

N-Channel MOSFET

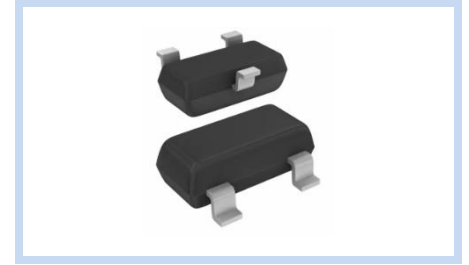
60V 0.38A 0.59W SOT-23 ESD

MFT6NA38S23E

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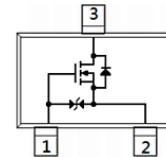
FEATURE

- $R_{DS(ON)} < 2.0\Omega$, $V_{GS}=4.5V$
- ESD Protected Gate
- Low Input Capacitance
- Extremely Low Threshold Voltage
- Applications: Motor Control, Power Management Functions, Backlighting



MECHANICAL DATA

- Case: SOT-23 Package
- Terminals: Solderable per MIL-STD-750, Method 2026

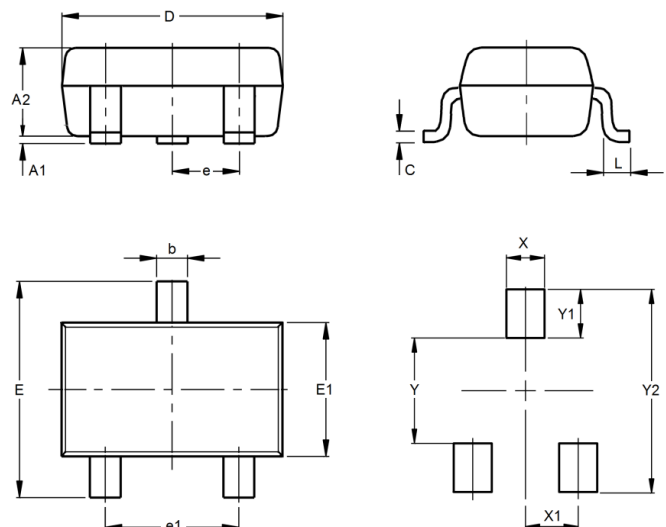


MAXIMUM RATINGS

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	± 20	V
Drain Current – Steady State	$V_{GS}=4.5V, T_A=25^\circ C$	I_D	380	mA
	$V_{GS}=4.5V, T_A=70^\circ C$		300	
Drain Current – $t < 5s$	$V_{GS}=4.5V, T_A=25^\circ C$		430	
	$V_{GS}=4.5V, T_A=70^\circ C$		340	
Drain Current – Pulsed		I_{DM}	1.2	A
Power Dissipation	(Note 3)	P_D	590	mW
	(Note 4)		380	
Thermal Resistance, Junction to Ambient	Steady State (Note 3)	$R_{\theta JA}$	216	$^\circ C/W$
	$t < 5s$ (Note 3)		117	
	Steady State (Note 4)		338	
	$t < 5s$ (Note 4)		292	
Operating and Storage Temperature Range		T_J, T_{stg}	-55 to +150	$^\circ C$

DIMENSIONS

SOT-23	Min (mm)	Max (mm)
A1	0.00	0.10
A2	0.79	1.40
b	0.30	0.50
c	0.08	0.20
D	2.70	3.10
e	0.955 TYP	
e1	1.78	2.04
E	2.10	2.80
E1	1.20	1.60
L	0.15	--
X	0.80	
X1	0.95	
Y	1.40	
Y1	1.00	
Y2	3.40	



