

# FS50SM-5A

High-Speed Switching Use  
Nch Power MOS FET

REJ03G0277-0100

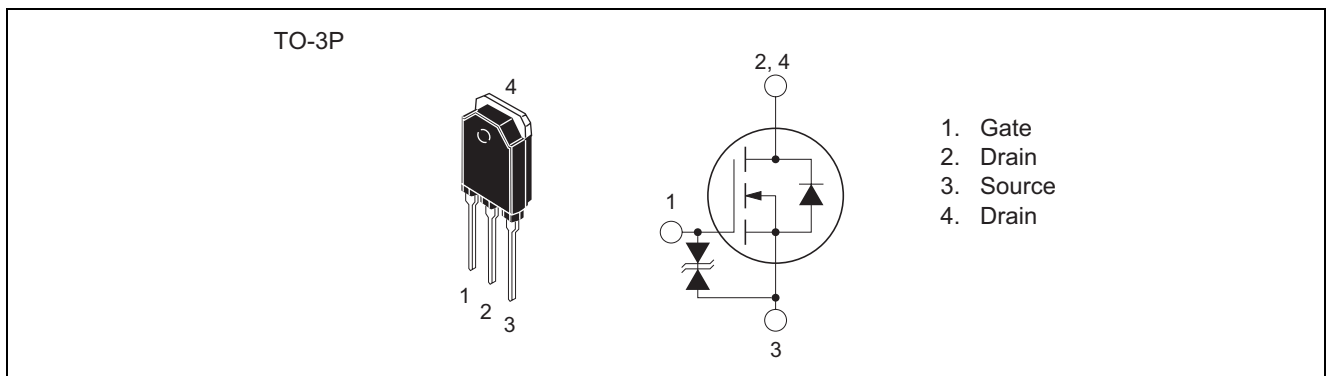
Rev.1.00

Aug.20.2004

## Features

- Drive voltage : 10 V
- $V_{DSS}$  : 250 V
- $r_{DS(ON)(max)}$  : 0.068  $\Omega$
- $I_D$  : 50 A

## Outline



## Applications

Switching mode power supply, plasma display TVs, DC-DC converters, etc.

## Maximum Ratings

( $T_c = 25^\circ\text{C}$ )

