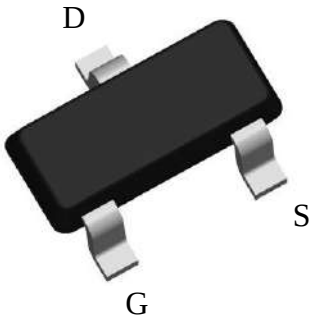
# P-Channel Enhancement Mode MOSFET

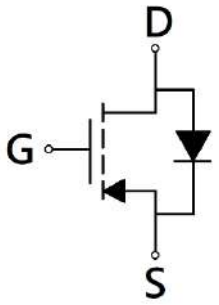
## Features:

- Low On Resistance
- Low Gate Charge
- Fast Switching Characteristic

SOT-23




| | |
|---|---|
| $BV_{DSS}$ | -40V |
| $I_D$@$V_{GS}$=-10V, $T_A$=25°C | -3.5A |
| $R_{DS(ON)}$ typ.@ $V_{GS}$=-10V, $I_D$=-3A | 43mΩ |
| $R_{DS(ON)}$ typ.@ $V_{GS}$=-4.5V, $I_D$=-2A | 54mΩ |




G : Gate S : Source D : Drain

## Ordering Information

| Device | Package | Shipping |
|---|---|---|
| KWB040P04 | SOT-23<br>(Pb-free lead plating and halogen-free package) | 3000 pcs / Tape & Reel |

## Absolute Maximum Ratings ($T_A$=25°C)

| Parameter | | Symbol | Limits | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | -40 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | |
| Continuous Drain Current @ $V_{GS}$=-10V, $T_A$=25°C | *a | $I_D$ | -3.5 | A |
| Continuous Drain Current @ $V_{GS}$=-10V, $T_A$=70°C | *a | | -2.8 | |
| Pulsed Drain Current | *b | $I_{DM}$ | -14 | |
| Continuous Body Diode Forward Current @ $T_A$=25°C | *a | $I_S$ | -1 | |
| Total Power Dissipation | $T_A$=25°C *a | $P_D$ | 1.2 | W |
| | $T_A$=70°C *a | | 0.8 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55~+150 | °C |

## Thermal Data

| Parameter | | Symbol | Steady State | Unit |
|---|---|---|---|---|
| Thermal Resistance, Junction-to-ambient | *a | $R_{\theta JA}$ | 100 | °C/W |

Note:

*a. The value of $R_{\theta JA}$ is measured with the device mounted on 1 $in^2$ FR -4 board with 2 oz. copper, in a still air environment with $T_A$=25℃. The power dissipation $P_D$ is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150℃. The value in any given application depends on the user's specific board design.

*b. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150℃. Ratings are based on low frequency and low duty cycles to keep initial $T_J$=25℃.

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

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Static** | | | | | |
| $BV_{DSS}$ | -40 | - | - | V | $V_{GS}$=0V, $I_D$=-250μA |
| $V_{GS(th)}$ | -1 | - | -2.5 | | $V_{DS}$=$V_{GS}$, $I_D$=-250μA |
| $G_{FS}$ | - | 7.4 | - | S | $V_{DS}$=-10V, $I_D$=-3A |
| $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±20V, $V_{DS}$=0V |
| $I_{DSS}$ | - | - | -1 | μA | $V_{DS}$=-32V, $V_{GS}$=0V |
| $R_{DS(ON)}$ | - | 43 | 56 | mΩ | $V_{GS}$=-10V, $I_D$=-3A |
| | - | 54 | 75 | | $V_{GS}$=-4.5V, $I_D$=-2A |
| **Dynamic** | | | | | |
| Ciss | - | 930 | - | pF | $V_{DS}$=-20V, $V_{GS}$=0V, f=1MHz |
| Coss | - | 80 | - | | |
| Crss | - | 60 | - | | |
| Rg | - | 17 | - | Ω | f=1MHz |
| Qg *1, 2 | - | 19 | - | nC | $V_{DS}$=-20V, $I_D$=-3A, $V_{GS}$=-10V |
| Qgs *1, 2 | - | 2.8 | - | | |
| Qgd *1, 2 | - | 3.6 | - | | |
| $t_{d(ON)}$ *1, 2 | - | 6.8 | - | ns | $V_{DS}$=-20V, $I_D$=-3A, $V_{GS}$=-10V, $R_{GS}$=1Ω |
| tr *1, 2 | - | 19 | - | | |
| $t_{d(OFF)}$ *1, 2 | - | 65 | - | | |
| $t_f$ *1, 2 | - | 31 | - | | |
| **Source-Drain Diode** | | | | | |
| $V_{SD}$ *1 | - | -0.8 | -1.2 | V | $I_S$=-3A, $V_{GS}$=0V |
| trr | - | 9.5 | - | ns | $I_F$=-3A, $dI_F/dt$=100A/μs |
| Qrr | - | 5 | - | nC | |

