

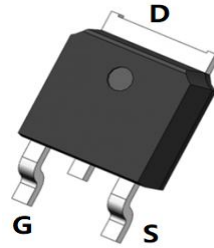


# SWD50N10YM

## N-channel Power MOSFET

### Features

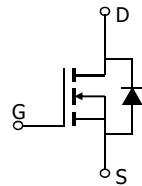
- 100V, 45A  
 $R_{DS(ON)} < 20m\Omega$  @  $V_{GS} = 10V$   
 $R_{DS(ON)} < 23m\Omega$  @  $V_{GS} = 4.5V$
- High Current Capability
- Provide Excellent  $R_{DS(ON)}$  and Low Gate Charge



TO-252 Top View

### Application

- Load Switch
- PWM Application
- Power management



Schematic Diagram

### Absolute Maximum Ratings (@ $T_A = 25^\circ C$ unless otherwise specified)

| Parameter                               | Symbol         | Value      | Unit       |
|-----------------------------------------|----------------|------------|------------|
| Drain-to-Source Voltage                 | $V_{DS}$       | 100        | V          |
| Gate-to-Source Voltage                  | $V_{GS}$       | $\pm 20$   | V          |
| Continuous Drain Current <sup>(1)</sup> | $I_D$          | 45         | A          |
|                                         |                | 32         |            |
| Pulsed Drain Current <sup>(2)</sup>     | $I_{DM}$       | 180        | A          |
| Avalanche Current <sup>(3)</sup>        | $I_{AS}$       | 17.0       | A          |
| Avalanche Energy <sup>(3)</sup>         | $E_{AS}$       | 43         | mJ         |
| Power Dissipation <sup>(4)</sup>        | $P_D$          | 83         | W          |
|                                         |                | 42         |            |
| Junction & Storage Temperature Range    | $T_J, T_{STG}$ | -55 to 175 | $^\circ C$ |



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### Electrical Characteristics (@ $T_J = 25^\circ\text{C}$ unless otherwise specified)

| Parameter                         | Symbol        | Conditions                                       | Min. | Typ. | Max.      | Unit             |
|-----------------------------------|---------------|--------------------------------------------------|------|------|-----------|------------------|
| <b>STATIC PARAMETERS</b>          |               |                                                  |      |      |           |                  |
| Drain-Source Breakdown Voltage    | $V_{(BR)DSS}$ | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$    | 100  |      |           | V                |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{DS} = 80\text{V}$ , $V_{GS} = 0\text{V}$     |      |      | 1.0       | $\mu\text{A}$    |
|                                   |               | $T_J = 55^\circ\text{C}$                         |      |      | 5.0       |                  |
| Gate-Body Leakage Current         | $I_{GSS}$     | $V_{DS} = 0\text{V}$ , $V_{GS} = \pm 20\text{V}$ |      |      | $\pm 100$ | nA               |
| Gate Threshold Voltage            | $V_{GS(th)}$  | $V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$       | 1.2  | 1.7  | 2.2       | V                |
| Static Drain-Source ON-Resistance | $R_{DS(on)}$  | $V_{GS} = 10\text{V}$ , $I_D = 10\text{A}$       |      | 14.0 | 20        | $\text{m}\Omega$ |
|                                   |               | $V_{GS} = 4.5\text{V}$ , $I_D = 6\text{A}$       |      | 18.5 | 23        | $\text{m}\Omega$ |
| Forward Transconductance          | $g_{FS}$      | $V_{DS} = 5\text{V}$ , $I_D = 20\text{A}$        |      | 48   |           | S                |
| Diode Forward Voltage             | $V_{SD}$      | $I_S = 1\text{A}$ , $V_{GS} = 0\text{V}$         |      | 0.7  | 1.0       | V                |
| Diode Continuous Current          | $I_S$         | $T_C = 25^\circ\text{C}$                         |      |      | 52        | A                |

