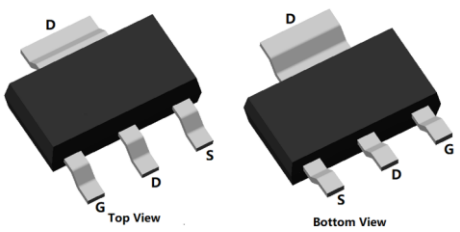
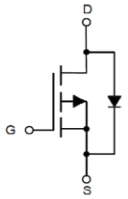
# P-Channel Enhancement Mode Field Effect Transistor




SOT-223




## Product Summary

- $V_{DS}$ -100V
- $I_D$ -3.2A
- $R_{DS(ON)}$( at $V_{GS}$=-10V) ＜90mΩ
- $R_{DS(ON)}$( at $V_{GS}$=-4.5V) ＜114mΩ

## General Description

- Excellent package for heat dissipation
- High density cell design for low $R_{DS(ON)}$
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free

## Applications

- Load switch

## ■ Limiting Values

| Parameter | Conditions | | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-source Voltage | | | $V_{DS}$ | - | -100 | V |
| Gate-source Voltage | | | $V_{GS}$ | -20 | 20 | |
| Continuous Drain Current (Note 1,2) | Steady-State | $T_A$=25℃,$V_{GS}$=-10V | $I_D$ | - | -3.2 | A |
| | | $T_A$=100℃,$V_{GS}$=-10V | | - | -2 | |
| Pulsed Drain Current | $T_A$=25℃,$t_p$≤10μs | | $I_{DM}$ | - | -25.6 | |
| Maximum Body-Diode Continuous Current | $T_A$=25℃ | | $I_S$ | | -1.6 | |
| Total Power Dissipation (Note 1,2) | Steady-State | $T_A$=25℃ | $P_D$ | - | 1.95 | W |
| | | $T_A$=100℃ | | - | 0.78 | |
| Junction and Storage Temperature Range | | | $T_J$ ,$T_{STG}$ | -55 | 150 | ℃ |

## ■Thermal Resistance

| Parameter | | Symbol | Typ | Max | Units |
|---|---|---|---|---|---|
| Thermal Resistance Junction-to-Ambient (Note 2) | Steady-State | $R_{\theta JA}$ | - | 64 | ℃/W |

## ■ Ordering Information (Example)

| PREFERED P/N | PACKING CODE | Marking | MINIMUM PACKAGE(pcs) | INNER BOX QUANTITY(pcs) | OUTER CARTON QUANTITY(pcs) | DELIVERY MODE |
|---|---|---|---|---|---|---|
| M090P10A | F2 | M090P10A | 2500 | 5000 | 25000 | 13” reel |

## ■ Electrical Characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Static Parameter** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V,$I_D$=-250μA,Tj=25℃ | -100 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=-100V,$V_{GS}$=0V,Tj=25℃ | - | - | -1 | μA |
| | | $V_{DS}$=-100V,$V_{GS}$=0V,Tj=150℃ | - | - | -100 | |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V,$V_{DS}$=0V,Tj=25℃ | - | - | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=-250μA,Tj=25℃ | -1.4 | -1.9 | -2.4 | V |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=-10V,$I_D$=-3A,Tj=25℃ | - | 70 | 90 | mΩ |
| | | $V_{GS}$=-4.5V,$I_D$=-1.5A,Tj=25℃ | - | 76 | 114 | mΩ |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=-1.5A,$V_{GS}$=0V,Tj=25℃ | - | -0.74 | -1.2 | V |
| Gate Resistance | $R_G$ | f=1MHz,Tj=25℃ | - | 10.6 | - | Ω |
| **Dynamic Parameters** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=-50V,$V_{GS}$=0V,f=1MHz,Tj=25℃ | - | 2114 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 91 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 69 | - | |
| **Switching Parameters** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{GS}$=-10V,$V_{DS}$=-50V,$I_D$=-3A,Tj=25℃ | - | 46.6 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 6.8 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 8 | - | |
| Reverse Recovery Charge | $Q_{rr}$ | $I_F$=-3A,di/dt=100A/μs,$V_{GS}$=0V, $V_R$=-50V,Tj=25℃ | - | 39.3 | - | nC |
| Reverse Recovery Time | $t_{rr}$ | | - | 26.2 | - | ns |
| Turn-on Delay Time | $t_{D(on)}$ | $V_{GS}$=-10V,$V_{DS}$=-50V,$I_D$=-3A, , $R_{GEN}$=3Ω,Tj=25℃ | - | 8.2 | - | ns |
| Turn-on Rise Time | $t_r$ | | - | 9.8 | - | |
| Turn-off Delay Time | $t_{D(off)}$ | | - | 114.5 | - | |
| Turn-off Fall Time | $t_f$ | | - | 46.6 | - | |

