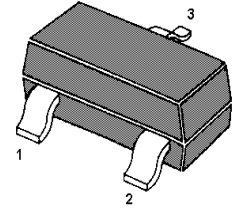
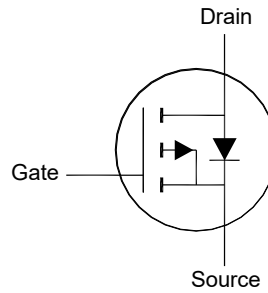


MMFTP2415

P-Channel Enhancement Mode MOSFET

Applications

- Portable appliances
- Battery management



1. Gate 2. Source 3. Drain
SOT-23 Plastic Package

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

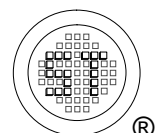
| Parameter | Symbol | Value | Unit |
|--|------------|---------------|------------------|
| Drain-Source Voltage | $-V_{DSS}$ | 20 | V |
| Gate-Source Voltage | V_{GS} | ± 12 | V |
| Drain Current - Continuous | $-I_D$ | 2.4 | A |
| Peak Drain Current, Pulsed ¹⁾ | $-I_{DM}$ | 10 | A |
| Power Dissipation | P_{tot} | 1 | W |
| Operating Junction Temperature | T_j | - 55 to + 150 | $^\circ\text{C}$ |
| Storage Temperature | T_{stg} | - 55 to + 150 | $^\circ\text{C}$ |

Thermal Resistance Ratings

| Parameter | Symbol | Max. | Unit |
|---|-----------------|-----------|--------------------|
| Thermal Resistance from Junction to Ambient ²⁾ Steady State $t \leq 10$ s | $R_{\theta JA}$ | 125 90 | $^\circ\text{C/W}$ |

¹⁾ Pulse Test: Pulse Width $\leq 100 \mu\text{s}$, Duty Cycle $\leq 2\%$, Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)} = 150^\circ\text{C}$

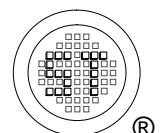
²⁾ Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate.



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Characteristics at $T_a = 25^\circ\text{C}$ unless otherwise specified

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|----------------|------|------|-------------------|---------------|
| STATIC PARAMETERS | | | | | |
| Drain-Source Breakdown Voltage at $-I_D = 250 \mu\text{A}$ | $-V_{(BR)DSS}$ | 20 | - | - | V |
| Zero Gate Voltage Drain Current at $-V_{DS} = 16 \text{ V}$ | $-I_{DSS}$ | - | - | 1 | μA |
| Gate-Source Leakage at $V_{GS} = \pm 12 \text{ V}$ | I_{GSS} | - | - | ± 100 | nA |
| Gate-Source Threshold Voltage at $V_{GS} = V_{DS}$, $-I_D = 250 \mu\text{A}$ | $-V_{GS(th)}$ | 0.3 | - | 1 | V |
