



**THE DATASHEET OF  
SSM3J35AMFV,L3F**



# SSM3J35AMFV

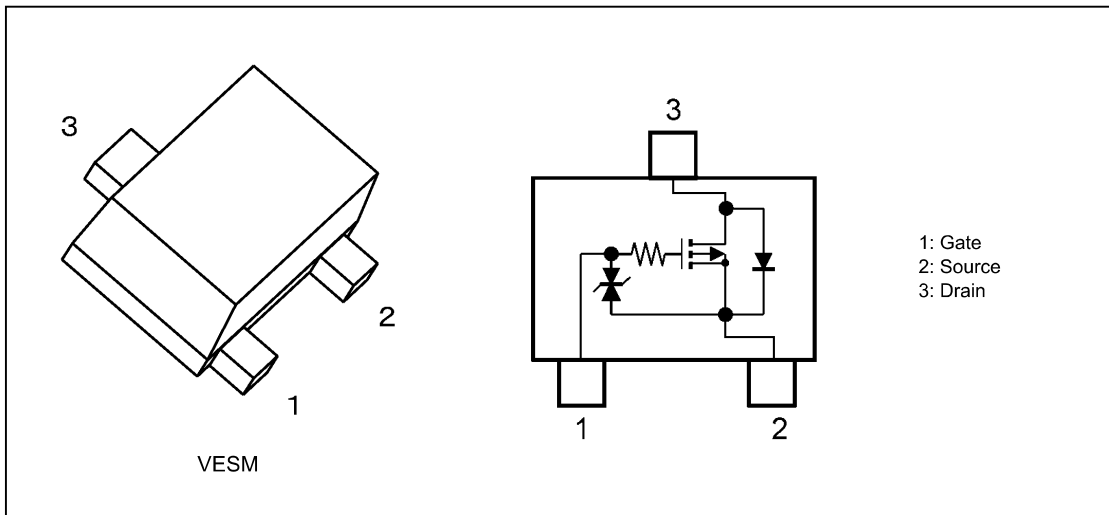
## 1. Applications

- Analog Switches

## 2. Features

- (1) 1.2 V drive
- (2) ESD(HBM) level 2 kV
- (3) Low drain-source on-resistance  
 $R_{DS(ON)} = 3.2 \Omega$  (typ.) (@ $V_{GS} = -1.2$  V)  
 $R_{DS(ON)} = 2.3 \Omega$  (typ.) (@ $V_{GS} = -1.5$  V)  
 $R_{DS(ON)} = 2.0 \Omega$  (typ.) (@ $V_{GS} = -1.8$  V)  
 $R_{DS(ON)} = 1.5 \Omega$  (typ.) (@ $V_{GS} = -2.5$  V)  
 $R_{DS(ON)} = 1.1 \Omega$  (typ.) (@ $V_{GS} = -4.5$  V)

## 3. Packaging and Internal Circuit



Start of commercial production

2017-07

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

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	-20	V
Gate-source voltage	$V_{GSS}$	$\pm 10$	
Drain current (DC) (Note 1)	$I_D$	-250	mA
Drain current (pulsed) (Note 1)	$I_{DP}$	-600	
Power dissipation (Note 2)	$P_D$	150	mW
Power dissipation (Note 3)		500	
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  $^\circ\text{C}$ .

Note 2: Mounted on an FR4 board (25.4 mm  $\times$  25.4 mm  $\times$  1.6 mm, Cu pad: 0.585 mm<sup>2</sup>)

Note 3: Mounted on an FR4 board (25.4 mm  $\times$  25.4 mm  $\times$  1.6 mm, Cu pad: 645 mm<sup>2</sup>)

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.

