



P-Channel 20V (D-S) MOSFET

General Description

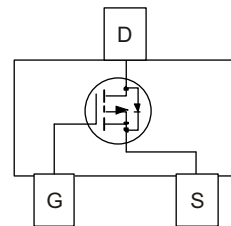
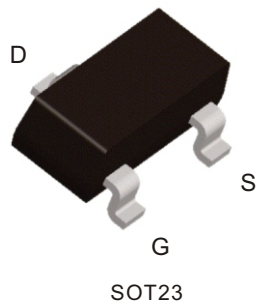
This miniature surface mount MOSFET uses advanced trench process, low $R_{DS(on)}$ assures minimal power loss and energy conversion, which makes this device ideal for use in power management circuit.

Applications

- Load switch
- DC-DC converters
- Power management

Features

- $V_{DS}(V) = -20V$
- $I_D(A) = -3.3A$ ($V_{GS} = -4.5V$)
- $R_{DS(on)} = 85\text{ m}\Omega$ @ $V_{GS} = -4.5V$
- $R_{DS(on)} = 95\text{ m}\Omega$ @ $V_{GS} = -2.5V$
- $R_{DS(on)} = 120\text{ m}\Omega$ @ $V_{GS} = -1.8V$
- Low gate charge
- Fast switching speed



Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	± 8	
Continuous Drain Current ^a	I_D	$T_A=25^\circ\text{C}$	-3.3
		$T_A=70^\circ\text{C}$	-2.6
Pulsed Drain Current ^b	I_{DM}	-13	A
Continuous Source Current (Diode Conduction) ^a	I_S	-1.0	A
Power Dissipation ^a	P_D	$T_A=25^\circ\text{C}$	1.4
		$T_A=70^\circ\text{C}$	1.0
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$

Thermal Resistance Ratings

Parameter	Symbol	Maximum	Units
Maximum Junction-to-Ambient ^a	$R_{\theta JA}$	$t \leq 10\text{ sec}$	90
		Steady-State	130



Ordering Information

Device	Device Marking	Reel Size	Tape Width	Quantity
MI2303	MPAS	7"	8mm	3000 units

Specifications (TA = 25°C Unless Otherwise Noted)

Parameter	Symbol	Test Conditions	Limits			Units
			Min	Typ	Max	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-20			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.45	-0.61	-0.9	V
Gate-Body Leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 12V$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-20V, V_{GS}=0V$			-1	uA
		$V_{DS}=-20V, V_{GS}=0V, T_J=55^\circ C$			-10	
On-State Drain Current ^c	$I_{D(on)}$	$V_{DS}=-5V, V_{GS}=-4.5V$	-13			A
Drain-Source On-Resistance ^c	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D=-4.4A$		35	50	mΩ
		$V_{GS}=-2.5V, I_D=-2.0A$		45	65	
		$V_{GS}=-1.8V, I_D=-1.0A$		60	75	
Forward Transconductance ^c	g_{fs}	$V_{DS}=-5V, I_D=-2.8A$		16		S
Diode Forward Voltage	V_{SD}	$I_S=-1.0A, V_{GS}=0V$		-0.7	-1.2	V
Dynamic						
Input Capacitance	C_{iss}	$V_{DS}=-10V, V_{GS}=0V$ $f=1MHz$		1020		pF
Output Capacitance	C_{oss}			191		
Reverse Transfer Capacitance	C_{rss}			140		
Switching						
Total Gate Charge	Q_g	$V_{GS}=-4.5V,$ $V_{DS}=-10V,$ $I_D=-3.3A$		12	19	nC
Gate Source Charge	Q_{gs}			1.7		
Gate Drain Charge	Q_{gd}			3.2		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=-10V,$ $R_G=60\Omega, V_{GEN}=-4.5V$ $R_L=10\Omega$		25	40	ns
Rise Time	t_r			42	63	
Turn-Off Delay Time	$t_{d(off)}$			70	110	
Fall-Time	t_f			47	74	

