MOSFETs Silicon N-Channel MOS

SSM3K7002KFU

1. Applications

- High-Speed Switching

2. Features

(1) AEC-Q101 qualified (Please see the orderable part number list)

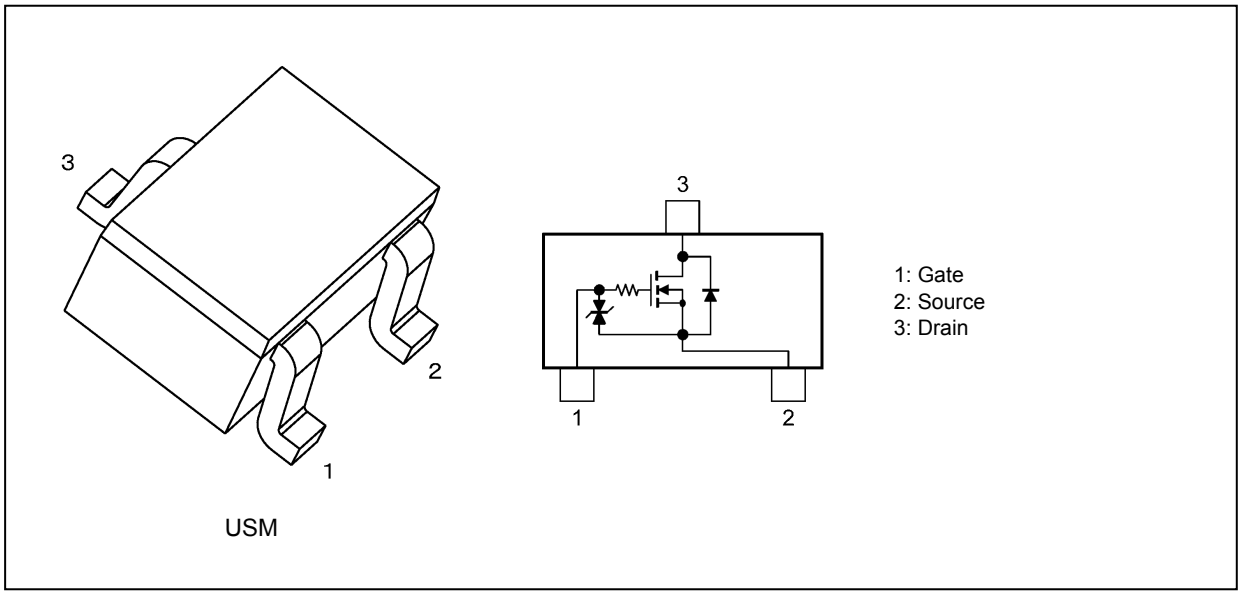
(2) Low drain-source on-resistance

: $R_{DS(ON)}$ = 1.05 Ω (typ.) (@V_{GS} = 10 V)

$R_{DS(ON)}$ = 1.15 Ω (typ.) (@V_{GS} = 5.0 V)

$R_{DS(ON)}$ = 1.2 Ω (typ.) (@V_{GS} = 4.5 V)

3. Packaging and Internal Circuit



4. Orderable part number

Orderable part number	AEC-Q101	Note
SSM3K7002KFU,LF	—	General Use
SSM3K7002KFU,LXG	YES (Note 1)	Unintended Use (Note 1)
SSM3K7002KFU,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
2016-01

5. Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25 °C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	60	V
Gate-source voltage		V_{GSS}	±20	
Drain current (DC)	(Note 1)	I_D	400	mA
Drain current (pulsed)	(Note 1), (Note 2)	I_{DP}	1200	
Power dissipation	(Note 3)	P_D	150	mW
Power dissipation	(Note 4)		700	
Channel temperature		T_{ch}	150	°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 °C.

Note 2: pulse width ≤ 10 μs, Duty ≤ 1 %

Note 3: Device mounted on a 25.4 mm × 25.4 mm × 1.6 mm FR4 glass epoxy board (Cu pad: 0.6 mm^2 × 3)

Note 4: Device mounted on a 25.4 mm × 25.4 mm × 1.6 mm FR4 glass epoxy board (Cu pad: 645 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 °C)

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

Note 1: Pulse measurement.