| Drain-Source On-State Resistance at $-V_{GS} = 4.5 \text{ V}$, $-I_D = 2 \text{ A}$ at $-V_{GS} = 2.5 \text{ V}$, $-I_D = 1.5 \text{ A}$ at $-V_{GS} = 1.8 \text{ V}$, $-I_D = 1 \text{ A}$ | $R_{DS(on)}$ | - | - | 130 170 220 | m Ω |
| DYNAMIC PARAMETERS | | | | | |
| Input Capacitance at $-V_{DS} = 10 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$ | C_{iss} | - | 535 | - | pF |
| Output Capacitance at $-V_{DS} = 10 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$ | C_{oss} | - | 87 | - | pF |
| Reverse Transfer Capacitance at $-V_{DS} = 10 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$ | C_{rss} | - | 82 | - | pF |
| Total Gate Charge at $-V_{DS} = 10 \text{ V}$, $-V_{GS} = 4.5 \text{ V}$, $-I_D = 2.4 \text{ A}$ | Q_g | - | 6.5 | - | nC |
| Gate-Source Charge at $-V_{DS} = 10 \text{ V}$, $-V_{GS} = 4.5 \text{ V}$, $-I_D = 2.4 \text{ A}$ | Q_{gs} | - | 1.8 | - | nC |
| Gate-Drain Charge at $-V_{DS} = 10 \text{ V}$, $-V_{GS} = 4.5 \text{ V}$, $-I_D = 2.4 \text{ A}$ | Q_{gd} | - | 1.6 | - | nC |
| Turn-On Delay Time at $-V_{DD} = 10 \text{ V}$, $-V_{GEN} = 4.5 \text{ V}$, $-I_D = 2.4 \text{ A}$, $R_G = 4.5 \Omega$ | $t_{d(on)}$ | - | 10 | - | ns |
| Turn-On Rise Time at $-V_{DD} = 10 \text{ V}$, $-V_{GEN} = 4.5 \text{ V}$, $-I_D = 2.4 \text{ A}$, $R_G = 4.5 \Omega$ | t_r | - | 43 | - | ns |
| Turn-Off Delay Time at $-V_{DD} = 10 \text{ V}$, $-V_{GEN} = 4.5 \text{ V}$, $-I_D = 2.4 \text{ A}$, $R_G = 4.5 \Omega$ | $t_{d(off)}$ | - | 105 | - | ns |
| Turn-Off Fall Time at $-V_{DD} = 10 \text{ V}$, $-V_{GEN} = 4.5 \text{ V}$, $-I_D = 2.4 \text{ A}$, $R_G = 4.5 \Omega$ | t_f | - | 73 | - | ns |
| Body-Diode PARAMETERS | | | | | |
| Body Diode Voltage at $-I_S = 1 \text{ A}$, $V_{GS} = 0 \text{ V}$ | $-V_{SD}$ | - | - | 1.2 | V |
| Continuous Source-Drain Diode Current | $-I_S$ | - | - | 2.4 | A |
| Body Diode Reverse Recovery Time at $-I_S = 2.4 \text{ A}$, $di/dt = 100 \text{ A} / \mu\text{s}$ | t_{rr} | - | 35 | - | ns |
| Body Diode Reverse Recovery Charge at $-I_S = 2.4 \text{ A}$, $di/dt = 100 \text{ A} / \mu\text{s}$ | Q_{rr} | - | 14 | - | nC |



