

# MS23N36

## P-Channel 30-V (D-S) MOSFET

### Description

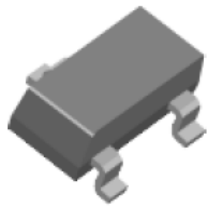
These miniature surface mount MOSFETs utilize a high cell density trench process to provide low  $r_{DS(on)}$  and to ensure minimal power loss and heat dissipation. Typical applications are DC-DC converters and power management in portable and battery-powered products such as computers, printers, PCMCIA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

### Features

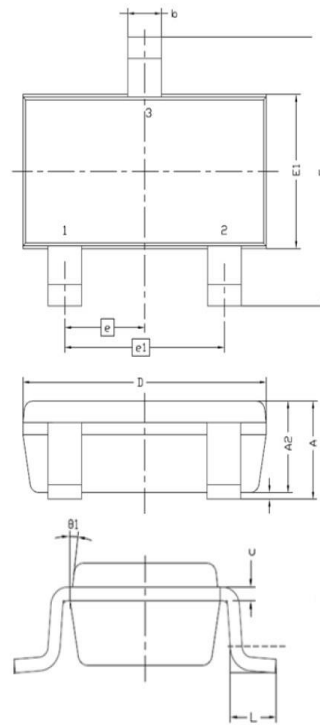
- Low  $r_{DS(on)}$  provides higher efficiency and extends battery life
- Miniature SOT-23 Surface Mount Package
- Saves Board Space
- RoHS compliant package

### Packing & Order Information

3,000/Reel

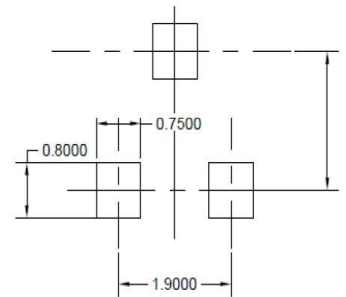


**RoHS  
COMPLIANT**



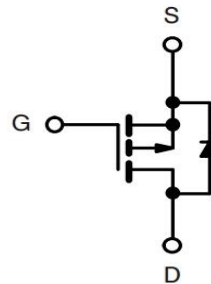
Symbol	MILLIMETERS	
	MIN	MAX
A	0.8	1.2
A1	0	0.1
A2	0.7	1.1
b	0.3	0.5
c	0.1	0.2
D	2.7	3.1
E	2.6	3
E1	1.4	1.8
e	0.95 BSC	
e1	1.9 BSC	
L	0.3	0.6
θ1	7° NOM	

### Recommended Pad Layout



Note: Drain opening is recommended to be solder mask defined in a copper fill for improved thermal performance

### Graphic symbol



### Absolute Maximum Ratings (Tc=25°C unless otherwise specified)

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-Source Voltage	30	V
$V_{GS}$	Gate-Source Voltage	±12	V
$I_D$	Continuous Drain Current <sup>a</sup> ( $T_A=25^\circ\text{C}$ )	5.2	A
	Continuous Drain Current <sub>a</sub> ( $T_A=70^\circ\text{C}$ )	4.1	A
$I_{DM}$	Pulsed Drain Current <sup>b</sup>	30	A
$I_S$	Continuous Source Current (Diode Conduction) <sup>a</sup>	1.6	A
$P_D$	Power Dissipation <sup>a</sup> ( $T_A=25^\circ\text{C}$ )	1.3	W
	Power Dissipation <sup>a</sup> ( $T_A=70^\circ\text{C}$ )	0.8	W
$T_J/T_{STG}$	Operating Junction and Storage Temperature	-55 to +150	°C

- Drain current limited by maximum junction temperature

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#### Thermal Resistance Ratings

Symbol	Parameter	Maximum	Units
R <sub>θJA</sub>	Maximum Junction-to-Ambient <sup>a</sup> (t ≤ 5 sec)	100	°C/W
	Maximum Junction-to-Ambient <sup>a</sup> (Steady-State)	166	

#### Notes:

- Surface Mounted on 1" x 1" FR4 Board.
- Pulse width limited by maximum junction temperature

#### Static

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	0.6			V
I <sub>GSS</sub>	Gate-Body Leakage	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = 8 V			±100	nA
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 24 V, V <sub>GS</sub> = 0 V V <sub>DS</sub> = 24 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55°C			1 25	μA
I <sub>D(on)</sub>	On-State Drain Current <sup>A</sup>	V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 4.5 V	20			A
I <sub>DS(on)</sub>	Drain-Source On-Resistance <sup>A</sup>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 5.2 A V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 3.7 A			32 64	mΩ
g <sub>fs</sub>	Forward Transconductance <sup>A</sup>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 5.2 A		40		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> = 2.3 V, V <sub>GS</sub> = 0 V		0.7		V

