MITSUBISHI Nch POWER MOSFET

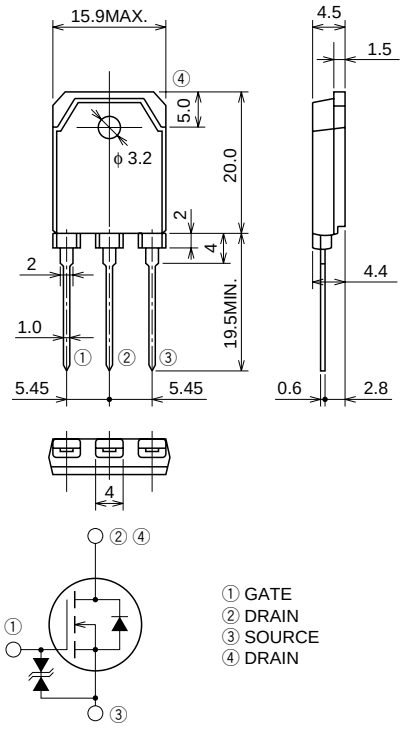
# FS20SM-12

HIGH-SPEED SWITCHING USE

**FS20SM-12**

- $V_{DSS}$ ..... 600V
- $r_{DS\ (ON)\ (MAX)}$ ..... 0.43Ω
- $I_D$ ..... 20A

**OUTLINE DRAWING** Dimensions in mm




TO-3P

## APPLICATION

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

**MAXIMUM RATINGS** ($T_c$ = 25°C)

| Symbol | Parameter | Conditions | Ratings | Unit |
|---|---|---|---|---|
| $V_{DSS}$ | Drain-source voltage | $V_{GS}$ = 0V | 600 | V |
| $V_{GSS}$ | Gate-source voltage | $V_{DS}$ = 0V | ±30 | V |
| $I_D$ | Drain current | | 20 | A |
| $I_{DM}$ | Drain current (Pulsed) | | 60 | A |
| $P_D$ | Maximum power dissipation | | 275 | W |
| $T_{ch}$ | Channel temperature | | –55 ~ +150 | °C |
| $T_{stg}$ | Storage temperature | | –55 ~ +150 | °C |
| — | Weight | Typical value | 4.8 | g |



