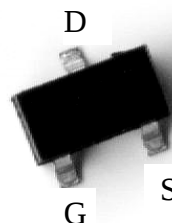


## -14V P-Channel Enhancement Mode MOSFET

## Outline

SOT-23

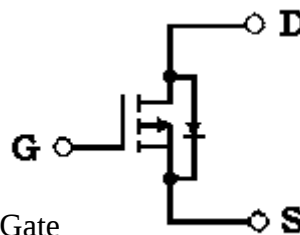


### Features:

- Low gate charge
- Compact and low profile SOT-23 package
- Advanced trench process technology
- High density cell design for ultra low on resistance
- Pb-free lead plating package

## Symbol

KW50P01SN3

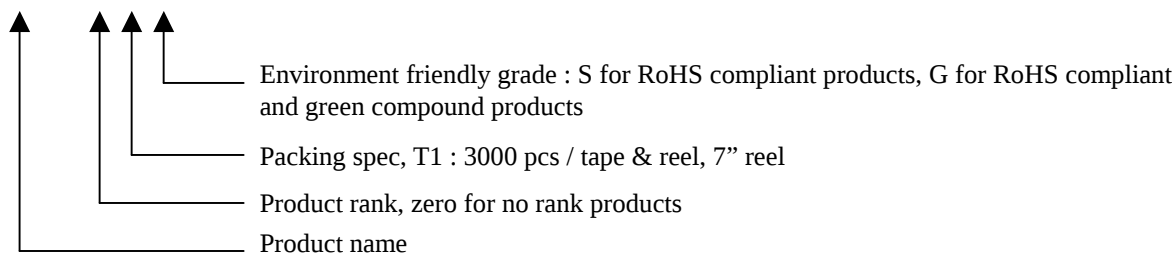


G : Gate  
S : Source  
D : Drain

|                                        |                      |
|----------------------------------------|----------------------|
| $BV_{DSS}$                             | -14V                 |
| $I_D @ V_{GS}=-10V, T_A=25^\circ C$    | -4.3A                |
| $R_{DS(on)} @ V_{GS}=-4.5V, I_D=-3.6A$ | 42.3m $\Omega$ (typ) |
| $R_{DS(on)} @ V_{GS}=-2.5V, I_D=-3.2A$ | 62.9m $\Omega$ (typ) |
| $R_{DS(on)} @ V_{GS}=-1.8V, I_D=-1A$   | 84.6m $\Omega$ (typ) |
| $R_{DS(on)} @ V_{GS}=-1.5V, I_D=-1A$   | 148m $\Omega$ (typ)  |

## Ordering Information

| Device            | Package                                                   | Shipping               |
|-------------------|-----------------------------------------------------------|------------------------|
| KW50P01SN3-0-T1-G | SOT-23<br>(Pb-free lead plating and halogen-free package) | 3000 pcs / tape & reel |



## Absolute Maximum Ratings (Ta=25°C)

| Parameter                                                           | Symbol                            | Limits   | Unit |
|---------------------------------------------------------------------|-----------------------------------|----------|------|
| Drain-Source Voltage                                                | V <sub>DS</sub>                   | -14      | V    |
| Gate-Source Voltage                                                 | V <sub>GS</sub>                   | ±8       |      |
| Continuous Drain Current @ TA=25°C, V <sub>GS</sub> =-4.5V (Note 3) | I <sub>D</sub>                    | -4.3     | A    |
| Continuous Drain Current @ TA=70°C, V <sub>GS</sub> =-4.5V (Note 3) |                                   | -3.4     |      |
| Pulsed Drain Current (Notes 1, 2)                                   | I <sub>DM</sub>                   | -20      |      |
| Maximum Power Dissipation (Note 3)                                  | P <sub>D</sub>                    | 1.38     | W    |
| Linear Derating Factor                                              |                                   | 0.01     | W/°C |
| Operating Junction and Storage Temperature Range                    | T <sub>j</sub> ; T <sub>stg</sub> | -55~+150 | °C   |

Note : 1. Pulse width limited by maximum junction temperature.  
2. Pulse width ≤ 300μs, duty cycle ≤ 2%.  
3. Surface mounted on 1 in<sup>2</sup> copper pad of FR-4 board; 270°C/W when mounted on minimum copper pad

## Thermal Performance

| Parameter                                            | Symbol             | Limit | Unit |
|------------------------------------------------------|--------------------|-------|------|
| Thermal Resistance, Junction-to-Ambient(PCB mounted) | R <sub>th,ja</sub> | 90    | °C/W |

Note : Surface mounted on 1 in<sup>2</sup> copper pad of FR-4 board; 270°C/W when mounted on minimum copper pad