**5. Electrical Characteristics**

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}$	—	—	$\pm 1$	$\mu\text{A}$
Drain cut-off current	$I_{DSS}$	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$	—	—	-1	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = -1\text{ mA}, V_{GS} = 0\text{ V}$	-20	—	—	V
Drain-source breakdown voltage (Note 1)	$V_{(BR)DSX}$	$I_D = -1\text{ mA}, V_{GS} = 10\text{ V}$	-10	—	—	
Gate threshold voltage (Note 2)	$V_{th}$	$V_{DS} = -10\text{ V}, I_D = -100\text{ }\mu\text{A}$	-0.3	—	-1	
Drain-source on-resistance (Note 3)	$R_{DS(ON)}$	$I_D = -10\text{ mA}, V_{GS} = -1.2\text{ V}$	—	3.2	20	$\Omega$
		$I_D = -20\text{ mA}, V_{GS} = -1.5\text{ V}$	—	2.3	4.0	
		$I_D = -50\text{ mA}, V_{GS} = -1.8\text{ V}$	—	2.0	2.9	
		$I_D = -150\text{ mA}, V_{GS} = -2.5\text{ V}$	—	1.5	2.1	
		$I_D = -150\text{ mA}, V_{GS} = -4.5\text{ V}$	—	1.1	1.4	
Forward transfer admittance (Note 3)	$ Y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -100\text{ mA}$	—	430	—	mS

Note 1: If a reverse bias is applied between gate and source, this device enters  $V_{(BR)DSX}$  mode. Note that the drain-source breakdown voltage is lowered in this mode.

Note 2: Let  $V_{th}$  be the voltage applied between gate and source that causes the drain current ( $I_D$ ) to below ( $-100\text{ }\mu\text{A}$  for this device). Then, for normal switching operation,  $V_{GS(ON)}$  must be higher than  $V_{th}$ , and  $V_{GS(OFF)}$  must be lower than  $V_{th}$ . This relationship can be expressed as:  $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$ . Take this into consideration when using the device.

Note 3: Pulse measurement.

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input capacitance	$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	—	21	42	$\text{pF}$
Reverse transfer capacitance	$C_{rss}$		—	2	—	
Output capacitance	$C_{oss}$		—	6	—	
Switching time (rise time)	$t_r$	$V_{DD} = -10\text{ V}, I_D = -50\text{ mA},$ $V_{GS} = 0\text{ to }-4.5\text{ V}, R_G = 10\text{ }\Omega$ Duty $\leq 1\%$ , $V_{IN}: t_r, t_f < 5\text{ ns},$ Common source, See Chapter 5.3.	—	42	—	$\text{ns}$
Switching time (turn-on delay time)	$t_{d(on)}$		—	17	—	
Switching time (fall time)	$t_f$		—	145	—	
Switching time (turn-off delay time)	$t_{d(off)}$		—	420	—	

**5.3. Switching Time Test Circuit**

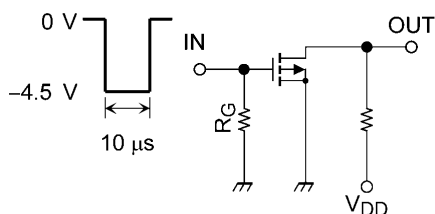


Fig. 5.3.1 Switching Time Test Circuit

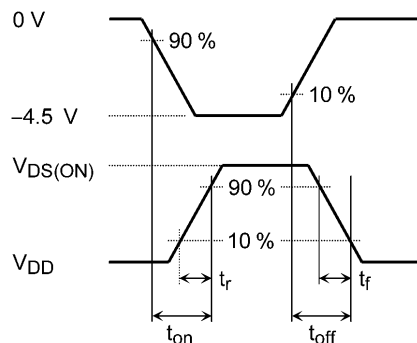


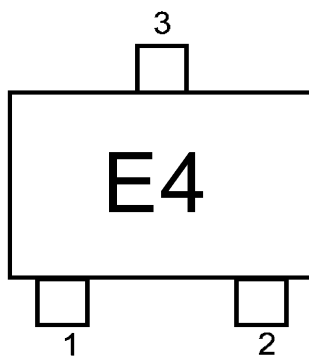
Fig. 5.3.2 Input Waveform/Output Waveform

**5.4. Source-Drain Characteristics (Unless otherwise specified,  $T_a = 25\text{ }^\circ\text{C}$ )**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Diode forward voltage (Note 1)	$V_{DSF}$	$I_D = 100\text{ mA}, V_{GS} = 0\text{ V}$	—	0.83	1.2	V

Note 1: Pulse measurement.

