N-Channel 40V (D-S) MOSFET

General Description

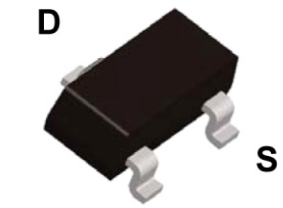
This miniature surface mount MOSFET uses advanced Trench process, low $R_{DS(ON)}$ assures minimal power loss and energy conversion, which makes this device ideal for use in power management circuit.

Features

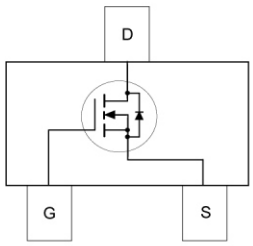
- V_{DS}(V)=40V
- I_D(A)=5. 0A (V_{GS}=10V)
- $R_{DS(ON)}$=31 mΩ @ V_{GS}=10V
- $R_{DS(ON)}$=45 mΩ @ V_{GS}= 4. 5V
- Low gate charge
- Fast switching speed
- High performance trench technology for extremely low $R_{DS(ON)}$
- High power and current handling capability

Applications

- Load switch
- DC-DC converters
- Power management



SOT-23



Absolute Maximum Ratings (T_A = 25℃ Unless Otherwise Noted)

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	±20	
Continuous Drain Current[a]	T_A=25℃	I_D	5.0	A
	T_A=70℃		4.0	
Pulsed Drain Current[b]		I_{DM}	20	
Continuous Source Current (Diode Conduction)[a]		I_S	3.5	A
Power Dissipation[a]	T_A=25℃	P_D	1.4	W
	T_A=70℃		1.0	
Operating Junction and Storage Temperature Range		T_J,T_{stg}	-55 to 150	℃

Thermal Resistance Ratings

Parameter		Symbol	Maximum	Units
Maximum Junction-to-Ambient[a]	t<= 10 sec	$R_{\theta JA}$	90	℃/W
	Steady-State		130	

Ordering Information

Device	Device Marking	Reel Size	Tape Width	Quantity
MI3446	S40N	7''	8mm	3000 units

Specifications (T_A = 25℃ Unless Otherwise Noted)

Parameter	Symbol	Test Conditions	Limits			Units
			Min	Typ	Max	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=250uA	40			V
Gate-Threshold Voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D = 250 uA	1. 0	2. 3	3. 0	V
Gate-Body Leakage	I_{GSS}	V_{DS}=0V, V_{GS}=±20V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=32V, V_{GS}=0V			1	uA
		V_{DS}=32V, V_{GS}=0V, T_J=55℃			5	uA
On-State Drain Current [c]	$I_{D(on)}$	V_{DS}=5V, V_{GS}=10V	20			A
Drain-Source On-Resistance [c]	$R_{DS(on)}$	V_{GS}=4. 5 V, I_D=3. 0A		32	45	mΩ
		V_{GS}=10 V, I_D=5. 0A		22	31	mΩ
Forward Tranconductance [c]	g_{fs}	V_{DS}=20V, I_D=5. 0A		23		S
Diode Forward Voltage	V_{SD}	I_S=1. 0A, V_{GS}=0V		0. 77	1. 0	V
Dynamic						
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=20V, f=1MHz		404		pF
Output Capacitance	C_{oss}			95		pF
Reverse Transfer Capacitance	C_{rss}			37		pF
Gate Resistance	R_g	V_{GS}=0V, V_{DS}=0V, f=1MHz		2. 7		Ω
Switching						
Total Gate Charge(10V)	Qg(10V)	V_{DS}=20V, V_{GS}=10V I_D =5. 0 A		12. 8		nC
Total Gate Charge(4. 5V)	Qg(4.5V)			7		nC
Gate-Source Charge	Qgs			1. 9		nC
Gate-Drain Charge	Qgd			3. 5		nC
Turn-On Delay Time	$t_{d(on)}$	V_{DD}=20V, I_D=1A, R_G=6 ohm, V_{GEN}=10V R_L=15 ohm		4. 3		ns
Rise Time	t_r			3. 4		ns
Turn-Off Delay Time	$t_{d(off)}$			15		ns
Fall-Time	t_f			2. 8		ns
Body Diode Reverse Recovery Time	t_{rr}	I_f=-5A, di/dt=100A/us		21		ns
Body Diode Reverse Recovery Charge	Q_{rr}	I_f=-5A, di/dt=100A/us		15		nC

Notes: a. Surface Mounted on 1" x 1" FR4 Board.
b. Pulse width limited by maximum junction temperature
c. Pulse test: PW <= 300us duty cycle <= 2%.

