



## TM10N06SI

## N-Channel Enhancement Mosfet

### General Description

- Low  $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

### Applications

- Load switch
- PWM

### General Features

$V_{DS}=60V$   $I_D=10A$

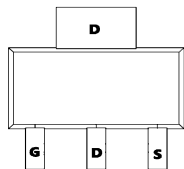
$R_{DS(ON)} = 40m\Omega$  (Typ.) @  $V_{GS}=10V$

100% UIS Tested

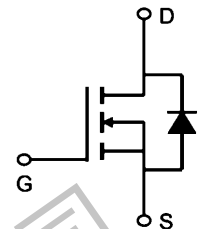
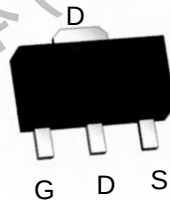
100%  $R_g$  Tested



SI:SOT-89-3L



Marking: 10N06



### Absolute Maximum Ratings ( $T_C = 25^\circ C$ Unless Otherwise Noted)

| Symbol                | Parameter                                  | Rating     | Units      |
|-----------------------|--------------------------------------------|------------|------------|
| $V_{DS}$              | Drain-Source Voltage                       | 60         | V          |
| $V_{GS}$              | Gate-Source Voltage                        | $\pm 20$   | V          |
| $I_D@T_C=25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V^1$ | 10         | A          |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^1$ | 6.8        | A          |
| $I_{DM}$              | Pulsed Drain Current <sup>2</sup>          | 37         | A          |
| EAS                   | Single Pulse Avalanche Energy <sup>3</sup> | 6.3        | mJ         |
| $P_D$                 | Total Power Dissipation <sup>3</sup>       | 4          | W          |
| $T_{STG}$             | Storage Temperature Range                  | -55 to 175 | $^\circ C$ |
| $T_J$                 | Operating Junction Temperature Range       | -55 to 175 | $^\circ C$ |

### Thermal Data

| Symbol          | Parameter                                        | Typ. | Max. | Unit         |
|-----------------|--------------------------------------------------|------|------|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient <sup>1</sup> | ---  | 62   | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 6.6  | $^\circ C/W$ |

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

| Symbol                                                 | Parameter                                                | Test Condition                                                                                               | Min. | Typ. | Max. | Units |
|--------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------|------|------|-------|
| Off Characteristic                                     |                                                          |                                                                                                              |      |      |      |       |
| V <sub>(BR)DSS</sub>                                   | Drain-Source Breakdown Voltage                           | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                                                   | 60   | -    | -    | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                          | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V,                                                                   | -    | -    | 1.0  | μA    |
| I <sub>GSS</sub>                                       | Gate to Body Leakage Current                             | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V                                                                   | -    | -    | ±100 | nA    |
| On Characteristics                                     |                                                          |                                                                                                              |      |      |      |       |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                   | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                                     | 1    | 2    | 3    | V     |
| R <sub>DS(on)</sub>                                    | Static Drain-Source on-Resistance<br>note3               | V <sub>GS</sub> =10V, I <sub>D</sub> =15A                                                                    | -    | 40   | 46   | mΩ    |
|                                                        |                                                          | V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A                                                                   | -    | 47   | 59   |       |
| Dynamic Characteristics                                |                                                          |                                                                                                              |      |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                                        | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V,<br>f=1.0MHz                                                       | -    | 725  | -    | pF    |
| C <sub>Oss</sub>                                       | Output Capacitance                                       |                                                                                                              | -    | 49   | -    | pF    |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                             |                                                                                                              | -    | 41   | -    | pF    |
| Q <sub>g</sub>                                         | Total Gate Charge                                        | V <sub>DS</sub> =30V, I <sub>D</sub> =4.5A,<br>V <sub>GS</sub> =10V                                          | -    | 14   | -    | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                       |                                                                                                              | -    | 2.9  | -    | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain(“Miller”) Charge                              |                                                                                                              | -    | 5.2  | -    | nC    |
| Switching Characteristics                              |                                                          |                                                                                                              |      |      |      |       |
| t <sub>d(on)</sub>                                     | Turn-on Delay Time                                       | V <sub>DS</sub> =30V,I <sub>D</sub> =2A,<br>R <sub>L</sub> =6.7Ω,R <sub>G</sub> =3Ω,<br>V <sub>GS</sub> =10V | -    | 5    | -    | ns    |
| t <sub>r</sub>                                         | Turn-on Rise Time                                        |                                                                                                              | -    | 2.6  | -    | ns    |
| t <sub>d(off)</sub>                                    | Turn-off Delay Time                                      |                                                                                                              | -    | 16.1 | -    | ns    |
| t <sub>f</sub>                                         | Turn-off Fall Time                                       |                                                                                                              | -    | 2.3  | -    | ns    |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                          |                                                                                                              |      |      |      |       |
| I <sub>S</sub>                                         | Maximum Continuous Drain to Source Diode Forward Current |                                                                                                              | -    | -    | 10   | A     |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain to Source Diode Forward Current     |                                                                                                              | -    | -    | 37   | A     |
| V <sub>SD</sub>                                        | Drain to Source Diode Forward Voltage                    | V <sub>GS</sub> =0V, I <sub>S</sub> =15A                                                                     | -    | -    | 1.2  | V     |
| t <sub>rr</sub>                                        | Body Diode Reverse Recovery Time                         | T <sub>J</sub> =25℃, I <sub>F</sub> =15A,<br>dI/dt=100A/μs                                                   | -    | 35   | -    | ns    |
| Q <sub>rr</sub>                                        | Body Diode Reverse Recovery Charge                       |                                                                                                              | -    | 53   | -    | nC    |