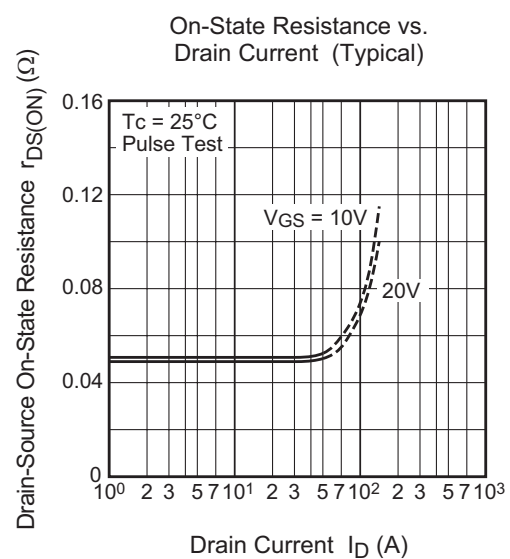
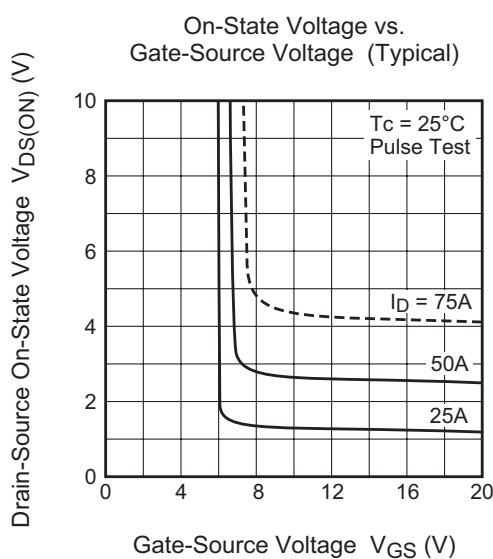
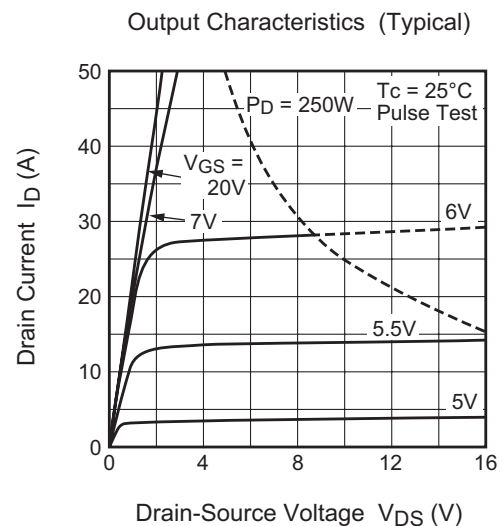
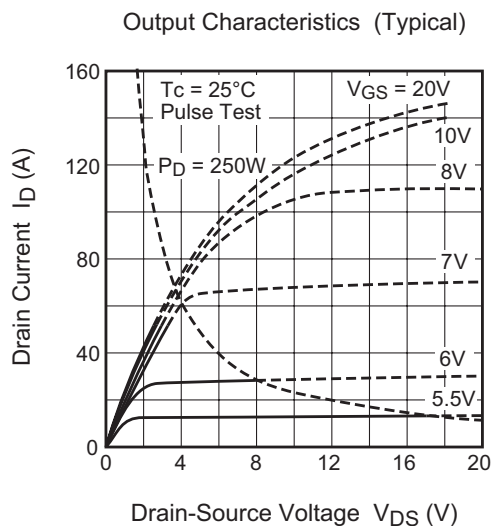
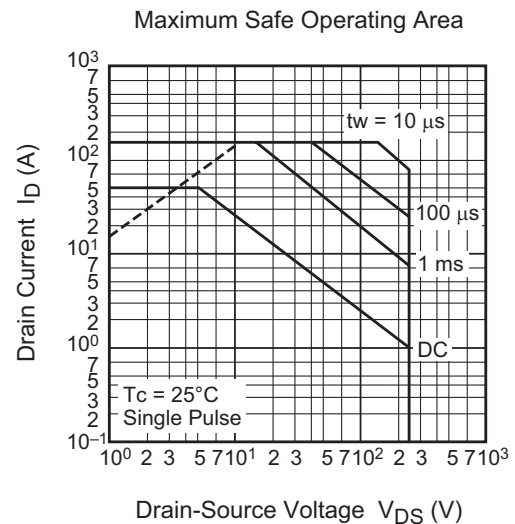
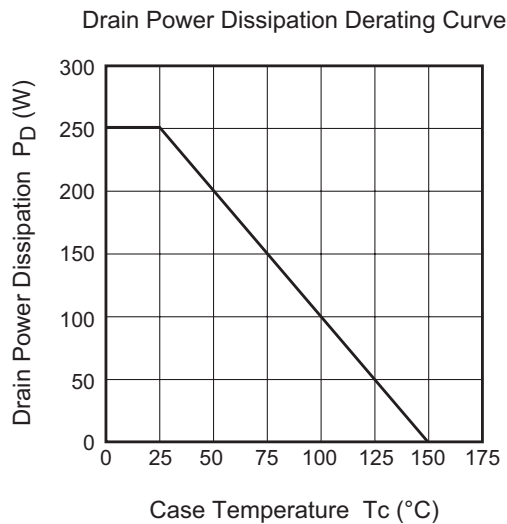
| Parameter                 | Symbol    | Ratings         | Unit             | Conditions             |
|---------------------------|-----------|-----------------|------------------|------------------------|
| Drain-source voltage      | $V_{DSS}$ | 250             | V                | $V_{GS} = 0 \text{ V}$ |
| Gate-source voltage       | $V_{GSS}$ | $\pm 30$        | V                | $V_{DS} = 0 \text{ V}$ |
| Drain current             | $I_D$     | 50              | A                |                        |
| Drain current (Pulsed)    | $I_{DM}$  | 150             | A                |                        |
| Maximum power dissipation | $P_D$     | 250             | W                |                        |
| Channel temperature       | $T_{ch}$  | $-55$ to $+150$ | $^\circ\text{C}$ |                        |
| Storage temperature       | $T_{stg}$ | $-55$ to $+150$ | $^\circ\text{C}$ |                        |
| Mass                      | —         | 4.8             | g                | Typical value          |

