MOSFETs Silicon N-Channel MOS

SSM3K7002KFU

1. Applications

- High-Speed Switching

2. Features

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

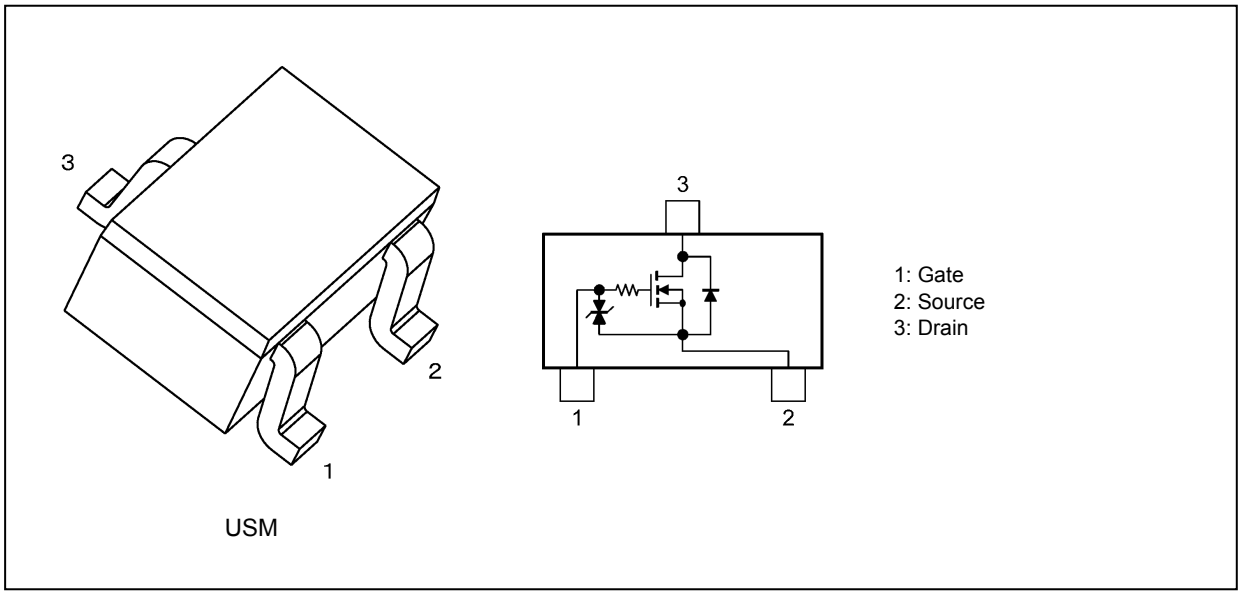
(2) Low drain-source on-resistance

: $R_{DS(ON)}$ = 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



USM

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

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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.

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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

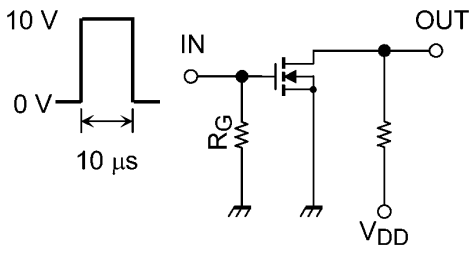


Fig. 6.3.1 Switching Time Test Circuit

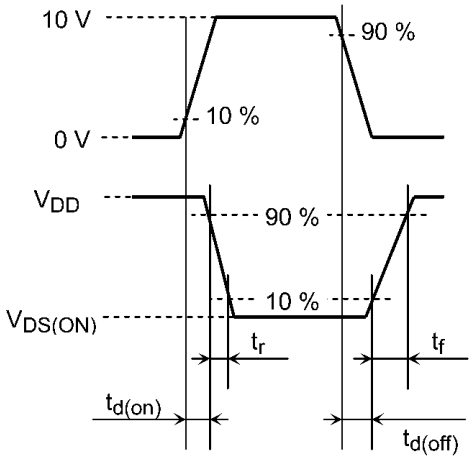


Fig. 6.3.2 Input Waveform/Output Waveform

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	—	

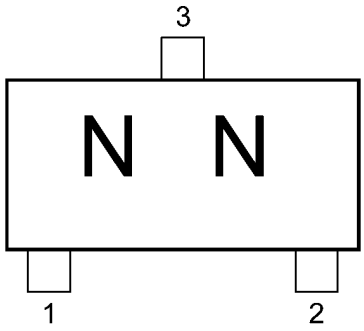
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6.5. Source-Drain Characteristics (Unless otherwise specified, T_a = 25 °C)

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



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8. Characteristics Curves (Note)