Note：

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. The value of $R_{\theta JA}$ is measured with the device mounted on the 40mm*40mm*1.1mm single layer FR-4 PCB board with 1 $in^2$ pad of 2oz. Copper, in the still air environment with $T_A$=25℃.The maximum allowed junction temperature of 150℃. The value in any given application depends on the user's specific board design.

## ■Typical Electrical and Thermal Characteristics Diagrams

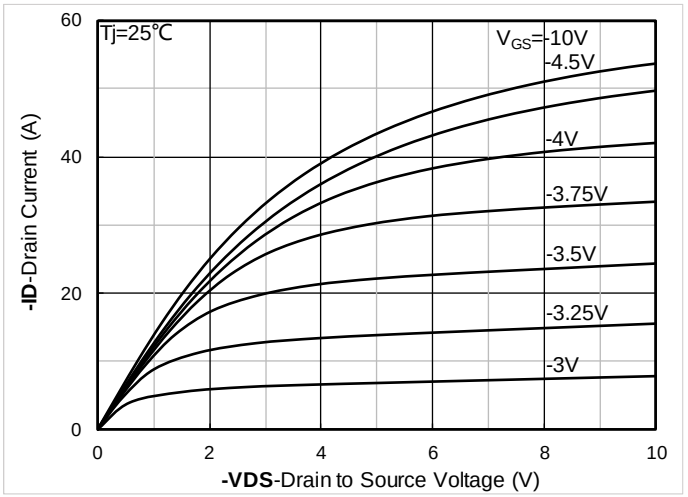



Figure 1. Output Characteristics; typical values

