

MOSFETs   Silicon N-Channel MOS (U-MOS<sup>™</sup>Ⅶ-H)

SSM6N7002KFU

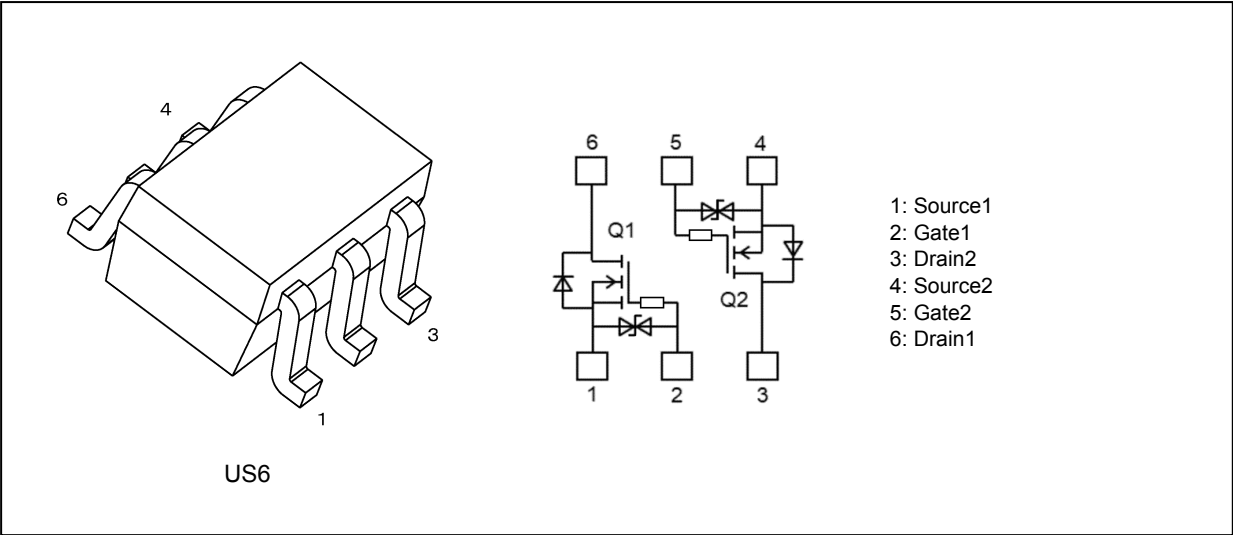
1. Applications

- High-Speed Switching

2. Features

- (1) AEC-Q101 qualified (Please see the orderable part number list)
- (2) Low drain-source on-resistance
  - :  $R_{DS(ON)} = 1.05\ \Omega$  (typ.) (@ $V_{GS} = 10\ V$ )
  - $R_{DS(ON)} = 1.15\ \Omega$  (typ.) (@ $V_{GS} = 5.0\ V$ )
  - $R_{DS(ON)} = 1.2\ \Omega$  (typ.) (@ $V_{GS} = 4.5\ V$ )

3. Packaging and Internal Circuit



4. Orderable part number

Orderable part number	AEC-Q101	Note
SSM6N7002KFU,LF	—	General Use
SSM6N7002KFU,LXG	YES (Note 1)	Unintended Use (Note 1)
SSM6N7002KFU,LXH	YES	Automotive Use

Note 1: For more information, please contact our sales or use the inquiry form on our website.

Start of commercial production  
2015-05

## 5. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25\text{ }^{\circ}\text{C}$ )

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DS}$	60	V
Gate-source voltage	$V_{GS}$	$\pm 20$	
Drain current (DC) (Note 1), (Note 2)	$I_D$	300	mA
Drain current (pulsed) (Note 1), (Note 3)	$I_{DP}$	1200	
Power dissipation (Note 2), (Note 4)	$P_D$	500	mW
Power dissipation (Note 4), (Note 5)		285	
Channel temperature	$T_{ch}$	150	$^{\circ}\text{C}$
Storage temperature	$T_{stg}$	-55 to 150	

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: Ensure that the channel temperature does not exceed  $150\text{ }^{\circ}\text{C}$ .