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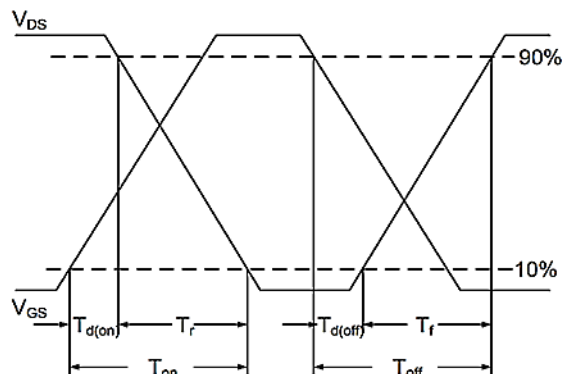
ELECTRICAL CHARACTERISTICS

Off Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=10\mu A$	BV_{DSS}	60	--	--	V
Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	$V_{GS(th)}$	0.5	--	1.0	V
Gate Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	I_{GSS}	--	--	± 10	μA
Zero Gate Voltage Drain Current	$V_{DS}=60V, V_{GS}=0V$	I_{DSS}	--	--	1	μA
On Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=500mA$	$R_{DS(on)}$	--	--	1.8	Ω
	$V_{GS}=4.5V, I_D=100mA$		--	--	2.0	
	$V_{GS}=2.5V, I_D=50mA$		--	--	2.5	
	$V_{GS}=1.8V, I_D=50mA$		--	--	3.0	
Forward Transconductance	$V_{DS}=5V, I_D=400mA$	g_{FS}	--	760	--	mS
Dynamic Characteristics	Conditions	Symbol	--	Typ.	Max	Unit
Gate Resistance	$V_{DS}=0V, F=1MHz$	R_g	--	38	--	Ω
Total Gate Charge	$V_{DS}=4.5V, V_{GS}=10V, I_D=0.5A$	Q_g	--	280	--	pC
Gate-Source Charge		Q_{gs}	--	82	--	
Gate-Drain Charge		Q_{gd}	--	201	--	
Input Capacitance	$V_{DS}=10V, V_{GS}=0V, F=1MHz$	C_{iss}	--	51	--	pF
Output Capacitance		C_{oss}	--	11	--	
Reverse Transfer Capacitance		C_{rss}	--	8	--	
Turn-On Delay Time	$V_{DS}=10V, I_D \equiv 1A, V_{GS}=4.5V, R_G=51\Omega$	$T_{d(on)}$	--	13.0	--	ns
Rise Time		T_r	--	13.0	--	
Turn-Off Delay Time		$T_{d(off)}$	--	7.7	--	
Fall Time		T_f	--	4.6	--	
Drain-Source Body Diode	Conditions	Symbol	Min	Typ.	Max	Unit
Diode Forward Voltage	$I_S=115mA, V_{GS}=0V$	V_{SD}	--	--	1.3	V
Reverse Recovery Time	$I_F=1A, di/dt=100A/\mu s,$	t_{rr}	--	9.0	--	ns
Reverse Recovery Charge		Q_{rr}	--	3.7	--	nC

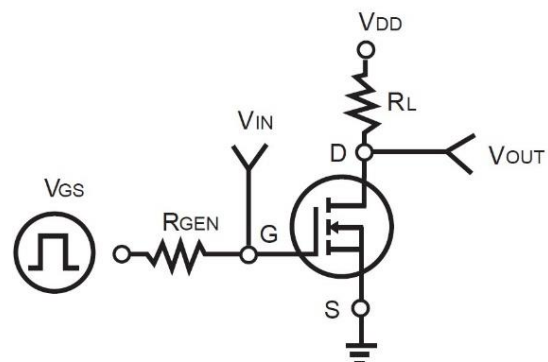
Note:

1. $T_A = 25^\circ C$ unless otherwise specified
2. Pulse width $< 10\mu s$, Duty cycle = 1%.
3. Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate
4. Device mounted on FR-4 PCB, with minimum recommended pad layout.