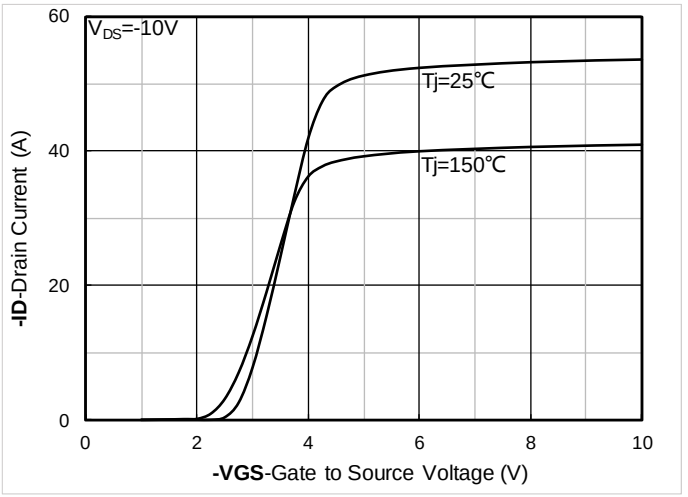



Figure 2. Transfer Characteristics; typical values

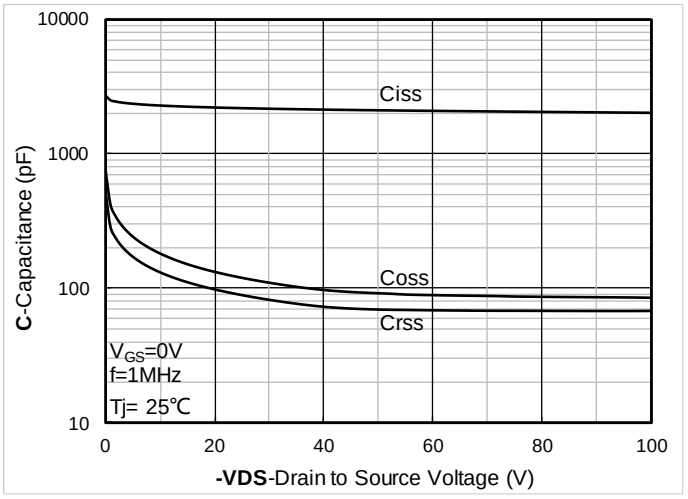



Figure 3. Capacitance Characteristics; typical values

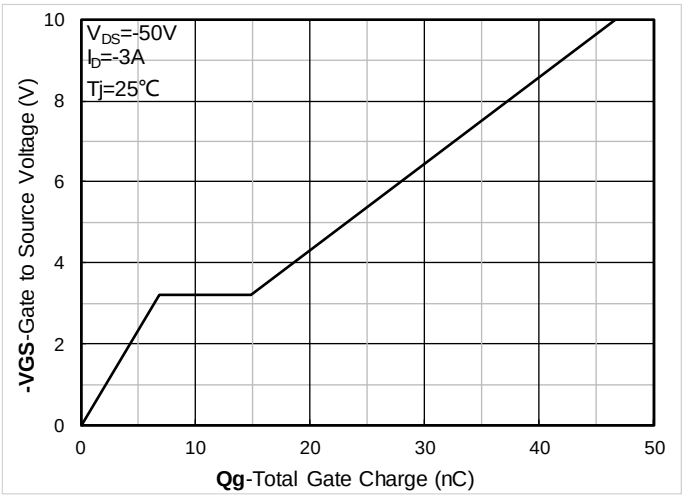



Figure 4. Gate Charge; typical values

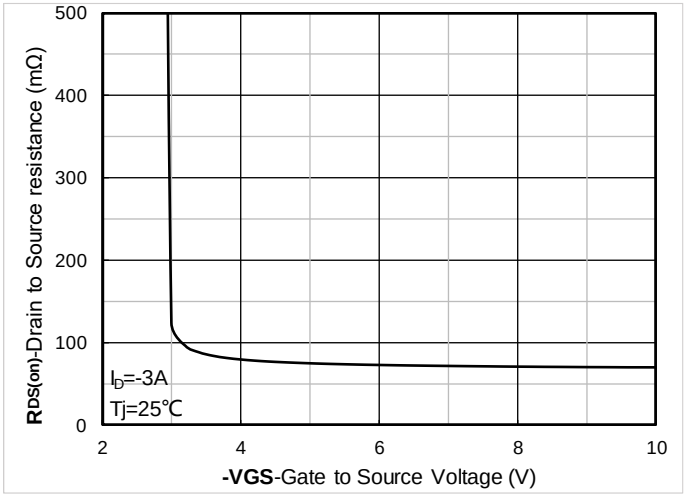



Figure 5. On-Resistance vs Gate to Source Voltage; typical values

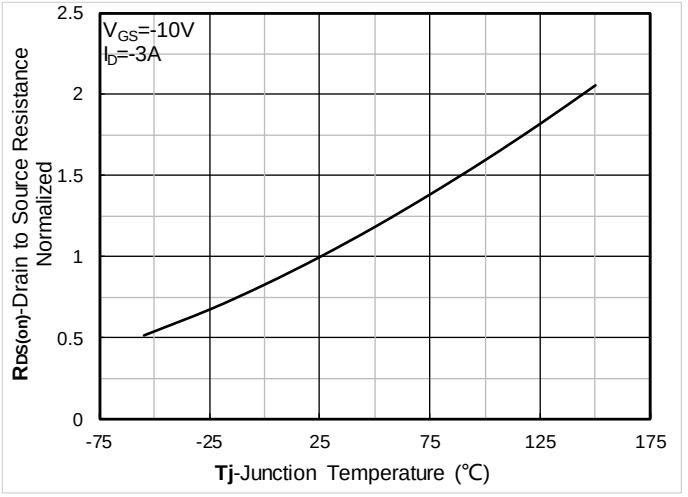



Figure 6. Normalized On-Resistance

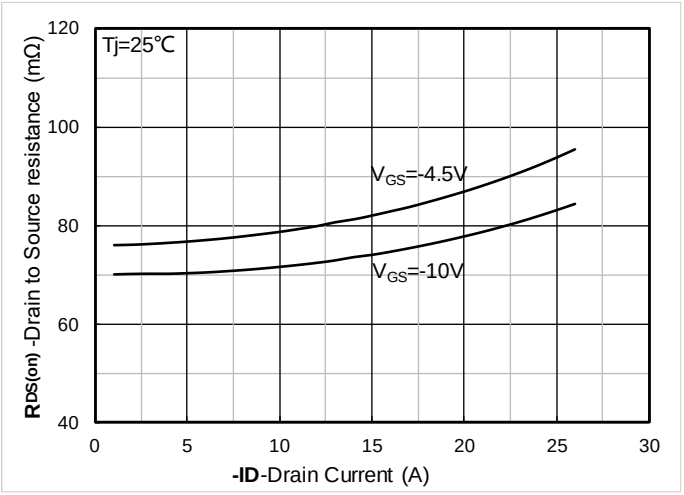