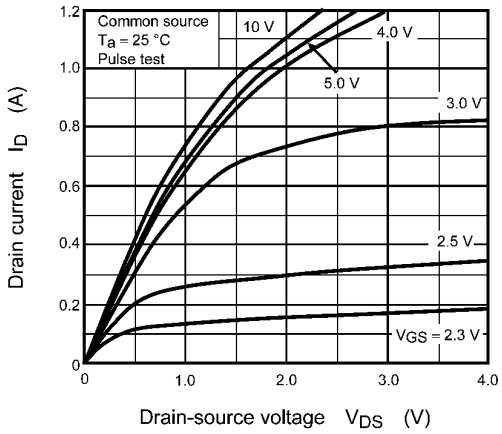


Fig. 8.1 I_D - V_{DS}

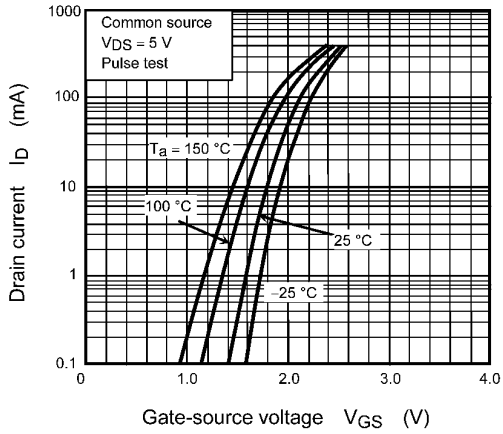


Fig. 8.2 I_D - V_{GS}

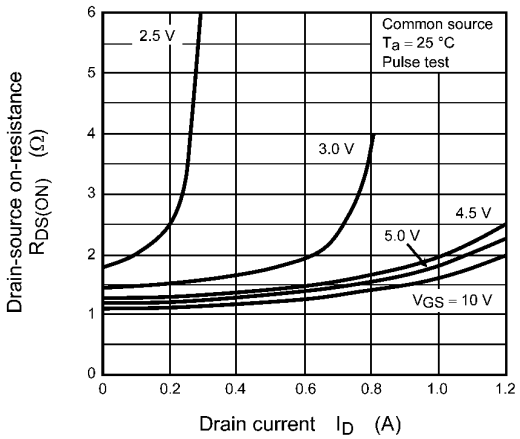


Fig. 8.3 $R_{DS(ON)}$ - I_D

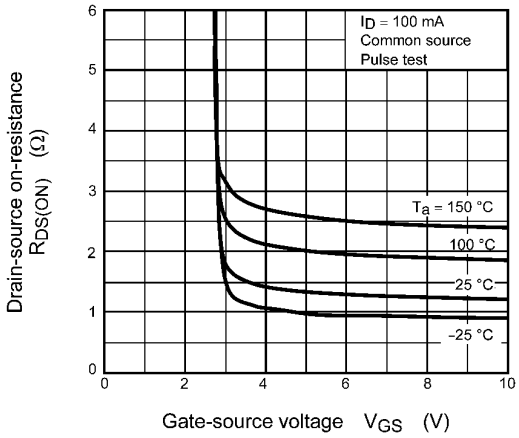


Fig. 8.4 $R_{DS(ON)}$ - V_{GS}

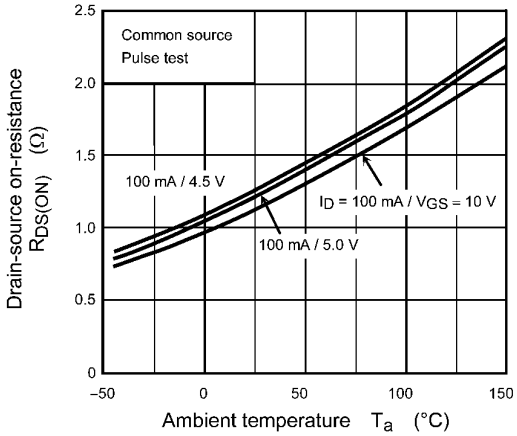


Fig. 8.5 $R_{DS(ON)}$ - T_a

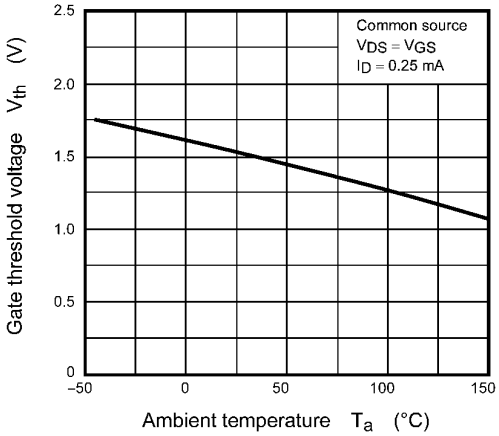


