


MITSUBISHI Nch POWER MOSFET

# FS40SM-5

HIGH-SPEED SWITCHING USE

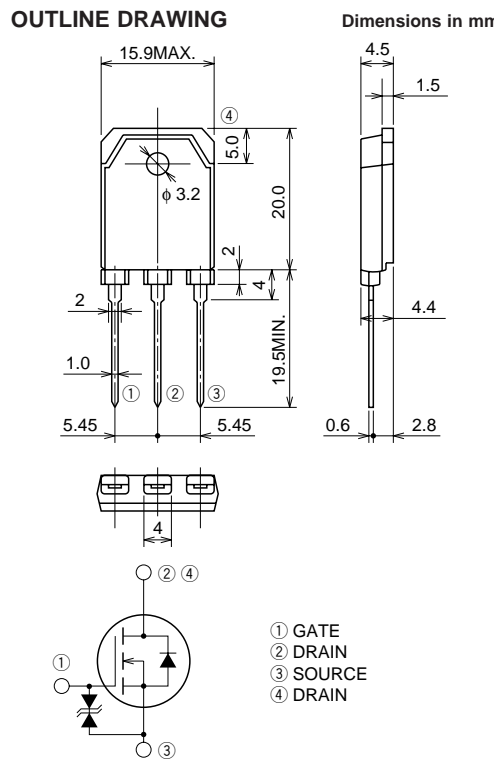
**FS40SM-5**



● V<sub>DSS</sub> ..... 250V  
 ● r<sub>DS (ON)</sub> (MAX) ..... 0.086Ω  
 ● I<sub>D</sub> ..... 40A

**OUTLINE DRAWING**

Dimensions in mm



① GATE  
 ② DRAIN  
 ③ SOURCE  
 ④ DRAIN

**TO-3P**

**APPLICATION**

SMPS, DC-DC Converter, battery charger, power supply of printer, copier, HDD, FDD, TV, VCR, personal computer etc.

**MAXIMUM RATINGS** (T<sub>c</sub> = 25°C)

| Symbol           | Parameter                 | Conditions           | Ratings    | Unit |
|------------------|---------------------------|----------------------|------------|------|
| V <sub>DSS</sub> | Drain-source voltage      | V <sub>GS</sub> = 0V | 250        | V    |
| V <sub>GSS</sub> | Gate-source voltage       | V <sub>DS</sub> = 0V | ±30        | V    |
| I <sub>D</sub>   | Drain current             |                      | 40         | A    |
| I <sub>DM</sub>  | Drain current (Pulsed)    |                      | 120        | A    |
| P <sub>D</sub>   | Maximum power dissipation |                      | 275        | W    |
| T <sub>ch</sub>  | Channel temperature       |                      | -55 ~ +150 | °C   |
| T <sub>stg</sub> | Storage temperature       |                      | -55 ~ +150 | °C   |
| —                | Weight                    | Typical value        | 4.8        | g    |