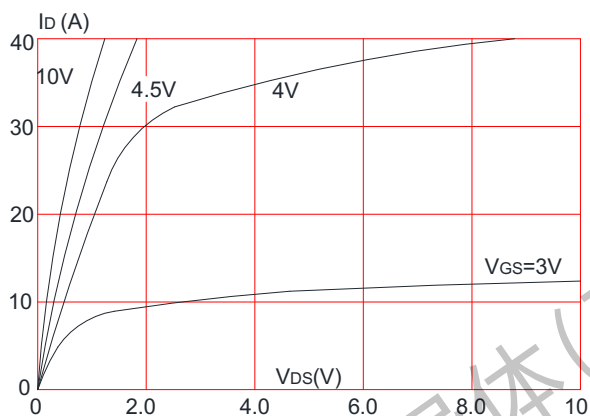
Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition : T<sub>J</sub>=25°C, V<sub>DD</sub>=30V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω, I<sub>AS</sub>=6.1A

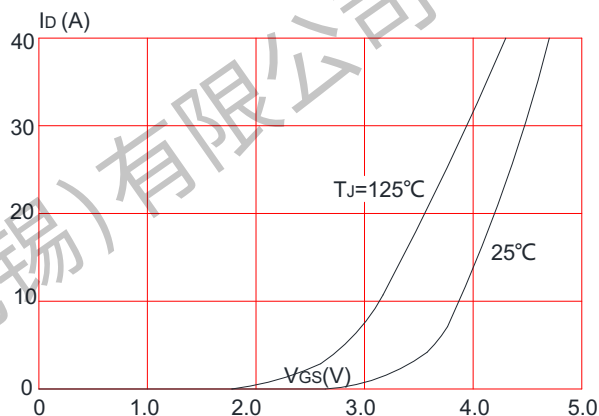
3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