Typical Electrical and Thermal Characteristics

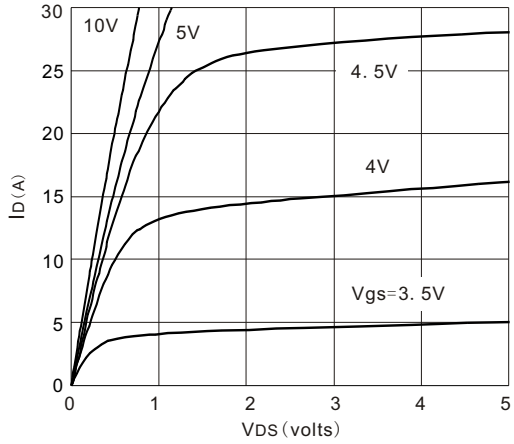


Figure1: On-Region Characteristics

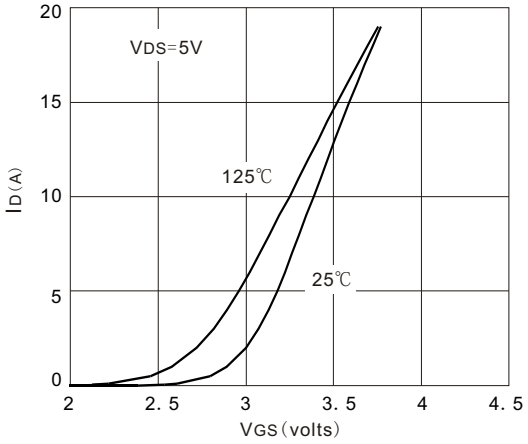


Figure2: Transfer Characteristics

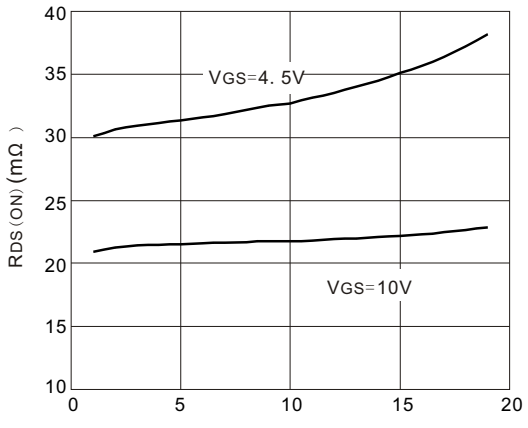


Figure 3: On-Resistance VS. Drain Current and Gate Voltage

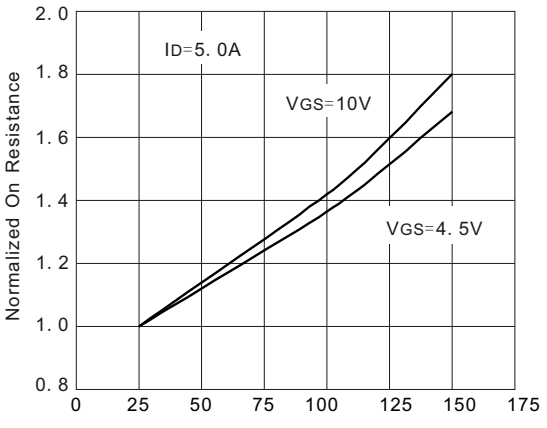


Figure4: On-Resistance vs. Junction Temperature

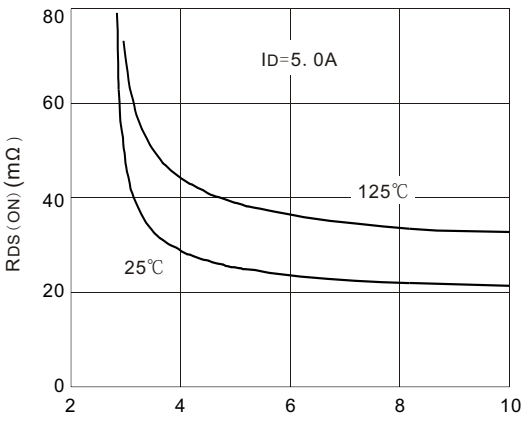


Figure 5: On-Resistance vs. Gate-Source Voltage