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

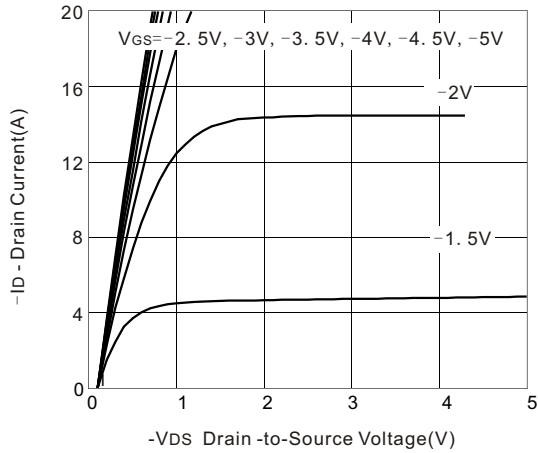


Figure 1. On-Region Characteristics

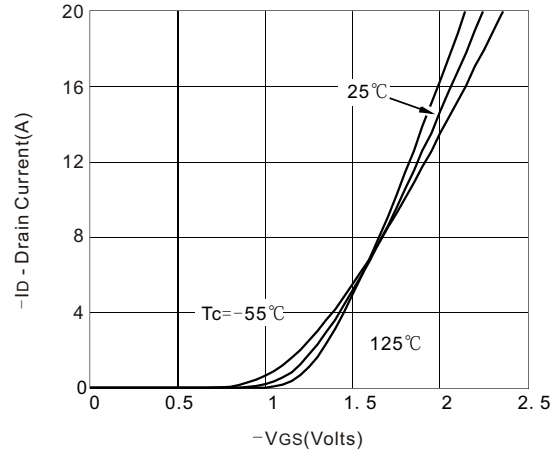


Figure 2. Transfer Characteristics

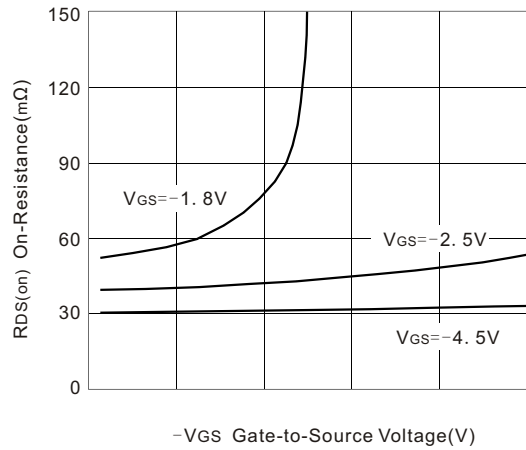


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

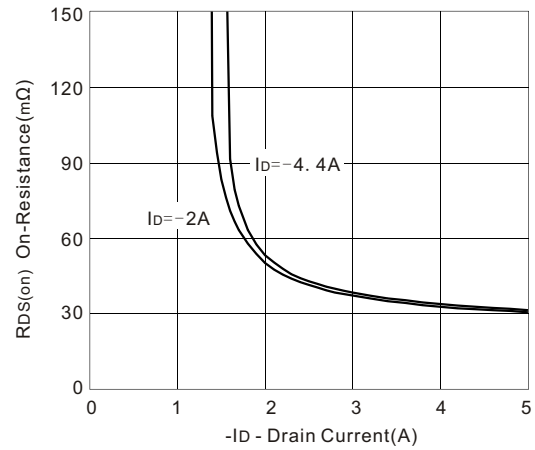


Figure 4. On Resistance vs. Gate-to-Source Voltage

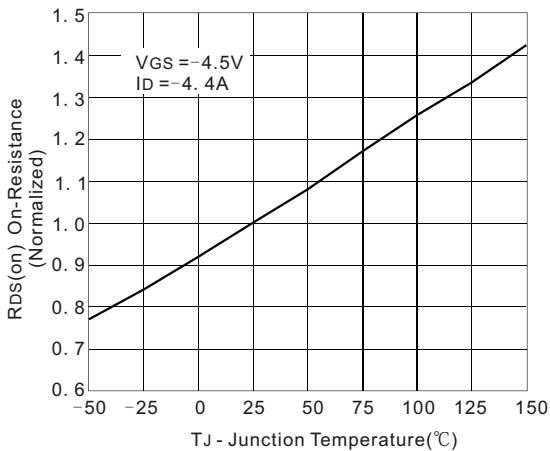