## Electrical Characteristics

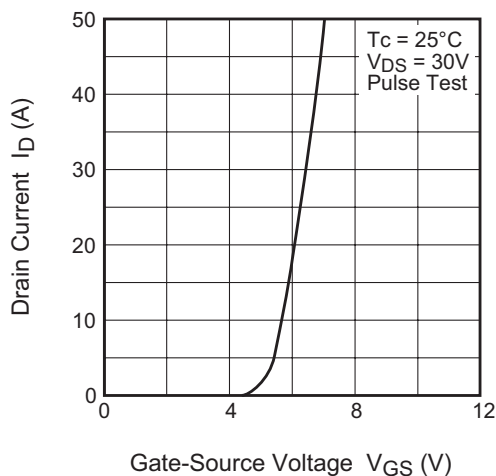
(Tch = 25°C)

| Parameter                        | Symbol         | Min.     | Typ.  | Max.     | Unit                 | Test conditions                                                                                                          |
|----------------------------------|----------------|----------|-------|----------|----------------------|--------------------------------------------------------------------------------------------------------------------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$  | 250      | —     | —        | V                    | $I_D = 1 \text{ mA}$ , $V_{GS} = 0 \text{ V}$                                                                            |
| Gate-source breakdown voltage    | $V_{(BR)GSS}$  | $\pm 30$ | —     | —        | V                    | $I_G = \pm 100 \text{ }\mu\text{A}$ , $V_{DS} = 0 \text{ V}$                                                             |
| Gate-source leakage current      | $I_{GSS}$      | —        | —     | $\pm 10$ | $\mu\text{A}$        | $V_{GS} = \pm 25 \text{ V}$ , $V_{DS} = 0 \text{ V}$                                                                     |
| Drain-source leakage current     | $I_{DSS}$      | —        | —     | 1        | mA                   | $V_{DS} = 250 \text{ V}$ , $V_{GS} = 0 \text{ V}$                                                                        |
| Gate-source threshold voltage    | $V_{GS(th)}$   | 3.0      | 3.5   | 4.0      | V                    | $I_D = 1 \text{ mA}$ , $V_{DS} = 10 \text{ V}$                                                                           |
| Drain-source on-state resistance | $r_{DS(on)}$   | —        | 0.052 | 0.068    | $\Omega$             | $I_D = 25 \text{ A}$ , $V_{GS} = 10 \text{ V}$                                                                           |
| Drain-source on-state voltage    | $V_{DS(on)}$   | —        | 1.3   | 1.7      | V                    | $I_D = 25 \text{ A}$ , $V_{GS} = 10 \text{ V}$                                                                           |
| Forward transfer admittance      | $ y_{fs} $     | —        | 35    | —        | S                    | $I_D = 25 \text{ A}$ , $V_{DS} = 10 \text{ V}$                                                                           |
| Input capacitance                | $C_{iss}$      | —        | 3500  | —        | pF                   | $V_{DS} = 25 \text{ V}$ , $V_{GS} = 0 \text{ V}$ ,<br>$f = 1 \text{ MHz}$                                                |
| Output capacitance               | $C_{oss}$      | —        | 500   | —        | pF                   |                                                                                                                          |
| Reverse transfer capacitance     | $C_{rss}$      | —        | 50    | —        | pF                   |                                                                                                                          |
| Turn-on delay time               | $t_{d(on)}$    | —        | 60    | —        | ns                   | $V_{DD} = 150 \text{ V}$ , $I_D = 25 \text{ A}$ ,<br>$V_{GS} = 10 \text{ V}$ ,<br>$R_{GEN} = R_{GS} = 50 \text{ }\Omega$ |
| Rise time                        | $t_r$          | —        | 110   | —        | ns                   |                                                                                                                          |
| Turn-off delay time              | $t_{d(off)}$   | —        | 270   | —        | ns                   |                                                                                                                          |
| Fall time                        | $t_f$          | —        | 90    | —        | ns                   |                                                                                                                          |
| Source-drain voltage             | $V_{SD}$       | —        | 1.5   | 2.0      | V                    | $I_S = 25 \text{ A}$ , $V_{GS} = 0 \text{ V}$                                                                            |
| Thermal resistance               | $R_{th(ch-c)}$ | —        | —     | 0.50     | $^{\circ}\text{C/W}$ | Channel to case                                                                                                          |