#### Dynamic<sup>b</sup>

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units	
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 4.5 A, V <sub>GS</sub> = 5.2 V		6.0		nC	
Q <sub>gs</sub>	Gate-Source Charge			1.0		nC	
Q <sub>gd</sub>	Gate-Drain Charge			1.5		nC	
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 25 V, R <sub>L</sub> = 25 Ω, V <sub>GEN</sub> = 10 V, I <sub>D</sub> = 1 A		7.8		ns	
t <sub>r</sub>	Rise Time			5.2		ns	
t <sub>d(off)</sub>	Turn-Off Delay Time				31.2		ns
t <sub>f</sub>	Fall Time				8		ns

#### Notes:

- Pulse test: PW ≤ 300us duty cycle ≤ 2%.
- Guaranteed by design, not subject to production testing.

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#### ■ Characteristic Curves

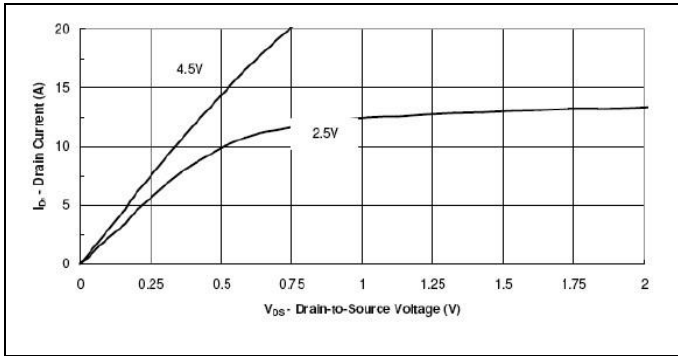


FIG.1-OUTPUT CHARACTERISTICS

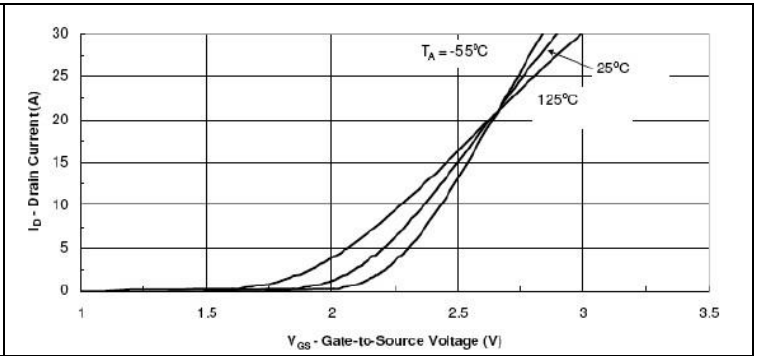


FIG.2-TRANSFER CHARACTERISTICS

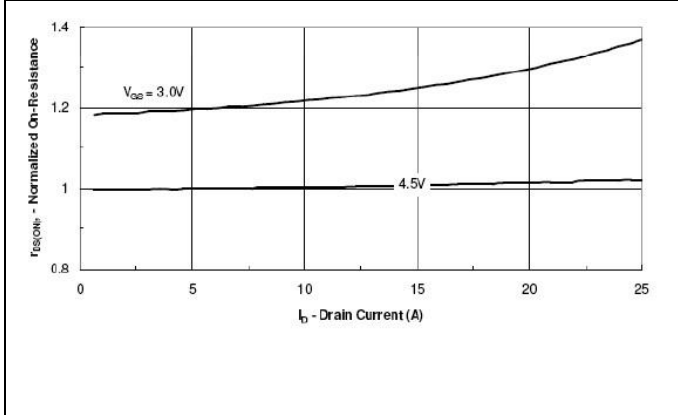


FIG.3-ON-RESISTANCE VS DRAIN CURRENT

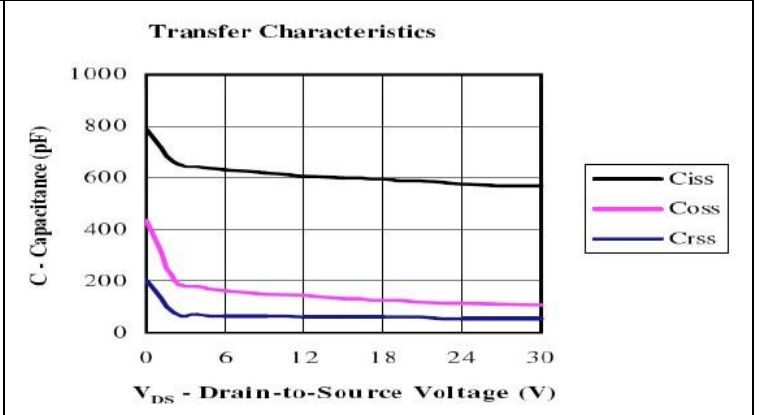


FIG.4-CAPACITANCE

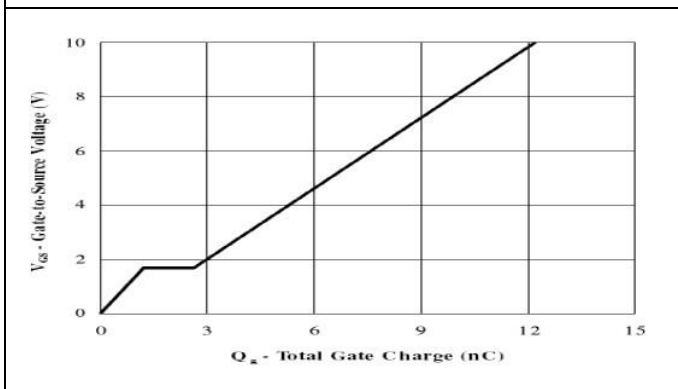


FIG.5-GATE CHARGE

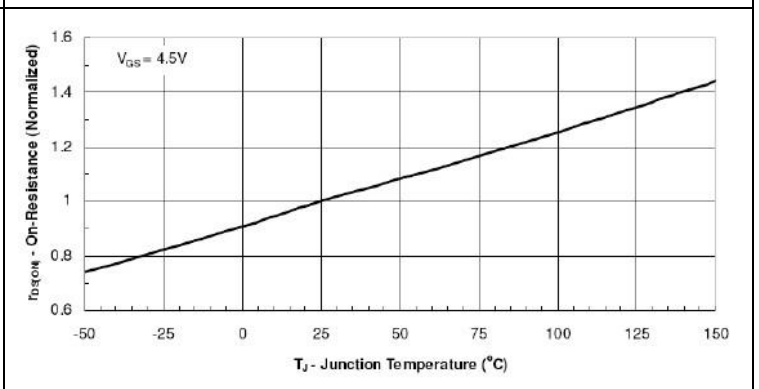
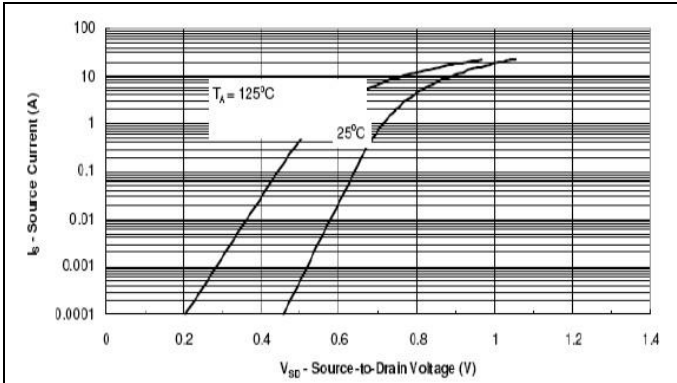


FIG.6-ON-RESISTANCE VS. JUNCTION TEMPERATURE

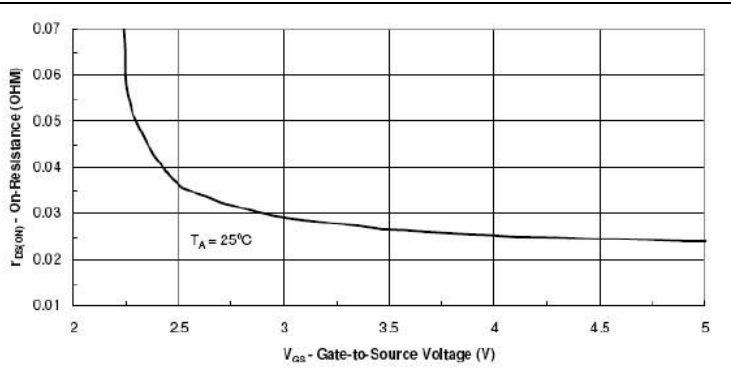
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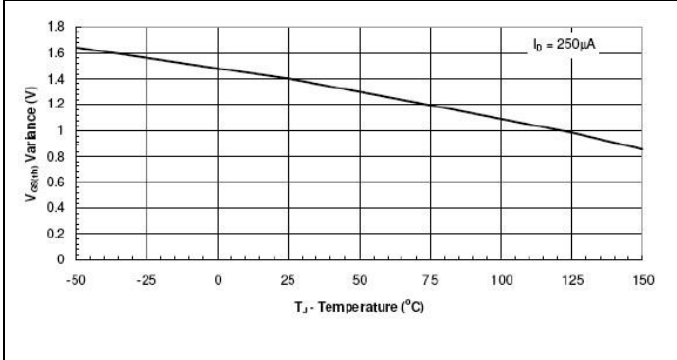
#### ■ Characteristic Curves



