



# FS70KMJ-06F

High-Speed Switching Use  
Nch Power MOS FET

REJ03G0256-0100

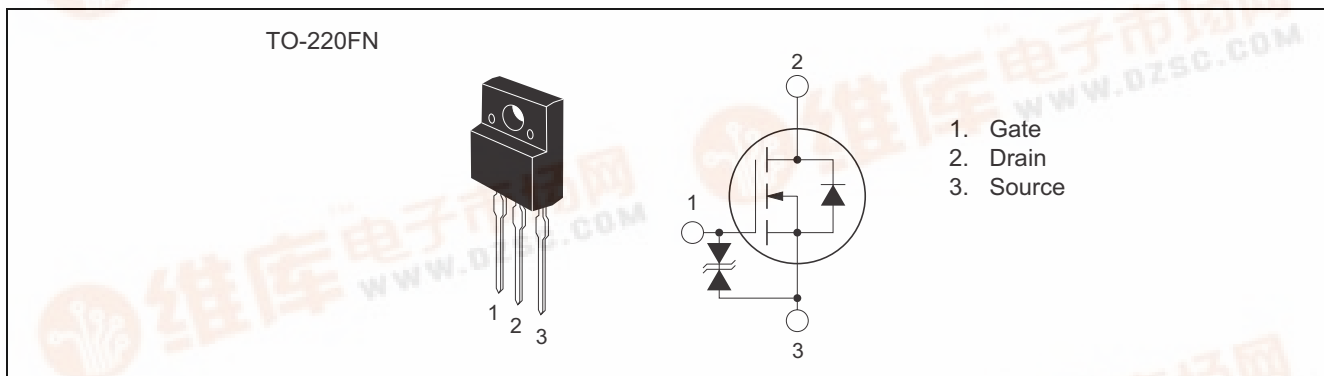
Rev.1.00

Aug.20.2004

## Features

- Drive voltage : 4 V
- $V_{DSS}$  : 60 V
- $r_{DS(ON)} (max)$  : 7.0 m $\Omega$
- $I_D$  : 70 A
- Recovery Time of the Integrated Fast Recovery Diode (TYP.) : 70 ns

## Outline



## Applications

Motor control, lamp control, solenoid control, DC-DC converters, etc.

## Maximum Ratings

(Tc = 25°C)

| Parameter                  | Symbol    | Ratings      | Unit | Conditions                       |
|----------------------------|-----------|--------------|------|----------------------------------|
| Drain-source voltage       | $V_{DSS}$ | 60           | V    | $V_{GS} = 0$ V                   |
| Gate-source voltage        | $V_{GSS}$ | $\pm 20$     | V    | $V_{DS} = 0$ V                   |
| Drain current              | $I_D$     | 70           | A    |                                  |
| Drain current (Pulsed)     | $I_{DM}$  | 280          | A    |                                  |
| Avalanche current (Pulsed) | $I_{DA}$  | 70           | A    | $L = 10$ $\mu$ H                 |
| Source current             | $I_S$     | 70           | A    |                                  |
| Source current (Pulsed)    | $I_{SM}$  | 280          | A    |                                  |
| Maximum power dissipation  | $P_D$     | 30           | W    |                                  |
| Channel temperature        | $T_{ch}$  | - 55 to +150 | °C   |                                  |
| Storage temperature        | $T_{stg}$ | - 55 to +150 | °C   |                                  |
| Isolation voltage          | $V_{iso}$ | 2000         | V    | AC 1 minute,<br>Terminal to case |
| Mass                       | —         | 2.0          | g    | Typical value                    |



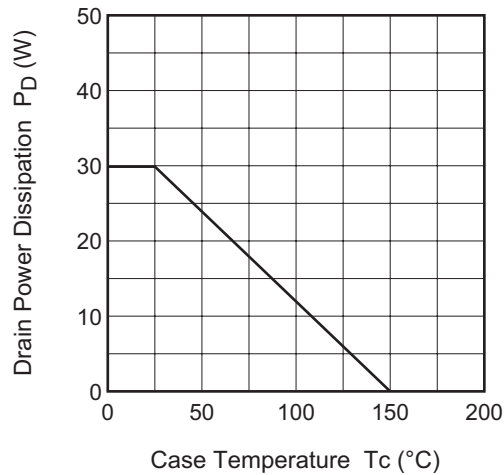
## Electrical Characteristics

(T<sub>ch</sub> = 25°C)

