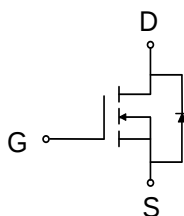
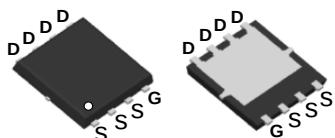


## N-Channel Advanced Trench MOSFET

### MSR002N03SD

#### PDFN5x6



### Features

- Very Low On-resistance  $R_{DS(ON)}$
- High power package (PDFN5X6)
- Halogen free
- Fast switching

### Applications

- Power Management Switches
- PWM Application
- Load Switch

### Maximum ratings, at $T_A = 25^\circ\text{C}$ , unless otherwise specified

| Symbol         | Parameter                              |                           | Rating     | Unit             |
|----------------|----------------------------------------|---------------------------|------------|------------------|
| $V_{(BR)DSS}$  | Drain-Source breakdown voltage         |                           | 30         | V                |
| $V_{GS}$       | Gate-Source voltage                    |                           | $\pm 20$   | V                |
| $I_D$          | Continuous drain current ③             | $T_C = 25^\circ\text{C}$  | 160        | A                |
|                |                                        | $T_C = 100^\circ\text{C}$ | 104        | A                |
| $I_{DM}$       | Pulse drain current tested ①           | $T_C = 25^\circ\text{C}$  | 640        | A                |
| EAS            | Avalanche energy, single pulsed ②      |                           | 870        | mJ               |
| PD             | Maximum power dissipation              | $T_C = 25^\circ\text{C}$  | 50         | W                |
| $T_{STG}, T_J$ | Storage and Junction Temperature Range |                           | -55 to 150 | $^\circ\text{C}$ |

NOTE: ① Repetitive Rating: Pulse width limited by maximum junction temperature.

② EAS Condition:  $L=0.5\text{mH}$ ,  $V_{DD}=15\text{V}$ ,  $V_G=10\text{V}$ ,  $R_G=25\Omega$ ,  $T_J=25^\circ\text{C}$ .

③ Pulse test: Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 0.5\%$

## Thermal Characteristics

| Symbol           | Parameter                            | Rating | Unit |
|------------------|--------------------------------------|--------|------|
| R <sub>θJC</sub> | Thermal Resistance, Junction-to-Case | 2.5    | °C/W |

## Electrical Characteristics

| Symbol | Parameter | Condition | Min. | Typ. | Max. | Unit |
|--------|-----------|-----------|------|------|------|------|
|--------|-----------|-----------|------|------|------|------|

Static Electrical Characteristics @T<sub>j</sub>=25°C (unless otherwise stated)

|                     |                                  |                                                          |    |     |      |    |
|---------------------|----------------------------------|----------------------------------------------------------|----|-----|------|----|
| V(BR)DSS            | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA               | 30 | --  | --   | V  |
| I <sub>DSS</sub>    | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V                | -- | --  | 1    | μA |
| I <sub>GSS</sub>    | Gate-Body Leakage Current        | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V               | -- | --  | ±100 | nA |
| V <sub>GS(th)</sub> | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA | 1  | 1.6 | 2.2  | V  |
| R <sub>DS(on)</sub> | Drain-Source On-State Resistance | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                | -- | 1.6 | 2.0  | mΩ |
|                     |                                  | V <sub>GS</sub> =10V, I <sub>D</sub> =15A                | -- | 2.3 | 3.0  | mΩ |

## Dynamic Electrical Characteristics@T<sub>j</sub> = 25°C (unless otherwise stated)

|                  |                              |                                                                        |    |      |    |    |
|------------------|------------------------------|------------------------------------------------------------------------|----|------|----|----|
| C <sub>iss</sub> | Input Capacitance            | V <sub>DS</sub> =30V, V <sub>GS</sub> =0 V ,<br>f=1MHz                 | -- | 7428 | -- | pF |
| C <sub>oss</sub> | Output Capacitance           |                                                                        | -- | 664  | -- | pF |
| C <sub>rss</sub> | Reverse Transfer Capacitance |                                                                        | -- | 544  | -- | pF |
| Q <sub>g</sub>   | Total Gate Charge            | V <sub>DS</sub> =30V,<br>I <sub>D</sub> =30A ,<br>V <sub>GS</sub> =10V | -- | 142  | -- | nC |
| Q <sub>gs</sub>  | Gate-Source Charge           |                                                                        | -- | 92   | -- | nC |
| Q <sub>gd</sub>  | Gate-Drain Charge            |                                                                        | -- | 18   | -- | nC |