6.2. Dynamic Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input capacitance	C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 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 V, I_D = 200 mA, V_{GS} = 0 to 10 V, R_G = 50 Ω Duty ≤ 1 %, V_{IN}: t_r, t_f < 5 ns, Common source	—	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

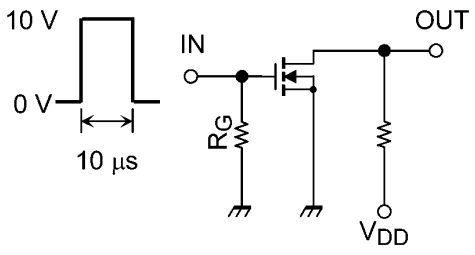


Fig. 6.3.1 Switching Time Test Circuit

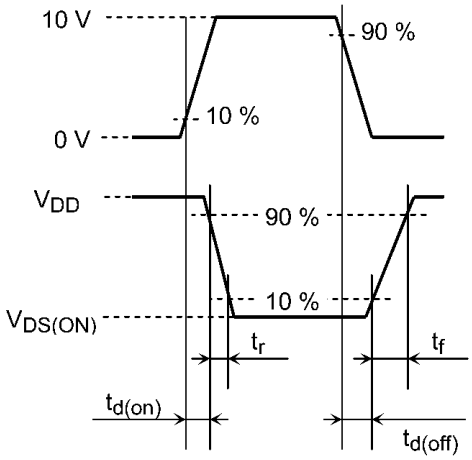


Fig. 6.3.2 Input Waveform/Output Waveform

6.4. Gate Charge Characteristics (Unless otherwise specified, T_a = 25 °C)

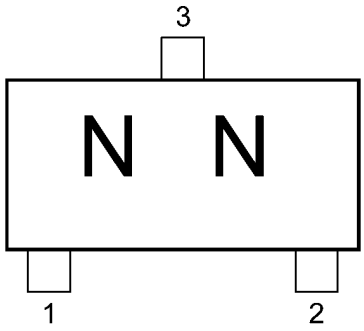
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Q_g	V_{DD} = 30 V, I_D = 200 mA, V_{GS} = 4.5 V	—	0.39	0.6	nC
Gate-source charge	Q_{gs}		—	0.2	—	
Gate-drain charge	Q_{gd}		—	0.11	—	

6.5. Source-Drain Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Diode forward voltage (Note 1)	V_{DSF}	I_D = -115 mA, V_{GS} = 0 V	—	-0.79	-1.1	V

Note 1: Pulse measurement.