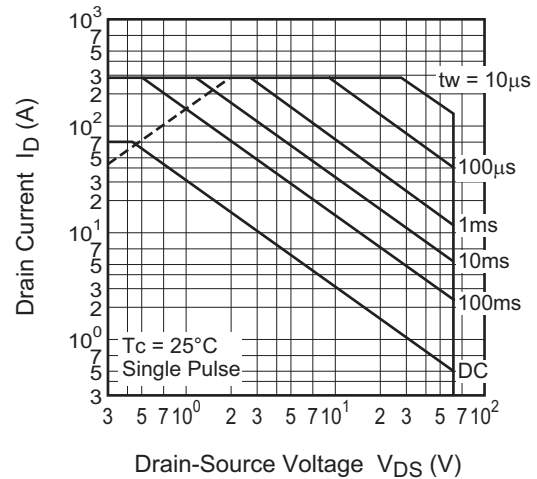
| Parameter                        | Symbol         | Min.     | Typ. | Max.     | Unit                 | Test conditions                                                                                                         |
|----------------------------------|----------------|----------|------|----------|----------------------|-------------------------------------------------------------------------------------------------------------------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$  | 60       | —    | —        | V                    | $I_D = 1 \text{ mA}$ , $V_{GS} = 0 \text{ V}$                                                                           |
| Gate-source breakdown voltage    | $V_{(BR)GSS}$  | $\pm 20$ | —    | —        | V                    | $I_G = \pm 100 \text{ }\mu\text{A}$ , $V_{DS} = 0 \text{ V}$                                                            |
| Drain-source leakage current     | $I_{DSS}$      | —        | —    | 100      | $\mu\text{A}$        | $V_{DS} = 60 \text{ V}$ , $V_{GS} = 0 \text{ V}$                                                                        |
| Gate-source leakage current      | $I_{GSS}$      | —        | —    | $\pm 10$ | $\mu\text{A}$        | $V_{GS} = \pm 20 \text{ V}$ , $V_{DS} = 0 \text{ V}$                                                                    |
| Gate-source threshold voltage    | $V_{GS(th)}$   | 1.0      | 1.5  | 2.0      | V                    | $I_D = 1 \text{ mA}$ , $V_{DS} = 10 \text{ V}$                                                                          |
| Drain-source on-state resistance | $r_{DS(on)}$   | —        | 5.5  | 7.0      | $\text{m}\Omega$     | $I_D = 35 \text{ A}$ , $V_{GS} = 10 \text{ V}$                                                                          |
| Drain-source on-state resistance | $r_{DS(on)}$   | —        | 6.6  | 8.3      | $\text{m}\Omega$     | $I_D = 35 \text{ A}$ , $V_{GS} = 4 \text{ V}$                                                                           |
| Drain-source on-state voltage    | $V_{DS(on)}$   | —        | 0.19 | 0.25     | V                    | $I_D = 35 \text{ A}$ , $V_{GS} = 10 \text{ V}$                                                                          |
| Forward transfer admittance      | $ y_{fs} $     | —        | 110  | —        | S                    | $I_D = 35 \text{ A}$ , $V_{DS} = 10 \text{ V}$                                                                          |
| Input capacitance                | $C_{iss}$      | —        | 8500 | —        | pF                   | $V_{DS} = 10 \text{ V}$ , $V_{GS} = 0 \text{ V}$ ,<br>$f = 1 \text{ MHz}$                                               |
| Output capacitance               | $C_{oss}$      | —        | 1300 | —        | pF                   |                                                                                                                         |
| Reverse transfer capacitance     | $C_{rss}$      | —        | 720  | —        | pF                   |                                                                                                                         |
| Turn-on delay time               | $t_{d(on)}$    | —        | 42   | —        | ns                   | $V_{DD} = 30 \text{ V}$ , $I_D = 35 \text{ A}$ ,<br>$V_{GS} = 10 \text{ V}$ ,<br>$R_{GEN} = R_{GS} = 50 \text{ }\Omega$ |
| Rise time                        | $t_r$          | —        | 130  | —        | ns                   |                                                                                                                         |
| Turn-off delay time              | $t_{d(off)}$   | —        | 800  | —        | ns                   |                                                                                                                         |
| Fall time                        | $t_f$          | —        | 330  | —        | ns                   |                                                                                                                         |
| Source-drain voltage             | $V_{SD}$       | —        | 1.0  | 1.5      | V                    | $I_S = 35 \text{ A}$ , $V_{GS} = 0 \text{ V}$                                                                           |
| Thermal resistance               | $R_{th(ch-c)}$ | —        | —    | 4.17     | $^{\circ}\text{C/W}$ | Channel to case                                                                                                         |
| Reverse recovery time            | $t_{rr}$       | —        | 70   | —        | ns                   | $I_S = 70 \text{ A}$ , $\text{dis}/\text{dt} = -100 \text{ A}/\mu\text{s}$                                              |

