MOSFETs Silicon N-channel MOS (U-MOSVII-H)

# SSM3K361R

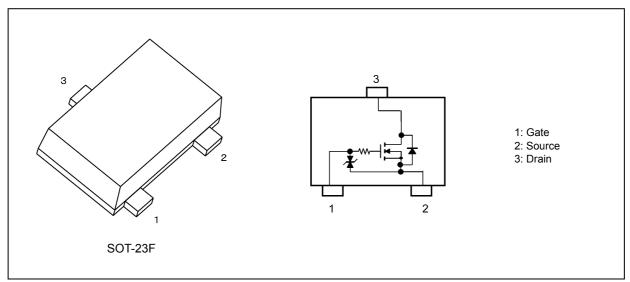
#### 1. Applications

- Power Management Switches
- DC-DC Converters

#### 2. Features

- (1) AEC-Q101 qualified (Please see the orderable part number list)
- (2) 175 °C MOSFET
- (3) 4.5 V drive
- (4) Low drain-source on-resistance
  - : R<sub>DS(ON)</sub> = 65 mΩ (typ.) (@V<sub>GS</sub> = 4.5 V)
  - $R_{DS(ON)} = 51 \text{ m}\Omega \text{ (typ.)} (@V_{GS} = 10 \text{ V})$

#### 3. Packaging and Pin Assignment



#### 4. Orderable part number

Orderable part number	AEC-Q101		Note			
SSM3K361R,LF	—		General Use			
SSM3K361R,LXGF	YES	(Note 1)	Unintended Use	(Note 1)		
SSM3K361R,LXHF	YES		Automotive Use			

1

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

### 5. Absolute Maximum Ratings (Note) (Unless otherwise specified, T<sub>a</sub> = 25 °C)

Characteristics	S		Symbol	Rating	Unit
Drain-source voltage			V <sub>DSS</sub>	100	V
Gate-source voltage			V <sub>GSS</sub>	±20	
Drain current (DC)		(Note 1)	Ι <sub>D</sub>	3.5	A
Drain current (pulsed)		(Note 1), (Note 2)	I <sub>DP</sub>	14	
Power dissipation		(Note 3)	PD	1.2	W
Power dissipation	(t = 10 s)	(Note 3)	P <sub>D</sub>	2.4	
Single-pulse avalanche energy		(Note 4)	E <sub>AS</sub>	9.1	mJ
Avalanche current			I <sub>AR</sub>	3.5	Α
Channel temperature		(Note 5)	T <sub>ch</sub>	175	°C
Storage temperature		(Note 5)	T <sub>stg</sub>	-55 to 175	

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 175  $^\circ \! \mathrm{C}.$
- Note 2: Pulse width  $\leq$  10 ms, Duty  $\leq$  1 %
- Note 3: Device mounted on a 25.4 mm  $\times$  25.4 mm  $\times$  1.6 mm FR4 glass epoxy board (Cu pad: 645 mm<sup>2</sup>)
- Note 4: V\_{DD} = 25 V, T\_{ch} = 25 °C (Initial state), L = 1 mH, R\_G = 25  $\Omega$
- Note 5: The definitions of the absolute maximum channel and storage temperatures are qualified per AEC-Q101.
- 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<sub>th(ch-a)</sub>, and the drain power dissipation, P<sub>D</sub>, 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, $T_a = 25 \text{ °C}$ )

Characteristics		Symbol	Test Condition	Min	Тур.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	$V_{DS}$ = 0 V, $V_{GS}$ = ±16 V	_	_	±10	μA
Drain cut-off current		I <sub>DSS</sub>	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V	_	_	10	
Drain-source breakdown voltage		V <sub>(BR)DSS</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	100		_	V
Drain-source breakdown voltage	(Note 1)	V <sub>(BR)DSX</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = -20 V	80	_	_	
Gate threshold voltage	(Note 2)	V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.1 mA	1.5	_	2.5	V
Drain-source on-resistance	(Note 3)	R <sub>DS(ON)</sub>	I <sub>D</sub> = 1 A, V <sub>GS</sub> = 4.5 V	_	65	92	mΩ
			I <sub>D</sub> = 2 A, V <sub>GS</sub> = 10 V	_	51	69	

Note 1: If a reverse bias is applied between gate and source, this device enters V<sub>(BR)DSX</sub> mode. Note that the drainsource 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<sub>D</sub>) to below (0.1 mA 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.