Note 2:  $T_{sp} = 25\text{ }^{\circ}\text{C}$

Note 3: Repetitive rating; pulse width limited by maximum channel temperature.  
pulse width  $\leq 10\text{ }\mu\text{s}$ , Duty 1 %

Note 4: Total rating

Note 5: Device mounted on a  $25.4\text{ mm} \times 25.4\text{ mm} \times 1.6\text{ mm}$  FR-4 glass epoxy board (Cu pad:  $645\text{ mm}^2$ )

Note: This transistor is sensitive to electrostatic discharge and should be handled with care.

Note: The MOSFETs in this device are sensitive to electrostatic discharge. When handling this device, the worktables, operators, soldering irons and other objects should be protected against anti-static discharge.

Note: The channel-to-ambient thermal resistance,  $R_{th(ch-a)}$ , and the drain power dissipation,  $P_D$ , vary according to the board material, board area, board thickness and pad area. When using this device, be sure to take heat dissipation fully into account.

## 6. Electrical Characteristics

### 6.1. Static Characteristics (Unless otherwise specified, $T_a = 25\text{ }^{\circ}\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 16\text{ V}$ , $V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current	$I_{DSS}$	$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$	—	—	1	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	60	—	—	V
Gate threshold voltage	$V_{th}$	$I_D = 250\text{ }\mu\text{A}$ , $V_{DS} = V_{GS}$	1.1	—	2.1	
Drain-source on-resistance (Note 1)	$R_{DS(ON)}$	$I_D = 100\text{ mA}$ , $V_{GS} = 10\text{ V}$	—	1.05	1.5	$\Omega$
		$I_D = 100\text{ mA}$ , $V_{GS} = 5.0\text{ V}$	—	1.15	1.65	
		$I_D = 100\text{ mA}$ , $V_{GS} = 4.5\text{ V}$	—	1.2	1.75	
Forward transfer admittance (Note 1)	$ Y_{fs} $	$V_{DS} = 10\text{ V}$ , $I_D = 200\text{ mA}$	—	1.0	—	S

Note 1: Pulse measurement.

### 6.2. Dynamic Characteristics (Unless otherwise specified, $T_a = 25\text{ }^{\circ}\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$	—	26	40	pF
Reverse transfer capacitance	$C_{rss}$		—	1.3	—	
Output capacitance	$C_{oss}$		—	5.5	—	
Switching time (rise time)	$t_r$	$V_{DD} = 30\text{ V}$ , $I_D = 200\text{ mA}$ $V_{GS} = 0\text{ to }10\text{ V}$ , $R_{GS} = 50\text{ }\Omega$ Duty $\leq 1\%$ , $V_{IN}$ : $t_r$ , $t_f < 5\text{ ns}$ , Common source, See Chapter 6.3.	—	3.6	—	ns
Switching time (turn-on delay time)	$t_{d(on)}$		—	5.5	11	
Switching time (fall time)	$t_f$		—	17	—	
Switching time (turn-off delay time)	$t_{d(off)}$		—	38	90	