### DYNAMIC PARAMETERS <sup>(5)</sup>

|                              |           |                                                                  |     |      |   |          |
|------------------------------|-----------|------------------------------------------------------------------|-----|------|---|----------|
| Input Capacitance            | $C_{iss}$ | $V_{GS} = 0\text{V}$ , $V_{DS} = 50\text{V}$ , $f = 1\text{MHz}$ |     | 1020 |   | pF       |
| Output Capacitance           | $C_{oss}$ |                                                                  |     | 540  |   | pF       |
| Reverse Transfer Capacitance | $C_{rss}$ |                                                                  |     | 40   |   | pF       |
| Gate Resistance              | $R_g$     | $V_{GS} = 0\text{V}$ , $V_{DS} = 0\text{V}$ , $f = 1\text{MHz}$  | 0.8 | 1.1  | 2 | $\Omega$ |

### SWITCHING PARAMETERS <sup>(5)</sup>

|                                               |              |                                                                                          |  |      |  |    |
|-----------------------------------------------|--------------|------------------------------------------------------------------------------------------|--|------|--|----|
| Total Gate Charge (@ $V_{GS} = 10\text{V}$ )  | $Q_g$        | $V_{GS} = 0$ to $10\text{V}$<br>$V_{DS} = 50\text{V}$ , $I_D = 10\text{A}$               |  | 12.7 |  | nC |
| Total Gate Charge (@ $V_{GS} = 6.0\text{V}$ ) | $Q_g$        |                                                                                          |  | 6.7  |  | nC |
| Gate Source Charge                            | $Q_{gs}$     |                                                                                          |  | 2.1  |  | nC |
| Gate Drain Charge                             | $Q_{gd}$     |                                                                                          |  | 3.3  |  | nC |
| Turn-On Delay Time                            | $t_{D(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 50\text{V}$<br>$R_L = 2.5\Omega$ , $R_{GEN} = 6\Omega$ |  | 4.3  |  | ns |
| Turn-On Rise Time                             | $t_r$        |                                                                                          |  | 5.1  |  | ns |
| Turn-Off Delay Time                           | $t_{D(off)}$ |                                                                                          |  | 16.7 |  | ns |
| Turn-Off Fall Time                            | $t_f$        |                                                                                          |  | 8.7  |  | ns |
| Body Diode Reverse Recovery Time              | $t_{rr}$     | $I_F = 15\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$                                 |  | 39   |  | ns |
| Body Diode Reverse Recovery Charge            | $Q_{rr}$     | $I_F = 15\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$                                 |  | 30   |  | nC |

### Thermal Performance

| Parameter                               | Symbol          | Typ. | Max. | Unit                      |
|-----------------------------------------|-----------------|------|------|---------------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 42   | 50   | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 1.8  | 2.4  | $^\circ\text{C}/\text{W}$ |

### Notes:

1. Computed continuous current assumes the condition of  $T_{J\_Max}$  while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under  $T_{J\_Max} = 150^\circ\text{C}$ .
3. This single-pulse measurement was taken under the following condition [ $L = 100\mu\text{H}$ ,  $V_{GS} = 10\text{V}$ ,  $V_{DD} = 50\text{V}$ ] while its value is limited by  $T_{J\_Max} = 150^\circ\text{C}$ .
4. The power dissipation  $P_D$  is based on  $T_{J\_Max} = 150^\circ\text{C}$ .
5. This value is guaranteed by design hence it is not included in the production test.



