Small Signal MOSFET

60 V, 310 mA, Single, N-Channel, SOT-23

Features

- Low R_{DS(on)}
- Small Footprint Surface Mount Package
- Trench Technology
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Low Side Load Switch
- Level Shift Circuits
- DC–DC Converter
- Portable Applications i.e. DSC, PDA, Cell Phone, etc.

MAXIMUM RATINGS (T_J = 25° C unless otherwise stated)

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Rating		Symbol	Value	Unit
Drain-to-Source Voltage	V _{DSS}	60	V	
Gate-to-Source Voltage	V _{GS}	±20	V	
Drain Current (Note 1) Steady State t < 5 s	$T_A = 25^{\circ}C$ $T_A = 85^{\circ}C$ $T_A = 25^{\circ}C$ $T_A = 85^{\circ}C$	ID	260 190 310 220	mA
Power Dissipation (Note 1) Steady State t < 5 s		P _D	300 420	mW
Pulsed Drain Current ($t_p = 10 \ \mu$	I _{DM}	1.2	А	
Operating Junction and Storage Temperature Range	T _J , T _{STG}	–55 to +150	°C	
Source Current (Body Diode)	۱ _S	300	mA	
Lead Temperature for Soldering (1/8" from case for 10 s)	ΤL	260	°C	

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Junction-to-Ambient - Steady State (Note 1)	R_{\thetaJA}	417	°C/W
Junction–to–Ambient – $t \le 5$ s (Note 1)	$R_{\theta JA}$	300	

1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces)



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V _{(BR)DSS}	R _{DS(on)} MAX	I <mark>D MAX</mark> (Note 1)
60 V	3.0 Ω @ 4.5 V	310 mA
	2.5 Ω @ 10 V	

Simplified Schematic





ORDERING INFORMATION

	Device	Package	Shipping [†]
2	2N7002ET1G	SOT-23 (Pb-Free)	3000/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ELECTRICAL CHARACTERISTICS (T_J = 25° C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Тур	Max	Units
OFF CHARACTERISTICS	-	•		-	-	-	-
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V_{GS} = 0 V, I_{D} = 250 μA		60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J				75		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V,	$T_J = 25^{\circ}C$	J = 25°C 1		μΑ	
		$V_{\rm DS} = 60 \text{ V}$	$T_J = 125^{\circ}C$			500	-
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V	V _{GS} = ±20 V			±100	nA
ON CHARACTERISTICS (Note 2)		•					-
Gate Threshold Voltage	V _{GS(TH)}	$V_{GS} = V_{DS}$	I _D = 250 μA	1.0		2.5	V
Negative Threshold Temperature Coefficient	V _{GS(TH)} /T _J				4.4		mV/°C
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V,	I _D = 240 mA		0.86	2.5	Ω
		V _{GS} = 4.5 V, I _D = 50 mA			1.1	3.0	
Forward Transconductance	9 FS	V _{DS} = 5 V, I _D = 200 mA			530		mS
CHARGES AND CAPACITANCES	•			•			
Input Capacitance	C _{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 25 V			26.7	40	pF
Output Capacitance	C _{OSS}				4.6		1
Reverse Transfer Capacitance	C _{RSS}				2.9		
Total Gate Charge	Q _{G(TOT)}				0.81		nC
Threshold Gate Charge	Q _{G(TH)}	V _{GS} = 5 V, V _{DS} = 10 V;			0.31		1
Gate-to-Source Charge	Q _{GS}	$I_{\rm D} = 2$	240 mA		0.48		
Gate-to-Drain Charge	Q _{GD}				0.08		
SWITCHING CHARACTERISTICS, V _{GS}	= V (Note 3)	•		•	•		•
Turn-On Delay Time	t _{d(ON)}				1.7		ns
Rise Time	t _r	V_{GS} = 10 V, V_{DD} = 30 V, I _D = 200 mA, R _G = 10 Ω			1.2		1
Turn-Off Delay Time	t _{d(OFF)}				4.8		1
Fall Time	t _f				3.6		1
DRAIN-SOURCE DIODE CHARACTER	ISTICS	•		•	•		•
Forward Diode Voltage	V _{SD}	V _{GS} = 0 V,	$T_J = 25^{\circ}C$		0.79	1.2	V
		I _S = 200 mA	T _J = 85°C		0.7		1

2. Pulse Test: pulse width \leq 300 μ s, duty cycle \leq 2% 3. Switching characteristics are independent of operating junction temperatures

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge



Figure 9. Diode Forward Voltage vs. Current

PACKAGE DIMENSIONS

SOT-23 (TO-236) CASE 318-08 ISSUE AP





NOTES:

STYLE 21: PIN 1. GATE

3. DRAIN

2. SOURCE

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 CONTROLLING DIMENSION: INCH.
- MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL
- THICKNESS OF BASE MATERIAL. 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	м	ILLIMETE	RS	INCHES			
DIM	MIN	NOM	MAX	MIN	NOM	MAX	
Α	0.89	1.00	1.11	0.035	0.040	0.044	
A1	0.01	0.06	0.10	0.001	0.002	0.004	
b	0.37	0.44	0.50	0.015	0.018	0.020	
С	0.09	0.13	0.18	0.003	0.005	0.007	
D	2.80	2.90	3.04	0.110	0.114	0.120	
Е	1.20	1.30	1.40	0.047	0.051	0.055	
е	1.78	1.90	2.04	0.070	0.075	0.081	
L	0.10	0.20	0.30	0.004	0.008	0.012	
L1	0.35	0.54	0.69	0.014	0.021	0.029	
ΗE	2.10	2.40	2.64	0.083	0.094	0.104	
θ	0°		10°	0°		10°	

SOLDERING FOOTPRINT



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