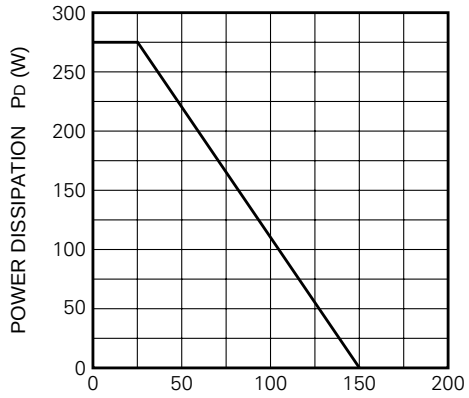
MITSUBISHI ELECTRIC

## ELECTRICAL CHARACTERISTICS (Tch = 25°C)

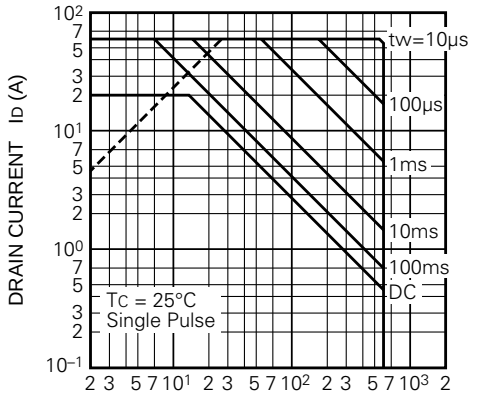
| Symbol | Parameter | Test conditions | Limits | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $V_{(BR)\ DSS}$ | Drain-source breakdown voltage | $I_D$ = 1mA, $V_{GS}$ = 0V | 600 | — | — | V |
| $V_{(BR)\ GSS}$ | Gate-source breakdown voltage | $I_G$ = ±100µA, $V_{DS}$ = 0V | ±30 | — | — | V |
| $I_{GSS}$ | Gate-source leakage current | $V_{GS}$ = ±25V, $V_{DS}$ = 0V | — | — | ±10 | µA |
| $I_{DSS}$ | Drain-source leakage current | $V_{DS}$ = 600V, $V_{GS}$ = 0V | — | — | 1 | mA |
| $V_{GS\ (th)}$ | Gate-source threshold voltage | $I_D$ = 1mA, $V_{DS}$ = 10V | 2 | 3 | 4 | V |
| $r_{DS\ (ON)}$ | Drain-source on-state resistance | $I_D$ = 10A, $V_{GS}$ = 10V | — | 0.33 | 0.43 | Ω |
| $V_{DS\ (ON)}$ | Drain-source on-state voltage | $I_D$ = 10A, $V_{GS}$ = 10V | — | 3.3 | 4.3 | V |
| $\lvert y_{fs} \rvert$ | Forward transfer admittance | $I_D$ = 10A, $V_{DS}$ = 10V | 8.0 | 13 | — | S |
| $C_{iss}$ | Input capacitance | $V_{DS}$ = 25V, $V_{GS}$ = 0V, f = 1MHz | — | 2800 | — | pF |
| $C_{oss}$ | Output capacitance | | — | 350 | — | pF |
| $C_{rss}$ | Reverse transfer capacitance | | — | 50 | — | pF |
| $t_{d\ (on)}$ | Turn-on delay time | $V_{DD}$ = 200V, $I_D$ = 10A, $V_{GS}$ = 10V, $R_{GEN}$ = $R_{GS}$ = 50Ω | — | 50 | — | ns |
| $t_r$ | Rise time | | — | 85 | — | ns |
| $t_{d\ (off)}$ | Turn-off delay time | | — | 350 | — | ns |
| $t_f$ | Fall time | | — | 100 | — | ns |
| $V_{SD}$ | Source-drain voltage | $I_S$ = 10A, $V_{GS}$ = 0V | — | 1.5 | 2.0 | V |
| $R_{th\ (ch-c)}$ | Thermal resistance | Channel to case | — | — | 0.45 | °C/W |