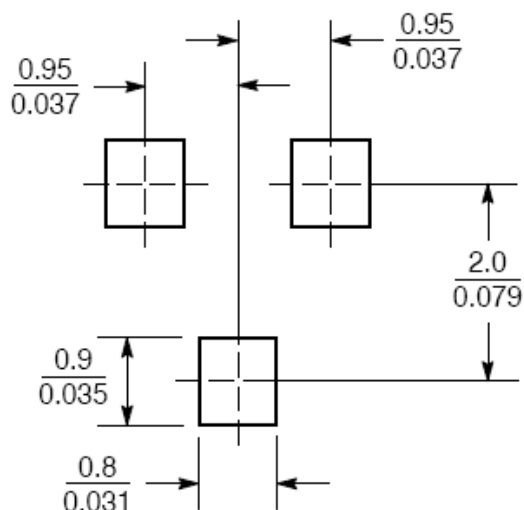
## Electrical Characteristics (Tj=25°C, unless otherwise noted)

| Symbol                              | Min. | Typ. | Max. | Unit  | Test Conditions                                                                        |
|-------------------------------------|------|------|------|-------|----------------------------------------------------------------------------------------|
| <b>Static</b>                       |      |      |      |       |                                                                                        |
| BV <sub>DSS</sub>                   | -14  | -    | -    | V     | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA                                            |
| ΔBV <sub>DSS</sub> /ΔT <sub>j</sub> | -    | 8    | -    | mV/°C | Reference to 25°C, I <sub>D</sub> =-250μA                                              |
| V <sub>GS(th)</sub>                 | -0.4 | -    | -1.0 | V     | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                              |
| I <sub>GSS</sub>                    | -    | -    | ±100 | nA    | V <sub>GS</sub> =±8V, V <sub>DS</sub> =0V                                              |
| I <sub>DSS</sub>                    | -    | -    | -1   | μA    | V <sub>DS</sub> =-12V, V <sub>GS</sub> =0V                                             |
|                                     | -    | -    | -10  |       | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V (T <sub>j</sub> =70°C)                      |
| *R <sub>DS(ON)</sub>                | -    | 42.3 | 56.5 | mΩ    | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3.6A                                          |
|                                     | -    | 62.9 | 83.5 |       | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-3.2A                                          |
|                                     | -    | 84.6 | 117  |       | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-1A                                            |
|                                     | -    | 148  | 197  |       | V <sub>GS</sub> =-1.5V, I <sub>D</sub> =-1A                                            |
|                                     | -    | -    | -    |       | V <sub>DS</sub> =-5V, I <sub>D</sub> =-3A                                              |
| *G <sub>FS</sub>                    | -    | 6.5  | -    | S     | V <sub>DS</sub> =-5V, I <sub>D</sub> =-3A                                              |
| <b>Dynamic</b>                      |      |      |      |       |                                                                                        |
| C <sub>iss</sub>                    | -    | 559  | -    | pF    | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, f=1MHz                                     |
| C <sub>oss</sub>                    | -    | 163  | -    |       |                                                                                        |
| C <sub>rss</sub>                    | -    | 149  | -    |       |                                                                                        |
| t <sub>d(ON)</sub>                  | -    | 11   | -    | ns    | V <sub>DS</sub> =-10V, I <sub>D</sub> =-1A, V <sub>GS</sub> =-5V, R <sub>G</sub> =3.3Ω |
| t <sub>r</sub>                      | -    | 21   | -    |       |                                                                                        |
| t <sub>d(OFF)</sub>                 | -    | 40   | -    |       |                                                                                        |
| t <sub>f</sub>                      | -    | 23   | -    |       |                                                                                        |

|                    |   |      |      |    |                                                                       |
|--------------------|---|------|------|----|-----------------------------------------------------------------------|
| Qg                 | - | 7.7  | -    | nC | V <sub>DS</sub> =-10V, I <sub>D</sub> =-2A, V <sub>GS</sub> =-4.5V    |
| Qgs                | - | 1    | -    |    |                                                                       |
| Qgd                | - | 2.7  | -    |    |                                                                       |
| Source-Drain Diode |   |      |      |    |                                                                       |
| *V <sub>SD</sub>   | - | -0.9 | -1.2 | V  | V <sub>GS</sub> =0V, I <sub>S</sub> =-3.4A                            |
| T <sub>rr</sub>    | - | 28   | -    | ns | V <sub>GS</sub> =0V, I <sub>F</sub> =-2A, dI <sub>F</sub> /dt=100A/μs |
| Q <sub>rr</sub>    | - | 8    | -    | nC |                                                                       |