Fig. 8.6 V_{th} - T_a

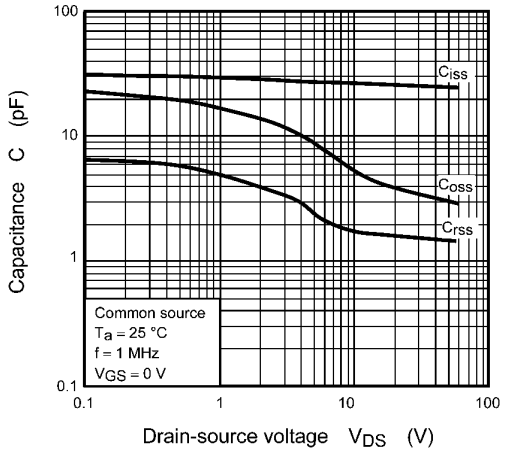


Fig. 8.7 C - V_{DS}

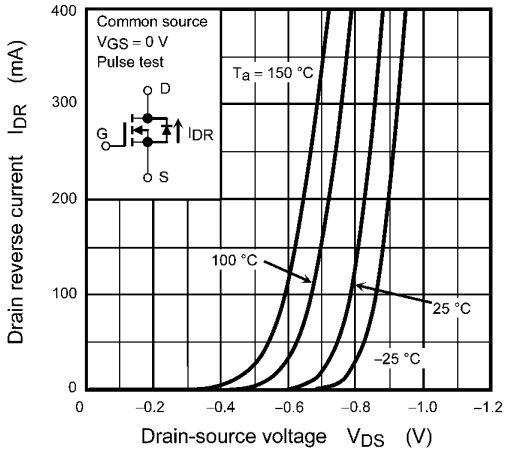


Fig. 8.8 I_{DR} - V_{DS}

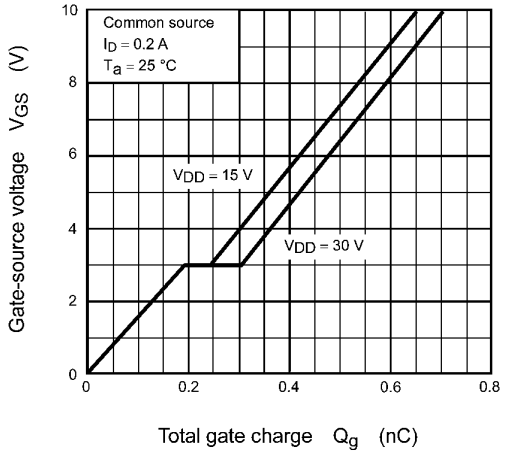


Fig. 8.9 Dynamic Input Characteristics

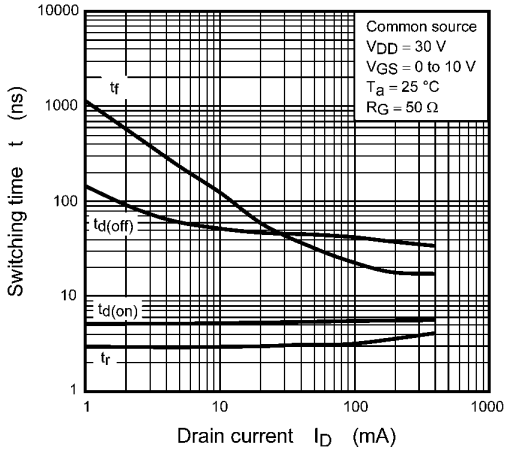


Fig. 8.10 t - I_D

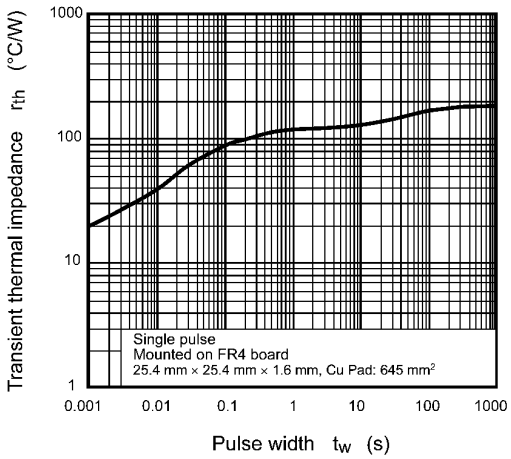


Fig. 8.11 r_{th} - t_w