## Typical Performance Characteristics

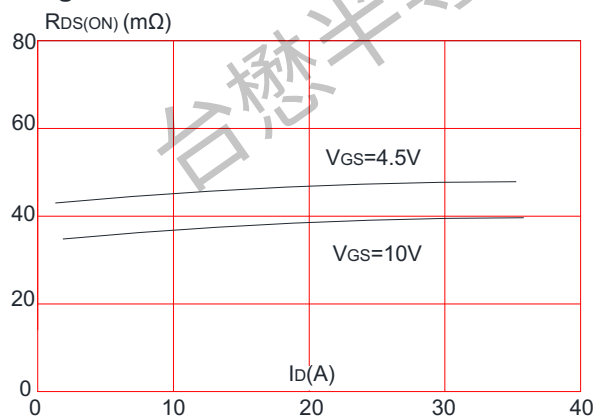
**Figure1: Output Characteristics**



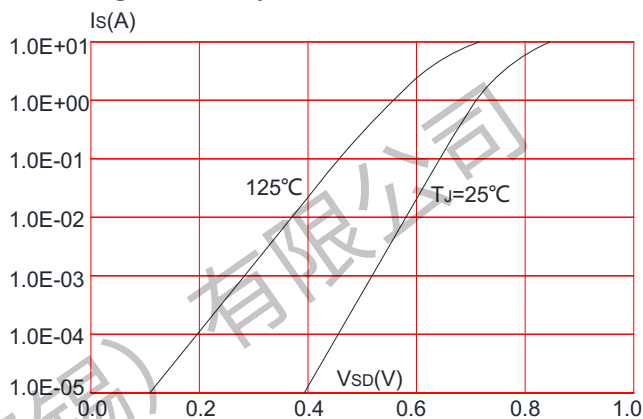
**Figure 2: Typical Transfer Characteristics**



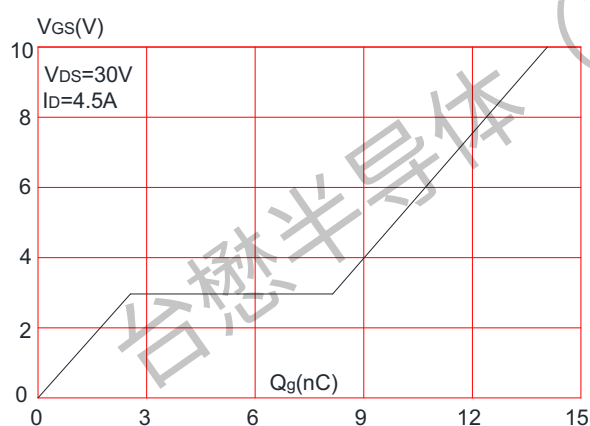
**Figure 3: On-resistance vs. Drain Current**



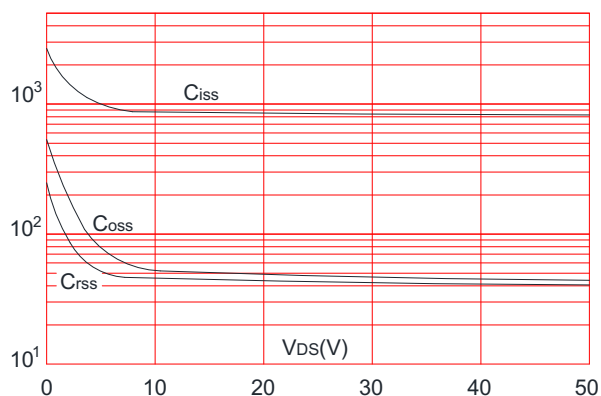
**Figure 4: Body Diode Characteristics**



**Figure 5: Gate Charge Characteristics**



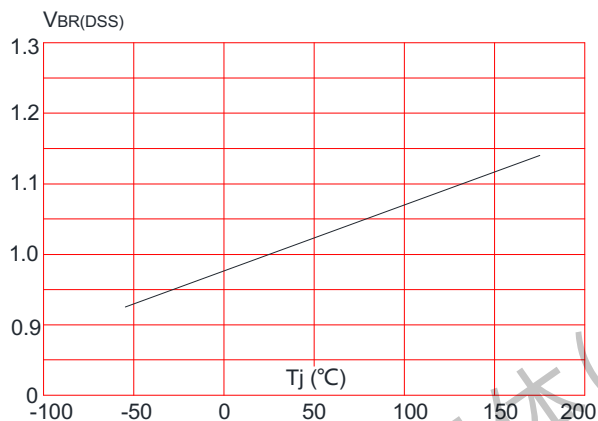
**Figure 6: Capacitance Characteristics**



