## P-CHANNEL Enhancement Mode MOSFET

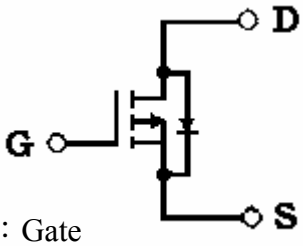
# MTP3403AN3

## Features

- $V_{DS}$=-30V
  $R_{DS(ON)}$=85mΩ@$V_{GS}$=-4.5V, $I_{DS}$=-2A
  $R_{DS(ON)}$=120mΩ@$V_{GS}$=-2.5V, $I_{DS}$=-1A
- Advanced trench process technology
- High density cell design for ultra low on resistance
- Low gate charge
- Compact and low profile SOT-23 package
- Pb-free package

## Equivalent Circuit

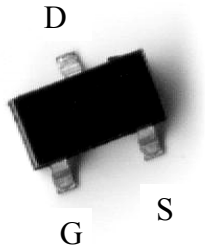
MTP3403AN3




G：Gate
S：Source
D：Drain

## Outline

SOT-23




## Absolute Maximum Ratings (Ta=25°C)

| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | -30 | V |
| Gate-Source Voltage | $V_{GS}$ | ±12 | V |
| Continuous Drain Current @$T_A$=25°C (Note 1) | $I_D$ | -3.2 | A |
| Continuous Drain Current @$T_A$=70°C (Note 1) | $I_D$ | -2.6 | A |
| Pulsed Drain Current (Note 2) | $I_{DM}$ | -10 | A |
| Maximum Power Dissipation | $P_D$ | 1.38 | W |
| Linear Derating Factor | | 0.01 | W/°C |
| Operating Junction and Storage Temperature | Tj, Tstg | -55~+150 | °C |

Note : 1. Surface mounted on 1 in² copper pad of FR-4 board, 270°C/W when mounted on minimum copper pad.
2. Pulse width limited by maximum junction temperature.

## Thermal Performance

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-Ambient | Rth,ja | 90 | °C/W |

Note : Surface mounted on 1 in² copper pad of FR-4 board, 270°C/W when mounted on minimum copper pad.

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

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Static** | | | | | |
| $BV_{DSS}$ | -30 | - | - | V | $V_{GS}$=0, $I_D$=-250μA |
| $\Delta BV_{DSS}/\Delta Tj$ | - | -0.1 | - | V/°C | Reference to 25°C, $I_D$=-1mA |
| $V_{GS(th)}$ | -0.5 | - | -1.2 | V | $V_{DS}$=$V_{GS}$, $I_D$=-250μA |
| $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±12V, $V_{DS}$=0 |
| $I_{DSS}$ | - | - | -1 | μA | $V_{DS}$=-30V, $V_{GS}$=0 |
| $I_{DSS}$ | - | - | -25 | μA | $V_{DS}$=-24V, $V_{GS}$=0, Tj=70°C |
| *$R_{DS(ON)}$ | - | - | 70 | mΩ | $I_D$=-2.6A, $V_{GS}$=-10V |
| | - | - | 85 | | $I_D$=-2.0A, $V_{GS}$=-4.5V |
| | - | - | 120 | | $I_D$=-1.0A, $V_{GS}$=-2.5V |
| *$G_{FS}$ | - | 9 | - | S | $V_{DS}$=-5V, $I_D$=-3A |
| **Dynamic** | | | | | |
| Ciss | - | 735 | 1325 | pF | $V_{DS}$=-25V, $V_{GS}$=0, f=1MHz |
| Coss | - | 100 | - | | |
| Crss | - | 80 | - | | |
| *$t_{d(ON)}$ | - | 7 | - | ns | $V_{DS}$=-15V, $I_D$=-3.2A, $V_{GS}$=-10V, $R_D$=4.6Ω, $R_G$=3.3Ω |
| *$t_r$ | - | 15 | - | | |
| *$t_{d(OFF)}$ | - | 21 | - | | |
| *$t_f$ | - | 15 | - | | |
| *Qg | - | 10 | 18 | nC | $V_{DS}$=-24V, $I_D$=-3.2A, $V_{GS}$=-4.5V, |
| *Qgs | - | 1.8 | - | | |
| *Qgd | - | 3.6 | - | | |
| **Source-Drain Diode** | | | | | |
| *$V_{SD}$ | - | - | -1.2 | V | $V_{GS}$=0V, $I_{SD}$=-1.2A |
| *trr | - | 24 | - | ns | $I_S$=-3.2A, $V_{GS}$=0V, dI/dt=100A/μs |
| *Qrr | - | 19 | - | nC | |