\*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

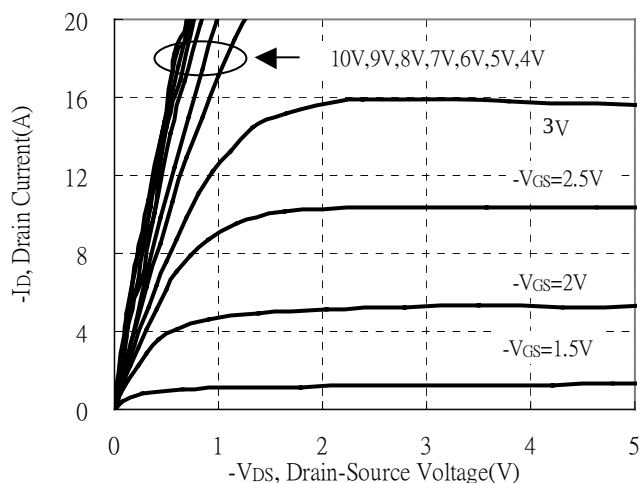
## Recommended Soldering Footprint



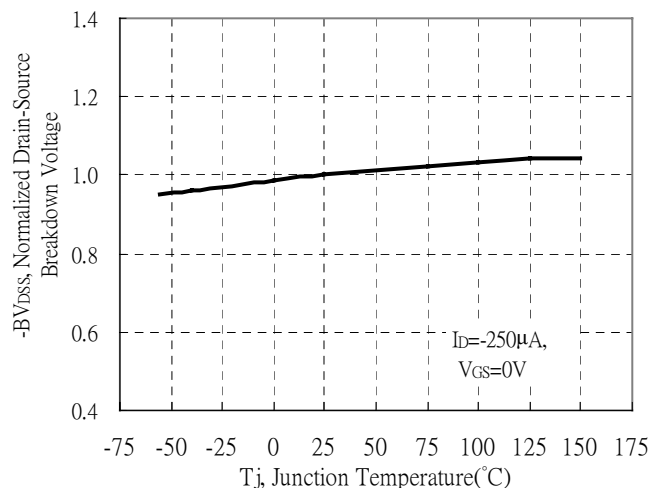
Unit :  $\frac{\text{mm}}{\text{inches}}$

## Typical Characteristics

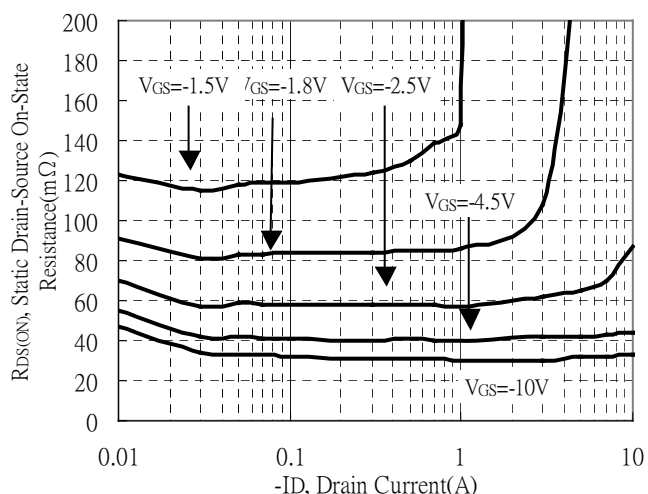
Typical Output Characteristics



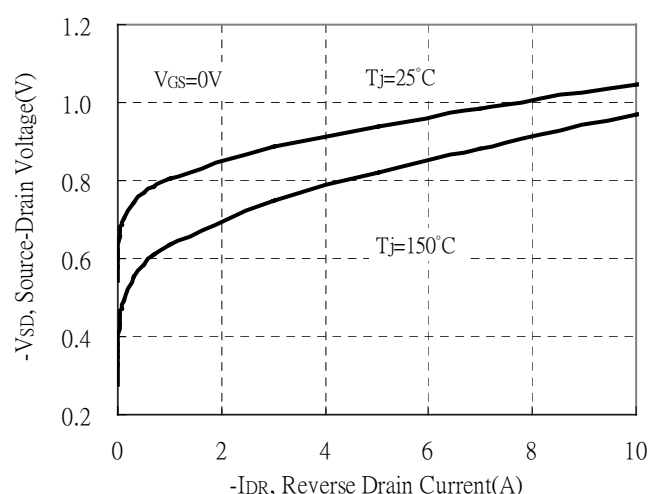
Breakdown Voltage vs Ambient Temperature



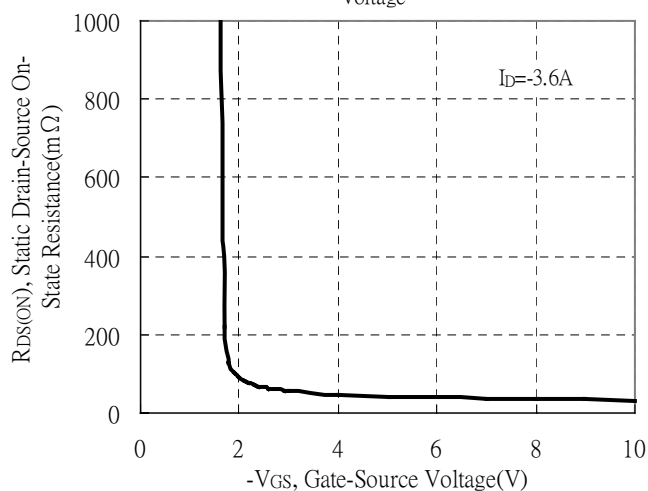
Static Drain-Source On-State resistance vs Drain Current