### 6.3. Switching Time Test Circuit

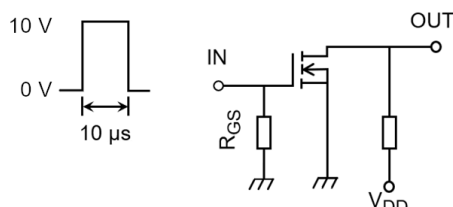


Fig. 6.3.1 Switching Time Test Circuit

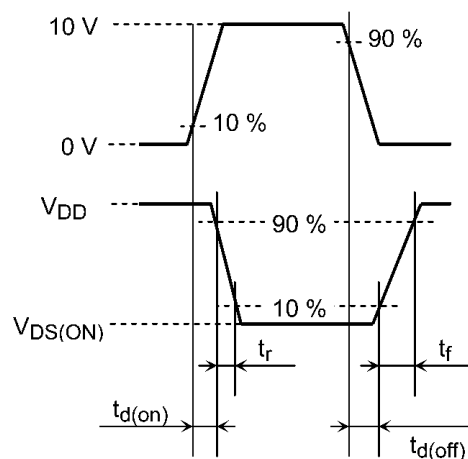


Fig. 6.3.2 Input Waveform/Output Waveform

### 6.4. Gate Charge Characteristics (Unless otherwise specified, $T_a = 25\text{ }^{\circ}\text{C}$ )

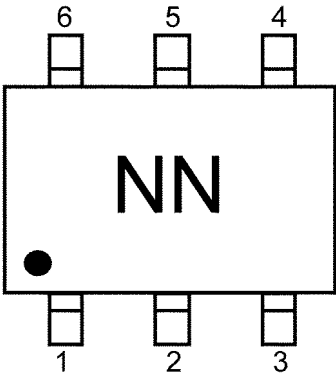
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Total gate charge (gate-source plus gate-drain)	$Q_g$	$V_{DD} = 30\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 200\text{ mA}$	—	0.39	0.6	nC
Gate-source charge	$Q_{gs}$		—	0.2	—	
Gate-drain charge	$Q_{gd}$		—	0.11	—	

6.5. Source-Drain Characteristics (Unless otherwise specified, T<sub>a</sub> = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Diode forward voltage (Note 1)	V <sub>DSF</sub>	I <sub>DR</sub> = 115 mA, V <sub>GS</sub> = 0 V	—	0.79	1.1	V

Note 1: Pulse measurement.