## Performance Curves

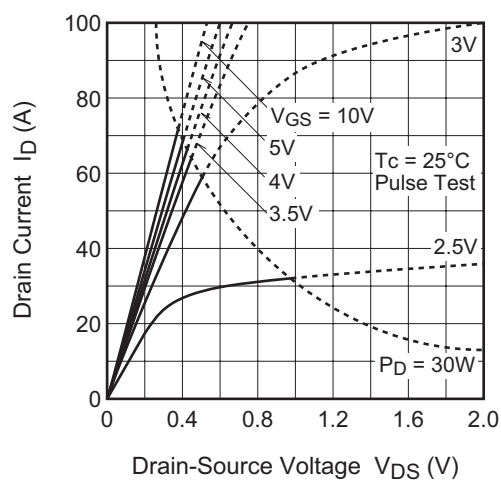
Drain Power Dissipation Derating Curve



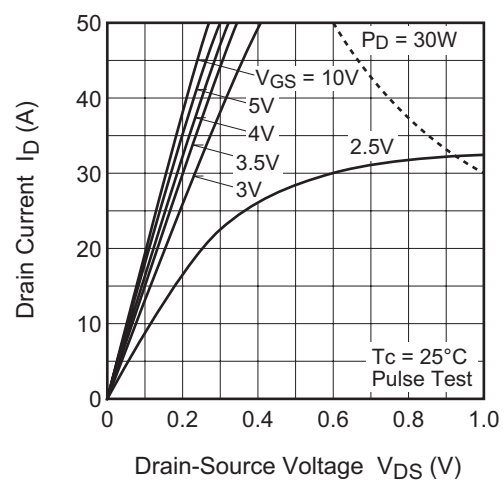
Maximum Safe Operating Area



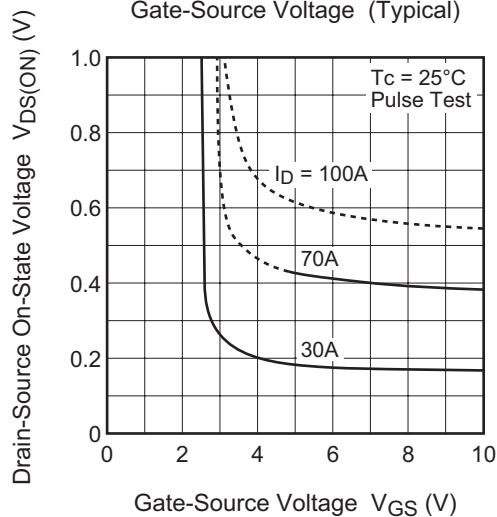
Output Characteristics (Typical)



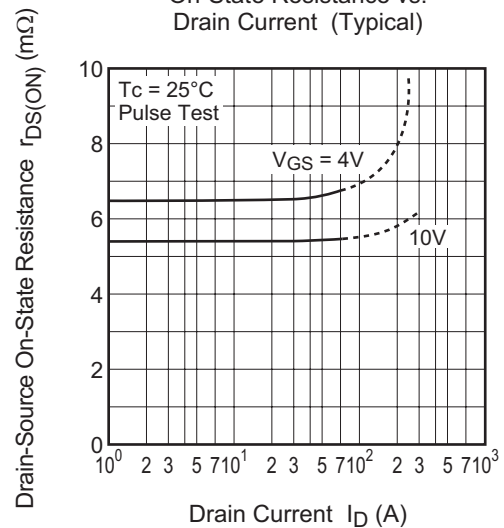
Output Characteristics (Typical)