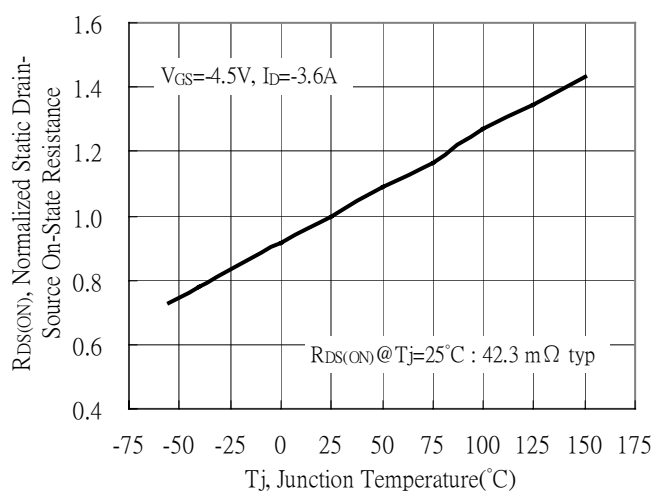
Reverse Drain Current vs Source-Drain Voltage



Static Drain-Source On-State Resistance vs Gate-Source Voltage

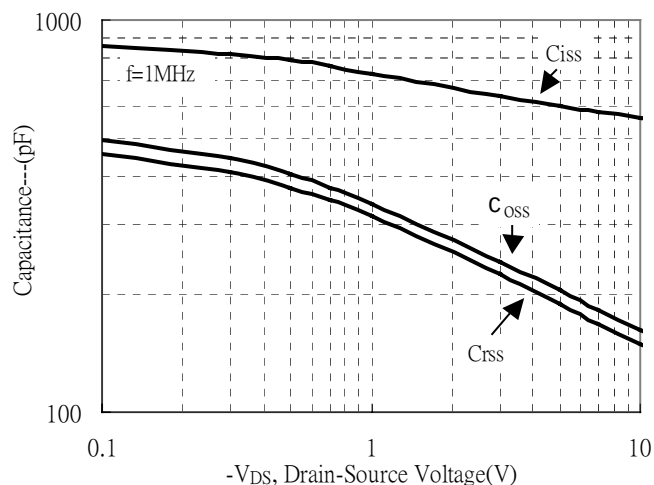


Drain-Source On-State Resistance vs Junction Temperature

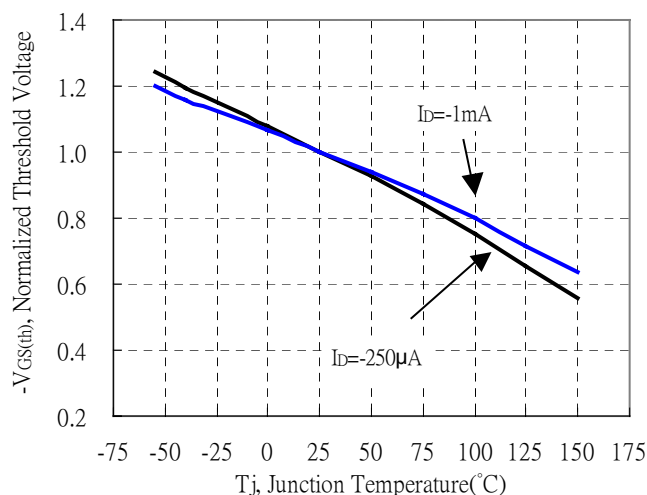


## Typical Characteristics(Cont.)

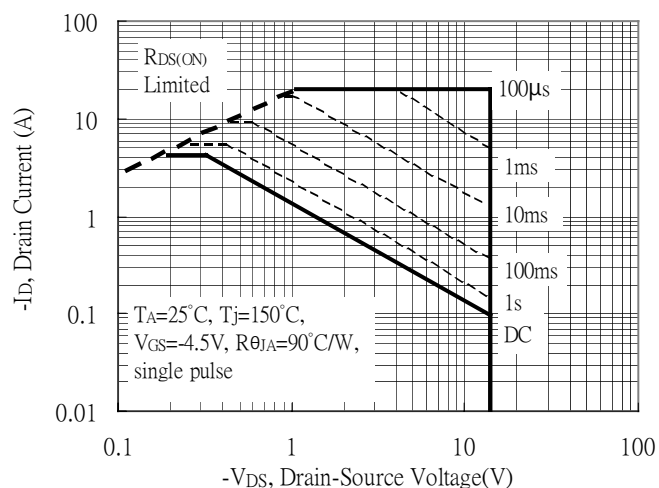
Capacitance vs Drain-to-Source Voltage



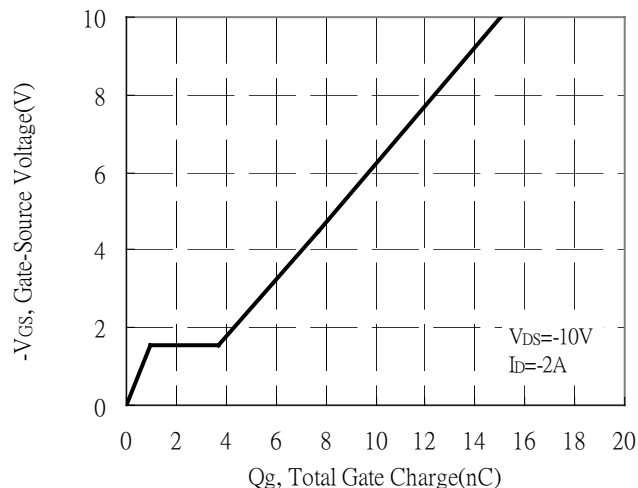
Threshold Voltage vs Junction Temperature