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

## Ordering Information

| Device | Package | Shipping | Marking |
|---|---|---|---|
| MTP3403AN3 | SOT-23 (Pb-free) | 3000 pcs / Tape & Reel | 3403A |

## Characteristic Curves

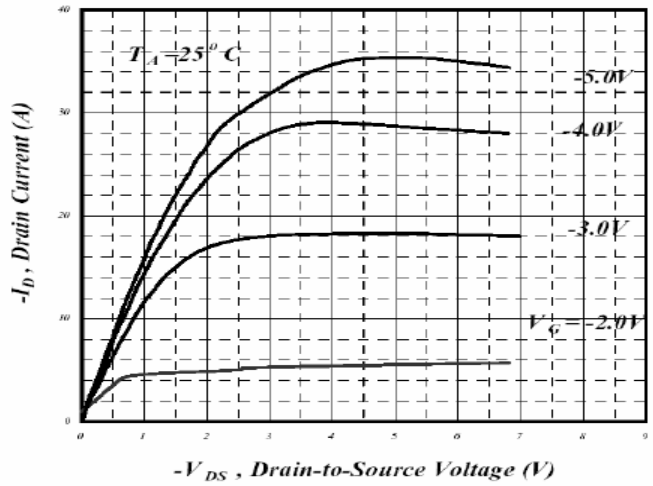