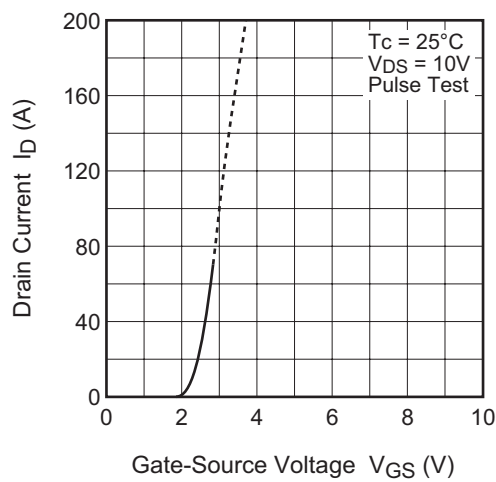
On-State Voltage vs. Gate-Source Voltage (Typical)



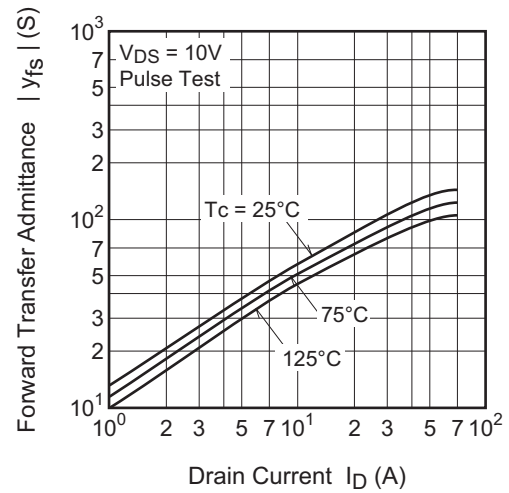
On-State Resistance vs. Drain Current (Typical)



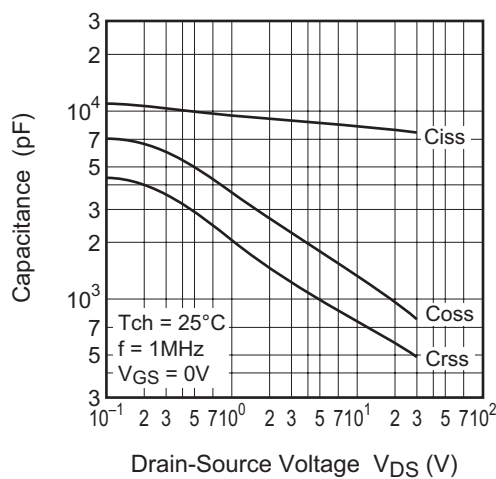
Transfer Characteristics (Typical)



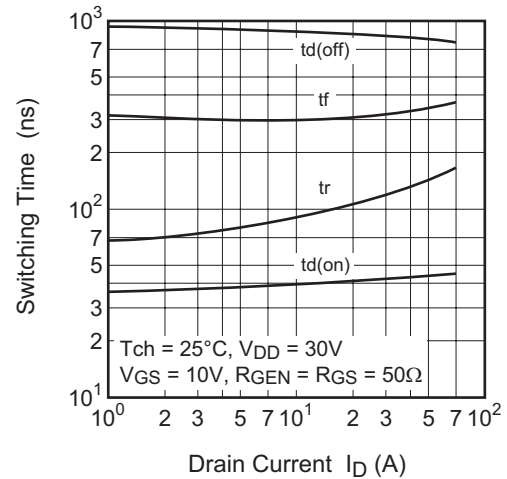
Forward Transfer Admittance vs. Drain Current (Typical)