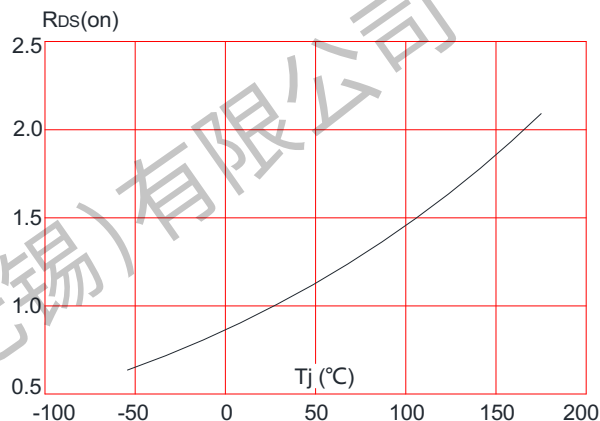
# TM10N06SI

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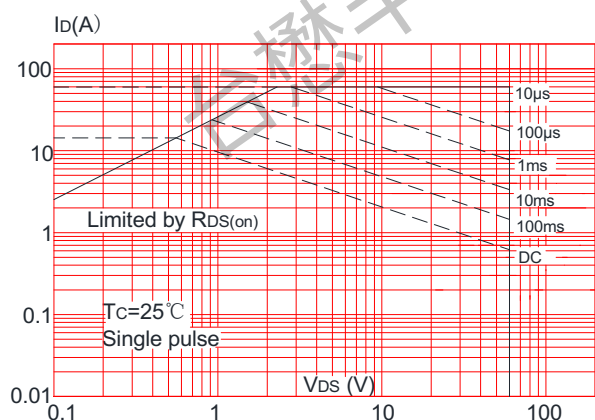
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



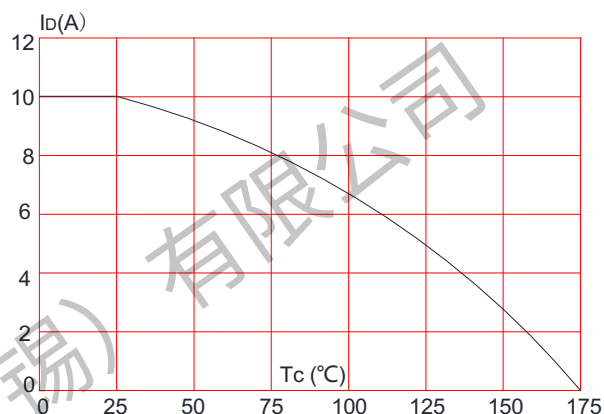
**Figure 8:** Normalized on Resistance vs. Junction Temperature



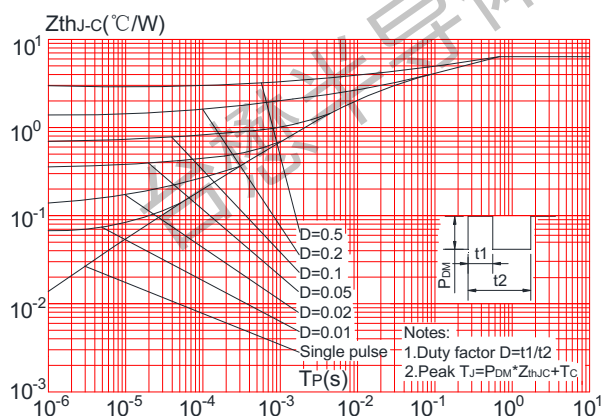
**Figure 9:** Maximum Safe Operating Area