## Switching Characteristics

|         |                     |                                                                                              |    |    |    |    |
|---------|---------------------|----------------------------------------------------------------------------------------------|----|----|----|----|
| Td(on)  | Turn-on Delay Time  | V <sub>DS</sub> =30V,<br>V <sub>GS</sub> =10V<br>I <sub>D</sub> =30A,<br>R <sub>G</sub> =25Ω | -- | 18 | -- | ns |
| Tr      | Turn-on Rise Time   |                                                                                              | -- | 10 | -- | ns |
| Td(off) | Turn-Off Delay Time |                                                                                              | -- | 64 | -- | ns |
| Tf      | Turn-Off Fall Time  |                                                                                              | -- | 16 | -- | ns |

## Source- Drain Diode Characteristics@ T<sub>j</sub> = 25°C (unless otherwise stated)

|                 |                                    |                                                                                       |    |    |     |    |
|-----------------|------------------------------------|---------------------------------------------------------------------------------------|----|----|-----|----|
| VSD             | Forward on voltage                 | I <sub>SD</sub> =20A, V <sub>GS</sub> =0V                                             | -- | -- | 1.2 | V  |
| I <sub>S</sub>  | Body Diode Forward Current         | --                                                                                    | -- | -- | 160 | A  |
| T <sub>rr</sub> | Body Diode Reverse Recovery Time   | I <sub>SD</sub> =20A, V <sub>GS</sub> =0V,<br>d <sub>i</sub> /d <sub>t</sub> =100A/μs | -- | 30 | --  | ns |
| Q <sub>rr</sub> | Body Diode Reverse Recovery Charge |                                                                                       | -- | 22 | --  | nC |