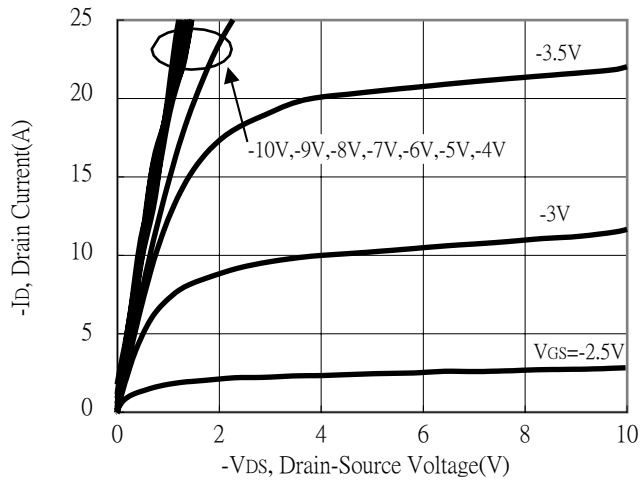
Note:

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

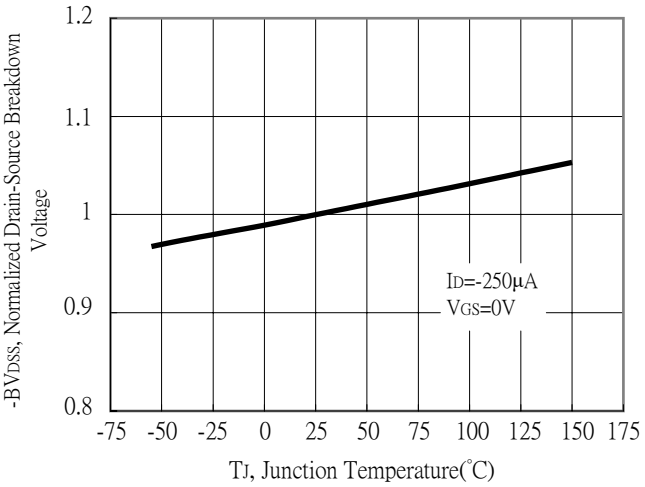
*2. Independent of operating temperature