Fig 1. Typical Output Characteristics

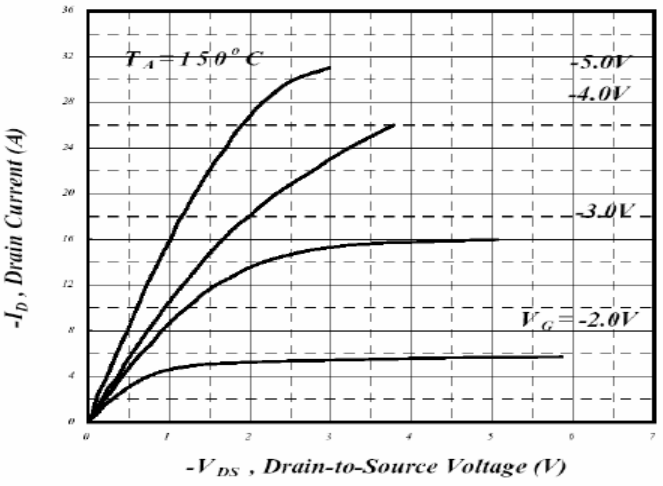



Fig 2. Typical Output Characteristics

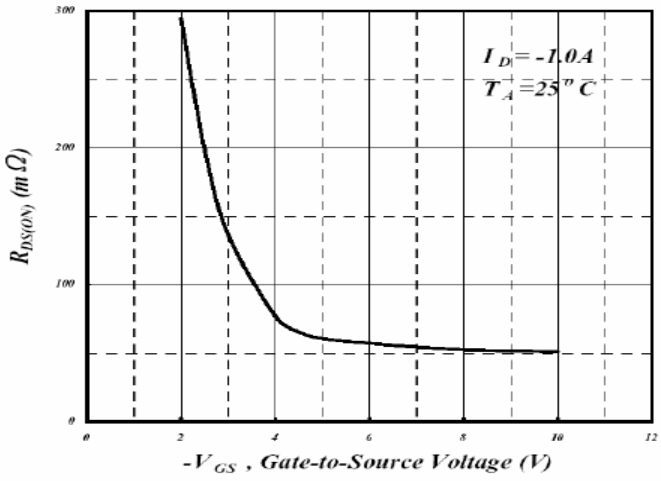



Fig 3. On-Resistance v.s. Gate Voltage

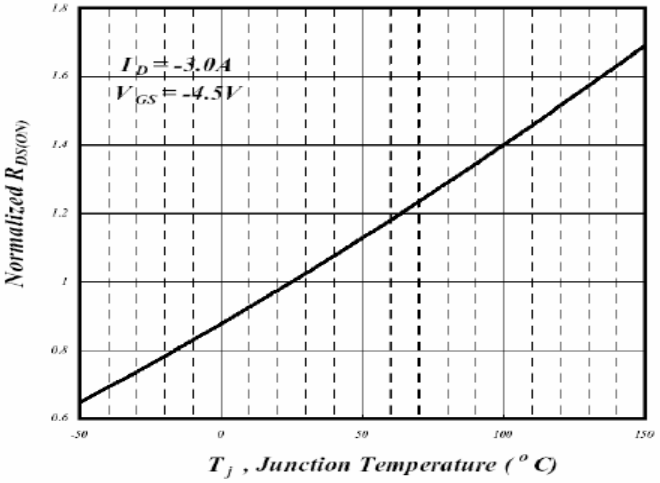