## Typical Characteristics

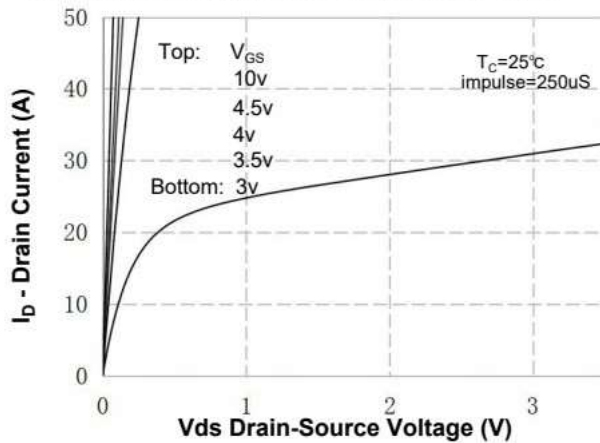


Figure 1. On-Region Characteristics

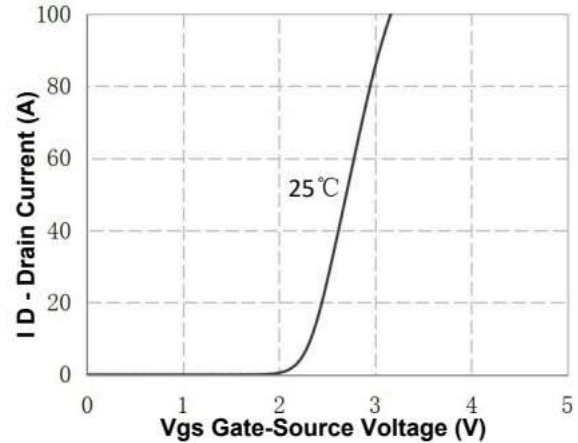


Figure 2. Transfer Characteristics

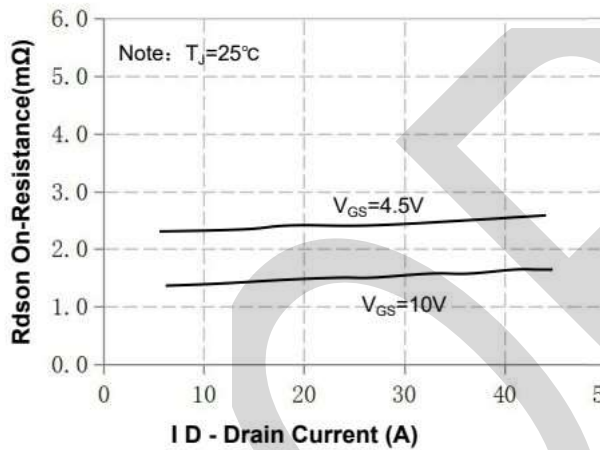


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

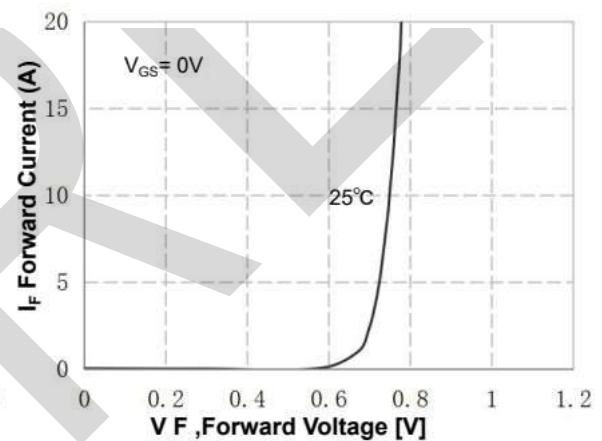


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

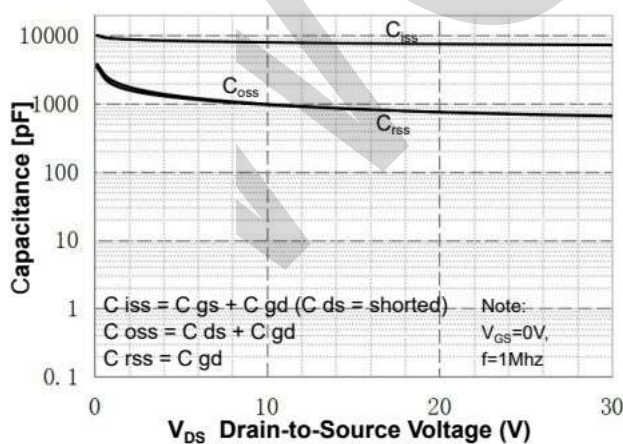


Figure 5. Capacitance Characteristics

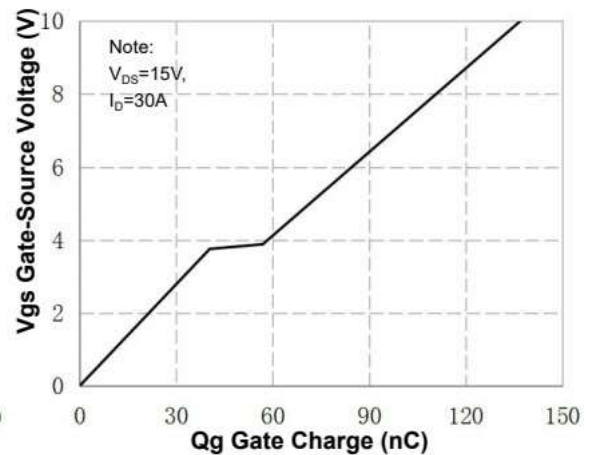