## Typical Characteristics

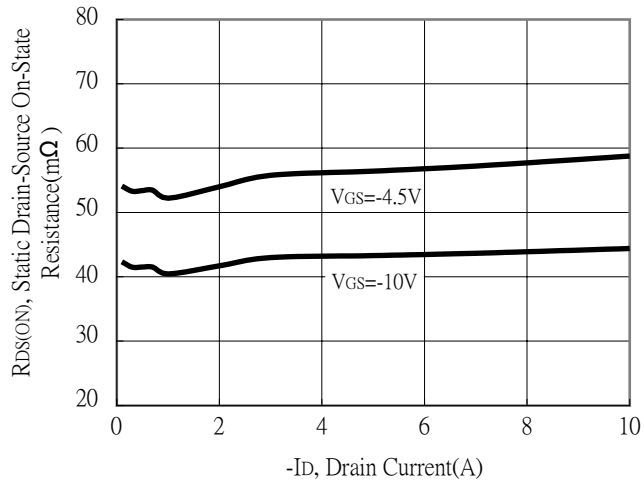
Typical Output Characteristics



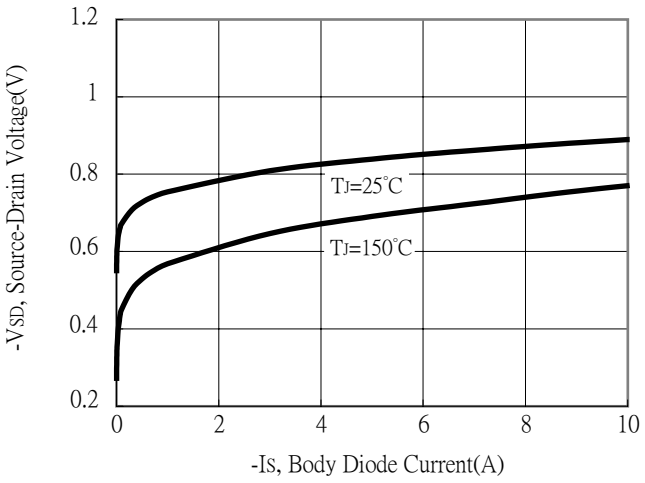

Breakdown Voltage vs Ambient Temperature



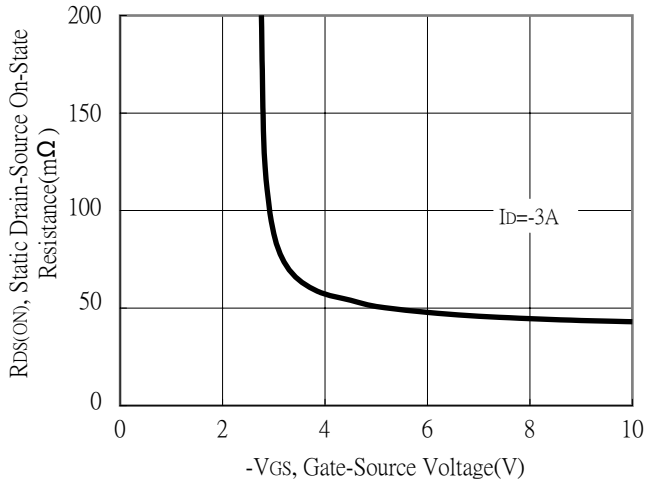

Static Drain-Source On-State resistance vs Drain Current



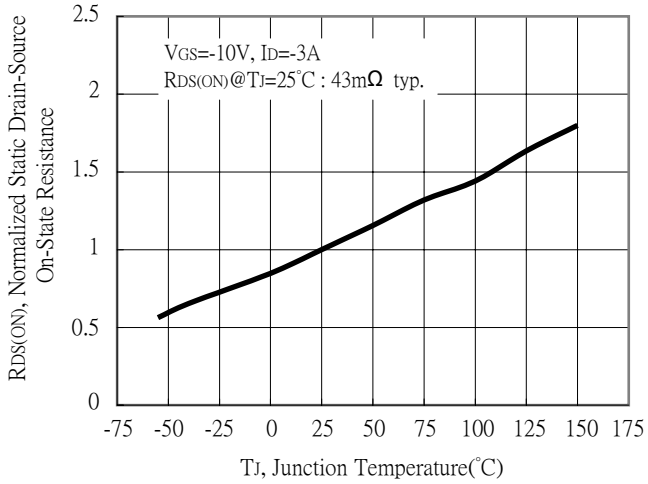

Body Diode Current vs Source-Drain Voltage




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