# SWD50N10YM

## N-channel Power MOSFET

### Typical Electrical & Thermal Characteristics

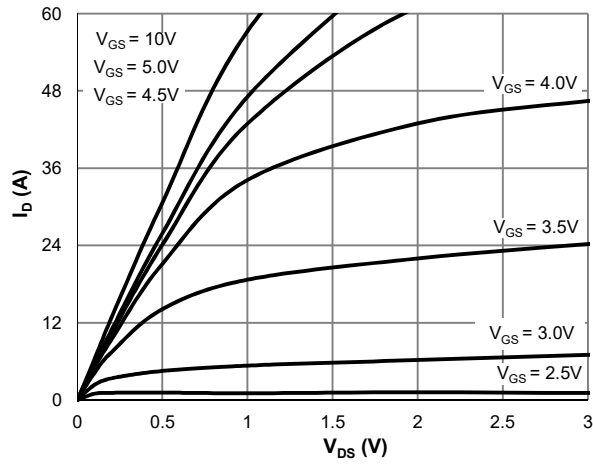


Figure 1: Saturation Characteristics

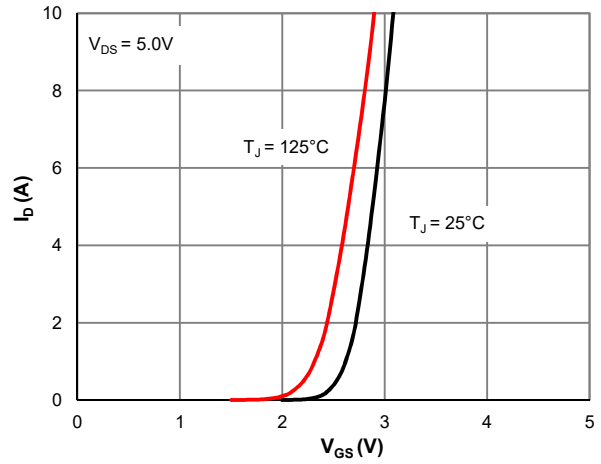


Figure 2: Transfer Characteristics

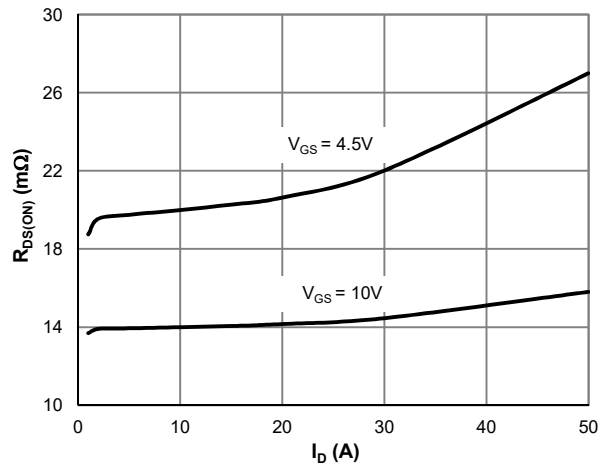


Figure 3:  $R_{DS(ON)}$  vs. Drain Current

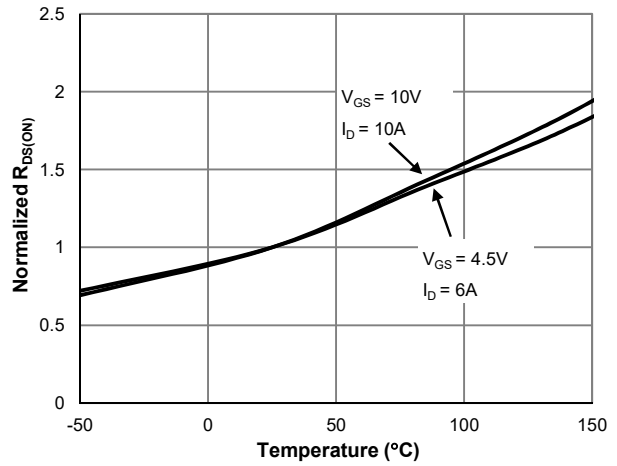


Figure 4:  $R_{DS(ON)}$  vs. Junction Temperature

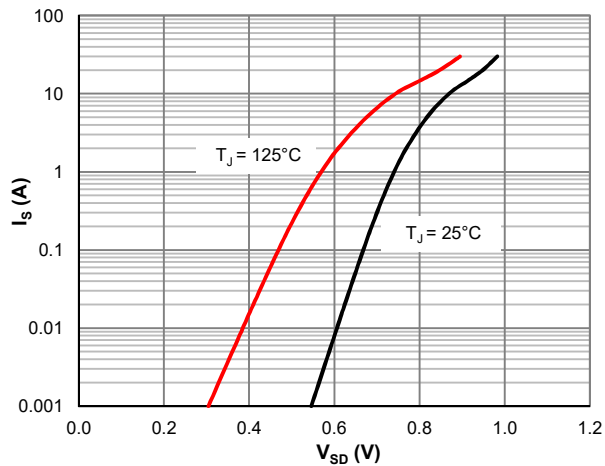