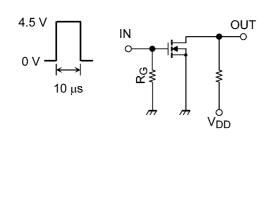
Note 3: Pulse measurement.

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

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V,	_	430	_	pF
Reverse transfer capacitance	C <sub>rss</sub>	f = 1 MHz	_	22	_	1
Output capacitance	C <sub>oss</sub>		_	160	_	
Switching time (rise time)	t <sub>r</sub>	V <sub>DD</sub> = 30 V, I <sub>D</sub> = 1.0 A,	_	9	_	ns
Switching time (turn-on time)	t <sub>on</sub>	$V_{GS}$ = 0 to 4.5 V, $R_G$ = 50 $\Omega$ Duty $\leq$ 1 %,Input: t <sub>r</sub> , t <sub>f</sub> < 5 ns,	_	21	_	
Switching time (fall time)	t <sub>f</sub>	Common source, $r_r, r_f < 5 \text{ ns},$	_	7	_	
Switching time (turn-off time)	t <sub>off</sub>	See Chapter 5.3.		16		

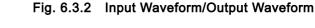
4.5 V

## 6.3. Switching Time Test Circuit



0 V  $V_{DD}$   $V_{DS(ON)}$   $V_{DS(ON)}$   $V_{DS(ON)}$   $V_{DS(ON)}$   $V_{DS(ON)}$   $V_{DS(ON)}$   $V_{DS(ON)}$   $V_{DS(ON)}$   $V_{DS(ON)}$ 

Fig. 6.3.1 Switching Time Test Circuit



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

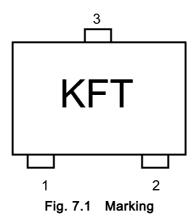
Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Qg	V <sub>DD</sub> = 50 V, I <sub>D</sub> = 2.0 A,	_	3.2	—	nC
Gate-source charge 1	Q <sub>gs1</sub>	V <sub>GS</sub> = 4.5 V	_	1.1	—	
Gate-drain charge	Q <sub>gd</sub>		_	1.5	_	

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

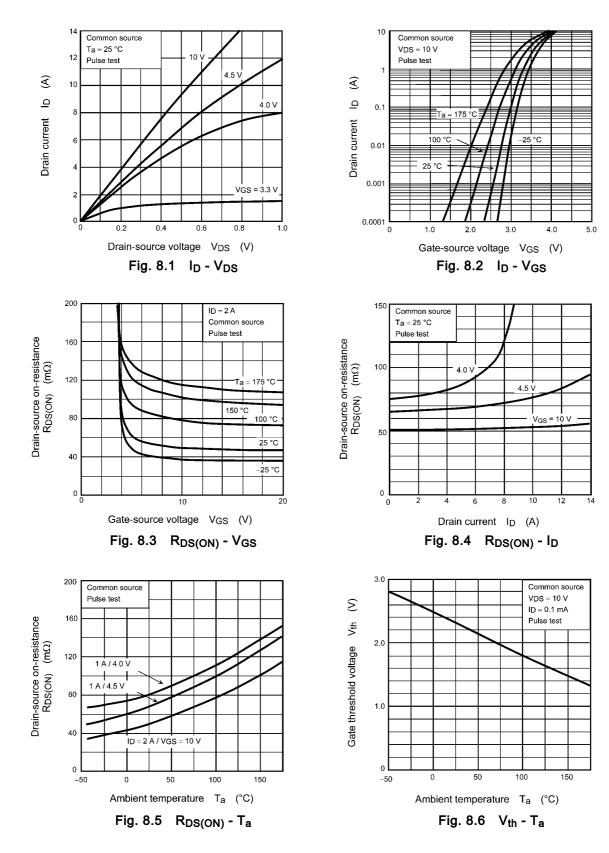
Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Diode forward voltage (Note	1) V <sub>DSF</sub>	$I_D$ = -3.5 A, $V_{GS}$ = 0 V		-0.9	-1.5	V