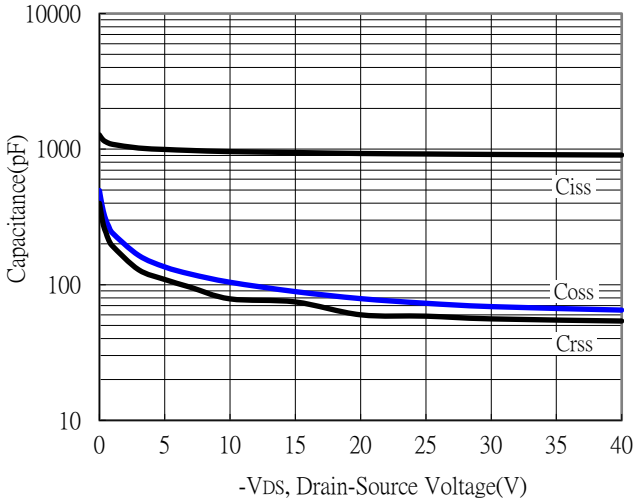



Drain-Source On-State Resistance vs Junction Temperature

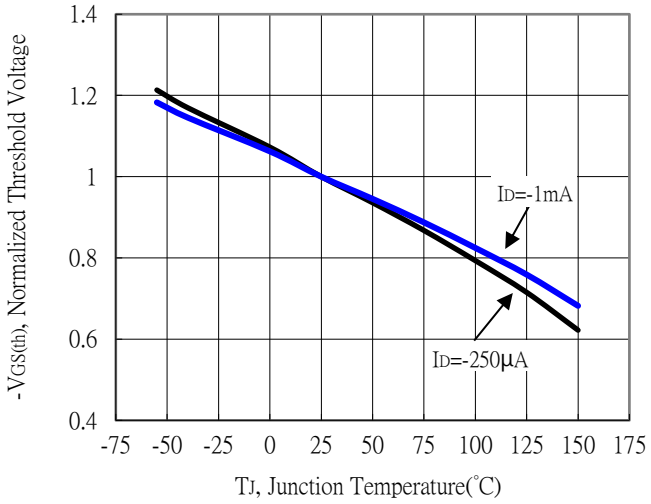


## Typical Characteristics (Cont.)

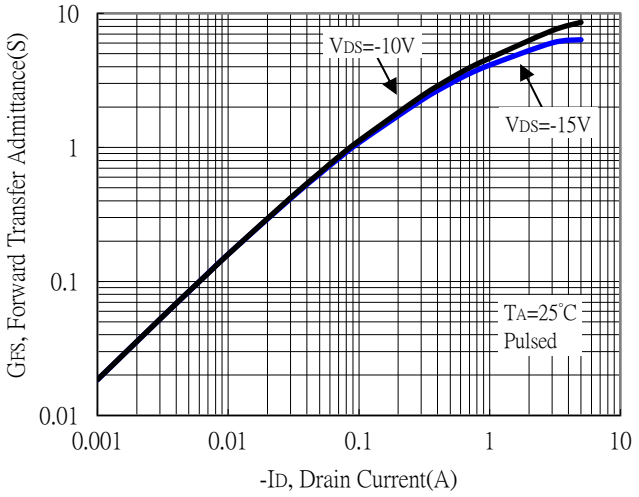
Capacitance vs Drain-to-Source Voltage



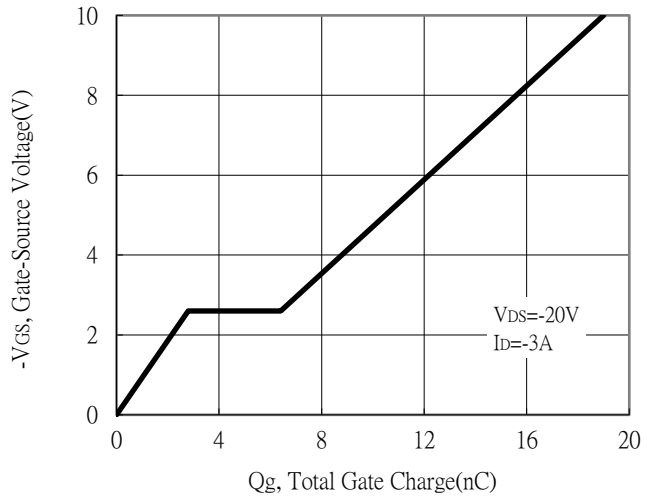

Threshold Voltage vs Junction Temperature



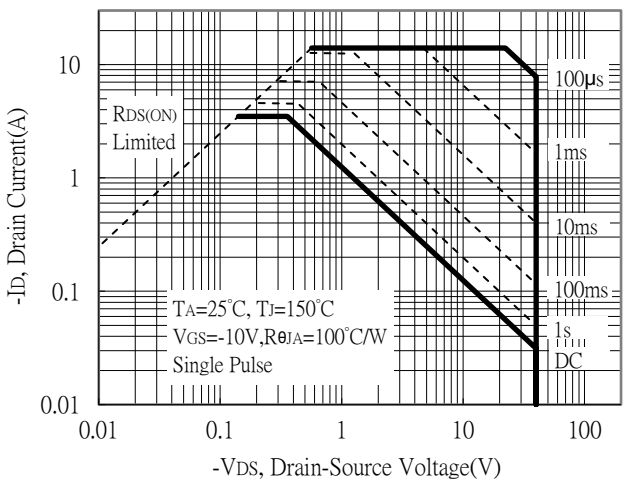

Forward Transfer Admittance vs Drain Current



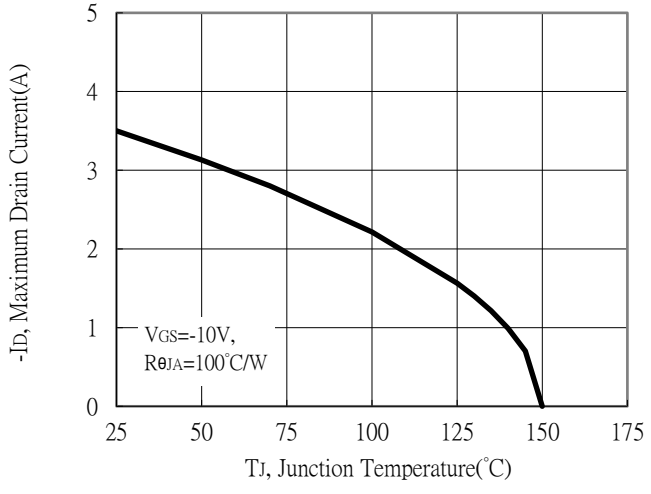