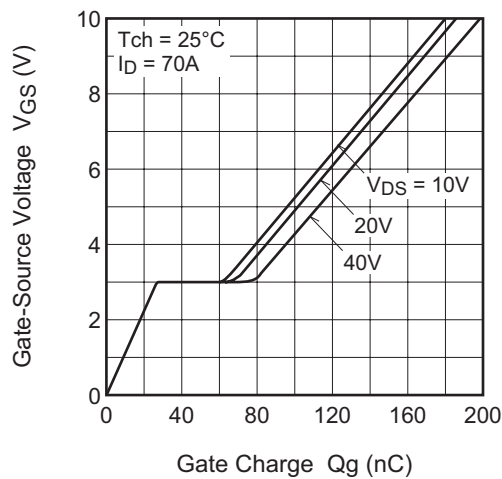
Capacitance vs. Drain-Source Voltage (Typical)



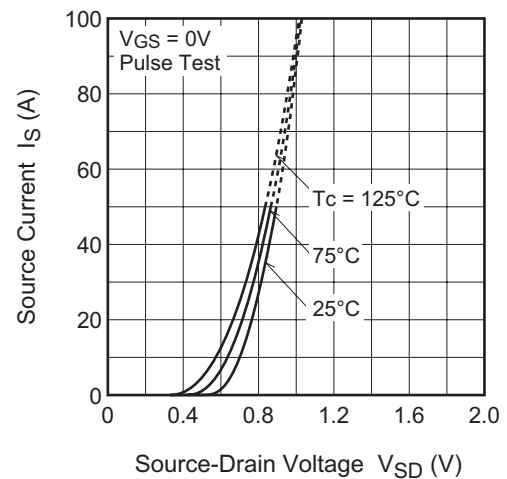
Switching Characteristics (Typical)

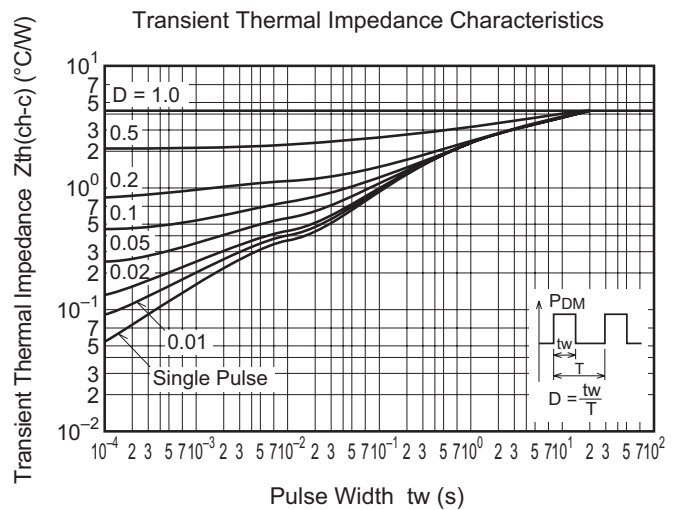
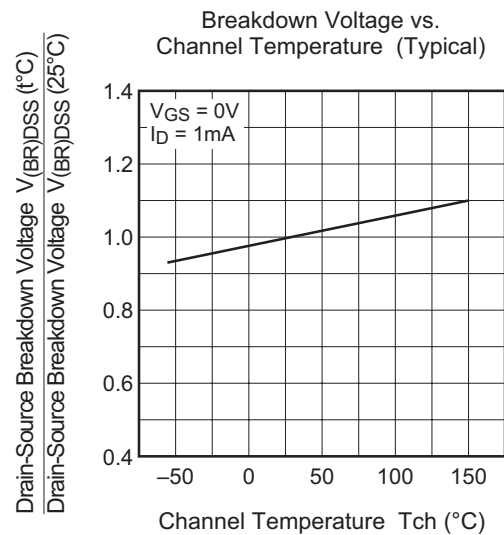
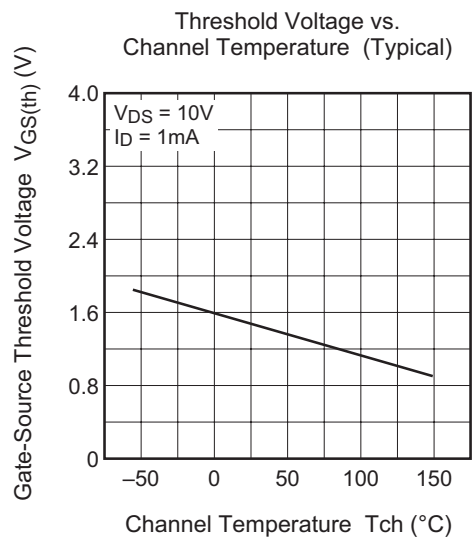
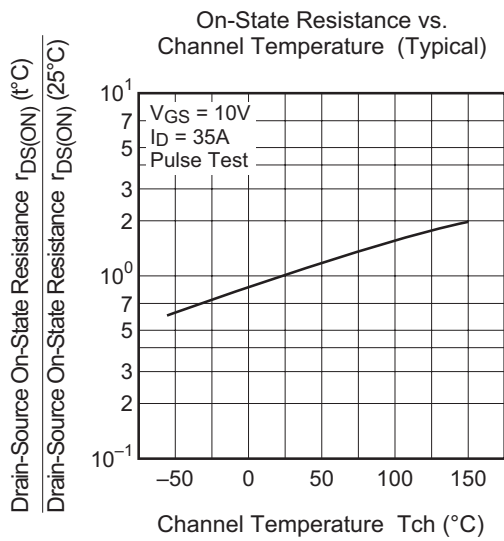