Note 1: Pulse measurement.

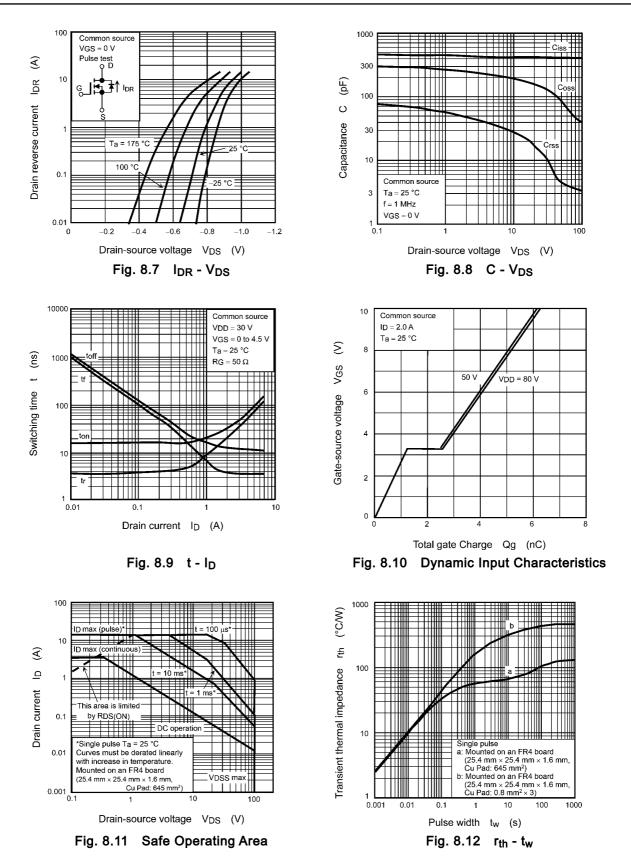
#### 7. Marking



#### 8. Characteristics Curves (Note)







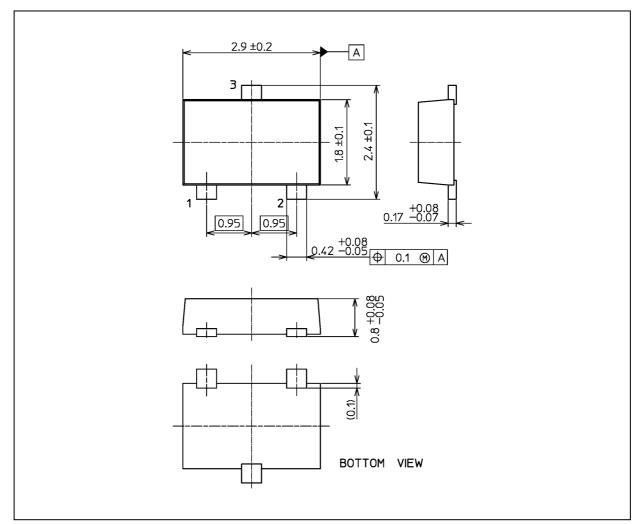
Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



## SSM3K361R

#### Package Dimensions

Unit: mm



Weight: 0.011 g (typ.)

	Package Name(s)
TOSHIBA: 2-3Z1S	
Nickname: SOT-23F	

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