7. Marking



8. Characteristics Curves (Note)

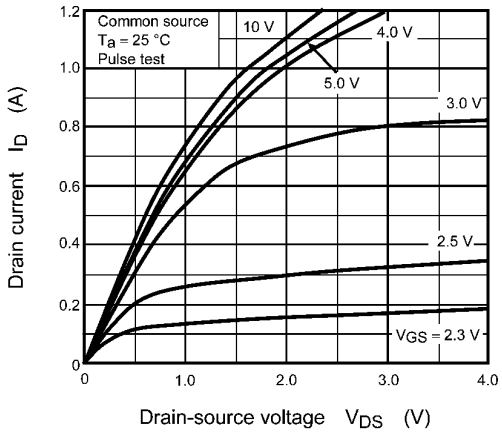


Fig. 8.1 I_D - V_{DS}

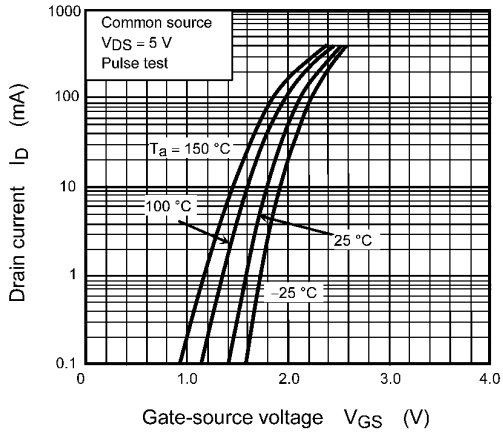


Fig. 8.2 I_D - V_{GS}

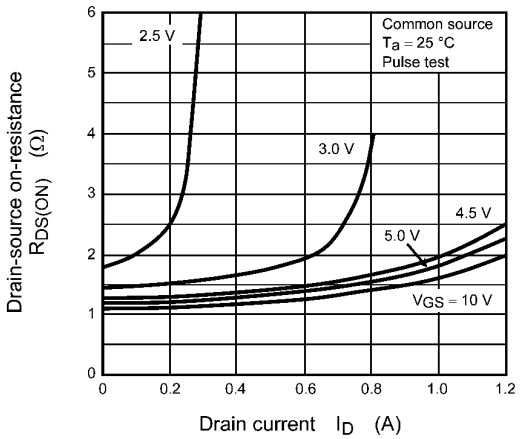


Fig. 8.3 $R_{DS(ON)}$ - I_D

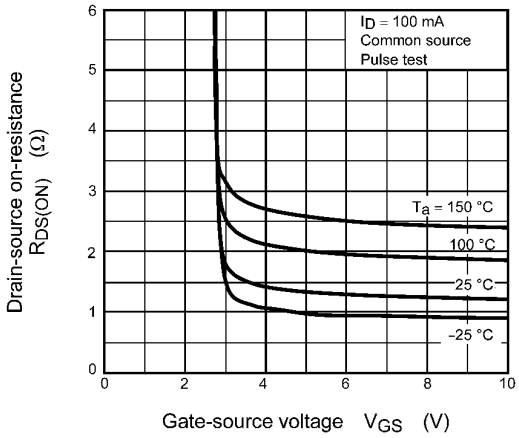


Fig. 8.4 $R_{DS(ON)}$ - V_{GS}

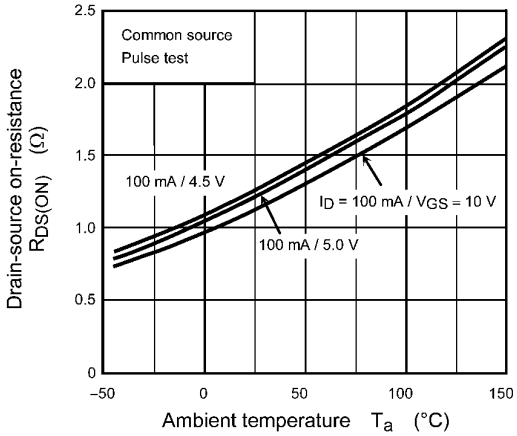