Figure 6. Gate Charge Characteristics

## Typical Characteristics

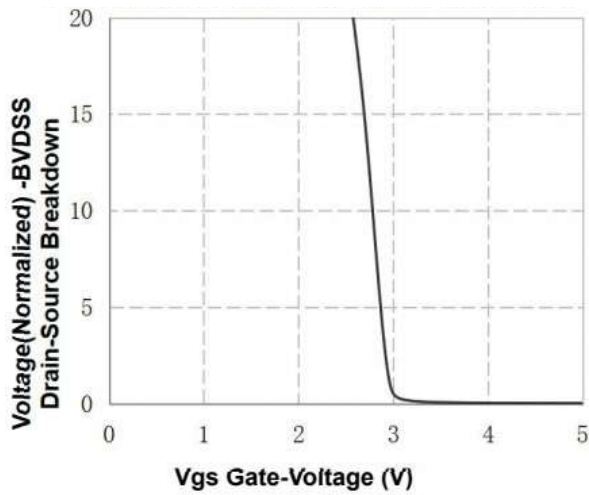


Figure 7. Breakdown Voltage Variation vs Gate-Voltage

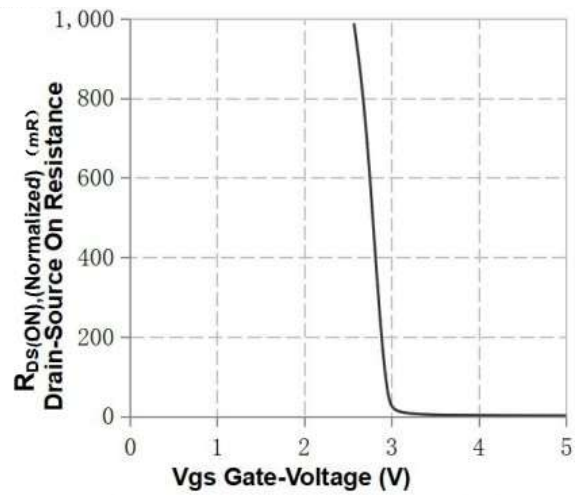


Figure 8. On-Resistance Variation vs Gate Voltage

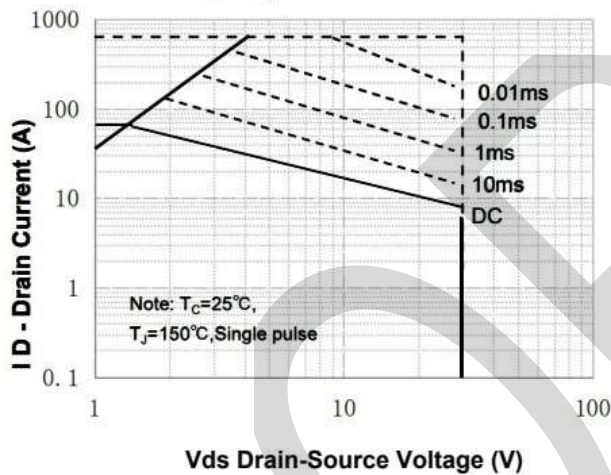


Figure 9. Maximum Safe Operating Area

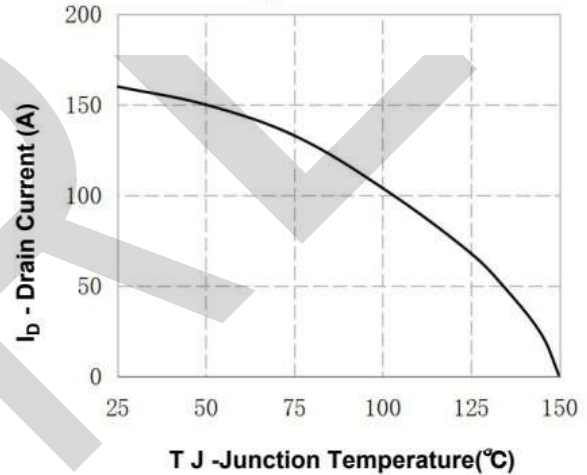


Figure 10. Maximum PContinuous Drain Current vs Case Temperature

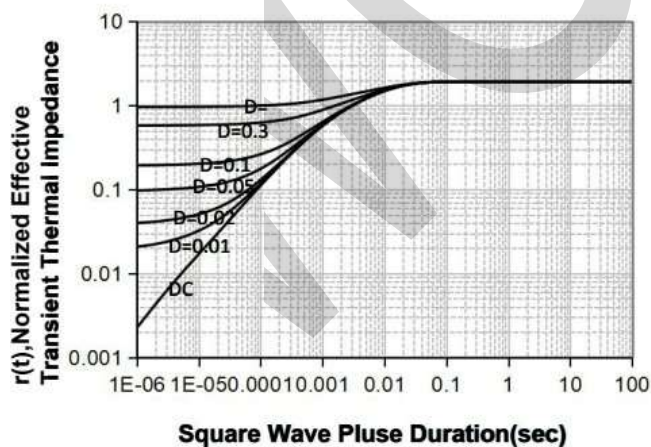
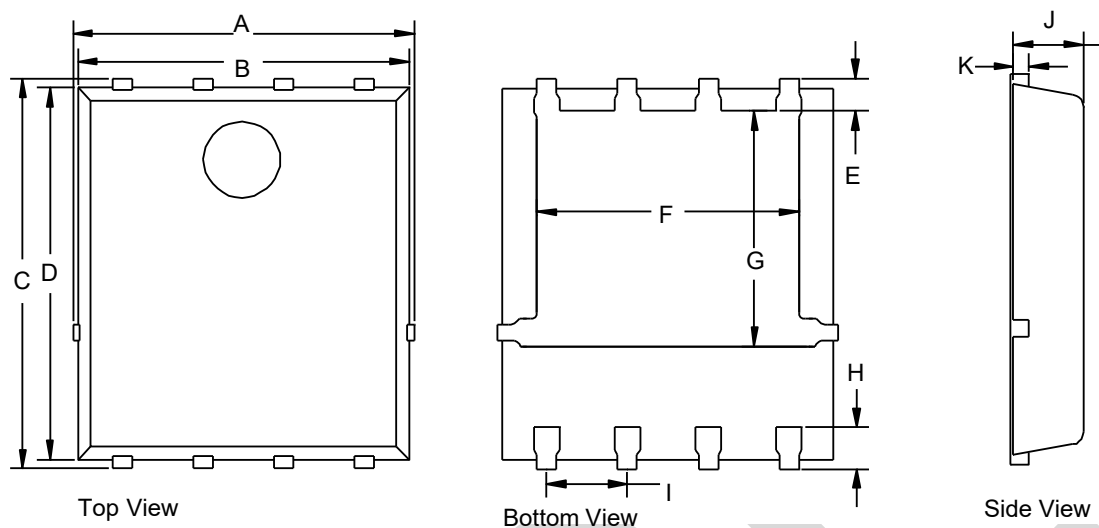