**6. Marking**



7. Characteristics Curves (Note)

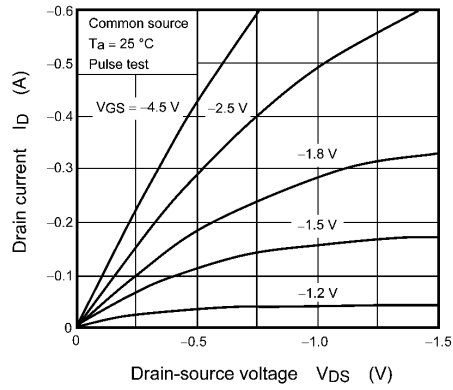


Fig. 7.1 ID - VDS

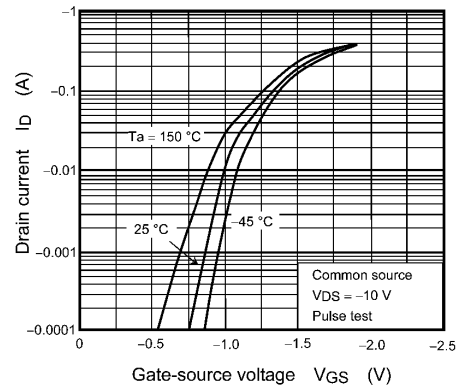


Fig. 7.2 ID - VGS

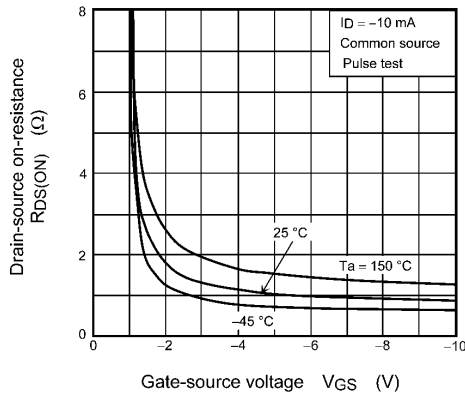


Fig. 7.3 RDS(ON) - VGS

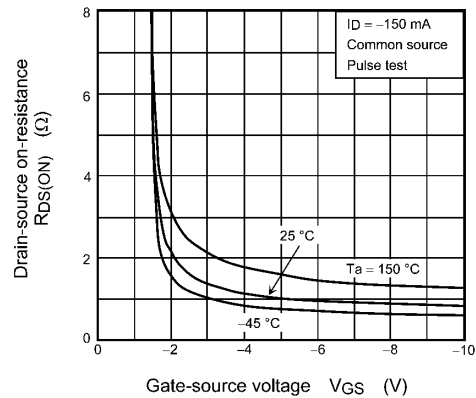


Fig. 7.4 RDS(ON) - VGS

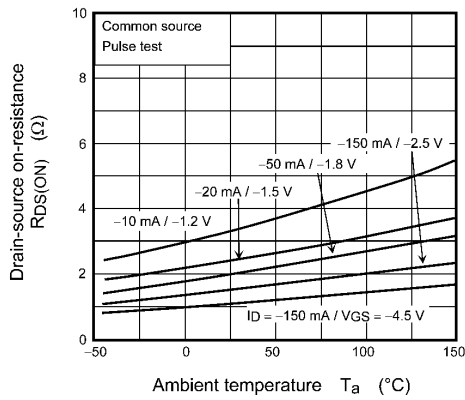


Fig. 7.5 RDS(ON) - Ta

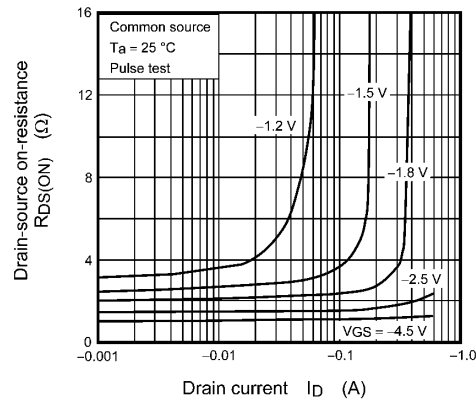
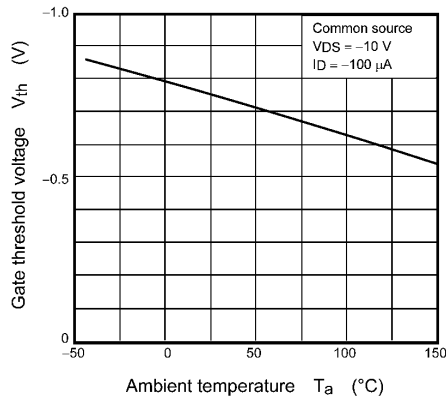
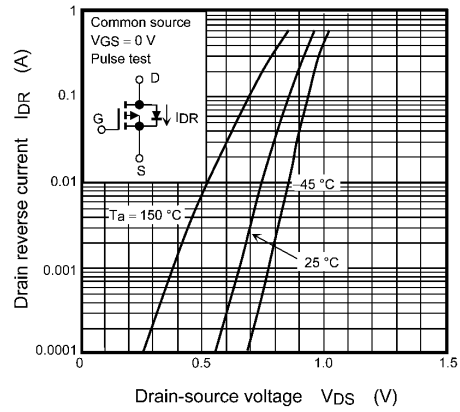


