

Small Signal MOSFET

380 mAmps, 60 Volts

N-Channel SOT-23

FEATURES

- ESD Protected
- Low $R_{DS(on)}$
- Surface Mount Package
- This is a Pb-Free Device
- We declare that the material of product are Halogen Free and compliance with RoHS requirements.
- S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

APPLICATIONS

- Low Side Load Switch
- Level Shift Circuits
- DC-DC Converter
- Portable Applications i.e. DSC, PDA, Cell Phone, etc.

MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

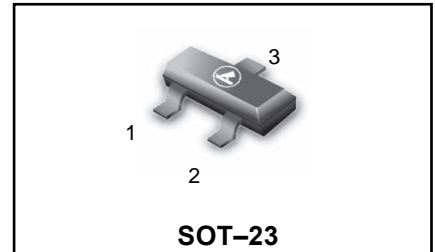
Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V _{DSS}	60	V
Gate-to-Source Voltage	V _{GS}	±20	V
Drain Current (Note 1) Steady State	I _D	T _A = 25°C	320
		T _A = 85°C	230
t < 5 s	I _D	T _A = 25°C	380
		T _A = 85°C	270
Power Dissipation (Note 1) Steady State	P _D		300
		t < 5 s	420
Pulsed Drain Current (t _p = 10 μs)	I _{DM}	1.5	A
Operating Junction and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C
Source Current (Body Diode)	I _S	300	mA
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T _L	260	°C
Gate-Source ESD Rating (HBM, Method 3015)	ESD	2000	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

THERMAL CHARACTERISTICS

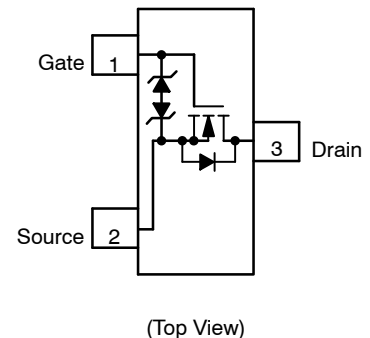
Characteristic	Symbol	Max	Unit
Junction-to-Ambient - Steady State (Note 1)	R _{θJA}	417	°C/W
Junction-to-Ambient - t ≤ 5 s (Note 1)	R _{θJA}	300	

1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces)

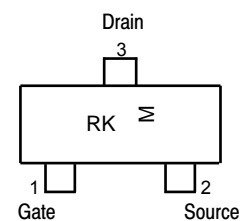


V _{(BR)DSS}	R _{DS(on)} MAX	I _D MAX (Note 1)
60 V	2.3 Ω @ 10 V	380 mA
	2.7 Ω @ 5.0 V \ddot{A}	

Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT



RK = Device Code
 M = Month Code

ORDERING INFORMATION

Device	Marking	Shipping
HMPT1E6GS	HMPT1E6GS	3000 Tape & Reel

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			71		mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 60\text{ V}$	$T_J = 25^\circ\text{C}$		1	μA
			$T_J = 125^\circ\text{C}$		500	
		$V_{GS} = 0\text{ V}, V_{DS} = 50\text{ V}$	$T_J = 25^\circ\text{C}$			100
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 10	μA

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.0		2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			4.0		mV/ $^\circ\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 500\text{ mA}$			2.3	Ω
		$V_{GS} = 5.0\text{ V}, I_D = 50\text{ mA}$			2.7	
Forward Transconductance	g_{FS}	$V_{DS} = 5\text{ V}, I_D = 200\text{ mA}$	80			mS

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 25\text{ V}$		34		μF
Output Capacitance	C_{OSS}			3		
Reverse Transfer Capacitance	C_{RSS}			2.2		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}; I_D = 500\text{ mA}$		0.71		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.1		
Gate-to-Source Charge	Q_{GS}			0.32		
Gate-to-Drain Charge	Q_{GD}			0.16		

SWITCHING CHARACTERISTICS, $V_{GS} = V$ (Note 3)

Turn-On Delay Time	$t_{d(ON)}$	$V_{DS} = 10\text{ V}, V_{GEN} = 10\text{ V}, I_D = 500\text{ mA}$		3.8		ns
Rise Time	t_r			3.4		
Turn-Off Delay Time	$t_{d(OFF)}$			19		
Fall Time	t_f			12		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 115\text{ mA}$	$T_J = 25^\circ\text{C}$		1.4	V
			$T_J = 85^\circ\text{C}$		0.7	

2. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$
3. Switching characteristics are independent of operating junction temperatures