Figure 5. On-Resistance Variation with Temperature

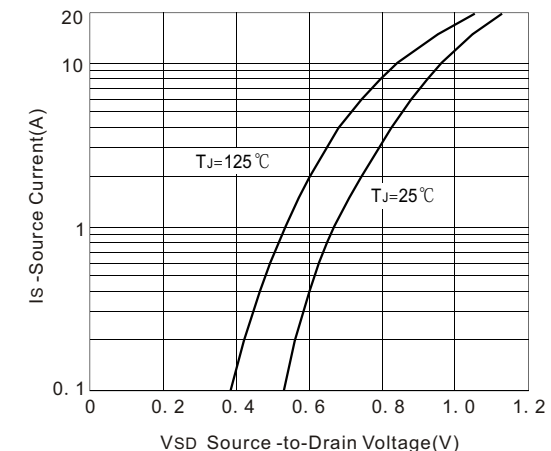


Figure 6: Source-Drain Forward Voltage



Typical Electrical and Thermal Characteristics

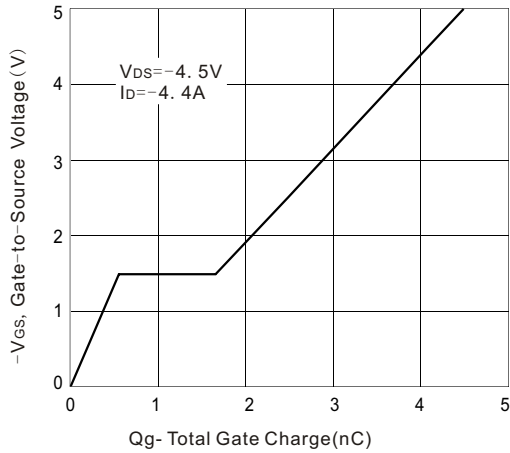


Figure 7: Gate Charge

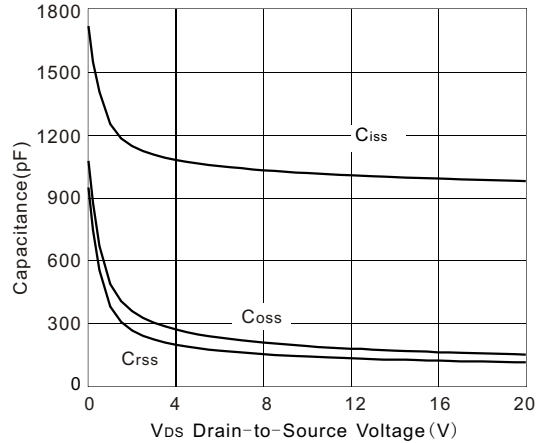


Figure 8: Capacitance

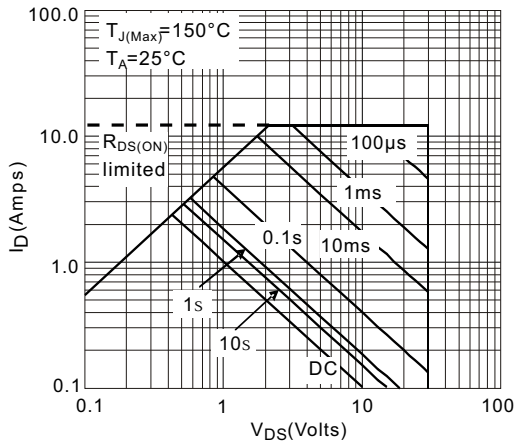


Figure 9: Maximum Forward Biased Safe Operating Area (Note d)