7. Marking



## 8. Characteristics Curves (Note)

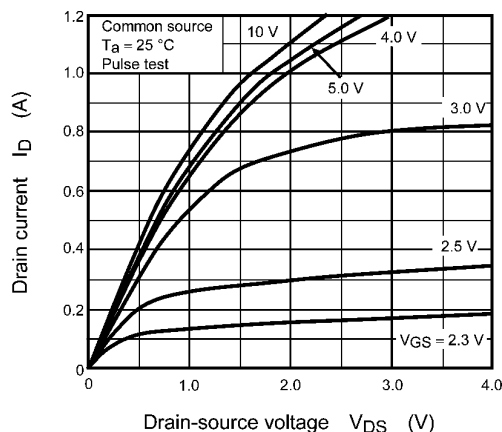


Fig. 8.1  $I_D - V_{DS}$

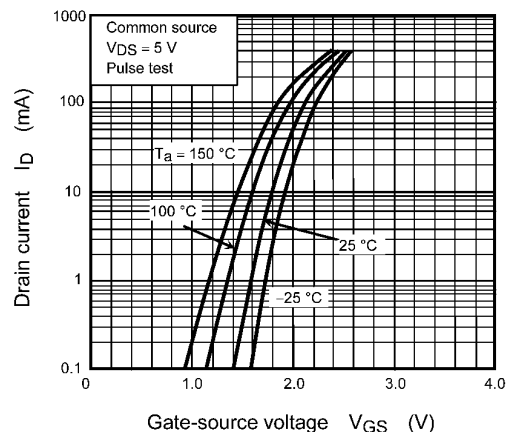


Fig. 8.2  $I_D - V_{GS}$

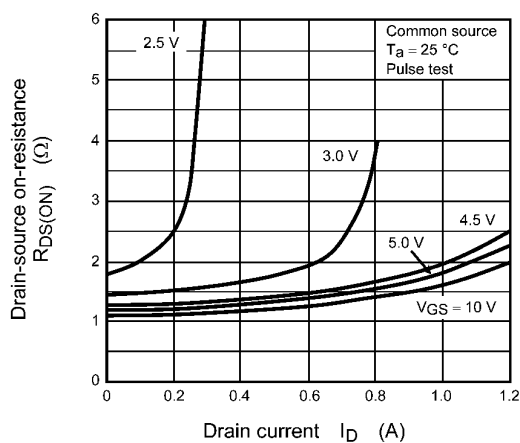


Fig. 8.3  $R_{DS(ON)} - I_D$

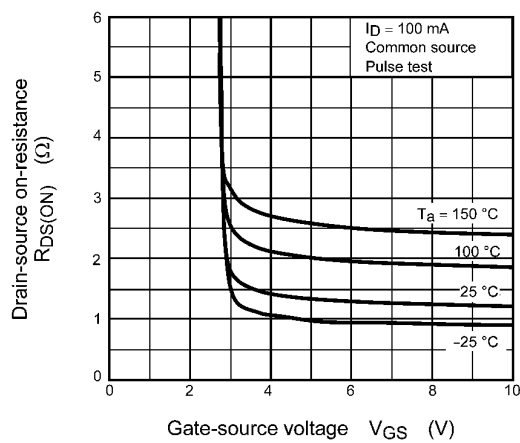


Fig. 8.4  $R_{DS(ON)} - V_{GS}$

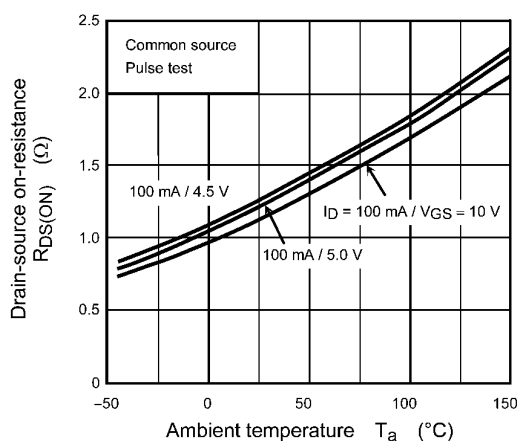