Figure 11. Transient Thermal Response Curve

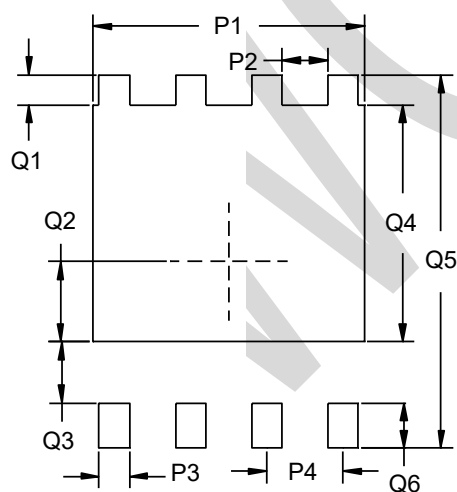
## PACKAGE OUTLINE DIMENSIONS



## PDFN5x6 mechanical data

| UNIT |     | A     | B     | C     | D     | E    | F     | G     | H    | I    | J    | K     |
|------|-----|-------|-------|-------|-------|------|-------|-------|------|------|------|-------|
| mm   | min | 4.90  | 4.8   | 5.90  | 5.66  | 0.60 | 3.90  | 3.30  | 0.53 | 1.27 | 0.9  | 0.254 |
|      | max | 5.55  | 5.4   | 6.35  | 6.06  |      | 4.32  | 3.92  | 0.76 |      | 1.2  |       |
| mil  | min | 192.9 | 188.9 | 232.3 | 222.8 | 23.6 | 153.5 | 129.9 | 20.8 | 50.0 | 35.4 | 10.0  |
|      | max | 218.5 | 212.6 | 250.0 | 238.6 |      | 170.1 | 154.3 | 29.9 |      | 47.2 |       |

## PDFN5x6 Suggested Pad Layout

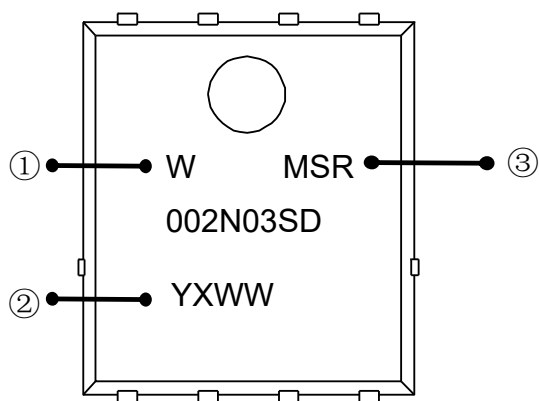


| UNIT |     | P1    | P2   | P3    | P4   | Q1   |
|------|-----|-------|------|-------|------|------|
| mm   | min | 4.52  | 0.76 | 0.51  | 1.27 | 0.50 |
| mil  | min | 177.9 | 29.9 | 20.07 | 50.0 | 20.0 |

| UNIT |     | Q2    | Q3    | Q4     | Q5     | Q6    |
|------|-----|-------|-------|--------|--------|-------|
| mm   | min | 1.34  | 1.02  | 3.97   | 6.25   | 0.76  |
| mil  | min | 52.75 | 40.15 | 156.30 | 246.06 | 29.92 |

## PACKAGE OUTLINE DIMENSIONS

### Marking Information



- ①W : Company's trademark
- ②Product model : MSR002N03SD

#### ③PDC information :

Y X WW

WW:Week code(01 to 53)

X:Internal identification code

Y:Year code(ex:0=2020)