Figure 7. $R_{DS(on)}$ VS Drain Current; typical values

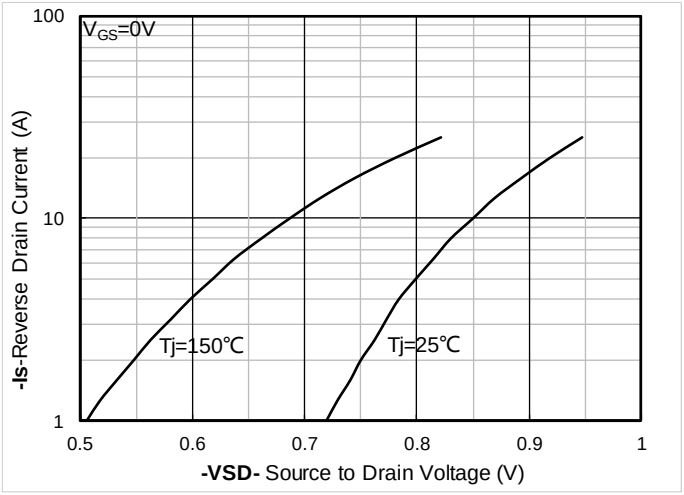



Figure 8. Forward characteristics of reverse diode; typical values

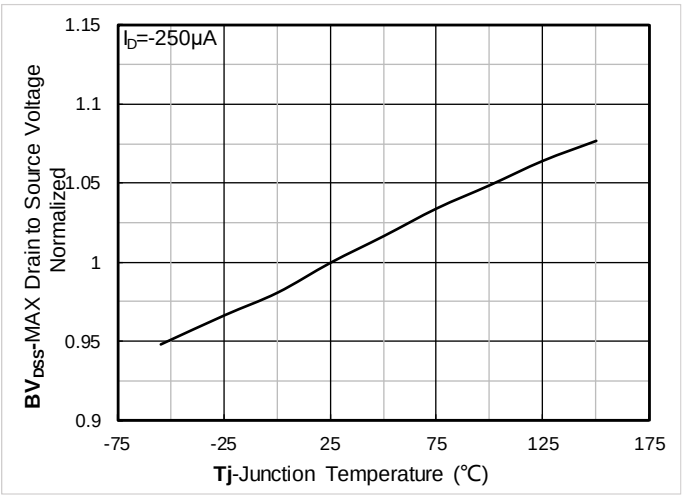



Figure 9. Normalized breakdown voltage

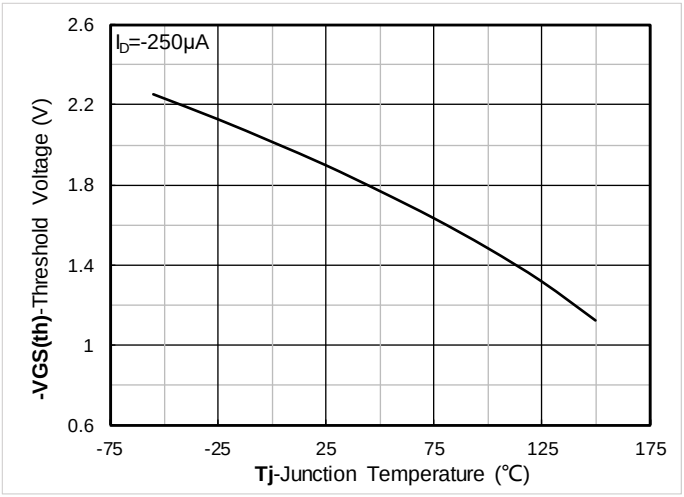



Figure 10. Gate Threshold voltage; typical values

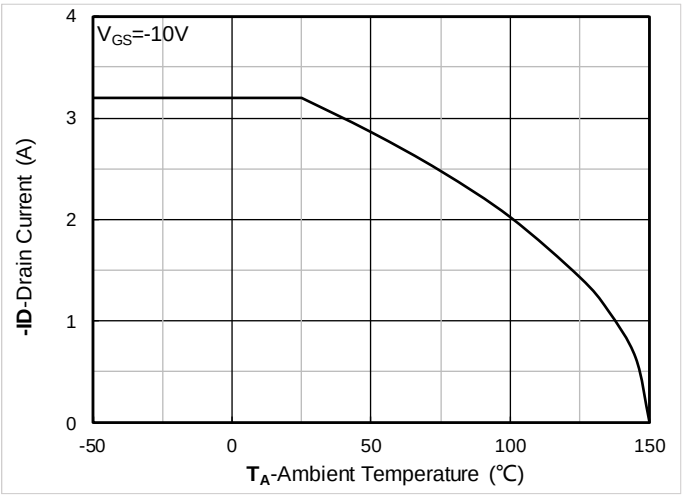



Figure 11. Current dissipation

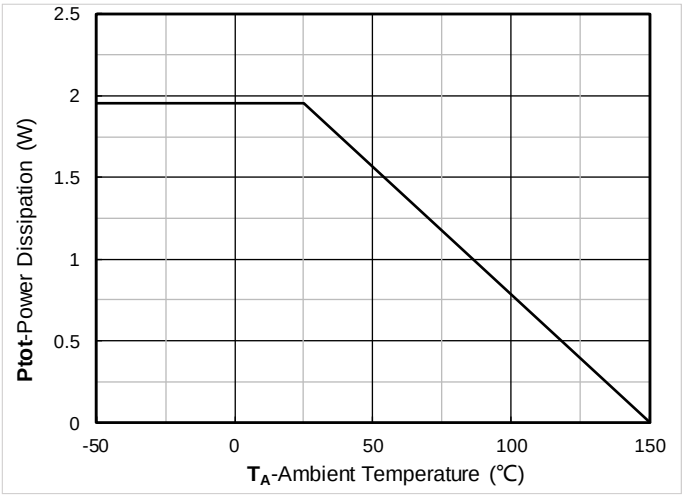



Figure 12. Power dissipation