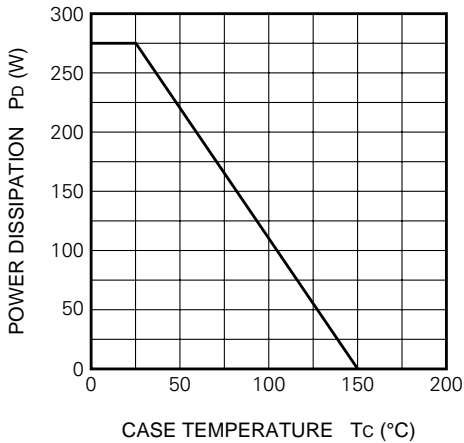


**ELECTRICAL CHARACTERISTICS** (T<sub>ch</sub> = 25°C)

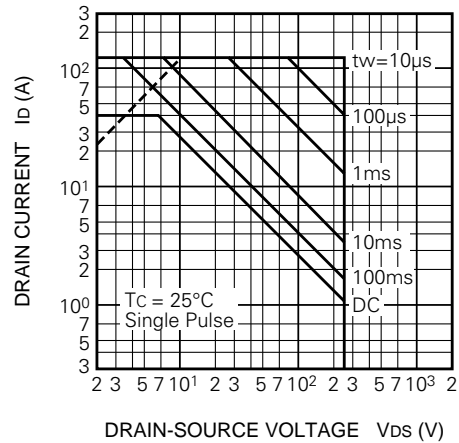
| Symbol                 | Parameter                        | Test conditions   | Limits |       |       | Unit |
|------------------------|----------------------------------|---|--------|-------|-------|------|
|                        |                                  |   | Min.   | Typ.  | Max.  |      |
| V (BR) DSS             | Drain-source breakdown voltage   | I <sub>D</sub> = 1mA, V <sub>GS</sub> = 0V  | 250    | —     | —     | V    |
| V (BR) GSS             | Gate-source breakdown voltage    | I <sub>G</sub> = ±100μA, V <sub>DS</sub> = 0V   | ±30    | —     | —     | V    |
| I <sub>GSS</sub>       | Gate-source leakage current      | V <sub>GS</sub> = ±25V, V <sub>DS</sub> = 0V  | —      | —     | ±10   | μA   |
| I <sub>DSS</sub>       | Drain-source leakage current     | V <sub>DS</sub> = 250V, V <sub>GS</sub> = 0V  | —      | —     | 1     | mA   |
| V <sub>GS</sub> (th)   | Gate-source threshold voltage    | I <sub>D</sub> = 1mA, V <sub>DS</sub> = 10V   | 2      | 3     | 4     | V    |
| r <sub>DS</sub> (ON)   | Drain-source on-state resistance | I <sub>D</sub> = 20A, V <sub>GS</sub> = 10V   | —      | 0.066 | 0.086 | Ω    |
| V <sub>DS</sub> (ON)   | Drain-source on-state voltage    | I <sub>D</sub> = 20A, V <sub>GS</sub> = 10V   | —      | 1.32  | 1.72  | V    |
| y <sub>fs</sub>        | Forward transfer admittance      | I <sub>D</sub> = 20A, V <sub>DS</sub> = 10V   | 12.0   | 18.0  | —     | S    |
| C <sub>iss</sub>       | Input capacitance                | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1MHz   | —      | 2850  | —     | pF   |
| C <sub>oss</sub>       | Output capacitance               |   | —      | 580   | —     | pF   |
| C <sub>rss</sub>       | Reverse transfer capacitance     |   | —      | 110   | —     | pF   |
| t <sub>d</sub> (on)    | Turn-on delay time               | V <sub>DD</sub> = 150V, I <sub>D</sub> = 20A, V <sub>GS</sub> = 10V, R <sub>GEN</sub> = R <sub>GS</sub> = 50Ω | —      | 45    | —     | ns   |
| t <sub>r</sub>         | Rise time                        |   | —      | 125   | —     | ns   |
| t <sub>d</sub> (off)   | Turn-off delay time              |   | —      | 310   | —     | ns   |
| t <sub>f</sub>         | Fall time                        |   | —      | 140   | —     | ns   |
| V <sub>SD</sub>        | Source-drain voltage             | I <sub>S</sub> = 20A, V <sub>GS</sub> = 0V  | —      | 1.5   | 2.0   | V    |
| R <sub>th</sub> (ch-c) | Thermal resistance               | Channel to case   | —      | —     | 0.45  | °C/W |