Fig 4. Normalized On-Resistance v.s. Junction Temperature

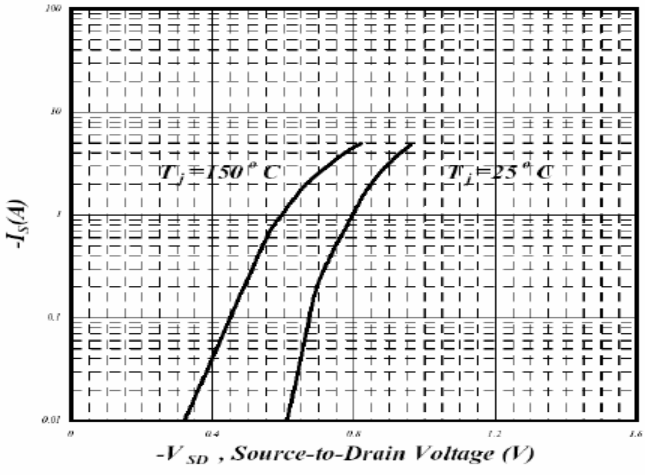



Fig 5. Forward Characteristics of Reverse Diode

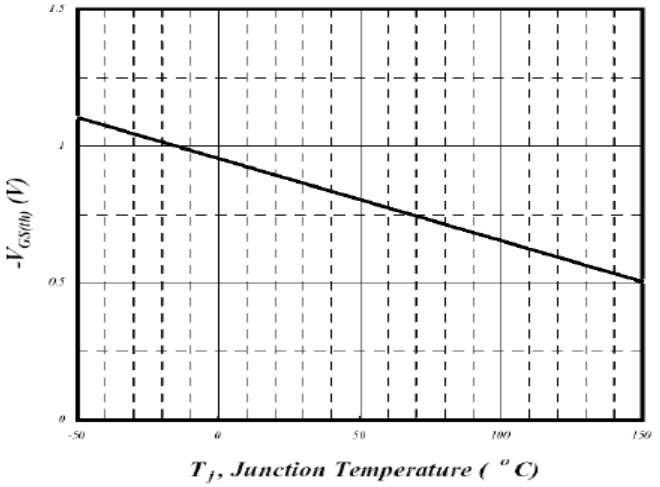



Fig 6. Gate Threshold Voltage v.s. Junction Temperature