Fig. 8.5  $R_{DS(ON)} - T_a$

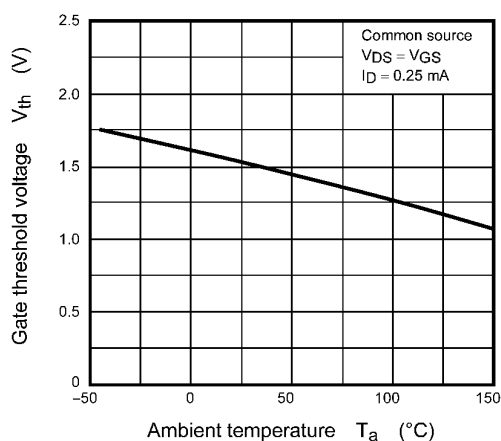


Fig. 8.6  $V_{th} - T_a$

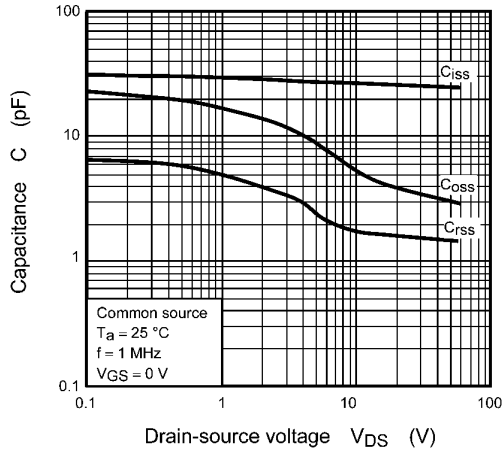


Fig. 8.7 C -  $V_{DS}$

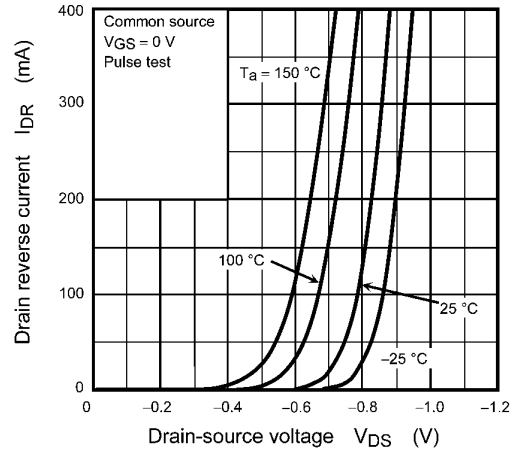


Fig. 8.8  $I_{DR}$  -  $V_{DS}$

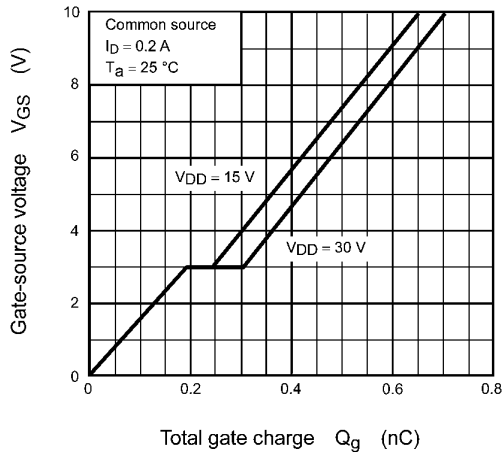


Fig. 8.9 Dynamic Input Characteristics

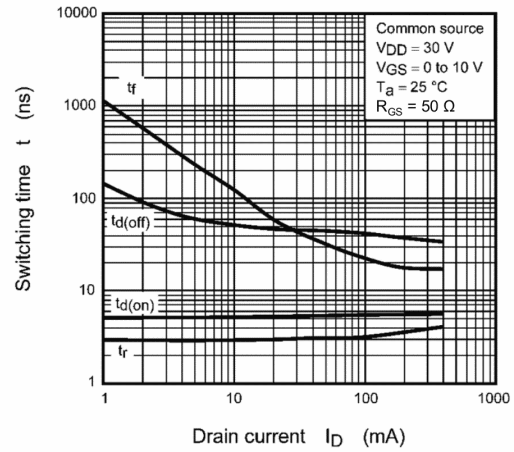


Fig. 8.10  $t$  -  $I_D$