Switching Time Waveform

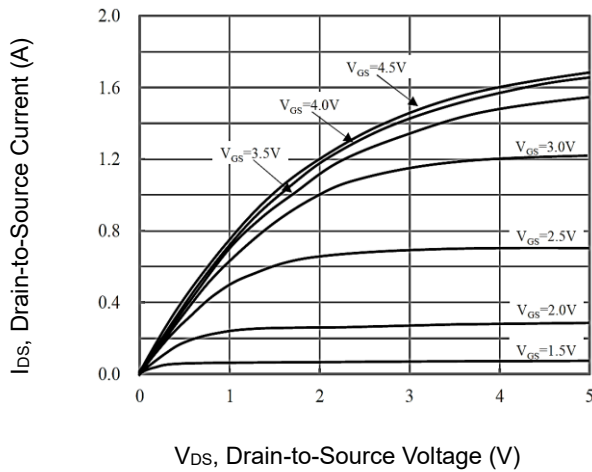


Switching Test Circuit

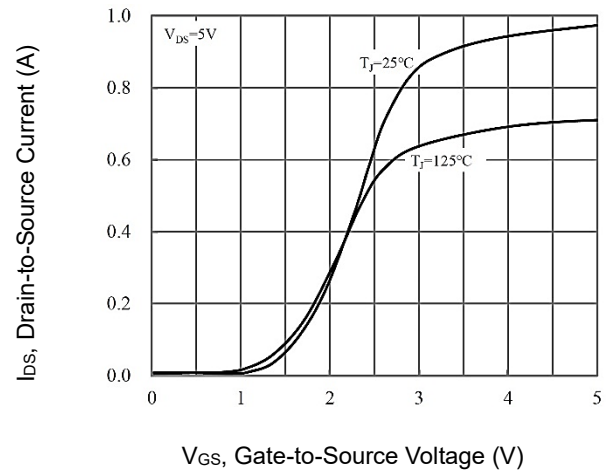


CHARACTERISTIC CURVES

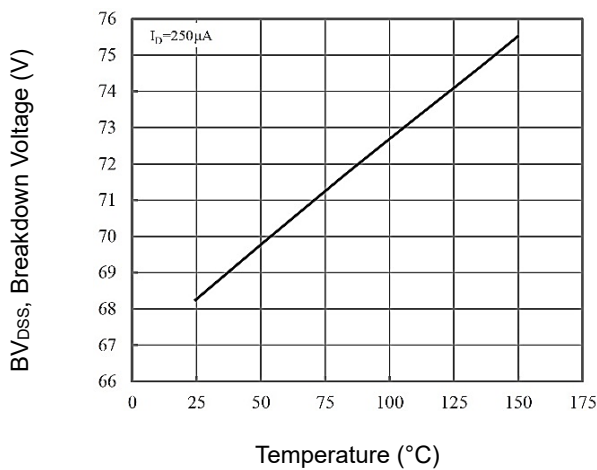
Output Characteristics



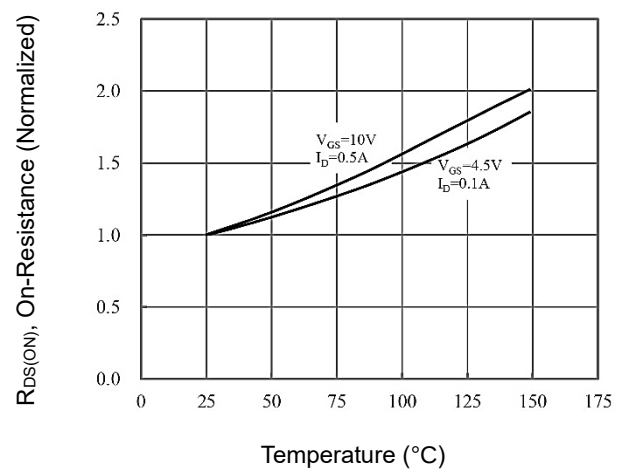
Transfer Characteristics



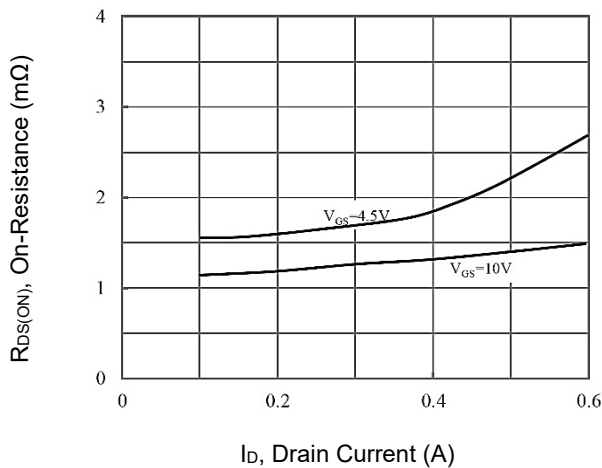
Breakdown Voltage vs. Temperature



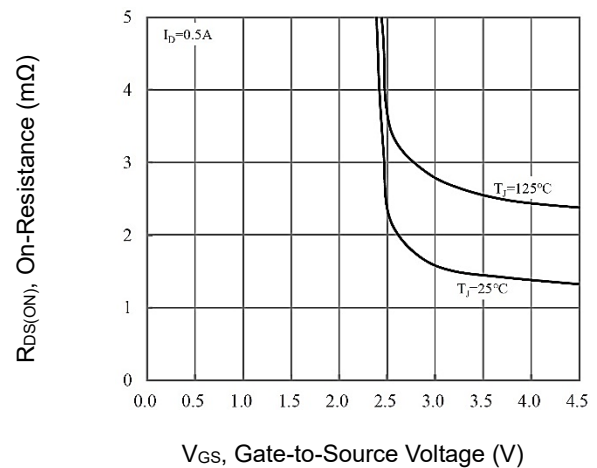