## Characteristic Curves(Cont.)

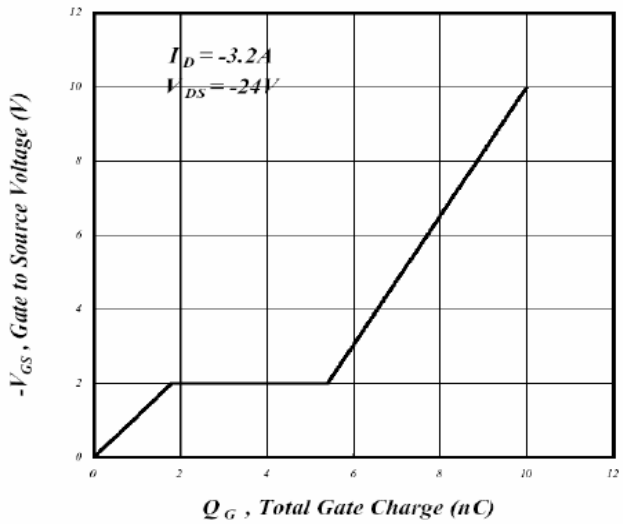



Fig 7. Gate Charge Characteristics

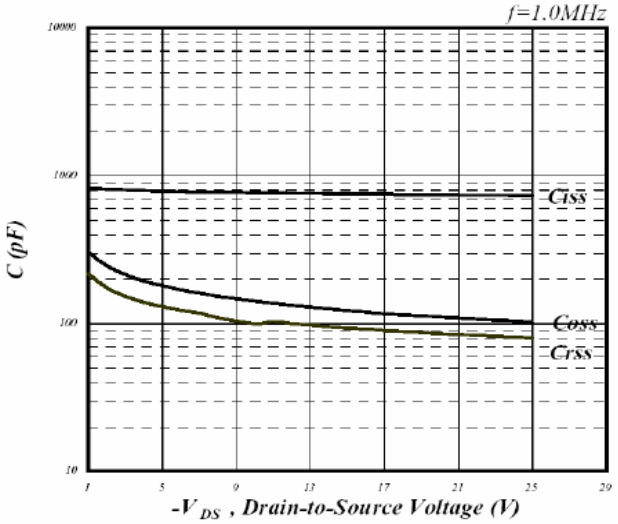



Fig 8. Typical Capacitance Characteristics

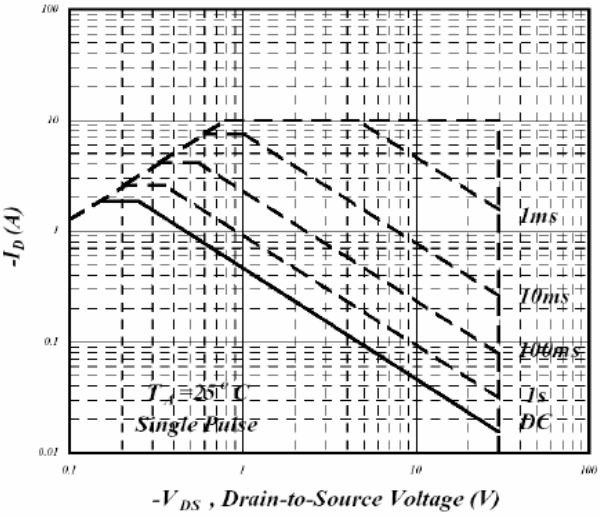



Fig 9. Maximum Safe Operating Area

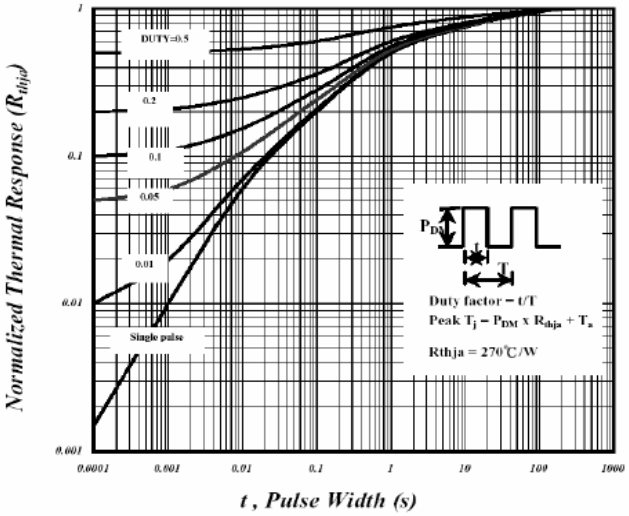