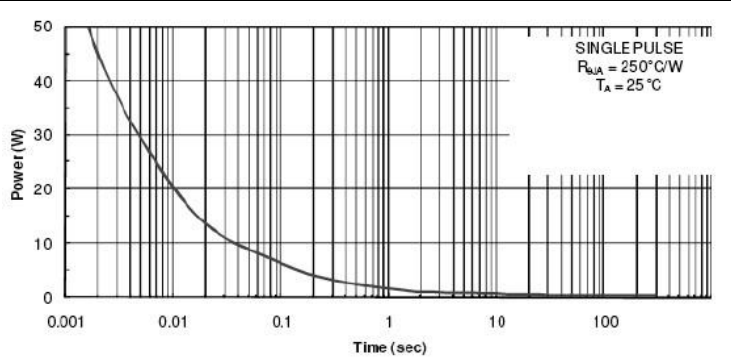
**FIG.7-SOURCE-DRAIN DIODE FORWARD VOLTAGE**



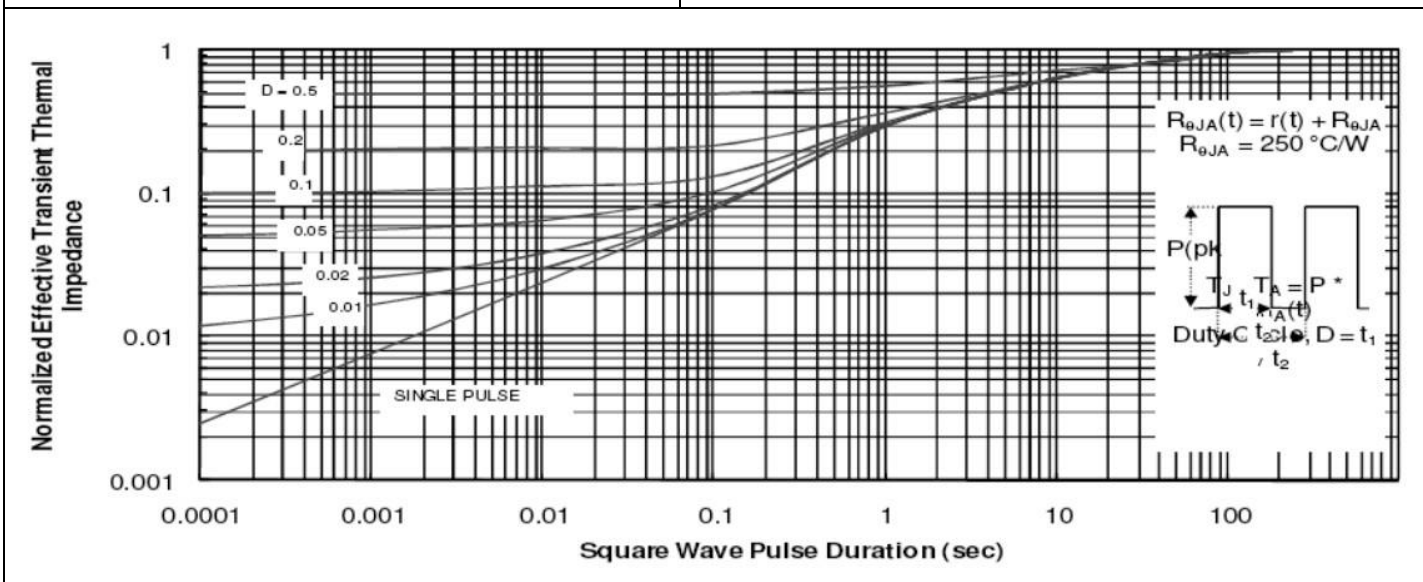
**FIG.8-ON-RESISTANCE VS. GATE-TO SOURCE VOLTAGE**



**FIG.9-THRESHOLD VOLTAGE**



**FIG.10-SINGLE PULSE POWER**



**FIG.11-NORMALIZED THERSIENT IMPEDANCE, JUNCTION-TO-AMBIENT**

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