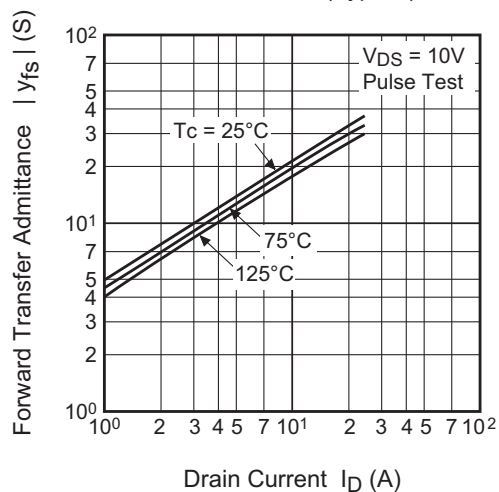
## Performance Curves



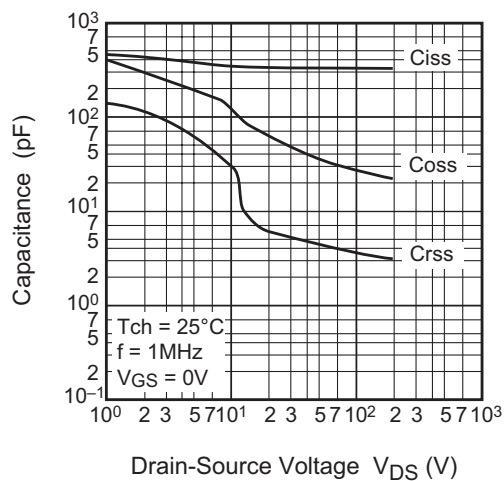
Transfer Characteristics (Typical)



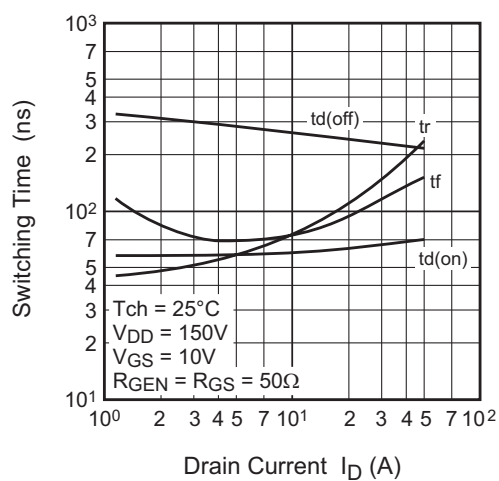
Forward Transfer Admittance vs. Drain Current (Typical)



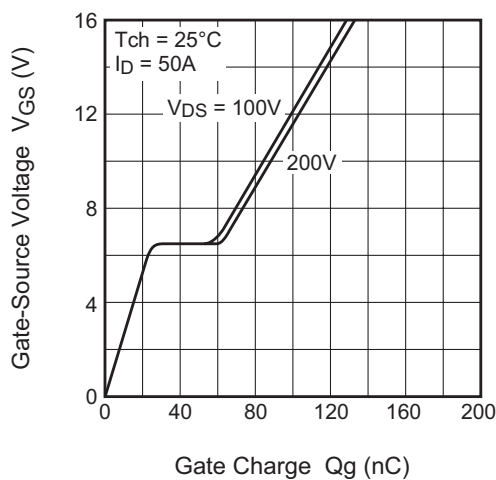
Capacitance vs. Drain-Source Voltage (Typical)