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



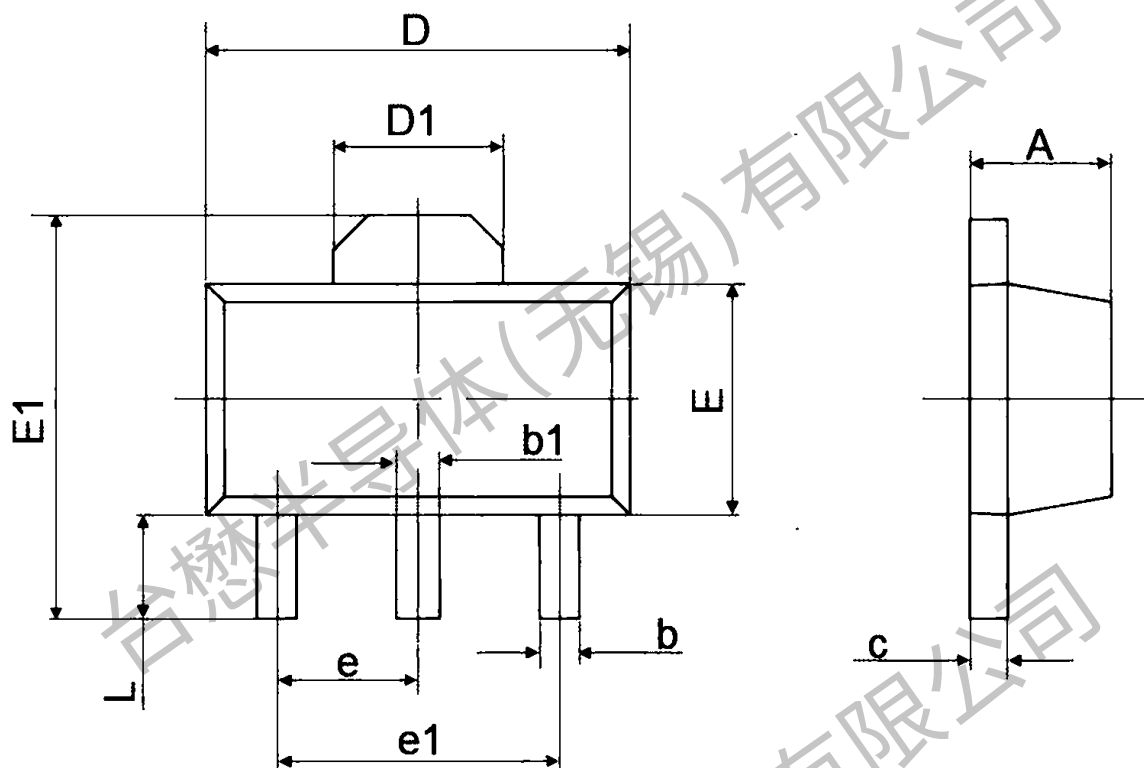
**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case



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N-Channel Enhancement Mosfet

Package Mechanical Data:SOT-89-3L

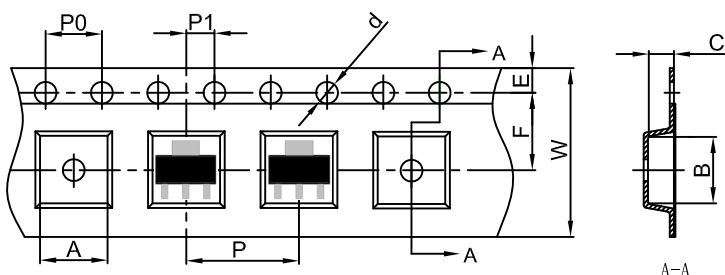


| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.400                     | 1.600 | 0.055                | 0.063 |
| b      | 0.320                     | 0.520 | 0.013                | 0.020 |
| b1     | 0.400                     | 0.580 | 0.016                | 0.023 |
| c      | 0.350                     | 0.440 | 0.014                | 0.017 |
| D      | 4.400                     | 4.600 | 0.173                | 0.181 |
| D1     | 1.550 REF.                |       | 0.061 REF.           |       |
| E      | 2.300                     | 2.600 | 0.091                | 0.102 |
| E1     | 3.940                     | 4.250 | 0.155                | 0.167 |
| e      | 1.500 TYP.                |       | 0.060 TYP.           |       |
| e1     | 3.000 TYP.                |       | 0.118 TYP.           |       |
| L      | 0.900                     | 1.200 | 0.035                | 0.047 |

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### SOT-89-3L Embossed Carrier Tape