## PERFORMANCE CURVES

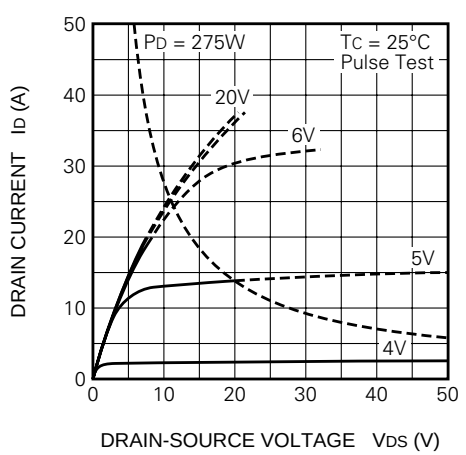
**POWER DISSIPATION DERATING CURVE**



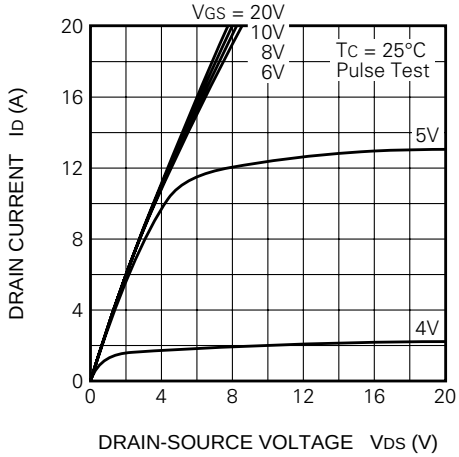

**MAXIMUM SAFE OPERATING AREA**



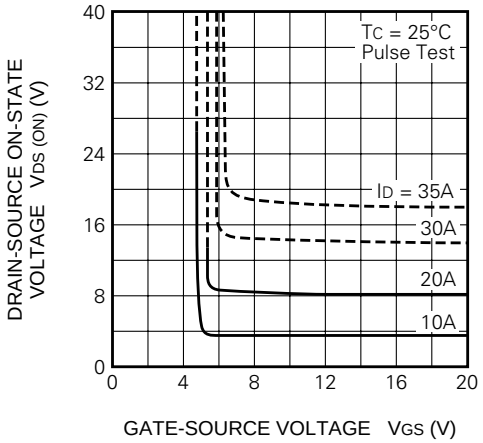

**OUTPUT CHARACTERISTICS (TYPICAL)**



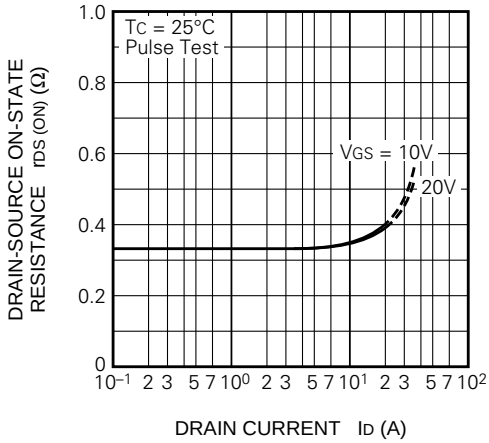

**OUTPUT CHARACTERISTICS (TYPICAL)**



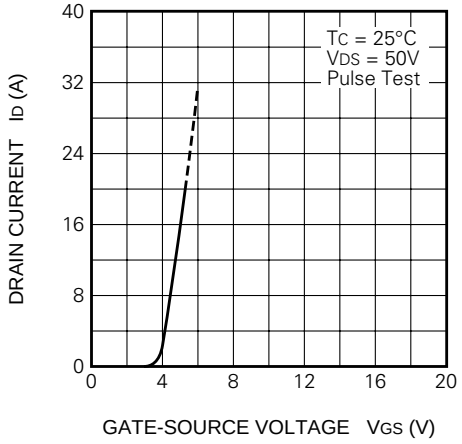
**ON-STATE VOLTAGE VS. GATE-SOURCE VOLTAGE (TYPICAL)**



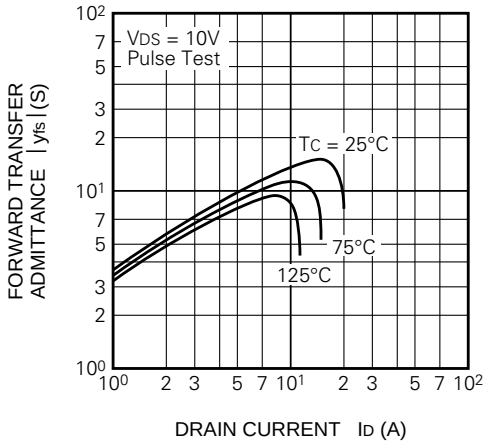

**ON-STATE RESISTANCE VS. DRAIN CURRENT (TYPICAL)**



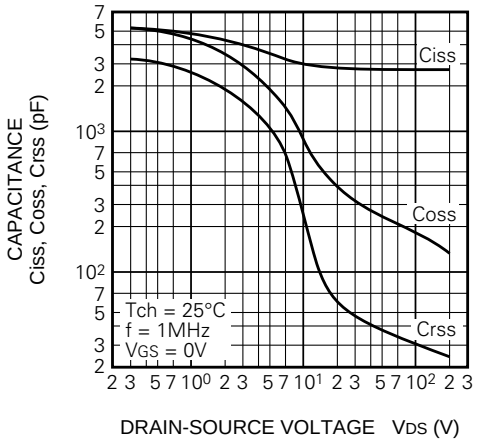

**TRANSFER CHARACTERISTICS (TYPICAL)**



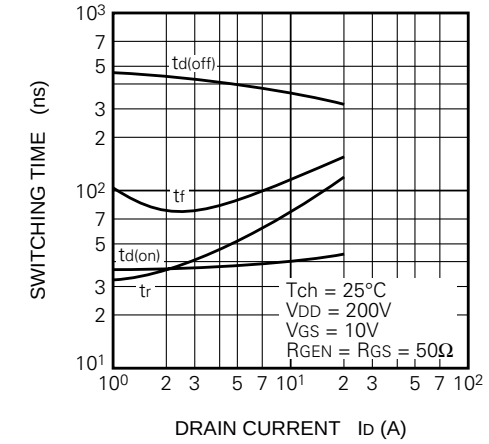

**FORWARD TRANSFER ADMITTANCE VS.DRAIN CURRENT (TYPICAL)**



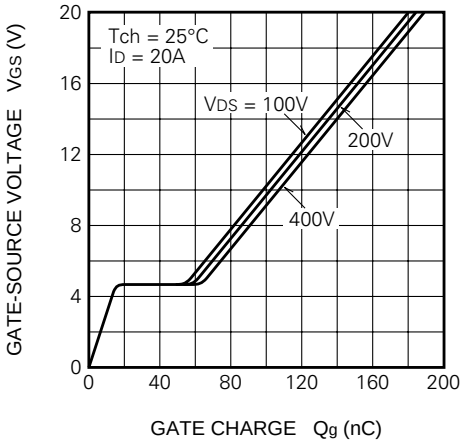