Fig. 8.5 $R_{DS(ON)}$ - T_a

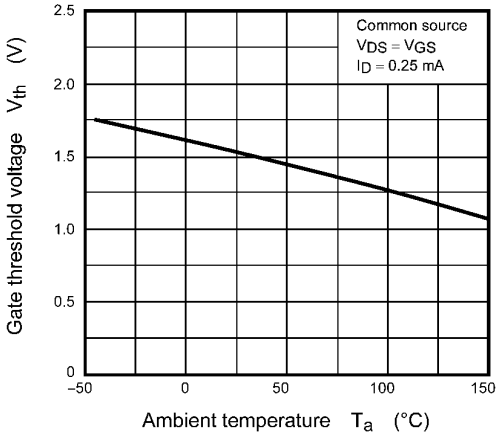


Fig. 8.6 V_{th} - T_a

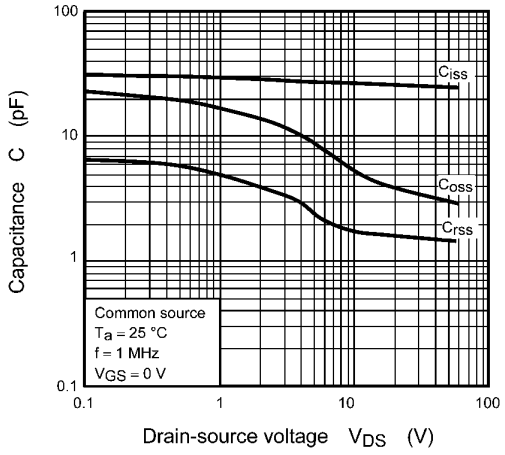


Fig. 8.7 C - V_{DS}

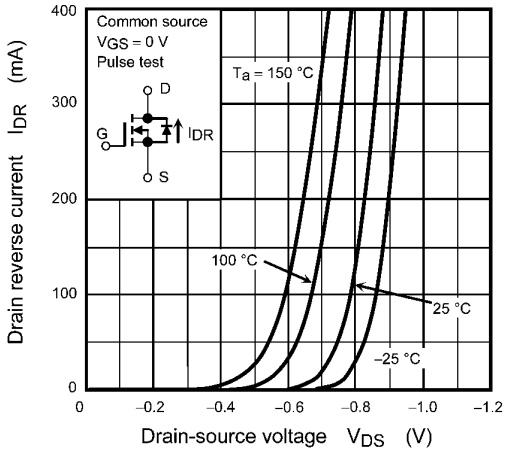


Fig. 8.8 I_{DR} - V_{DS}

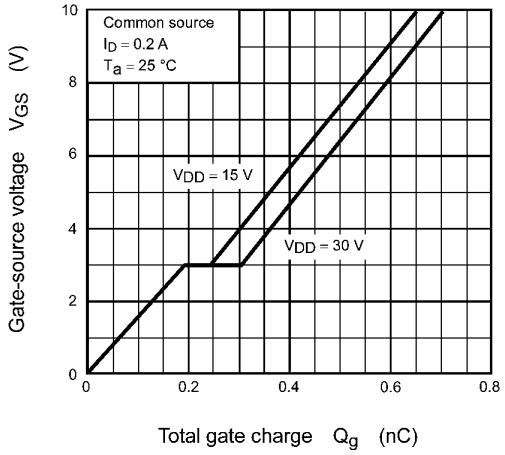


Fig. 8.9 Dynamic Input Characteristics

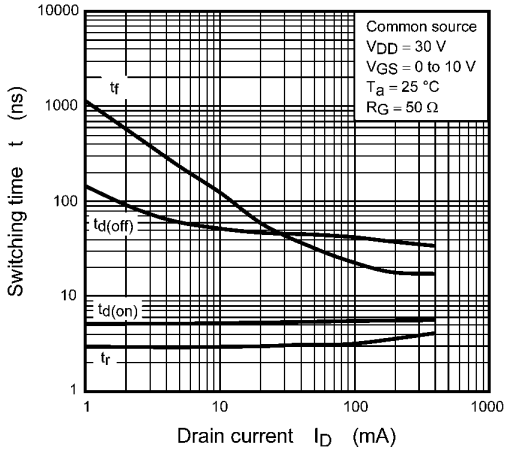


Fig. 8.10 t - I_D