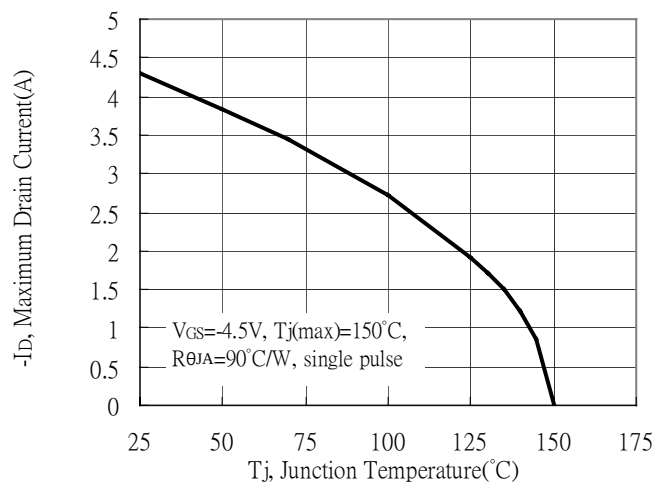
Maximum Safe Operating Area



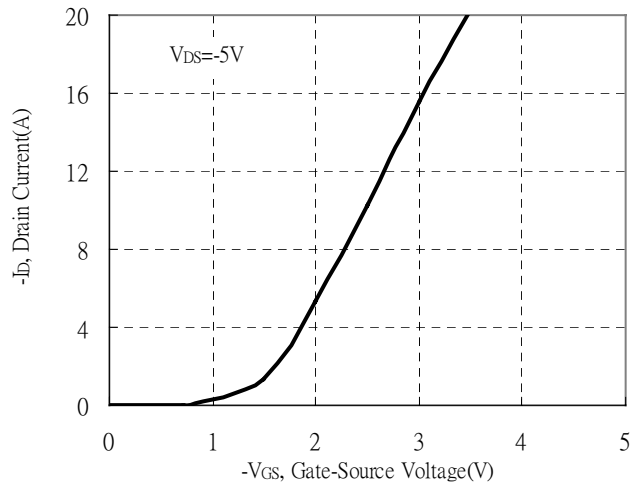
Gate Charge Characteristics



Maximum Drain Current vs Junction Temperature

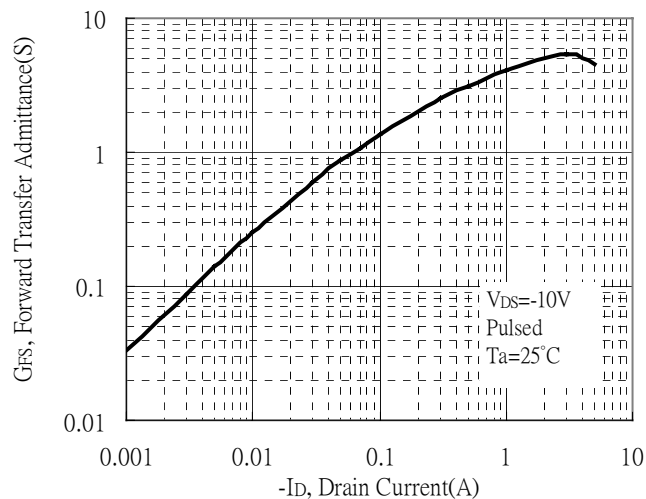


Typical Transfer Characteristics

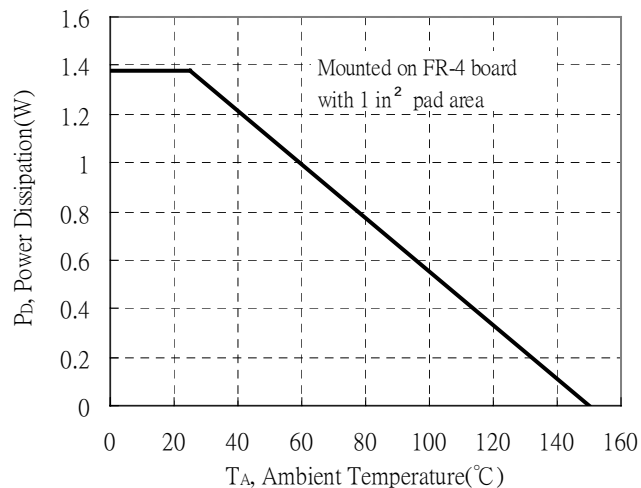


## Typical Characteristics(Cont.)

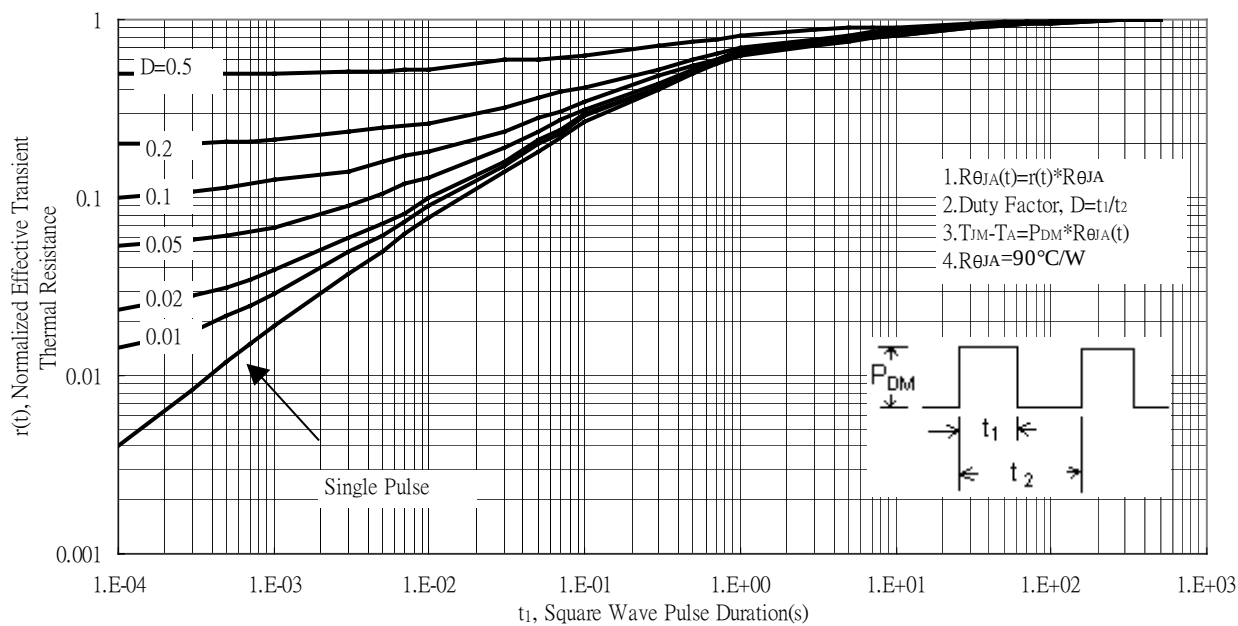
Forward Transfer Admittance vs Drain Current