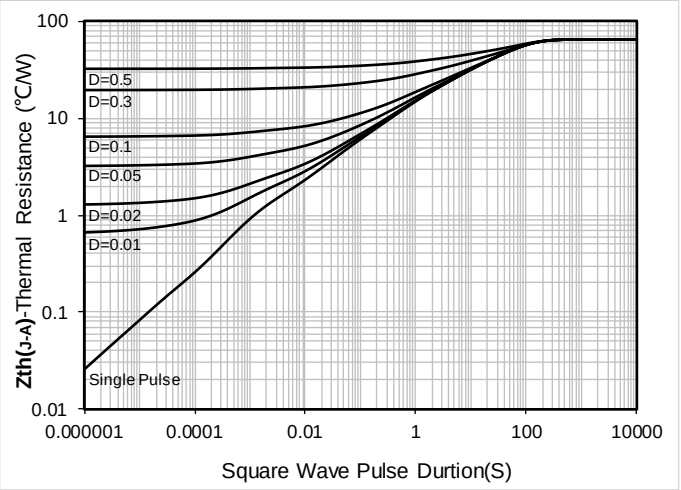



Figure 13. Maximum Transient Thermal Impedance

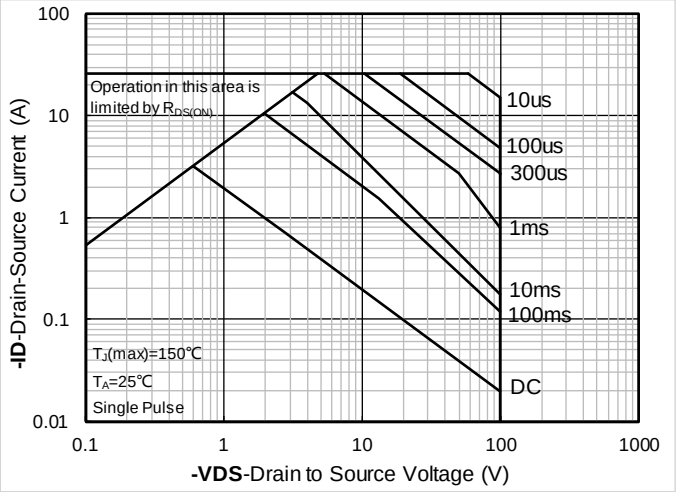
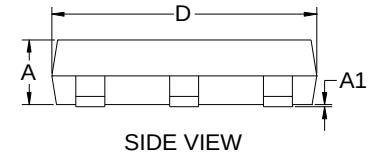
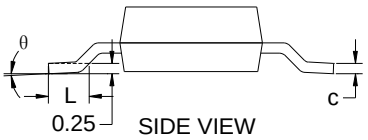



Figure 14. Safe Operation Area

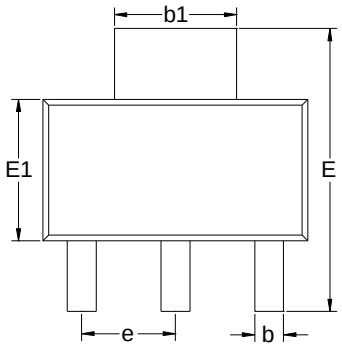
## ■ SOT-223 Package information



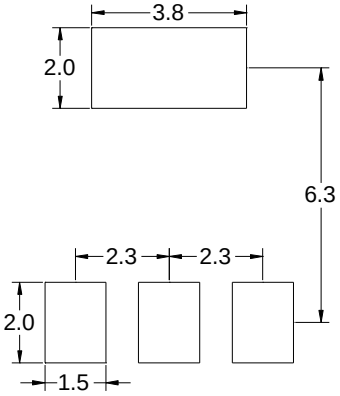

SIDE VIEW




SIDE VIEW




TOP VIEW




SUGGESTED SOLDER PAD LAYOUT

| DIMENSIONS | | | | |
|---|---|---|---|---|
| DIM | INCHES | | MM | |
| | MIN | MAX | MN | MAX |
| A | 0.0591 | 0.0670 | 1.5000 | 1.7000 |
| A1 | 0.0008 | 0.0039 | 0.0200 | 0.1000 |
| b | 0.0259 | 0.0330 | 0.6600 | 0.8400 |
| b1 | 0.1140 | 0.1220 | 2.9000 | 3.1000 |
| c | 0.0090 | 0.0138 | 0.2300 | 0.3500 |
| D | 0.2480 | 0.2640 | 6.3000 | 6.7000 |
| E | 0.2637 | 0.2874 | 6.7000 | 7.3000 |
| E1 | 0.1290 | 0.1460 | 3.3000 | 3.7000 |
| e | 0.0866 | 0.0945 | 2.2000 | 2.4000 |
| L | 0.0295 | 0.0492 | 0.7500 | 1.2500 |
| θ | 0° | 10° | 0° | 10° |

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