**CAPACITANCE VS. DRAIN-SOURCE VOLTAGE (TYPICAL)**



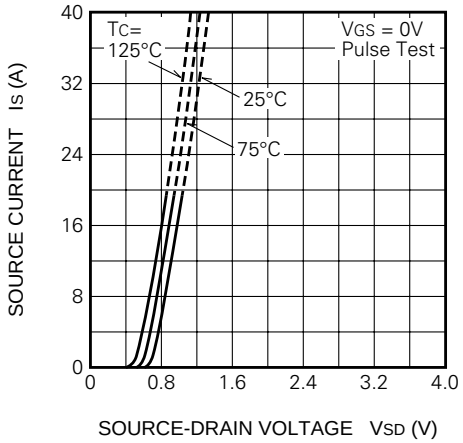

**SWITCHING CHARACTERISTICS (TYPICAL)**



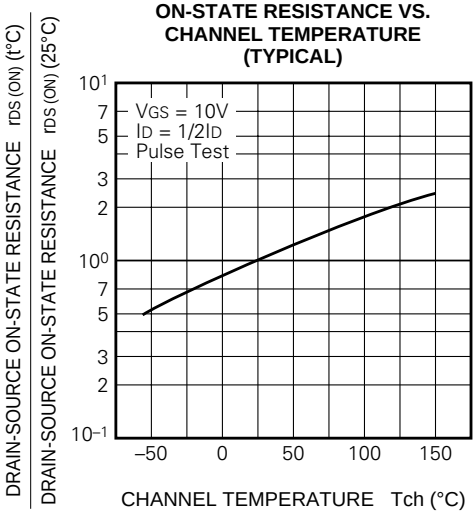
**GATE-SOURCE VOLTAGE VS.GATE CHARGE (TYPICAL)**



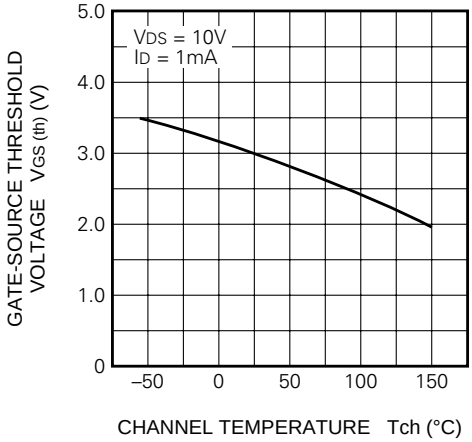

**SOURCE-DRAIN DIODE FORWARD CHARACTERISTICS (TYPICAL)**



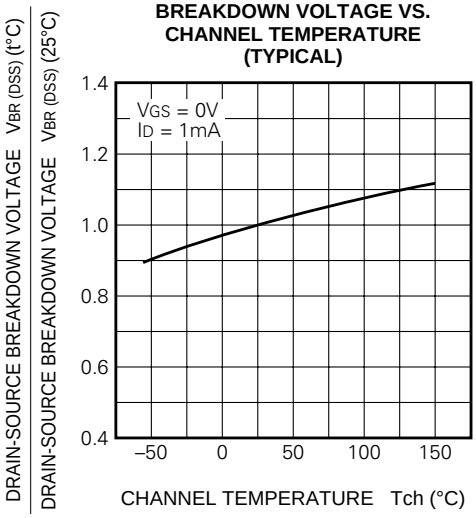

**ON-STATE RESISTANCE VS. CHANNEL TEMPERATURE (TYPICAL)**



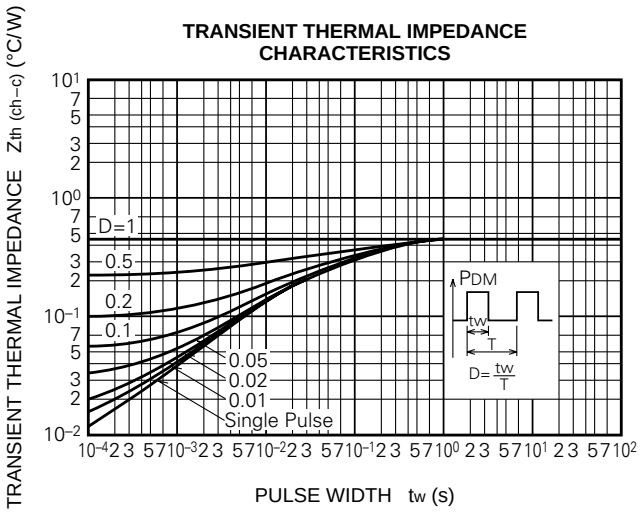

**THRESHOLD VOLTAGE VS. CHANNEL TEMPERATURE (TYPICAL)**




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




**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS**



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