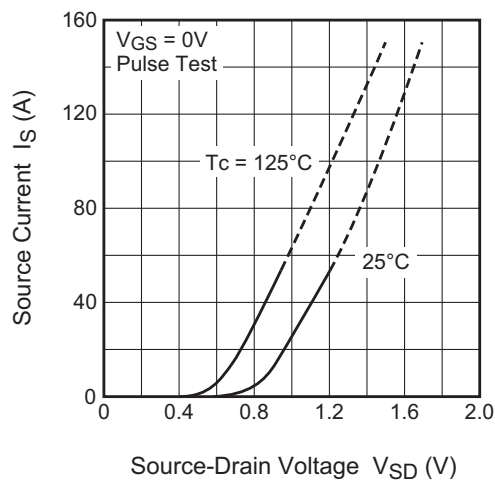
Switching Characteristics (Typical)

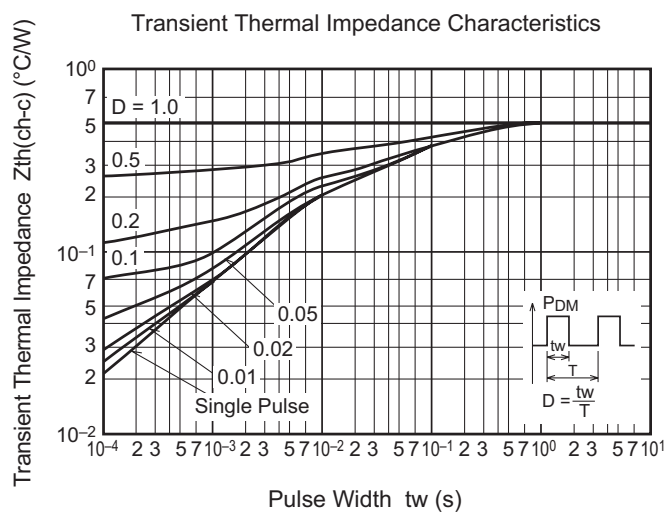
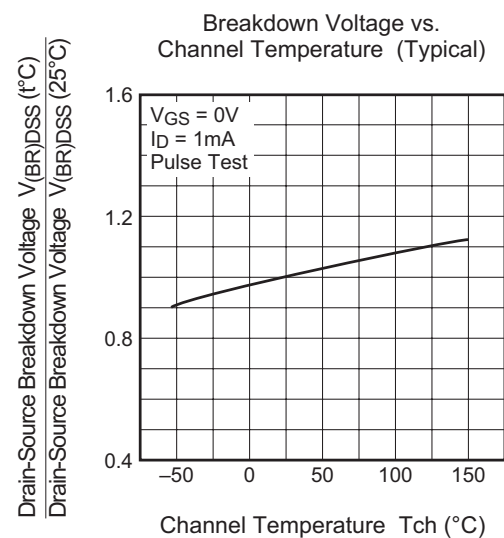
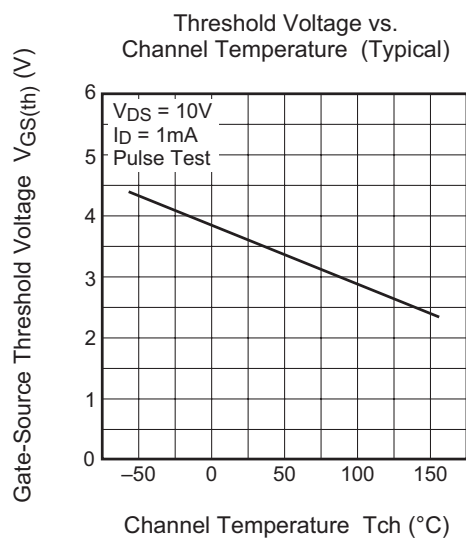
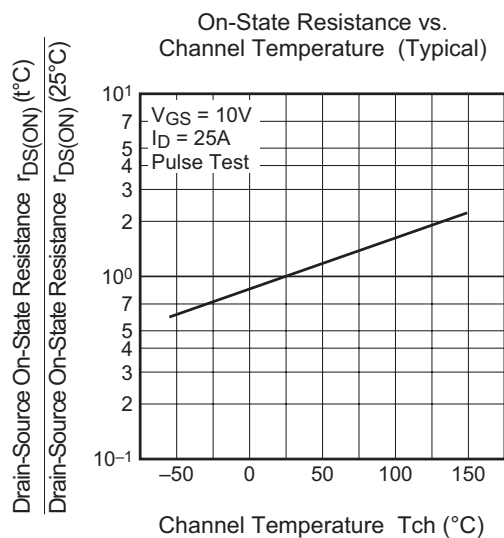