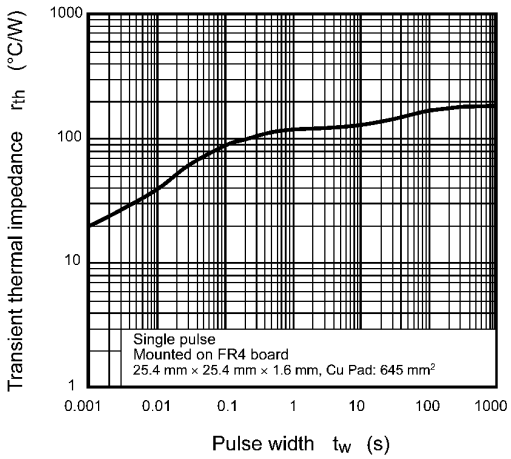


Fig. 8.11 r_{th} - t_w

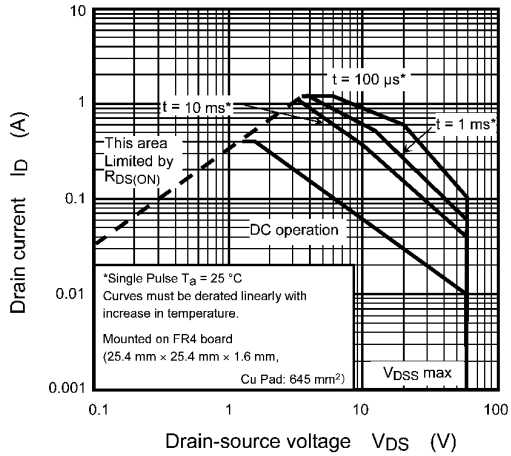
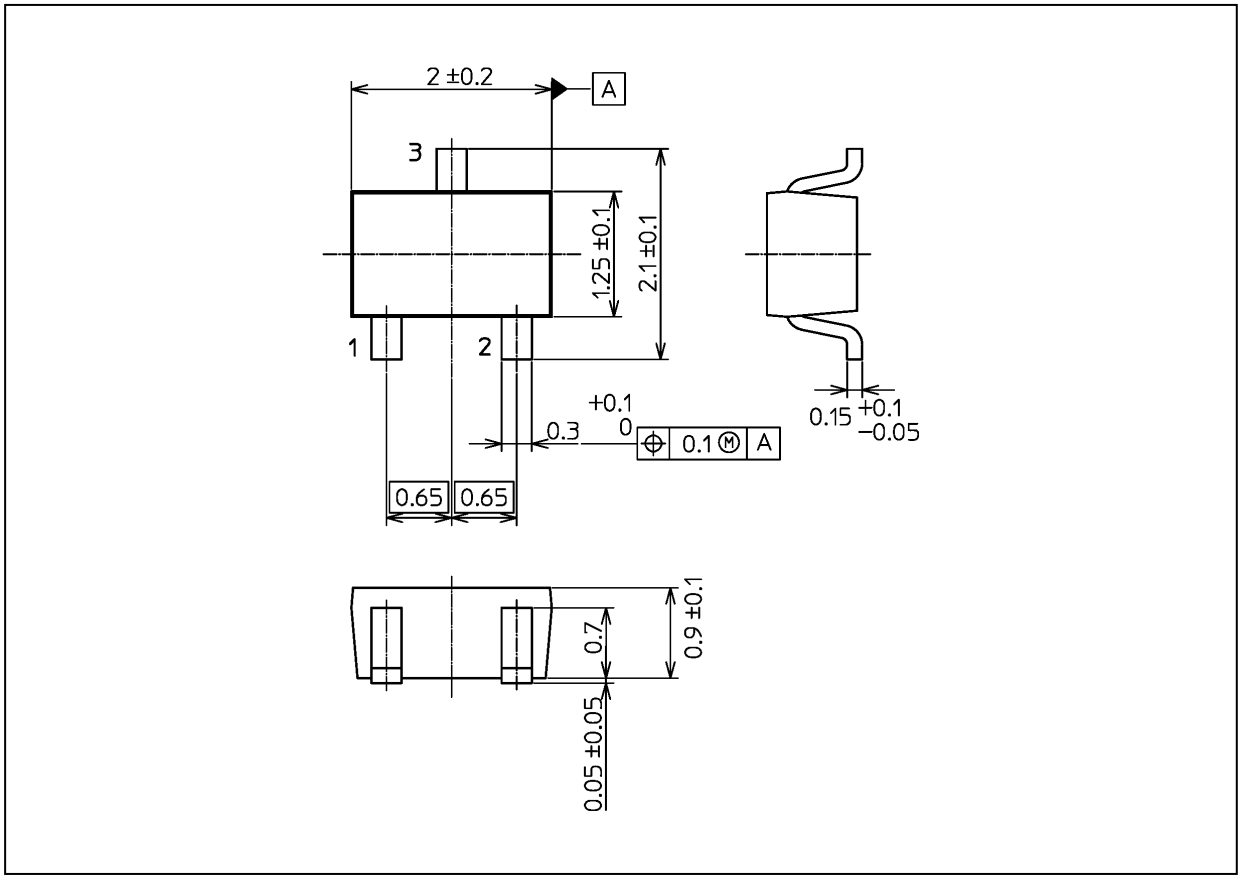


Fig. 8.12 Safe Operating Area

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

Package Dimensions

Unit: mm



Weight: 6.0 mg (typ.)

Package Name(s)
TOSHIBA: 2-2E1S
Nickname: USM

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