Gate-Source Voltage vs. Gate Charge (Typical)

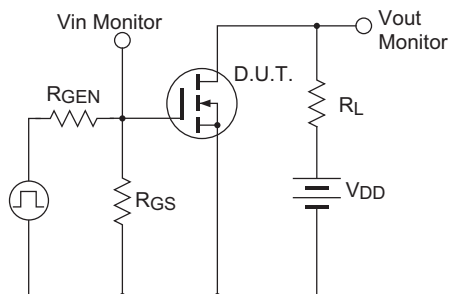


Source-Drain Diode Forward Characteristics (Typical)

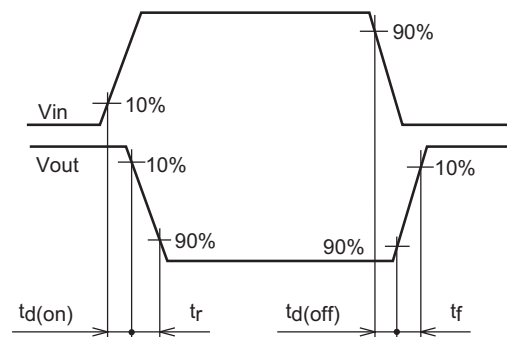




Switching Time Measurement Circuit



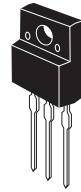
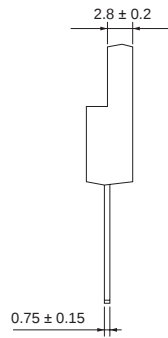
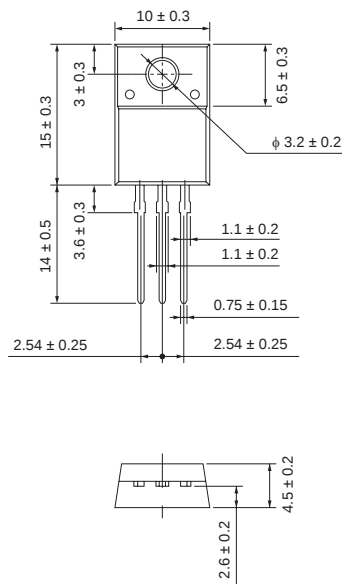
Switching Waveform



Package Dimensions

TO-220FN

| EIAJ Package Code | JEDEC Code | Mass (g) (reference value) | Lead Material |
|-------------------|------------|----------------------------|---------------|
| —                 | —          | 2.0                        | Cu alloy      |



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

| 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             | —                        | —   | —   |

Order Code

| Lead form     | Standard packing        | Quantity | Standard order code           | Standard order code example |
|---------------|-------------------------|----------|-------------------------------|-----------------------------|
| Straight type | Plastic Magazine (Tube) | 50       | Type name                     | FS70KMJ-06F                 |
| Lead form     | Plastic Magazine (Tube) | 50       | Type name – Lead forming code | FS70KMJ-06F-A8              |

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

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