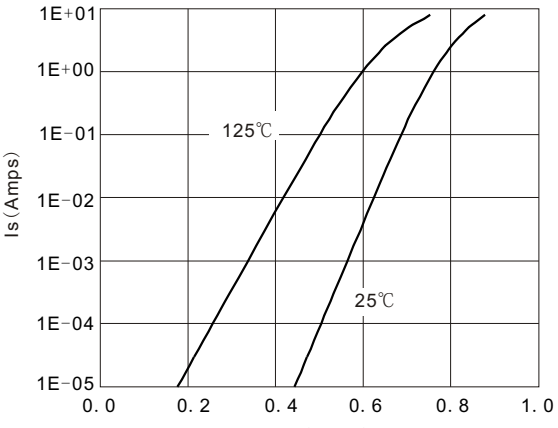


Figure 6: Body diode characteristics

Typical Electrical and Thermal Characteristics

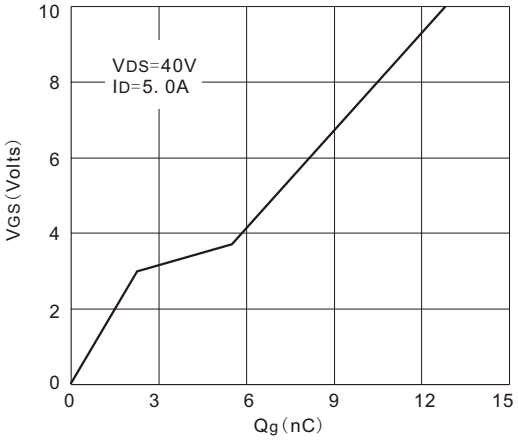


Figure 7: Gate-Charge Characteristics

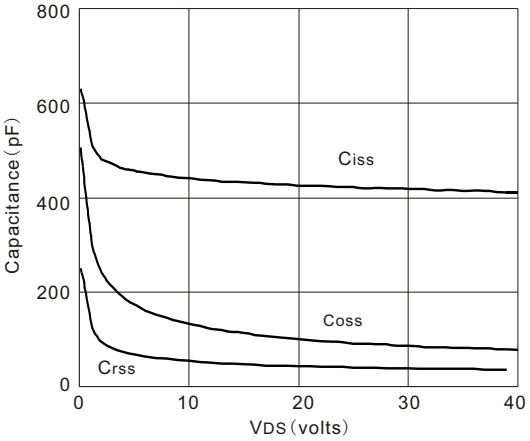


Figure 8: capacitance Characteristics

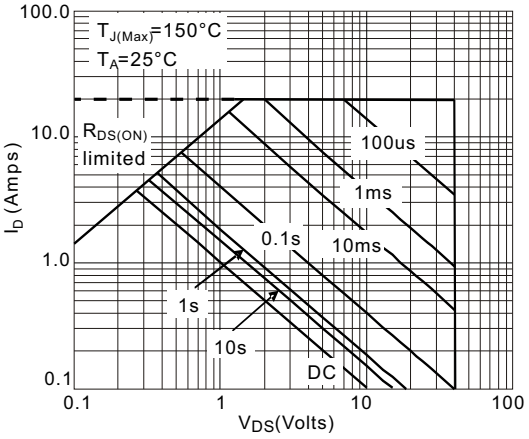


Figure 9: Maximum Forward Biased Safe Operating Area (Note d)

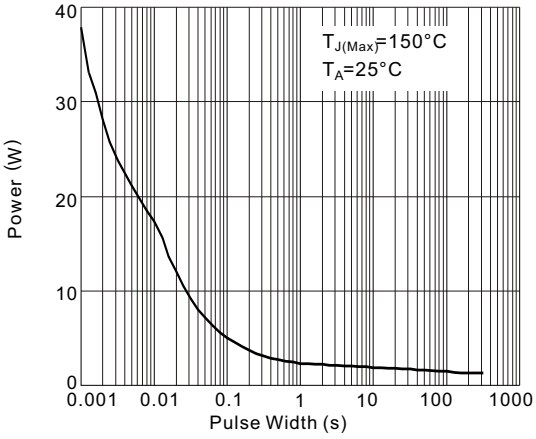


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note d)