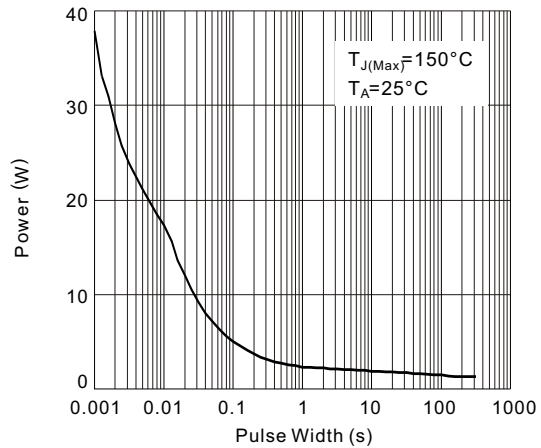


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note d)

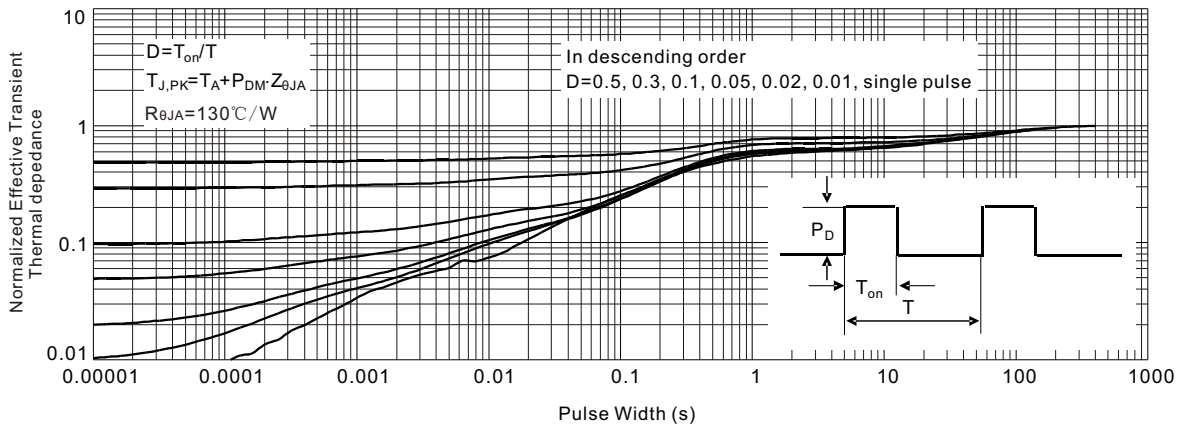


Figure 11: Normalized Maximum Transient Thermal Impedance

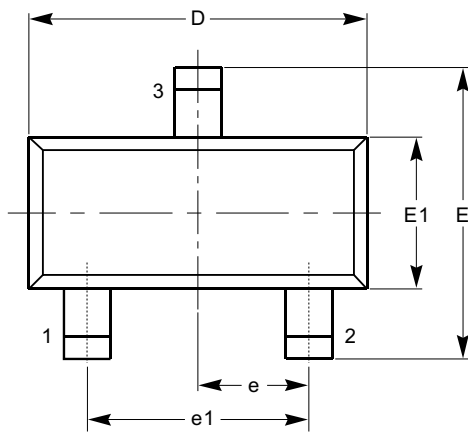
Note d: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with TA=25°C. The SOA curve provides a single pulse rating.



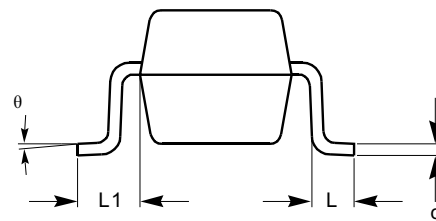
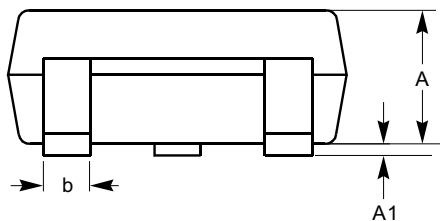
Package Outline

SOT23_3Lead

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°



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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