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Electrical Characteristics Curves

Fig. 1 Output Characteristic

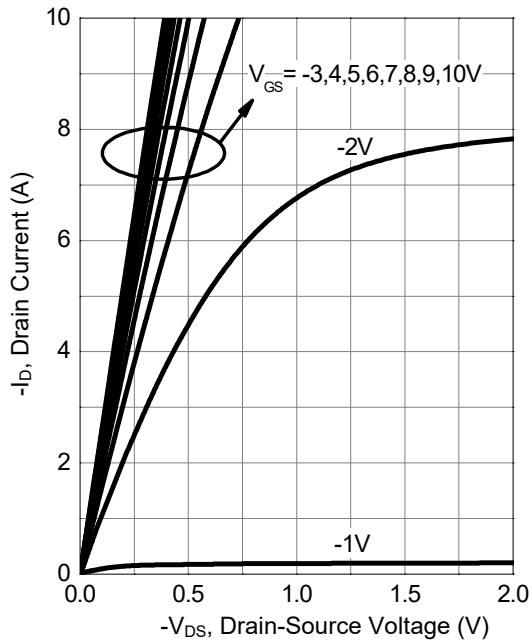


Fig. 2 Transfer Characteristics

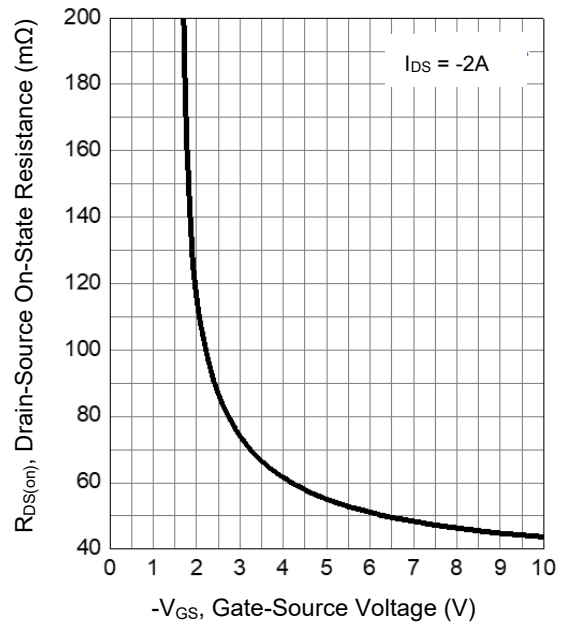


Fig. 3 On-Resistance vs. Drain Current

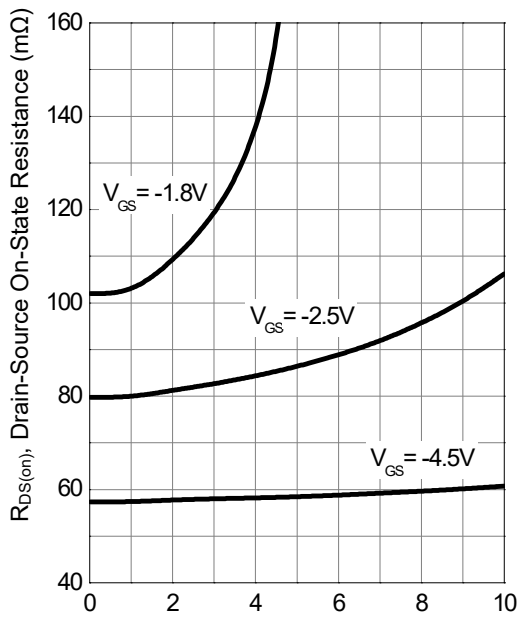
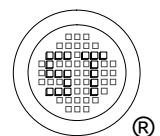
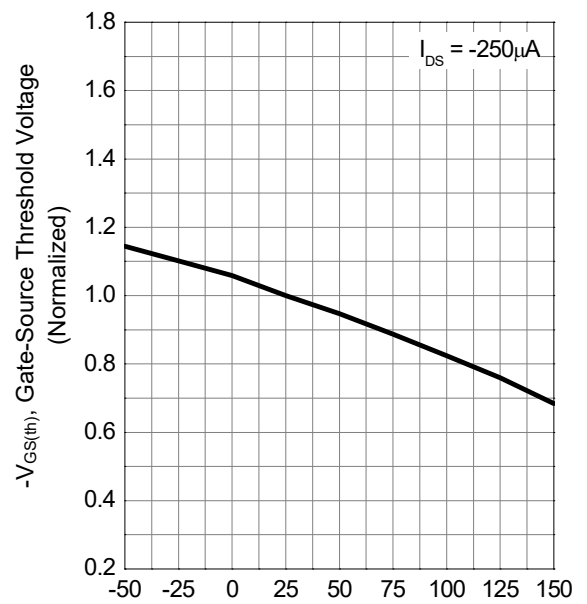


Fig. 4 Gate-Source Threshold Voltage vs. T_j



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Electrical Characteristics Curves