Figure 5: Body-Diode Characteristics

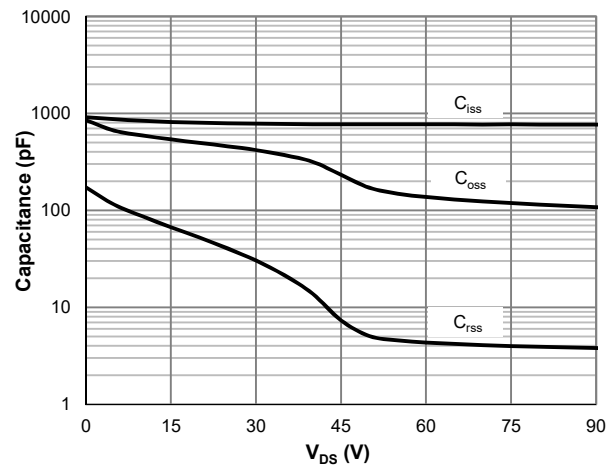


Figure 6: Capacitance Characteristics



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## N-channel Power MOSFET

### Typical Electrical & Thermal Characteristics

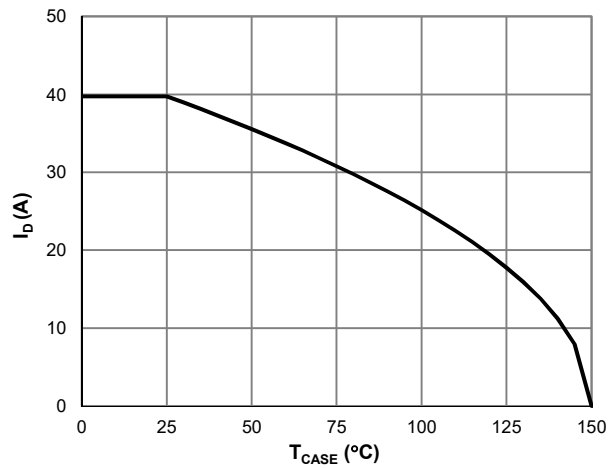


Figure 7: Current De-rating

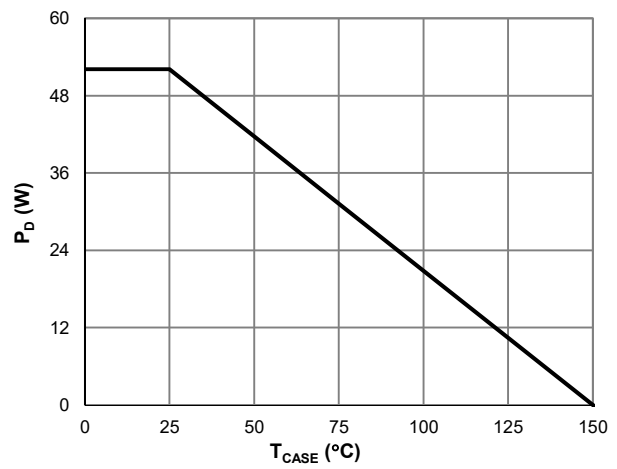


Figure 8: Power De-rating

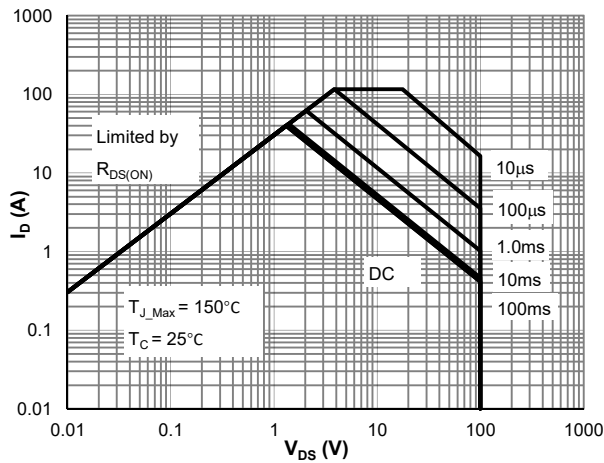