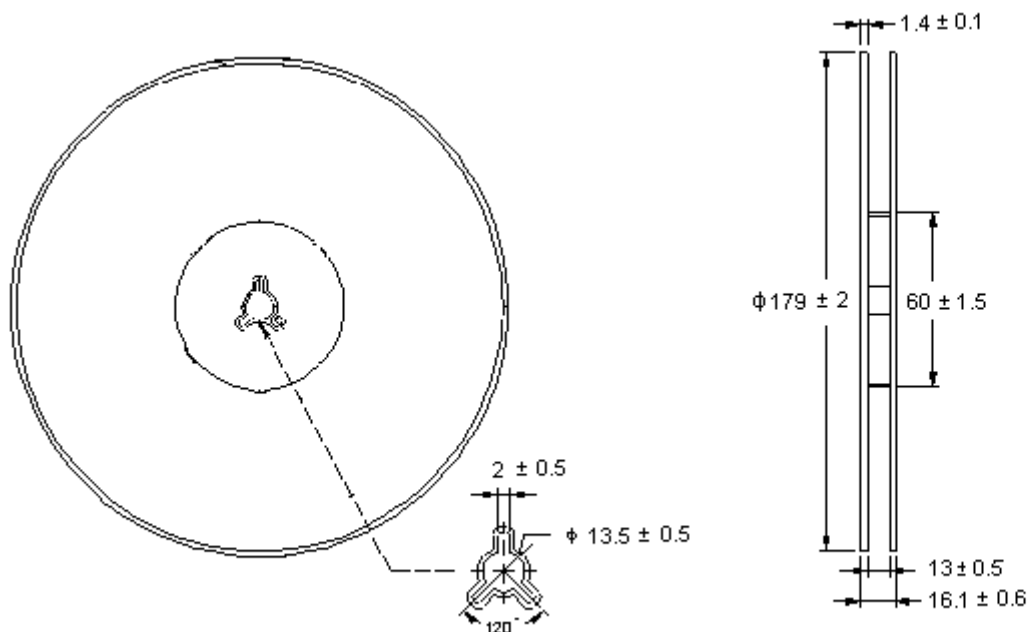
Power Derating Curve



Transient Thermal Response Curves

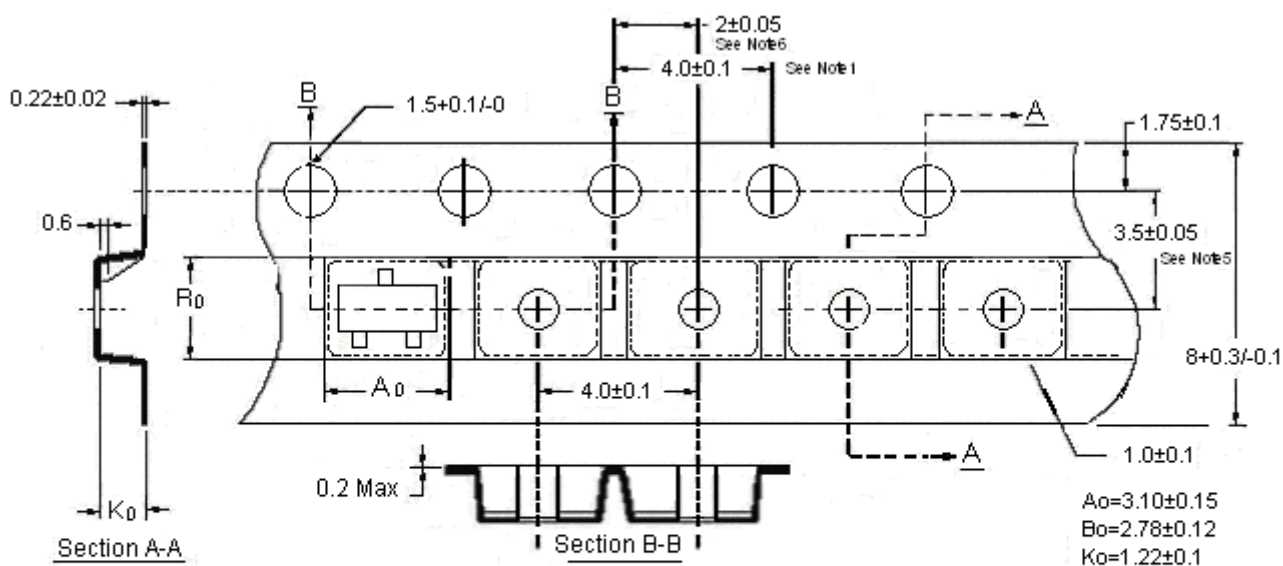


## Reel Dimension



Unit: millimeter

## Carrier Tape Dimension

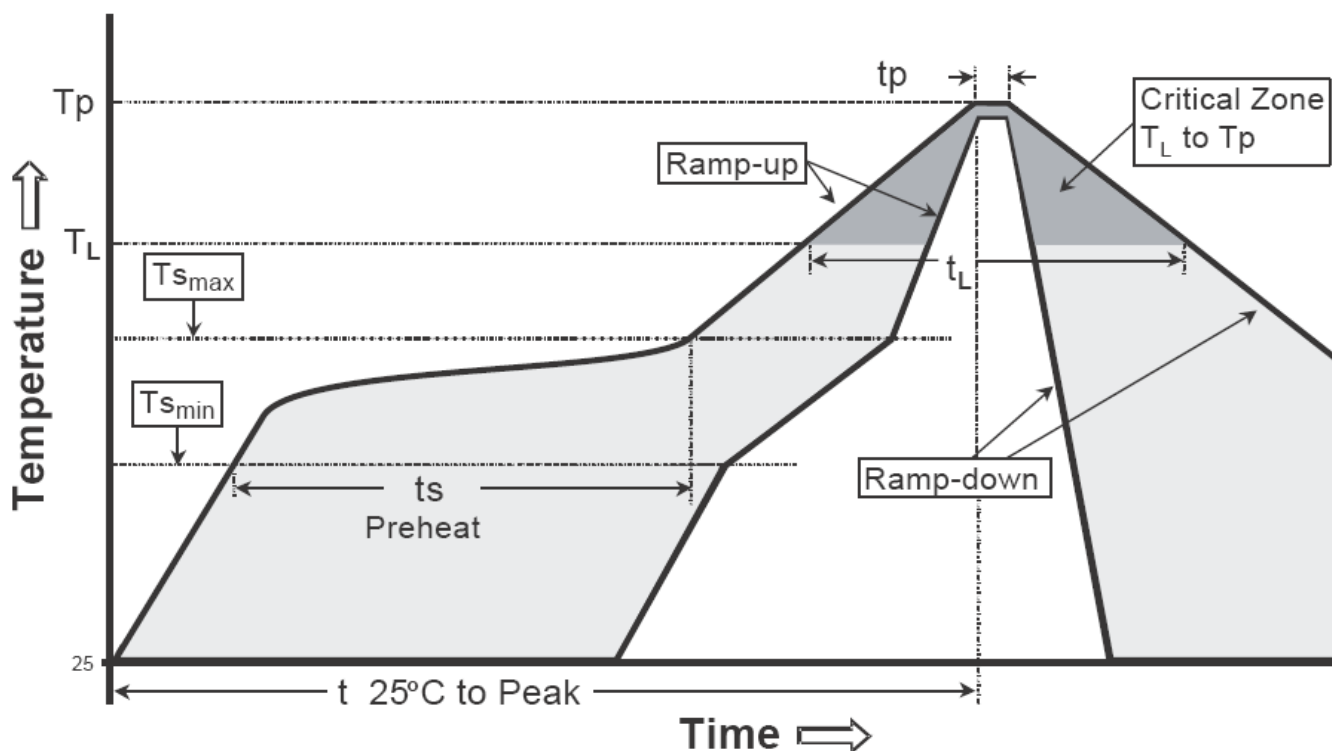


Unit : millimeter

### Recommended wave soldering condition

| Product         | Peak Temperature | Soldering Time  |
|-----------------|------------------|-----------------|
| Pb-free devices | 260 +0/-5 °C     | 5 +1/-1 seconds |

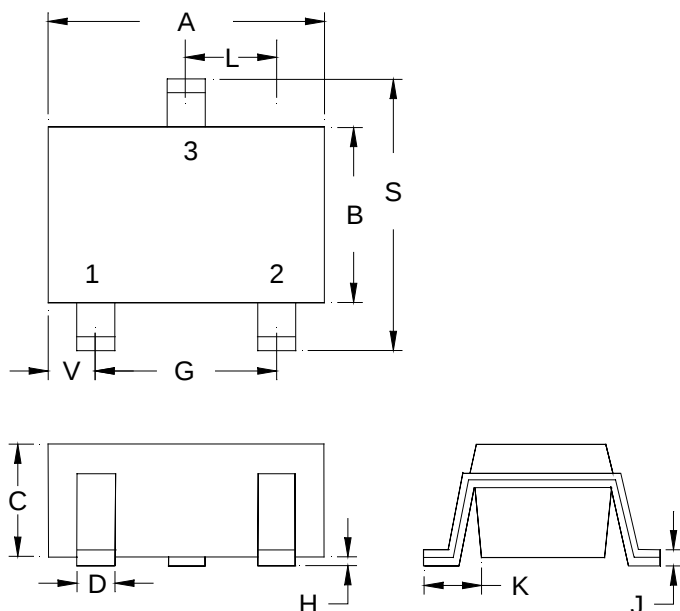
### Recommended temperature profile for IR reflow



| Profile feature                                | Sn-Pb eutectic Assembly | Pb-free Assembly |
|------------------------------------------------|-------------------------|------------------|
| Average ramp-up rate (Tsmax to Tp)             | 3°C/second max.         | 3°C/second max.  |
| Preheat                                        |                         |                  |
| -Temperature Min(Ts min)                       | 100°C                   | 150°C            |