**PERFORMANCE CURVES**

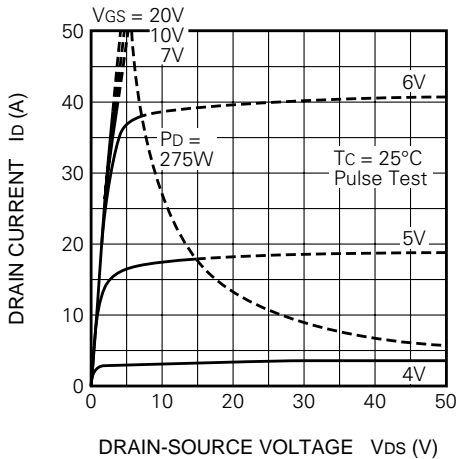
**POWER DISSIPATION DERATING CURVE**



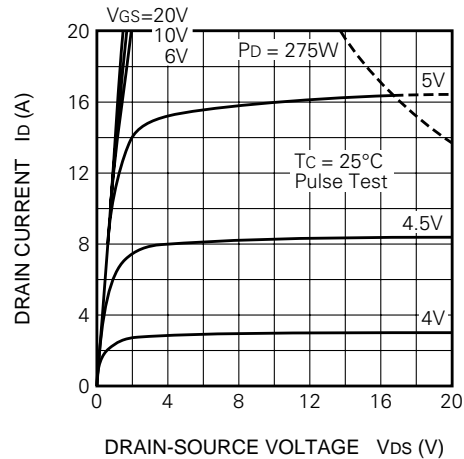
**MAXIMUM SAFE OPERATING AREA**



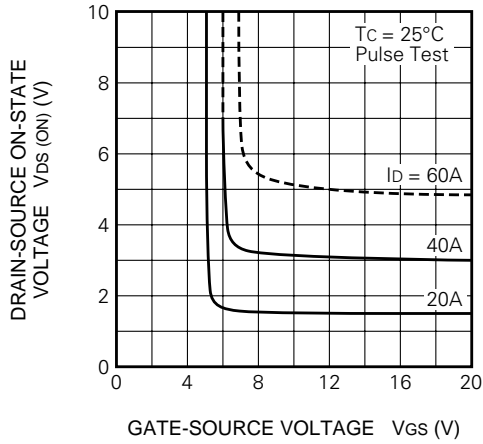
**OUTPUT CHARACTERISTICS (TYPICAL)**



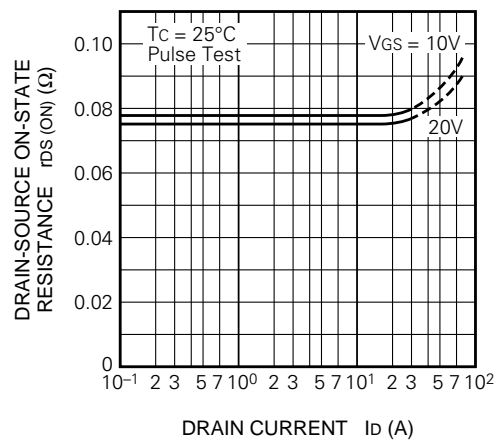
**OUTPUT CHARACTERISTICS (TYPICAL)**



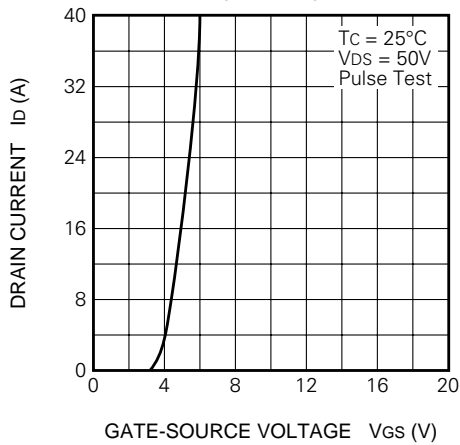
**ON-STATE VOLTAGE VS. GATE-SOURCE VOLTAGE (TYPICAL)**



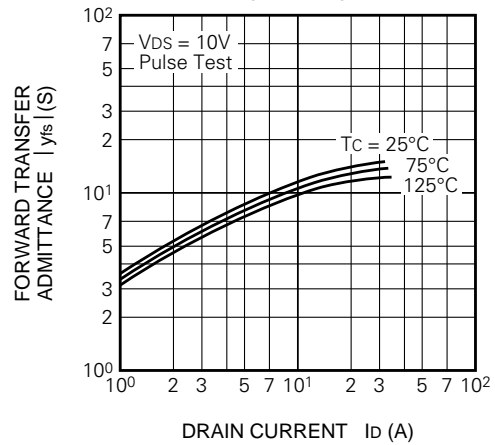
**ON-STATE RESISTANCE VS. DRAIN CURRENT (TYPICAL)**



