

## MSQ94P33

### Dual N-Channel 20-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.

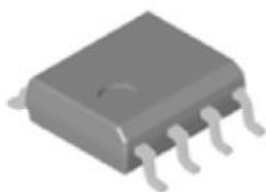
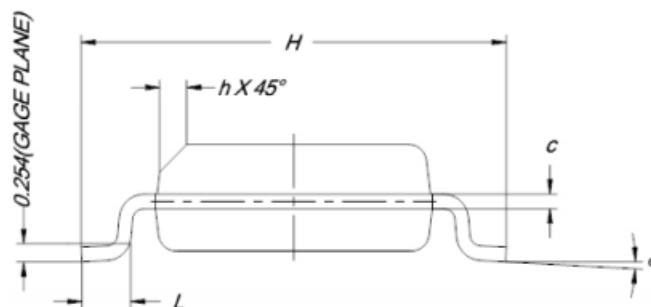
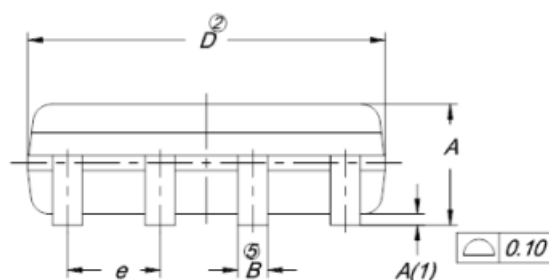
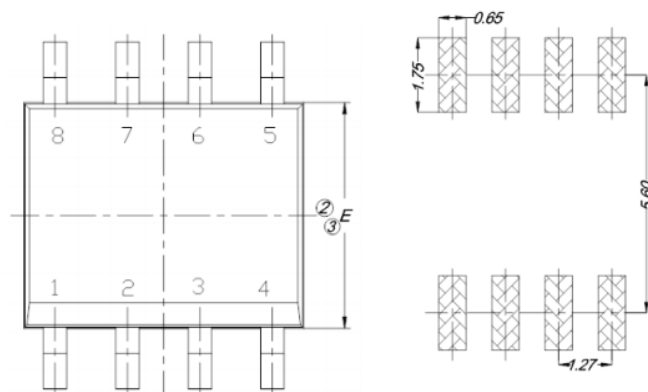
#### Application

- DC-DC converters
- Power management in portable
- Battery-powered products such as computers, Printers PCMCIA cards, cellular and cordless telephones.

Package type : SO-8

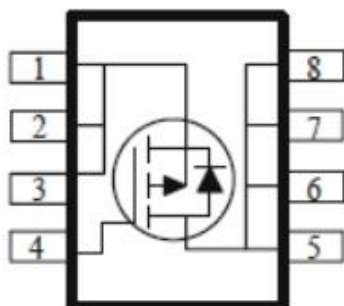
#### Packing & Order Information

3,000/Reel



**RoHS**  
COMPLIANT

Graphic symbol



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	1.35	1.55	1.75
A(1)	0.10	0.18	0.25
B	0.38	0.45	0.51
C	0.19	0.22	0.25
D	4.80	4.90	5.00
E	3.80	3.90	4.00
e	1.27 BSC		
H	5.80	6.00	6.20
L	0.50	0.72	0.93
α	0°	4°	8°
h	0.25	0.38	0.50

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#### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

##### Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-Source Voltage	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D$	Drain Current -Continuous ( $T_A=25^\circ\text{C}$ )	-8.3	A
	Drain Current -Continuous ( $T_A=70^\circ\text{C}$ )	-6.7	A
$I_{DM}$	Drain Current Pulsed	$\pm 50$	A
$I_S$	Continuous Source Current (Diode Conduction) <sup>a</sup>	-2.1	A
$P_D$	Power Dissipation <sup>a</sup> ( $T_A=25^\circ\text{C}$ )	3.1	W
	Power Dissipation <sup>a</sup> ( $T_A=70^\circ\text{C}$ )	2.0	
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

##### Thermal Resistance Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient <sup>a</sup> ( $t \leq 10$ sec)	40	$^\circ\text{C/W}$
	Maximum Junction-to-Ambient <sup>a</sup> (Steady State)	70	

##### Notes

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

##### Static

Symbol	Test Conditions	Min	Typ.	Max.	Units
$V_{GS(th)}$	$V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$	-0.7	--	--	V
$r_{DS(on)}$	$V_{GS} = -4.5$ V, $I_D = -8.3$ A	--	--	60	m $\Omega$
	$V_{GS} = -2.5$ V, $I_D = -6.7$ A	--	--	80	
$I_{DSS}$	$V_{DS} = -16$ V, $V_{GS} = 0$ V	--	--	-1	uA
	$V_{DS} = -16$ V, $V_{GS} = 0$ V, $T_J = 55^\circ\text{C}$	--	--	-5	
$I_{GSS}$	$V_{GS} = \pm 12$ V, $V_{DS} = 0$ V	--	--	$\pm 100$	nA
$I_{D(on)}$	$V_{GS} = -10$ V, $V_{DS} = -4.5$ V	-50	--	--	A
$V_{SD}$	$V_{GS} = 0$ V, $I_S = 2.5$ A	--	-0.6	--	V
$G_{fs}$	$V_{DS} = -15$ V, $I_D = -8.3$ A	--	70	--	S

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Dynamic Characteristics					
Symbol	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	$V_{DD} = 15\text{ V}, I_D = 1\text{ A}, R_L = 6\ \Omega$ $V_{GEN} = 10\text{ V}$	--	15	--	ns
$t_r$		--	10	--	ns
$t_{d(off)}$		--	54	--	ns
$t_f$		--	26	--	ns
$Q_g$	$V_{DS} = 15\text{ V}, I_D = 10\text{ A},$ $V_{GS} = 4.5\text{ V}$	--	15	--	nC
$Q_{gs}$		--	3	--	nC
$Q_{gd}$		--	5	--	nC

#### Notes

- Pulse test:  $PW \leq 300\mu s$  duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.

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#### Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE

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