Fig. 5 On-Resistance vs. Junction Temperature

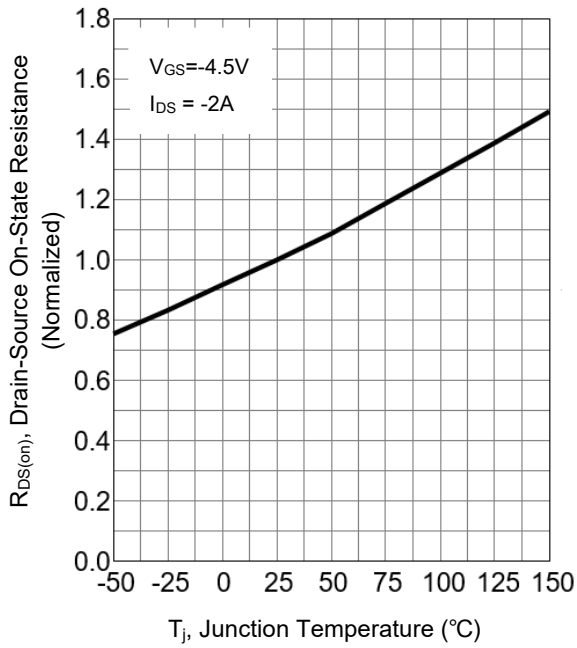


Fig. 6 Diode Forward Characteristics

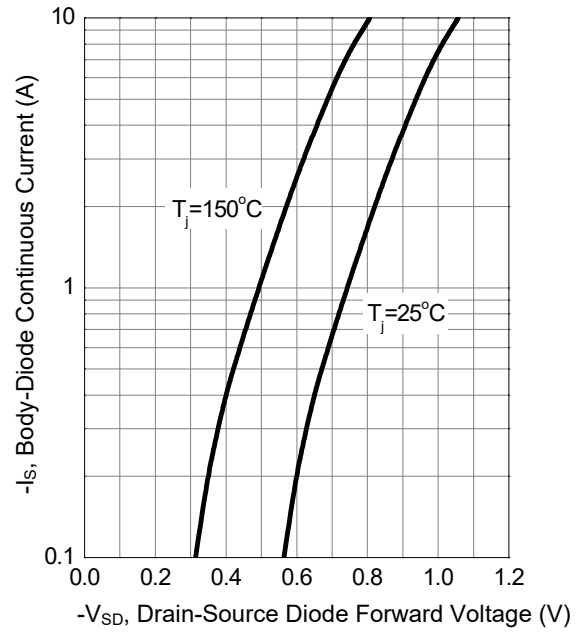


Fig. 7 Capacitance Characteristic

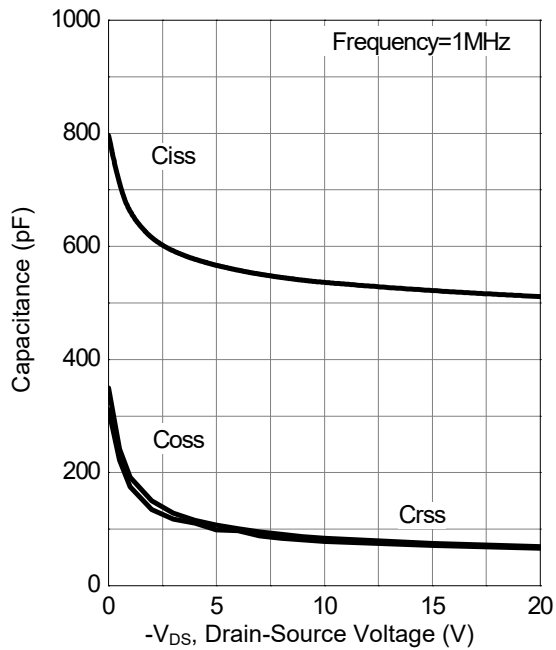
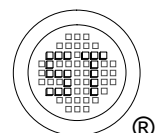
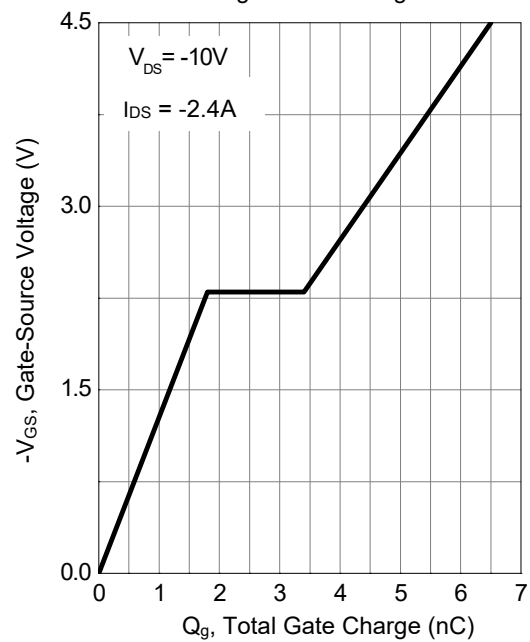