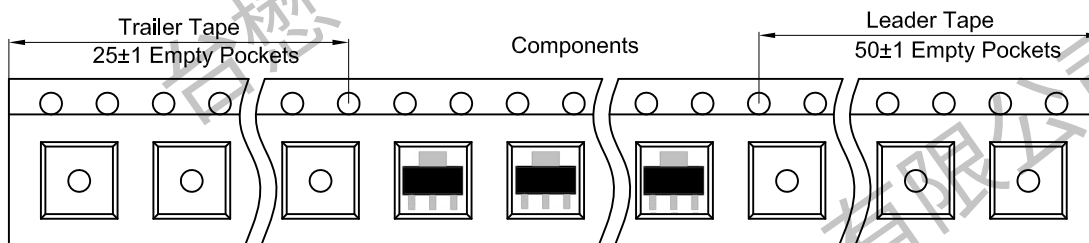
#### Packaging Description:

SOT-89-3L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 1,000 units per 7" or 18.0 cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

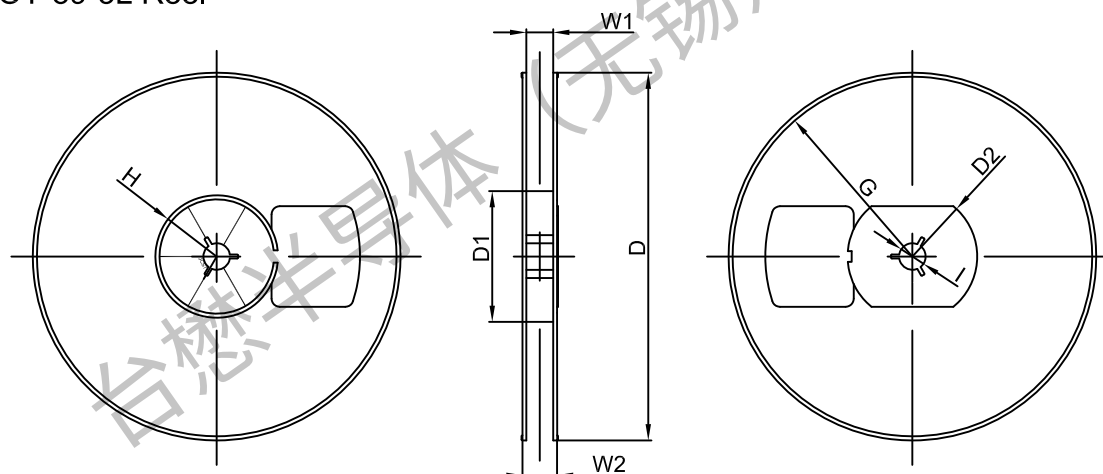
ALL DIM IN mm

| Dimensions are in millimeter |      |      |      |       |      |      |      |      |      |       |
|------------------------------|------|------|------|-------|------|------|------|------|------|-------|
| Pkg type                     | A    | B    | C    | d     | E    | F    | P0   | P    | P1   | W     |
| SOT-89-3L                    | 4.85 | 4.45 | 1.85 | Ø1.50 | 1.75 | 5.50 | 4.00 | 8.00 | 2.00 | 12.00 |

### SOT-89-3L Tape Leader and Trailer



### SOT-89-3L Reel



| Dimensions are in millimeter |         |       |        |        |        |        |       |       |
|------------------------------|---------|-------|--------|--------|--------|--------|-------|-------|
| Reel Option                  | D       | D1    | D2     | G      | H      | I      | W1    | W2    |
| 7"Dia                        | Ø180.00 | 60.00 | R32.00 | R86.50 | R30.00 | Ø13.00 | 13.20 | 16.50 |

| REEL     | Reel Size | Box        | Box Size(mm) | Carton     | Carton Size(mm) | G.W.(kg) |
|----------|-----------|------------|--------------|------------|-----------------|----------|
| 1000 pcs | 7 inch    | 10,000 pcs | 205×195×220  | 40,000 pcs | 430×415×240     |          |

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Revision history:

| Date       | Rev   | Description | Page |
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