | 8°    |

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