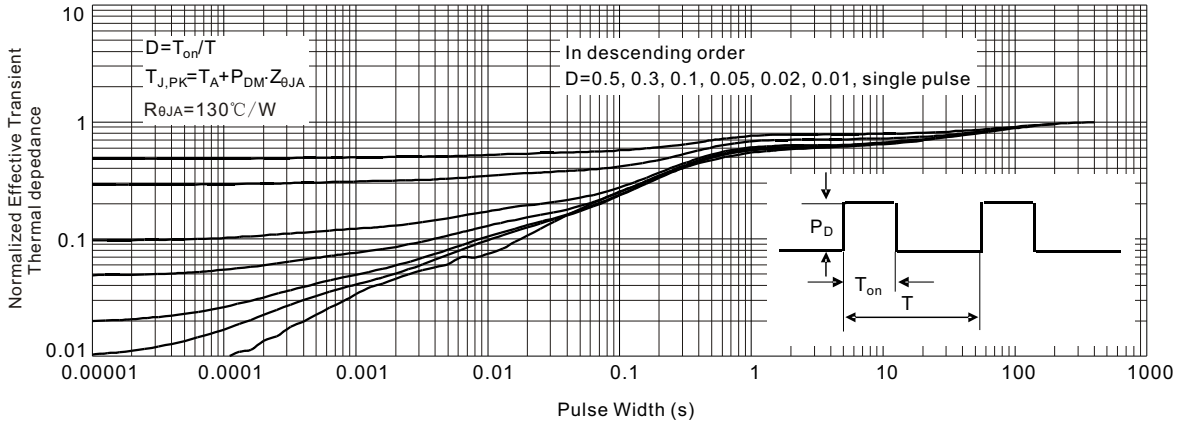
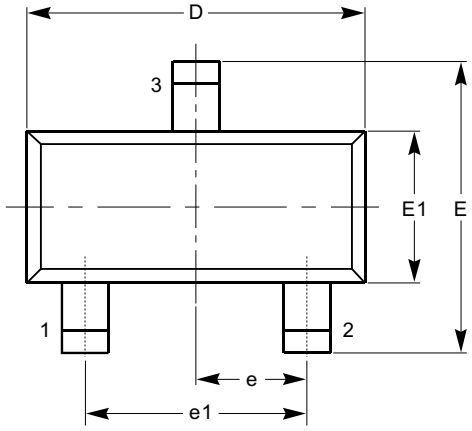


Figure 11: Normalized Maximum Transient Thermal Impedance

Note d: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with TA=25°C. The SOA curve provides a single pulse rating.

Package Outline

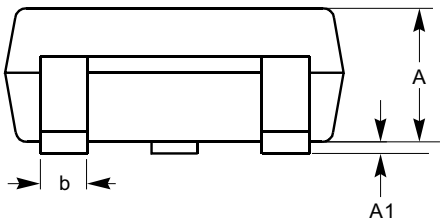
SOT23_3Lead



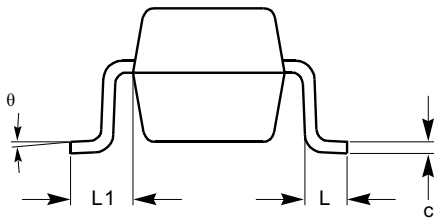
TOP VIEW

Unit: mm

Symbol	Min	Nom	Max
A	0.70	1.00	1.15
A1	0.00	---	0.13
b	0.30	0.40	0.50
c	0.08	0.13	0.20
D	2.80	2.90	3.10
E	2.60	2.80	3.00
E1	1.40	1.60	1.80
e	0.95 BSC		
e1	1.90 BSC		
L	0.40 REF		
L1	0.54 REF		
θ	0°	5°	8°



SIDE VIEW



END VIEW

Notes:

(1) All dimensions are in millimeters.Angles in degrees.
(2) Package body sizes exclude mold flash and gate burrs.
(3) Complies with JEDEC TO-236.

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