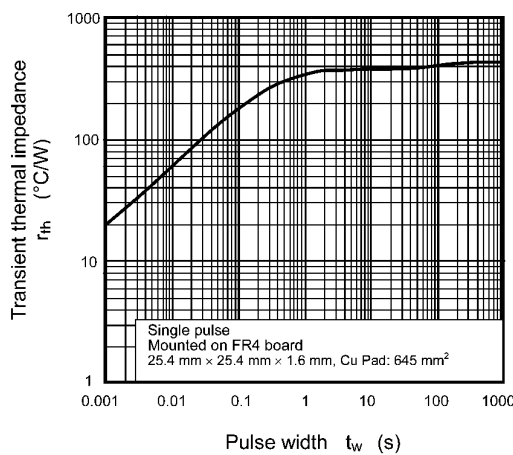


Fig. 8.11  $r_{th}$  -  $t_w$

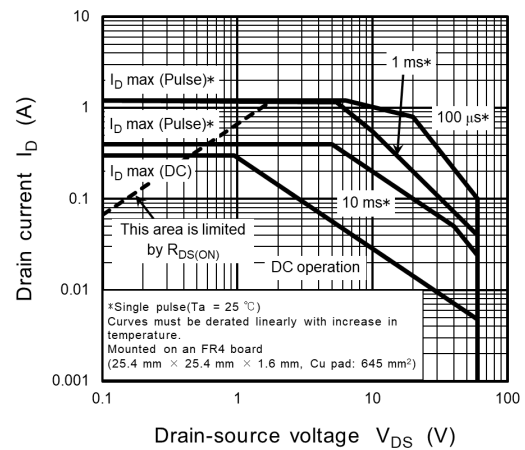
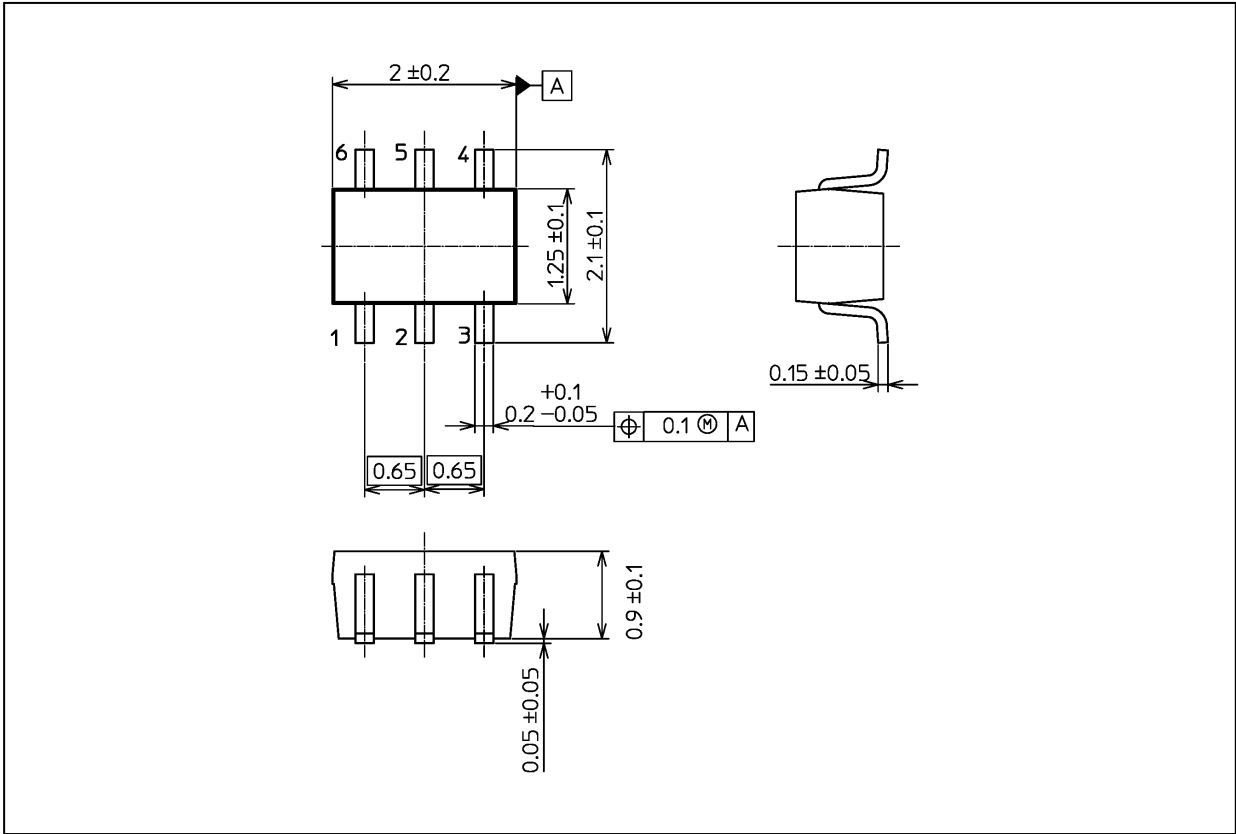


Fig. 8.12 Safe Operating Area

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

Package Dimensions

Unit: mm



Weight: 6.8 mg (typ.)

Package Name(s)
JEDEC: SOT-363
Nickname: US6

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