| -Temperature Max(Ts max)                       | 150°C                   | 200°C            |
| -Time(ts min to ts max)                        | 60-120 seconds          | 60-180 seconds   |
| Time maintained above:                         |                         |                  |
| -Temperature (TL)                              | 183°C                   | 217°C            |
| - Time (tL)                                    | 60-150 seconds          | 60-150 seconds   |
| Peak Temperature(Tp)                           | 240 +0/-5 °C            | 260 +0/-5 °C     |
| Time within 5°C of actual peak temperature(tp) | 10-30 seconds           | 20-40 seconds    |
| Ramp down rate                                 | 6°C/second max.         | 6°C/second max.  |
| Time 25 °C to peak temperature                 | 6 minutes max.          | 8 minutes max.   |

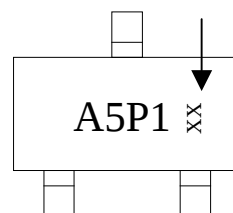
Note : All temperatures refer to topside of the package, measured on the package body surface.

## SOT-23 Dimension



Marking:

Date Code



3-Lead SOT-23 Plastic  
 Surface Mounted Package  
 CYStek Package Code: N3

Style: Pin 1.Gate 2.Source 3.Drain

| DIM | Inches |        | Millimeters |      | DIM | Inches |        | Millimeters |      |
|-----|--------|--------|-------------|------|-----|--------|--------|-------------|------|
|     | Min.   | Max.   | Min.        | Max. |     | Min.   | Max.   | Min.        | Max. |
| A   | 0.1063 | 0.1220 | 2.70        | 3.10 | J   | 0.0034 | 0.0079 | 0.085       | 0.20 |
| B   | 0.0472 | 0.0630 | 1.20        | 1.60 | K   | 0.0128 | 0.0266 | 0.32        | 0.67 |
| C   | 0.0335 | 0.0512 | 0.89        | 1.30 | L   | 0.0335 | 0.0453 | 0.85        | 1.15 |
| D   | 0.0118 | 0.0197 | 0.30        | 0.50 | S   | 0.0830 | 0.1161 | 2.10        | 2.95 |
| G   | 0.0669 | 0.0910 | 1.70        | 2.30 | V   | 0.0098 | 0.0256 | 0.25        | 0.65 |
| H   | 0.0000 | 0.0040 | 0.00        | 0.10 |     |        |        |             |      |

Notes: 1.Controlling dimension: millimeters.

2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.

3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.