

## MS 60P02NE

### P-Channel 60-V (D-S) MOSFET

#### Description

These miniature surface mount MOSFETs utilize a high cell density trench process to provide low  $r_{DS(on)}$  and to ensure minimal power loss and heat dissipation. Typical applications are DC-DC converters and power management in portable and battery-powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

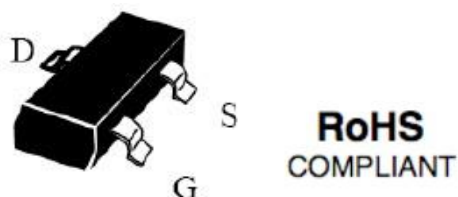
#### Features

- Low  $r_{DS(on)}$  provides higher efficiency and extends battery life
- Low thermal impedance copper leadframe
- SOT-23 saves board space
- Fast switching speed
- High performance trench technology

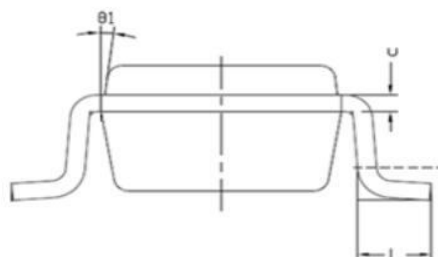
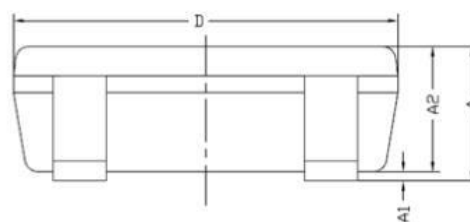
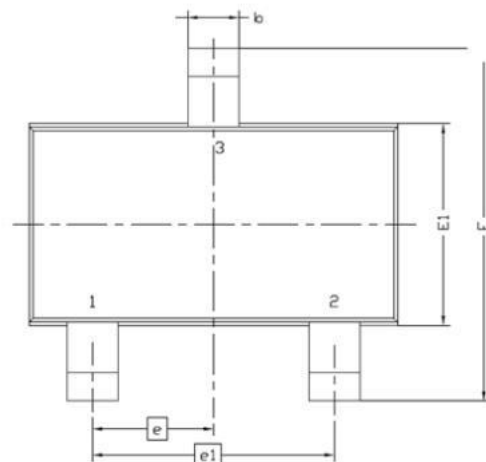
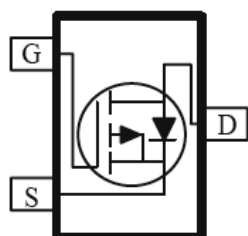
**Package type :** SOT-23

#### Packing & Order Information

3,000/Reel



Graphic symbol



Symbol	MILLIMETERS	
	MIN	MAX
A	0.8	1.2
A1	0	0.1
A2	0.7	1.1
b	0.3	0.5
c	0.1	0.2
D	2.7	3.1
E	2.6	3
E1	1.4	1.8
e	0.95 BSC	
e1	1.9 BSC	
L	0.3	0.6
θ1	7° NOM	

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#### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings (T <sub>A</sub> =25°C unless otherwise specified)			
Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-Source Voltage	-60	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub>	Continuous Drain Current <sup>a</sup> @ T <sub>A</sub> =25°C	1.7	A
	Continuous Drain Current <sup>a</sup> @ T <sub>A</sub> =70°C	1.4	A
I <sub>DM</sub>	Pulsed Drain Current <sup>b</sup>	±15	A
I <sub>S</sub>	Continuous Source Current (Diode Conduction) <sup>a</sup>	-1.7	A
P <sub>D</sub>	Power Dissipation <sup>a</sup> (T <sub>A</sub> =25°C)	1.3	W
	Power Dissipation <sup>a</sup> (T <sub>A</sub> =70°C)	0.8	W
T <sub>J</sub> /T <sub>STG</sub>	Operating Junction and Storage Temperature	-55 to +150	°C

Thermal Resistance Ratings			
Symbol	Parameter	Value	Units
R <sub>THJA</sub>	Maximum Junction-to-Ambient <sup>a</sup> ( t<=5sec)	100	°C/W
	Maximum Junction-to-Ambient <sup>a</sup> (Steady-State)	166	

Notes :

a.Surface Mounted on 1"x1" FR4 Board.

b.Pulse width limited by maximum junction temperature.

Specifications (T <sub>A</sub> =25°C unless otherwise specified)						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
V <sub>GS(th)</sub>	Gate-Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA	-1.2			V
I <sub>GSS</sub>	Gate-Body Leakage	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±100	nA
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -48 V, V <sub>GS</sub> = 0 V V <sub>DS</sub> = -48 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55°C			-1 -10	uA
I <sub>D(on)</sub>	On-State Drain Current <sup>A</sup>	V <sub>DS</sub> = -5 V, V <sub>GS</sub> = -10 V	-8			A
r <sub>DS(on)</sub>	Drain-Source On-Resistance <sup>A</sup>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -1.6 A V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -1.3 A			770 1200	mΩ
g <sub>fs</sub>	Forward Transconductance <sup>A</sup>	V <sub>DS</sub> = -15 V, I <sub>D</sub> = -1.6 A		8		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> = -2.5 V, V <sub>GS</sub> = 0 V		0.8		V

Dynamic <sup>b</sup>						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -30 V, I <sub>D</sub> = -1.6 A, V <sub>GS</sub> = -4.5 V		18		nC
Q <sub>gs</sub>	Gate-Source Charge			5		nC
Q <sub>gd</sub>	Gate-Drain Charge			2		nC

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Dynamic <sup>b</sup>						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -30\text{ V}$ , $R_G = 6\ \Omega$ , $V_{GEN} = 10\text{ V}$ , $I_D = -1\text{ A}$ , $R_L = 30\ \Omega$		8		ns
$t_r$	Rise Time			10		ns
$t_{d(off)}$	Turn-Off Delay Time			35		ns
$t_f$	Fall Time			12		ns

Notes :

a. Pulse test:  $PW \leq 300\mu s$  duty cycle  $\leq 2\%$ .

b. Guaranteed by design, not subject to production testing.

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