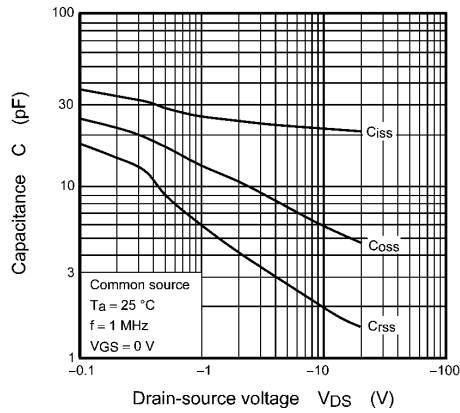
Fig. 7.6 RDS(ON) - ID



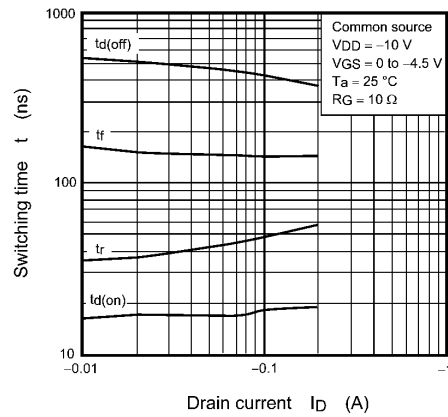
**Fig. 7.7  $V_{th} - T_a$**



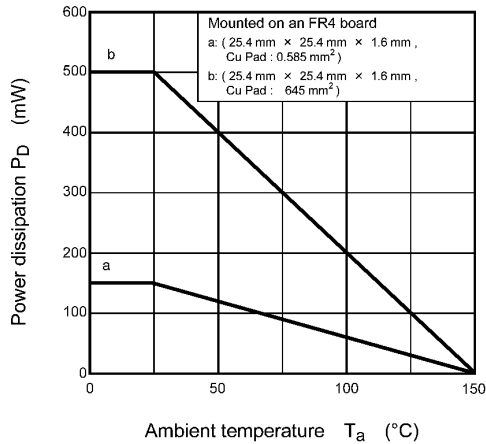
**Fig. 7.8  $I_{DR} - V_{DS}$**



**Fig. 7.9  $C - V_{DS}$**



**Fig. 7.10  $t - I_D$**

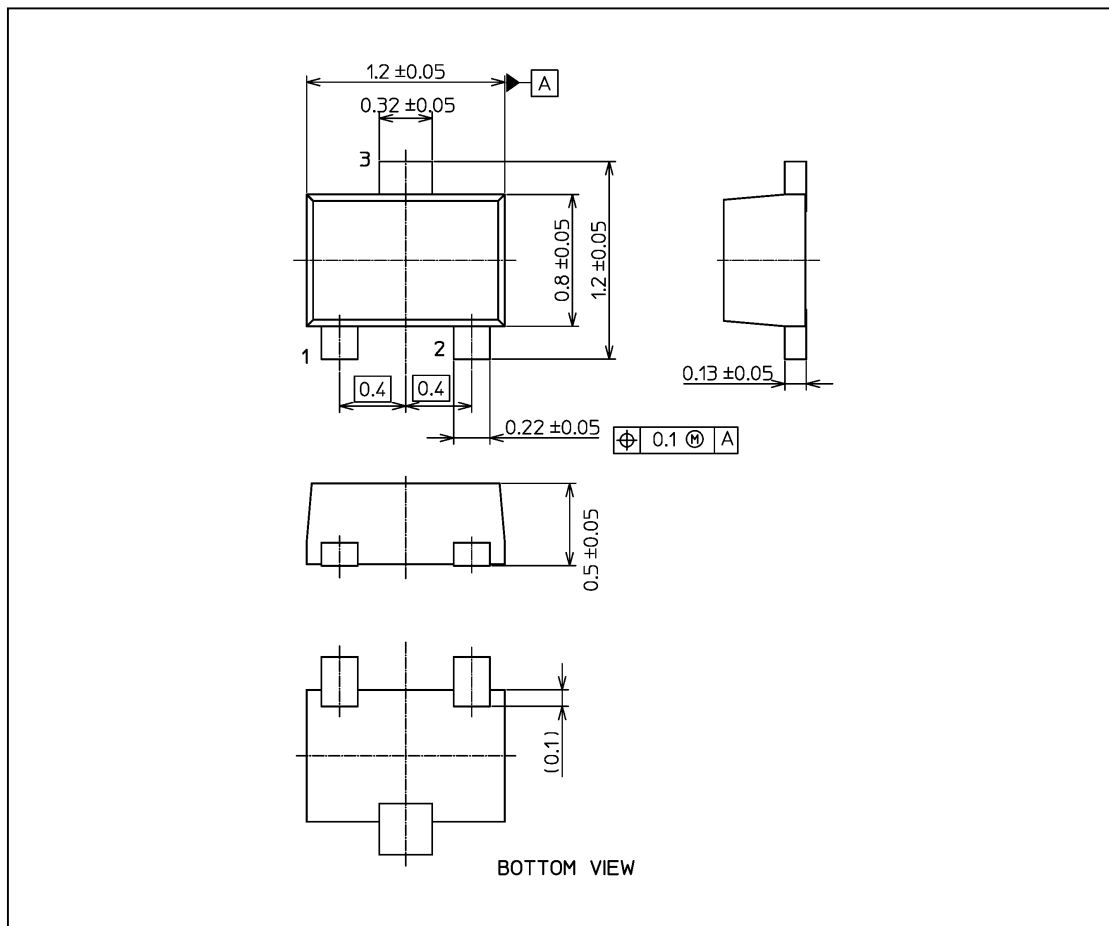


**Fig. 7.11  $P_D - T_a$**

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

Package Dimensions

Unit: mm



Weight: 1.5 mg (typ.)

Package Name(s)
JEDEC: SOT-723
Nickname: VESM

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