On-Resistance vs. Junction temperature



On-Resistance vs. Drain Current



On-Resistance vs. Gate-to-Source Voltage



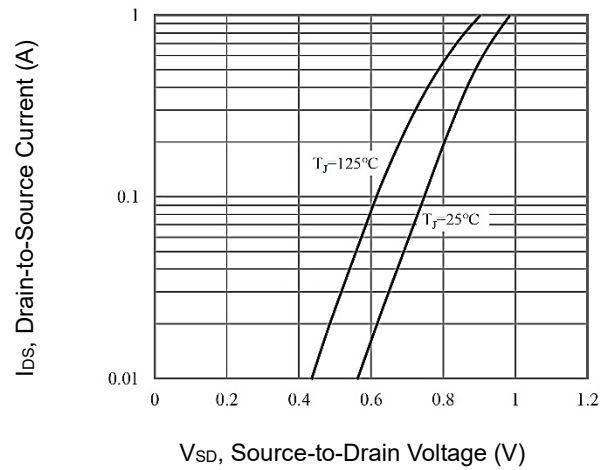
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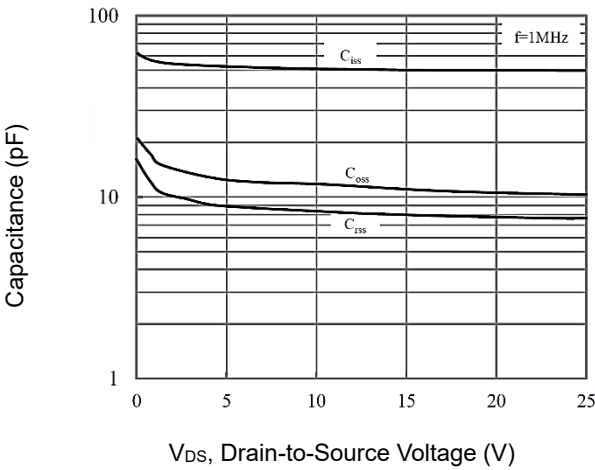
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CHARACTERISTIC CURVES

Body Diode Characteristics



Typical Capacitance



Gate Threshold Voltage