Gate-Source Voltage vs. Gate Charge (Typical)

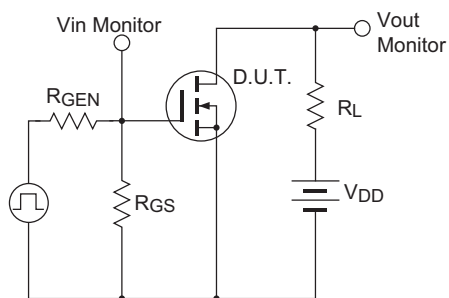


Source-Drain Diode Forward Characteristics (Typical)

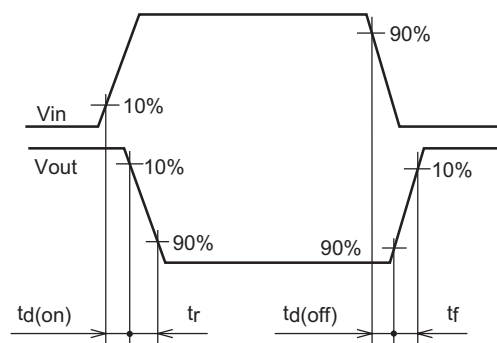




Switching Time Measurement Circuit



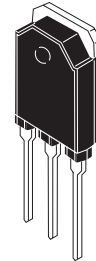
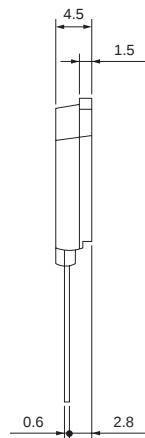
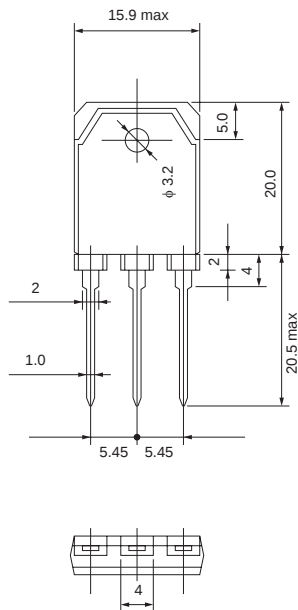
Switching Waveform



## Package Dimensions

### TO-3P

| EIAJ Package Code | JEDEC Code | Mass (g) (reference value) | Lead Material |
|-------------------|------------|----------------------------|---------------|
| Conforms          | —          | 4.8                        | Cu alloy      |



| Symbol         | Dimension in Millimeters |     |     |
|----------------|--------------------------|-----|-----|
|                | Min                      | Typ | Max |
| A              | —                        | —   | —   |
| A <sub>1</sub> | —                        | —   | —   |
| A <sub>2</sub> | —                        | —   | —   |
| b              | —                        | —   | —   |
| D              | —                        | —   | —   |
| E              | —                        | —   | —   |
| e              | —                        | —   | —   |
| x              | —                        | —   | —   |
| y              | —                        | —   | —   |
| y <sub>1</sub> | —                        | —   | —   |
| ZD             | —                        | —   | —   |
| ZE             | —                        | —   | —   |

Note 1) The dimensional figures indicate representative values unless otherwise the tolerance is specified.

## Order Code

| Lead form     | Standard packing                  | Quantity | Standard order code           | Standard order code example |
|---------------|-----------------------------------|----------|-------------------------------|-----------------------------|
| Straight type | Static electricity prevention bag | 20       | Type name                     | FS50SM-5A                   |
| Lead form     | Plastic Magazine (Tube)           | 30       | Type name – Lead forming code | FS50SM-5A-A8                |

Note : Please confirm the specification about the shipping in detail.