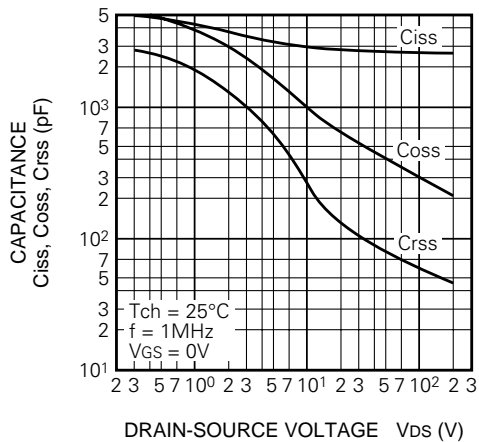
**TRANSFER CHARACTERISTICS (TYPICAL)**



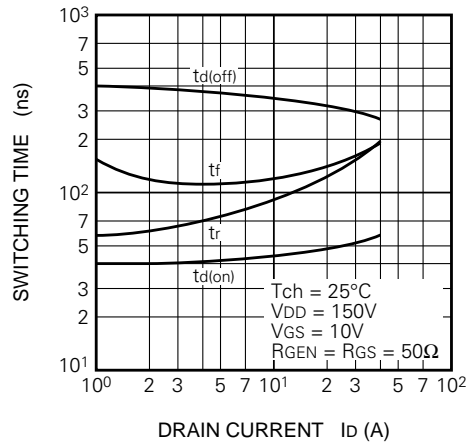
**FORWARD TRANSFER ADMITTANCE VS. DRAIN CURRENT (TYPICAL)**



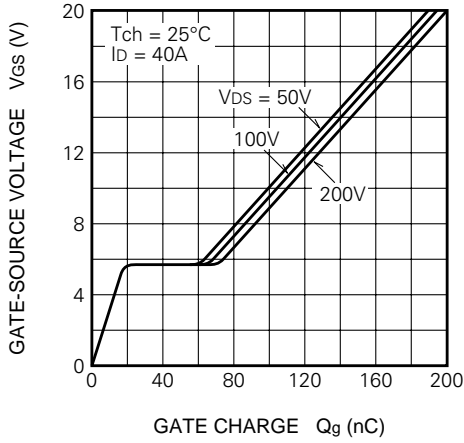
**CAPACITANCE VS. DRAIN-SOURCE VOLTAGE (TYPICAL)**



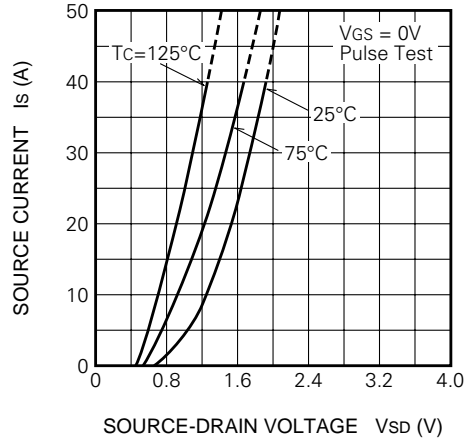
**SWITCHING CHARACTERISTICS (TYPICAL)**



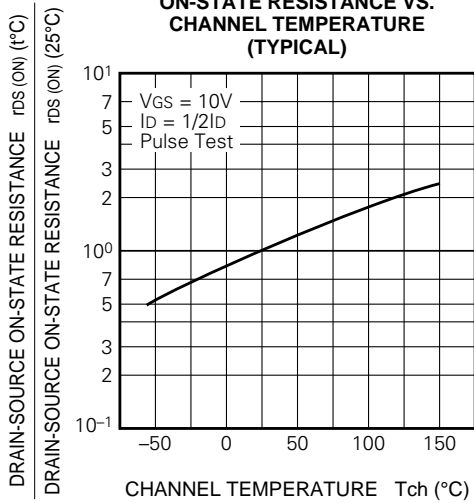
**GATE-SOURCE VOLTAGE VS. GATE CHARGE (TYPICAL)**



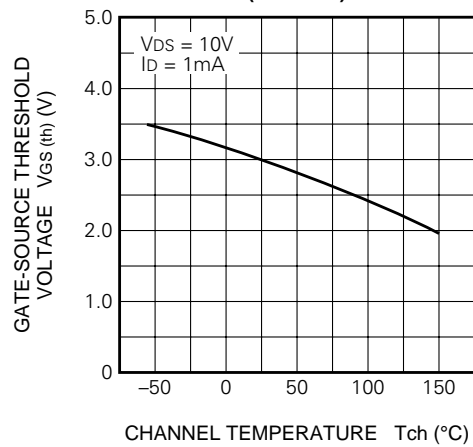
**SOURCE-DRAIN DIODE FORWARD CHARACTERISTICS (TYPICAL)**



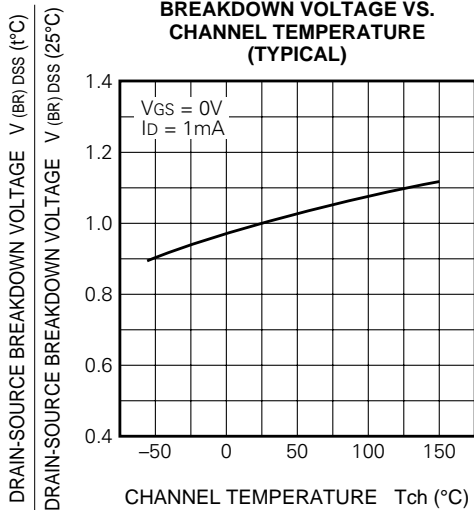
**ON-STATE RESISTANCE VS. CHANNEL TEMPERATURE (TYPICAL)**



**THRESHOLD VOLTAGE VS. CHANNEL TEMPERATURE (TYPICAL)**



**BREAKDOWN VOLTAGE VS. CHANNEL TEMPERATURE (TYPICAL)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS**