Fig. 8 Gate Charge



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Test Circuits

Fig.1-1 Switching times test circuit

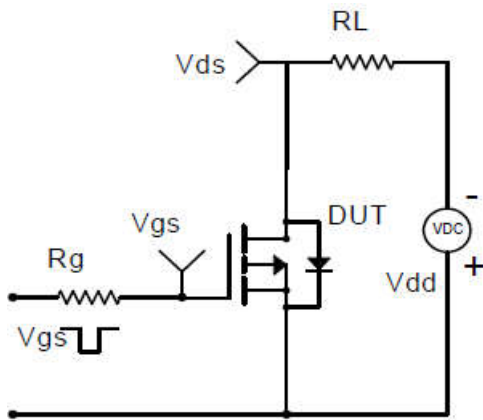


Fig.1-2 Switching Waveform

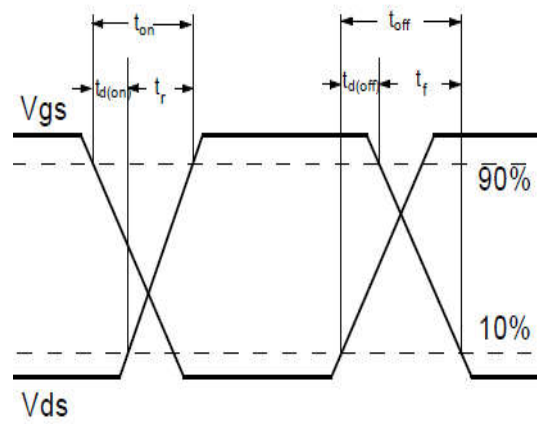


Fig.2-1 Gate charge test circuit

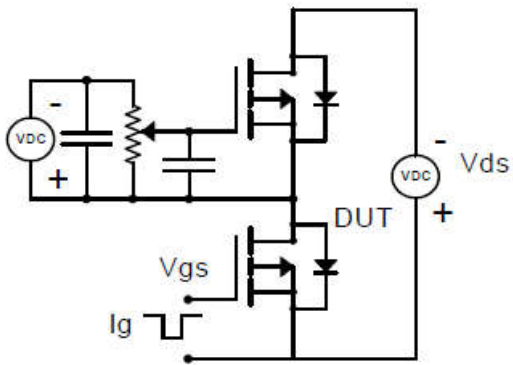
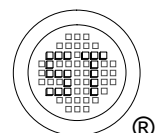
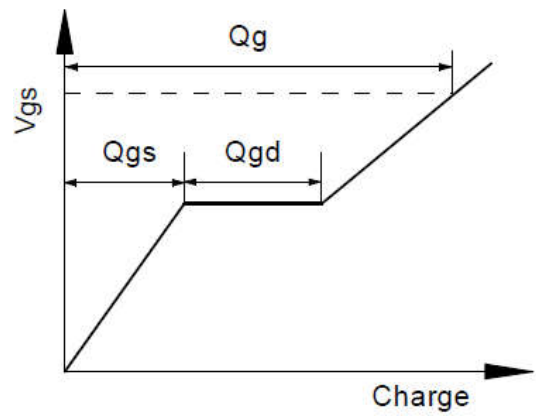


Fig.2-2 Gate charge waveform

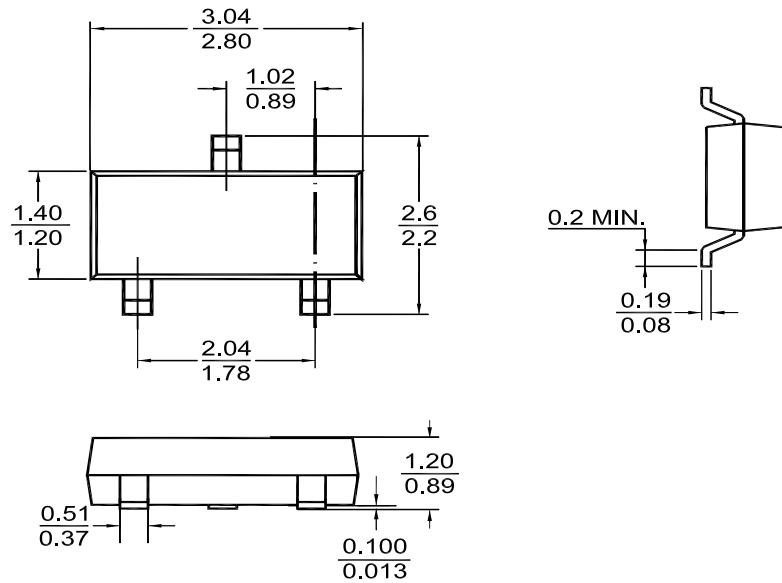


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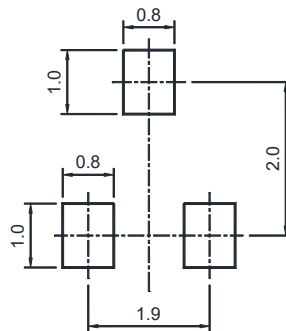
PACKAGE OUTLINE

Plastic surface mounted package (Dimensions in mm)

SOT-23



Recommended Soldering Footprint



Packing information

| Package | Tape Width (mm) | Pitch | | Reel Size | | Per Reel Packing Quantity |
|---------|-----------------|---------|---------------|-----------|------|---------------------------|
| | | mm | inch | mm | inch | |
| SOT-23 | 8 | 4 ± 0.1 | 0.157 ± 0.004 | 178 | 7 | 3,000 |

Marking information

" WF " = Part No.
 "YM" = Date Code Marking
 "Y" = Year
 "M" = Month
 Font type: Arial