Gate Charge Characteristics



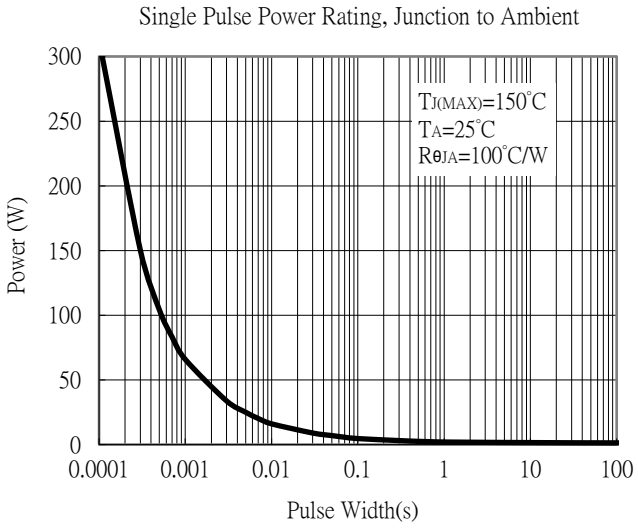

Maximum Safe Operating Area

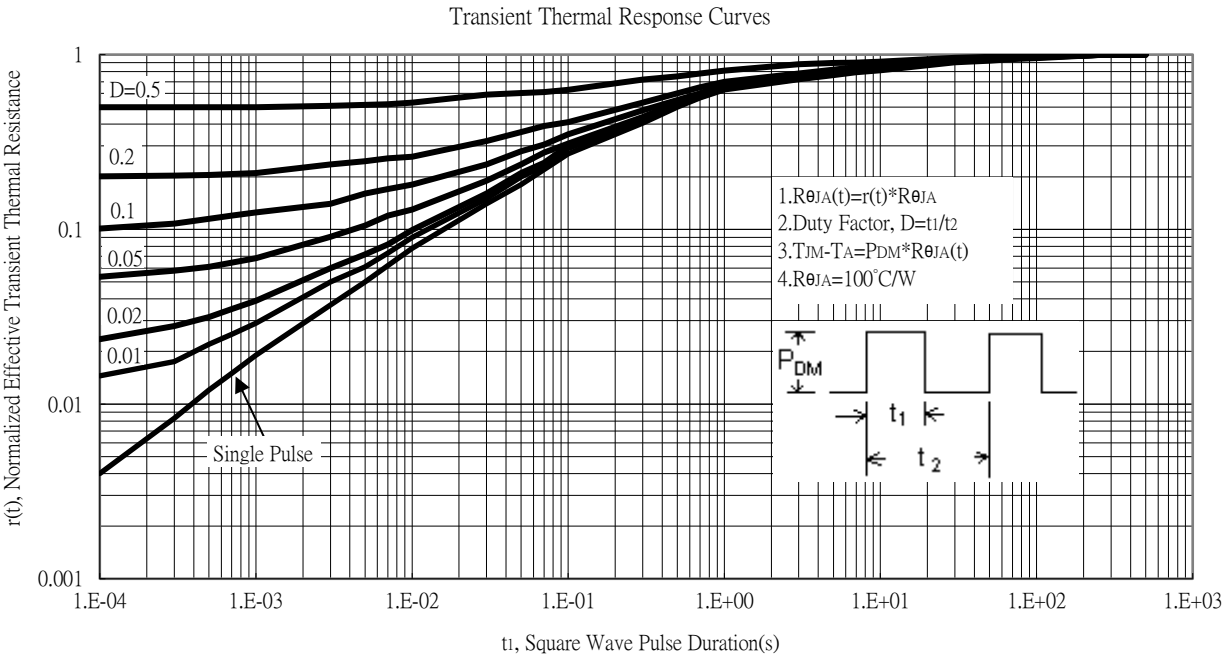



Maximum Drain Current vs Junction Temperature

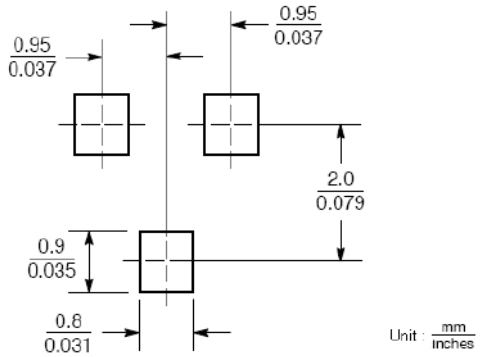


## Typical Characteristics (Cont.)

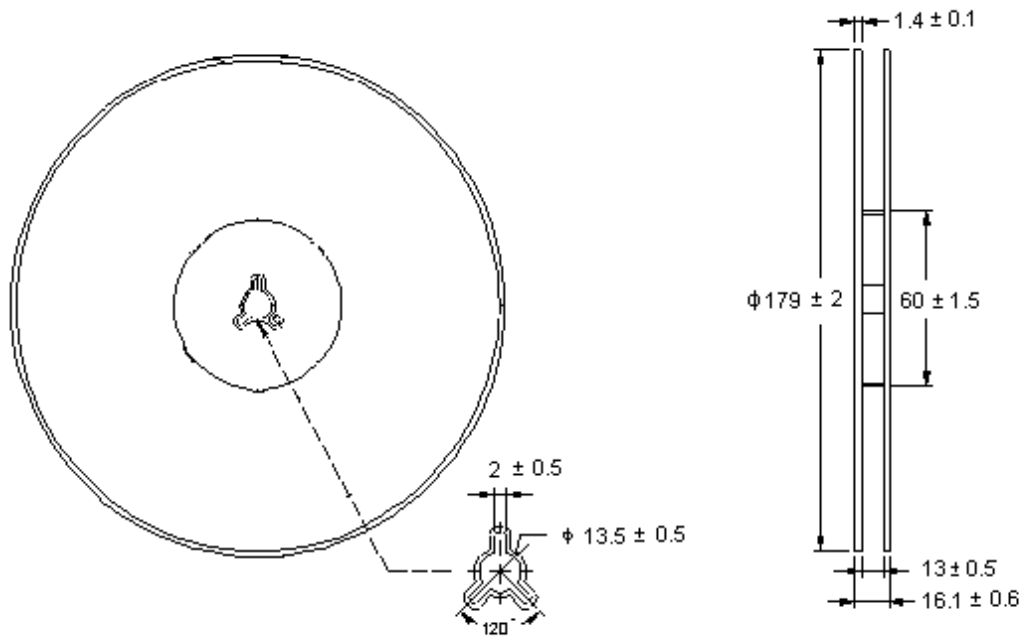



## Recommended Soldering Footprint

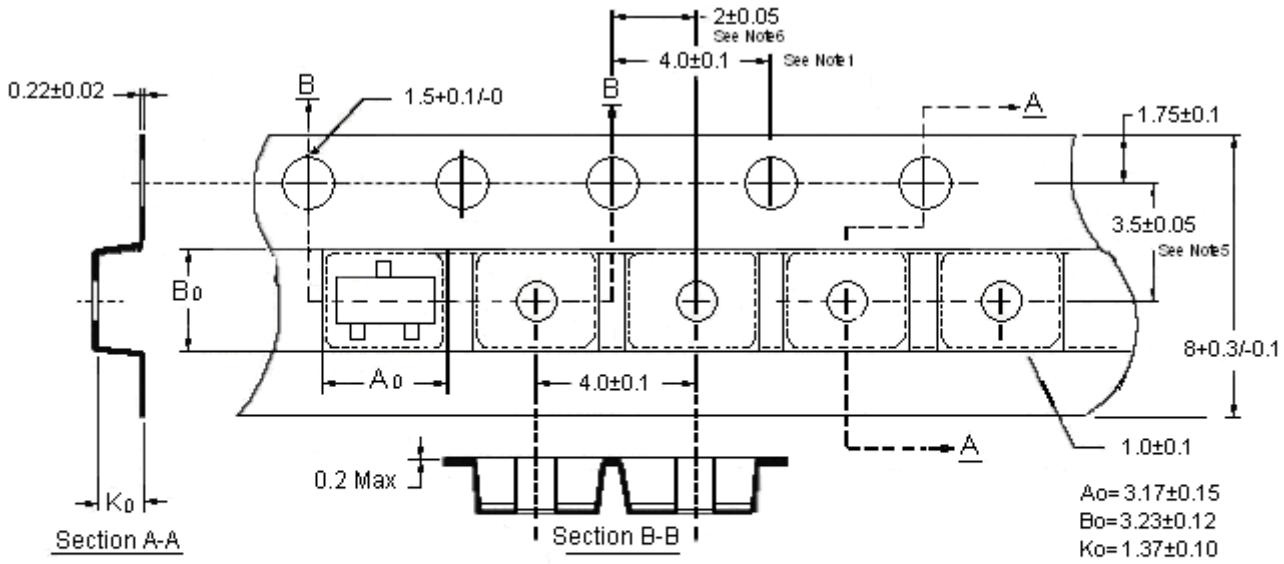


## Reel Dimension




Unit: millimeter