Figure 9: Maximum Safe Operating Area

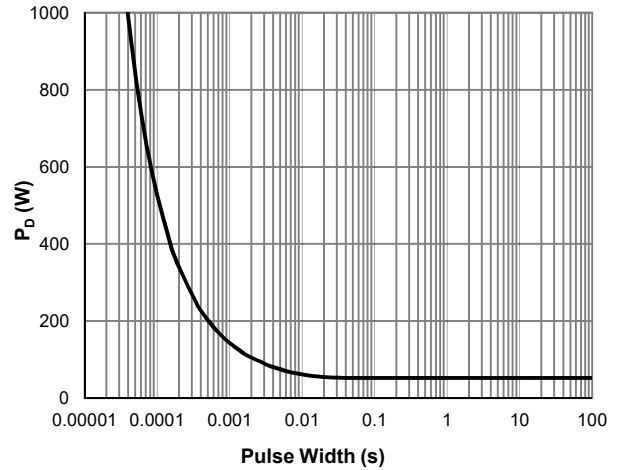


Figure 10: Single Pulse Power Rating, Junction-to-Case

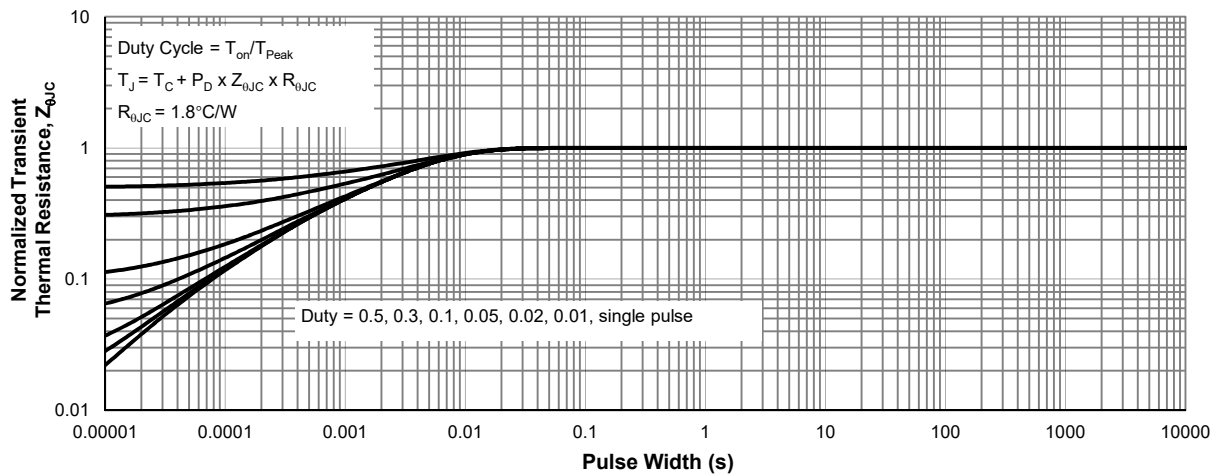


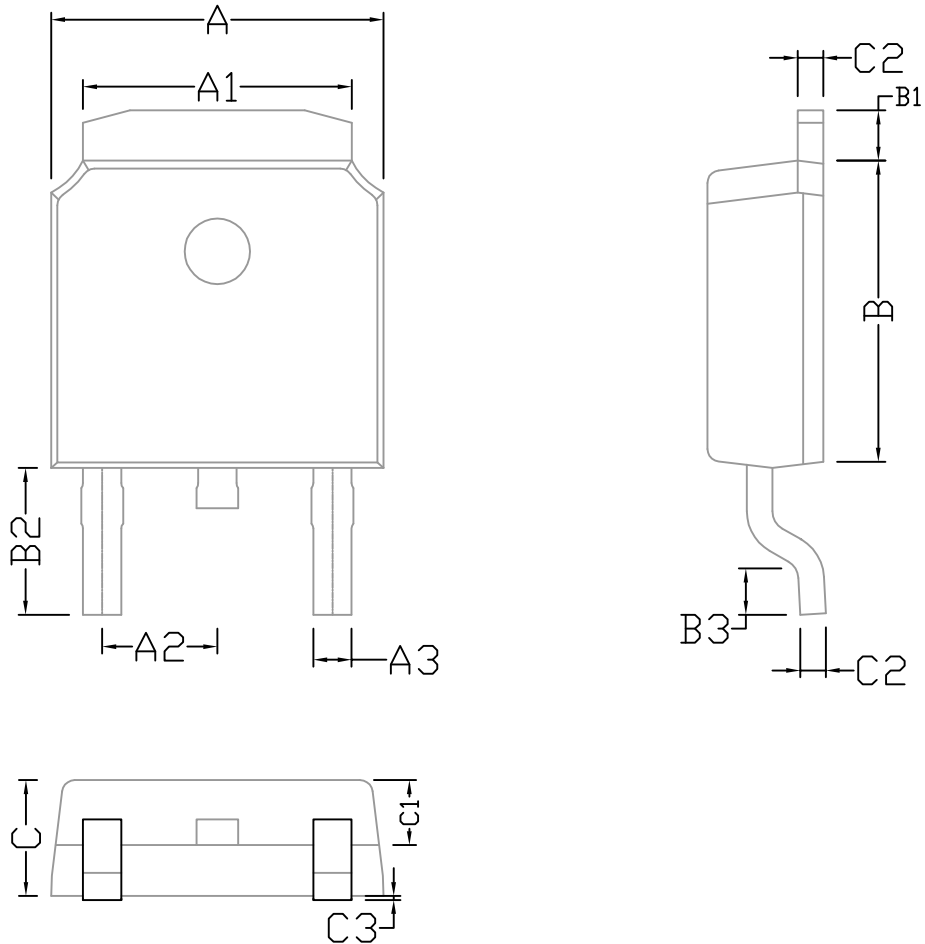
Figure 11: Normalized Maximum Transient Thermal Impedance



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### Package Mechanical Data-TO-252



| 标注 | 最小   | 标准   | 最大   | 标注 | 最小   | 标准   | 最大   | 标注 | 最小   | 标准   | 最大   |
|----|------|------|------|----|------|------|------|----|------|------|------|
| A  | 6.50 | 6.60 | 6.70 | B  | 6.05 | 6.10 | 6.15 | C  | 2.25 | 2.30 | 2.35 |
| A1 | 5.28 | 5.33 | 5.38 | B1 | 0.95 | 1.00 | 1.05 | C1 | 0.76 | 0.81 | 0.86 |
| A2 | 2.23 | 2.28 | 2.33 | B2 | 2.85 | 2.9  | 2.95 | C2 | 0.45 | 0.50 | 0.55 |
| A3 | 0.70 | 0.75 | 0.80 | B3 | 1.45 | 1.50 | 1.55 | C3 | 0.01 | 0.05 | 0.10 |
|    |      |      |      |    |      |      |      |    |      |      |      |