Fig 10. Effective Transient Thermal Impedance

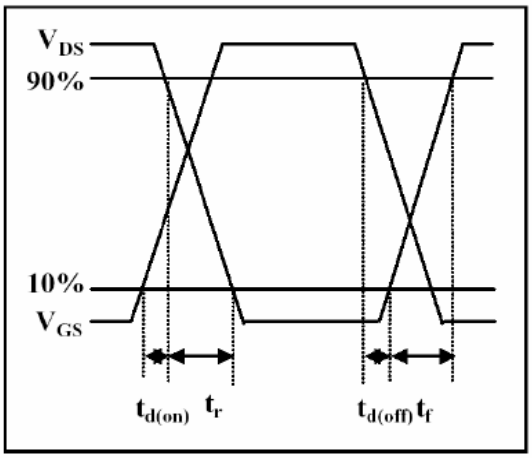



Fig 11. Switching Time Waveform

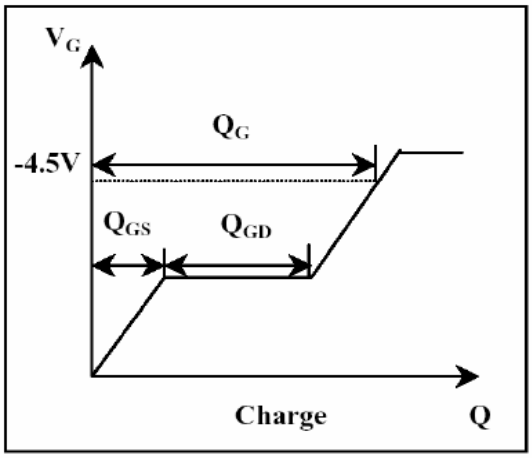
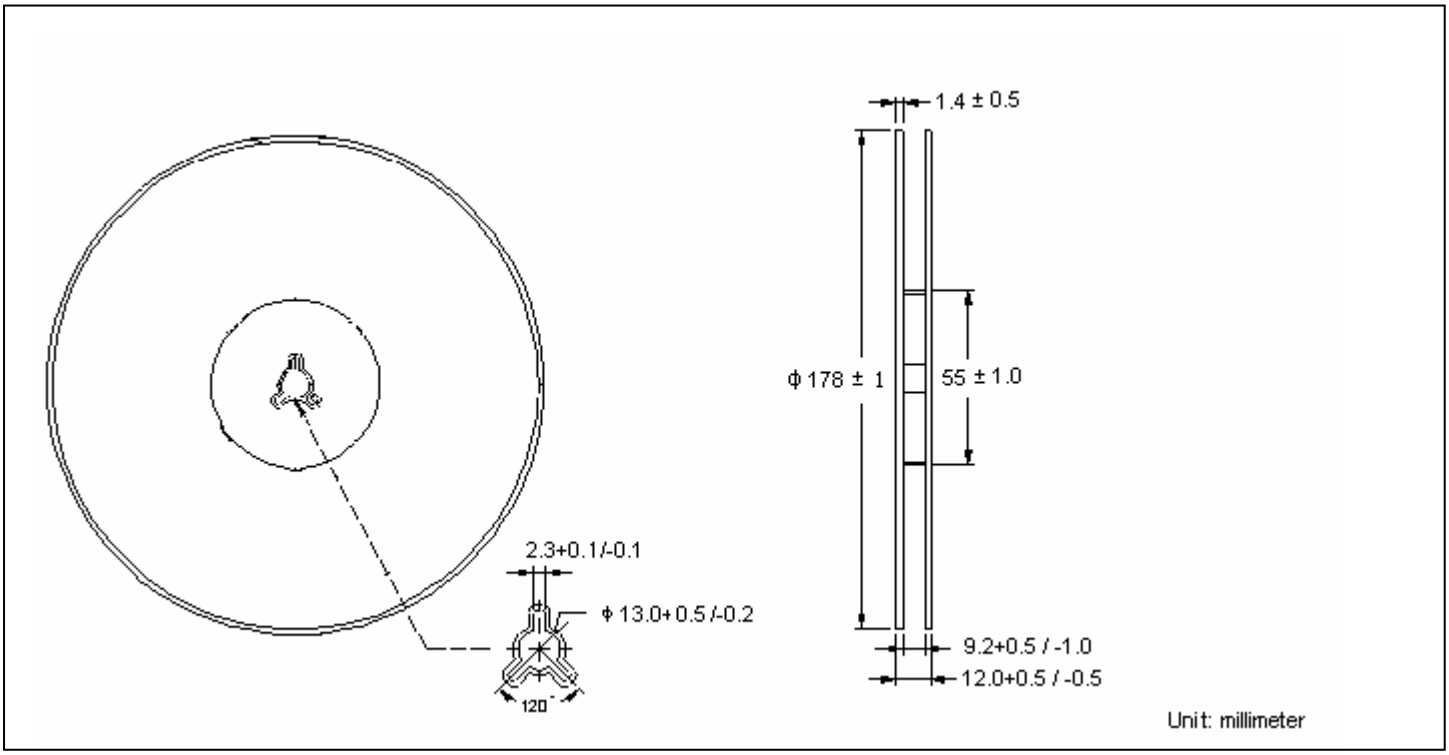
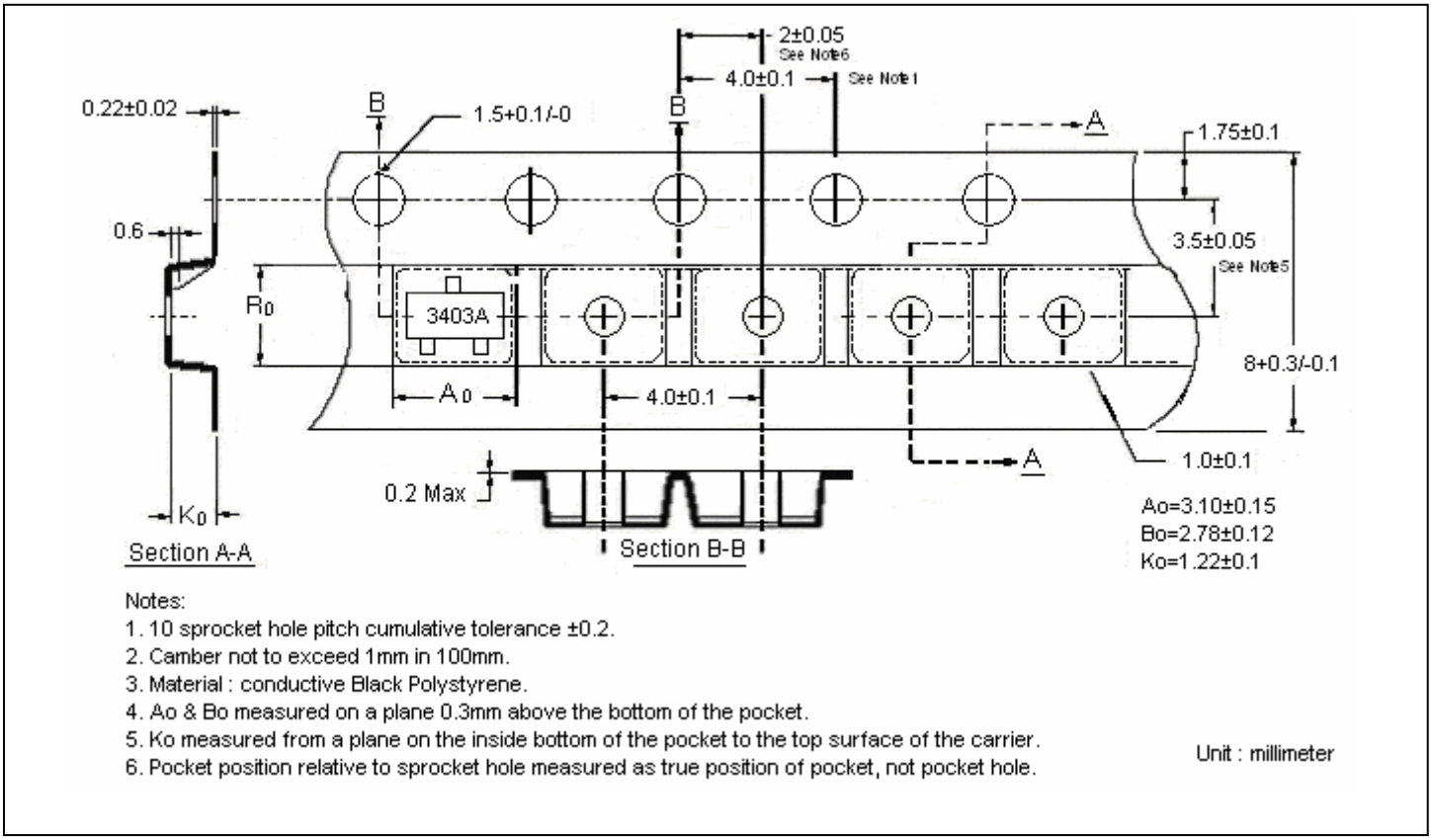