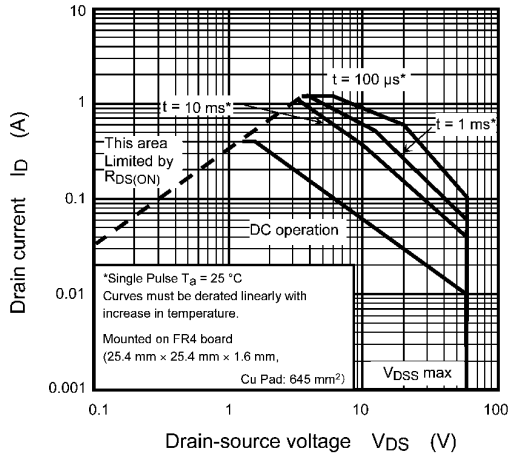


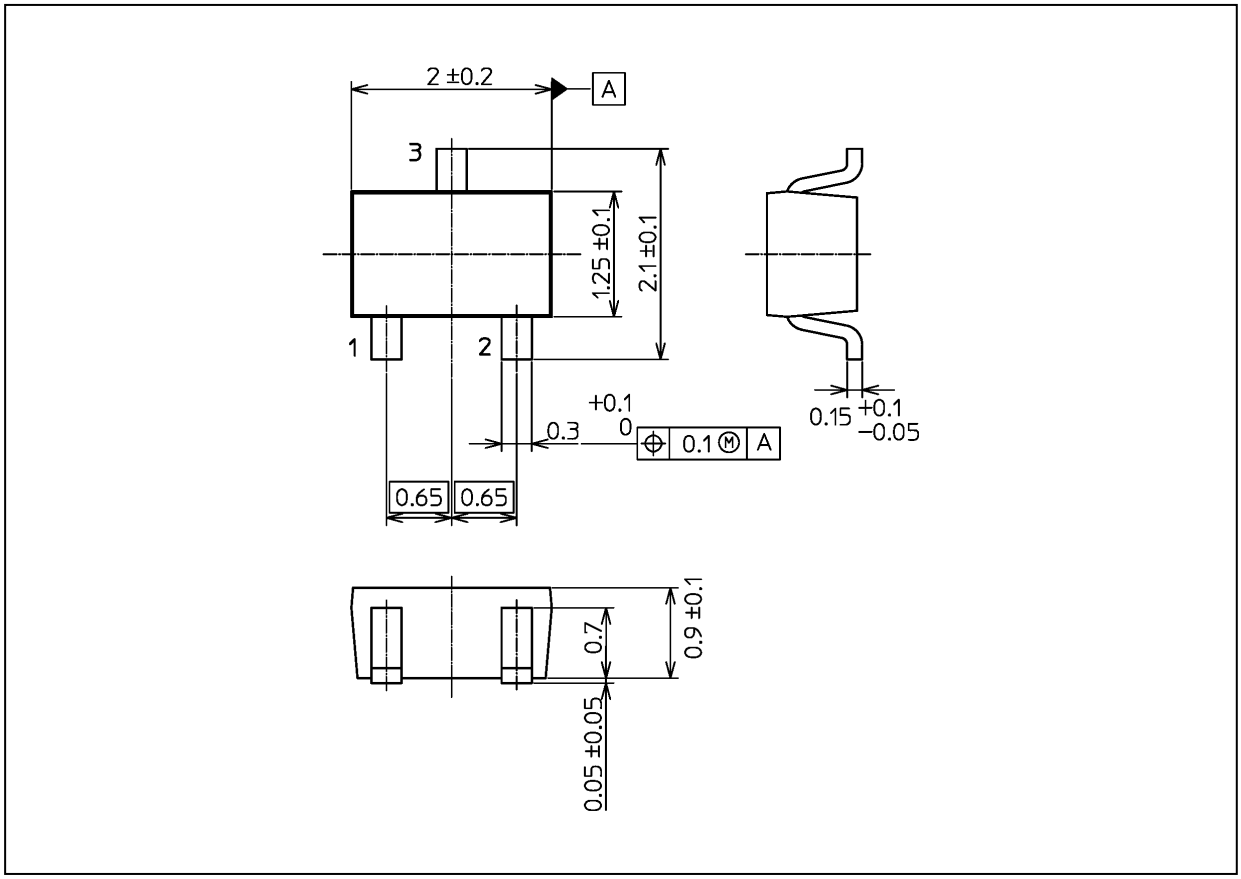
Fig. 8.12 Safe Operating Area

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

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Package Dimensions

Unit: mm



Weight: 6.0 mg (typ.)

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

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