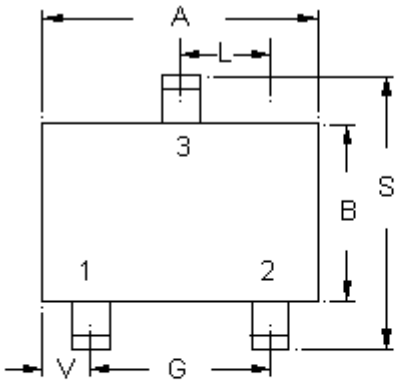
## Carrier Tape Dimension



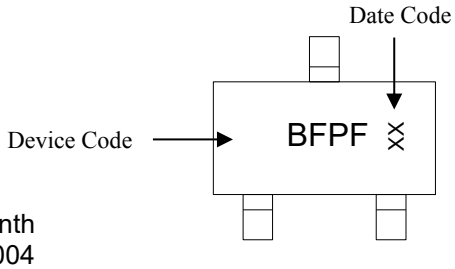

Notes:
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material : conductive Black Polystyrene.
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.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

Unit : millimeter

## SOT-23 Dimension




Marking:

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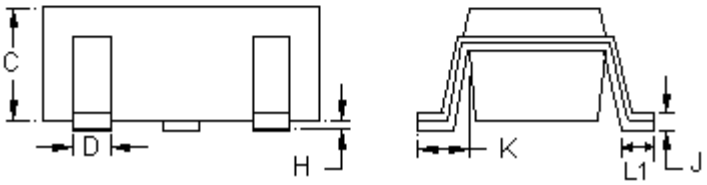
Month: 1→1, 2→2, • • •
9→9, A→10, B→11, C→12




3-Lead SOT-23 Plastic
Surface Mounted Package

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

| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.1102 | 0.1204 | 2.80 | 3.04 | J | 0.0032 | 0.0079 | 0.08 | 0.20 |
| B | 0.0472 | 0.0669 | 1.20 | 1.70 | K | 0.0118 | 0.0266 | 0.30 | 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 | L1 | 0.0118 | 0.0197 | 0.30 | 0.50 |