Fig 12. Gate Charge Waveform

## Reel Dimension




## Carrier Tape Dimension



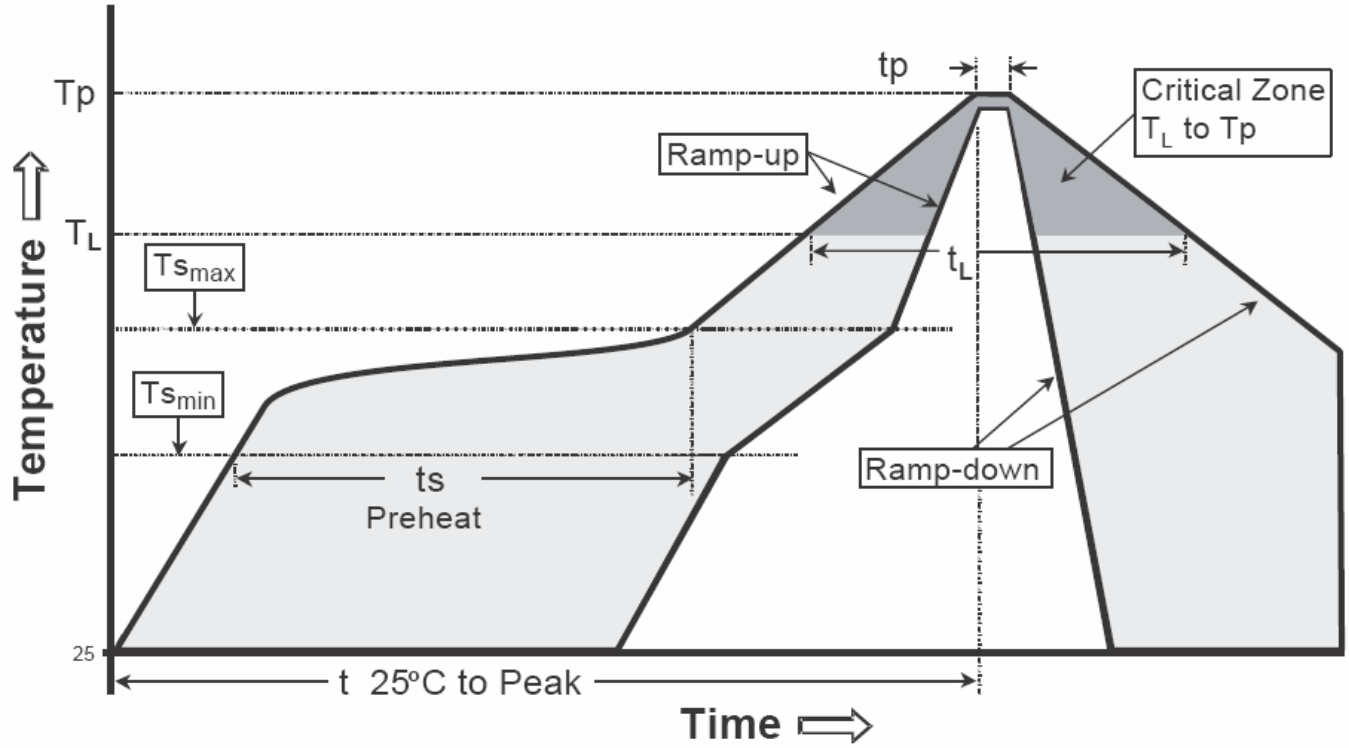

Notes:
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material : conductive Black Polystyrene.
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

Unit : millimeter

## Recommended wave soldering condition

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

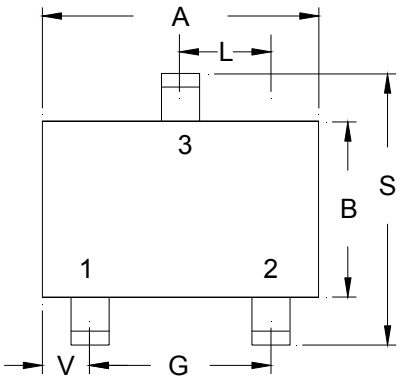
## Recommended temperature profile for IR reflow

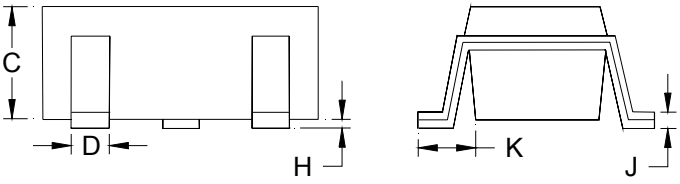



| Profile feature | Sn-Pb eutectic Assembly | Pb-free Assembly |
|---|---|---|
| Average ramp-up rate (Tsmax to Tp) | 3°C/second max. | 3°C/second max. |
| Preheat<br>−Temperature Min($T_S$ min)<br>−Temperature Max($T_S$ max)<br>−Time($t_{s\ min}$ to $t_{s\ max}$) | <br>100°C<br>150°C<br>60-120 seconds | <br>150°C<br>200°C<br>60-180 seconds |
| Time maintained above:<br>−Temperature ($T_L$)<br>− Time ($t_L$) | <br>183°C<br>60-150 seconds | <br>217°C<br>60-150 seconds |
| Peak Temperature($T_P$) | 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. |

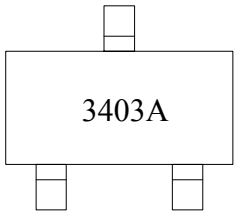
Note : All temperatures refer to topside of the package, measured on the package body surface.

## SOT-23 Dimension




Marking:




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

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

*: Typical

| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.1102 | 0.1204 | 2.80 | 3.04 | J | 0.0034 | 0.0070 | 0.085 | 0.177 |
| 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 | 0.0005 | 0.0040 | 0.013 | 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.