TYPICAL ELECTRICAL CHARACTERISTICS

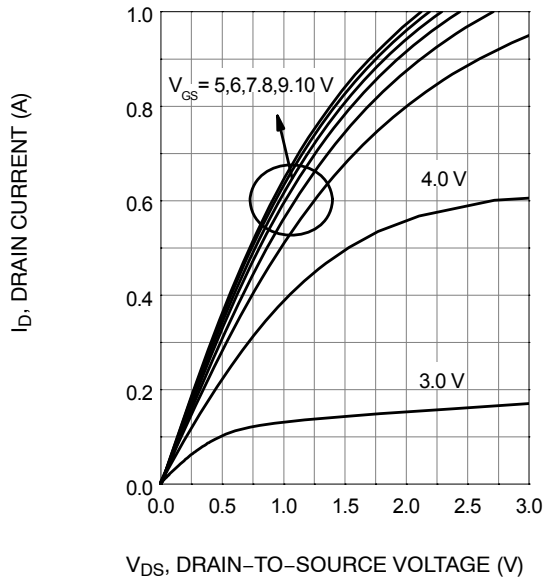


Figure 1. On-Region Characteristics

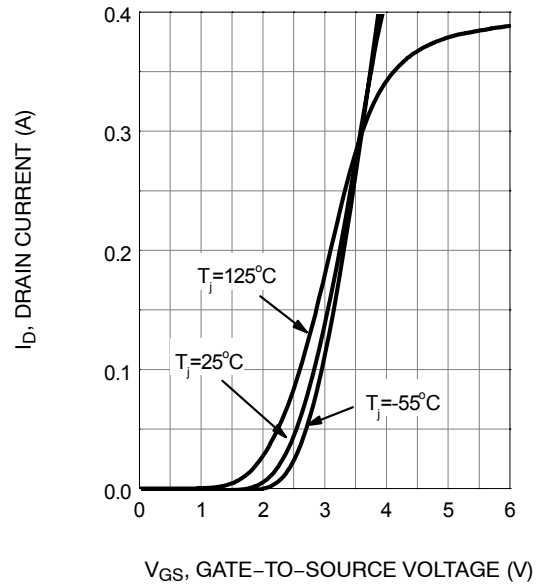


Figure 2. Transfer Characteristics

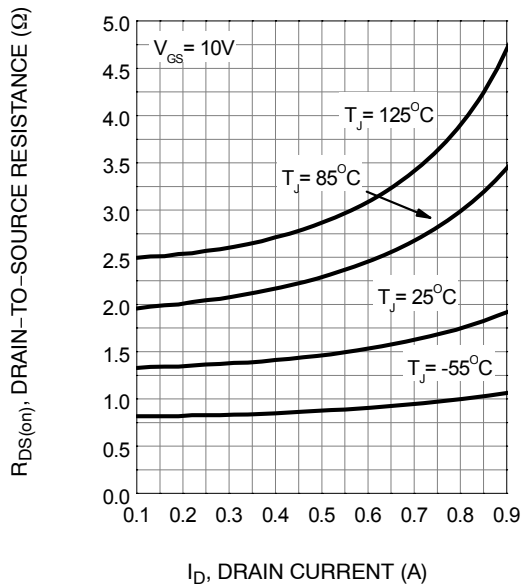


Figure 3. On-Resistance vs. Drain Current and Temperature

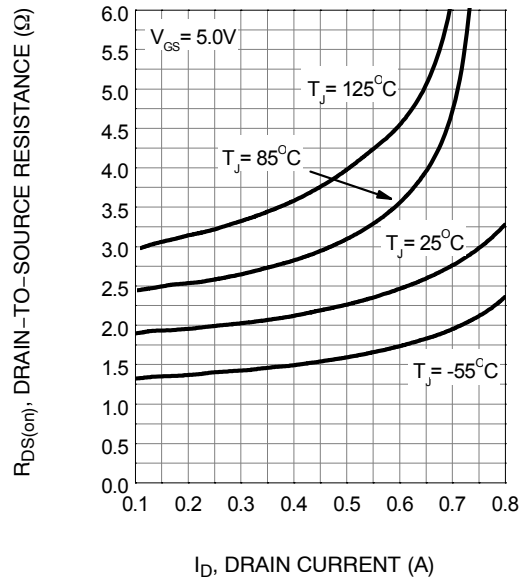


Figure 4. On-Resistance vs. Drain Current and Temperature

TYPICAL ELECTRICAL CHARACTERISTICS

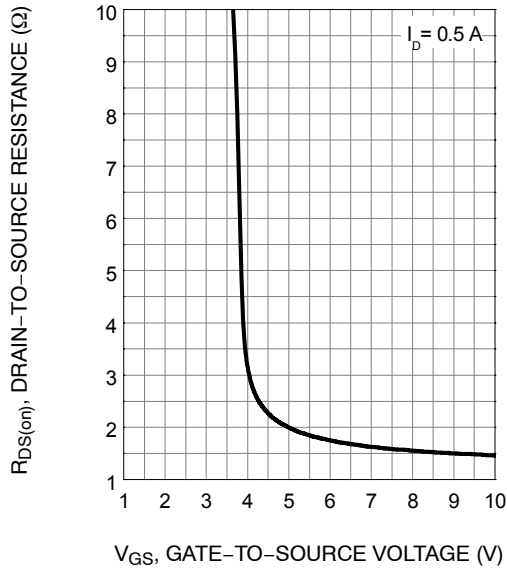


Figure 5. On-Resistance vs. Gate-to-Source Voltage

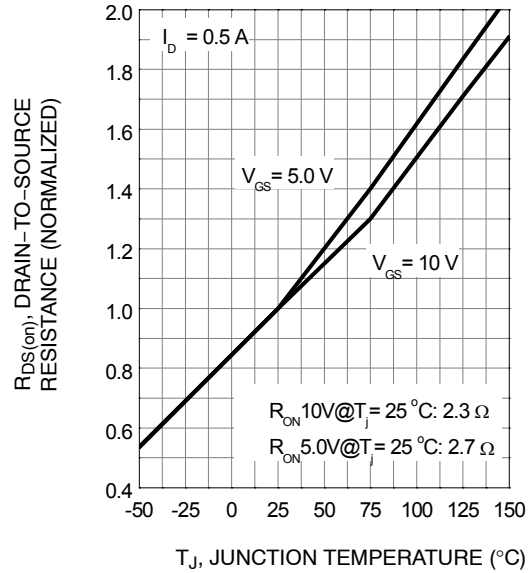


Figure 6. On-Resistance Variation with Temperature

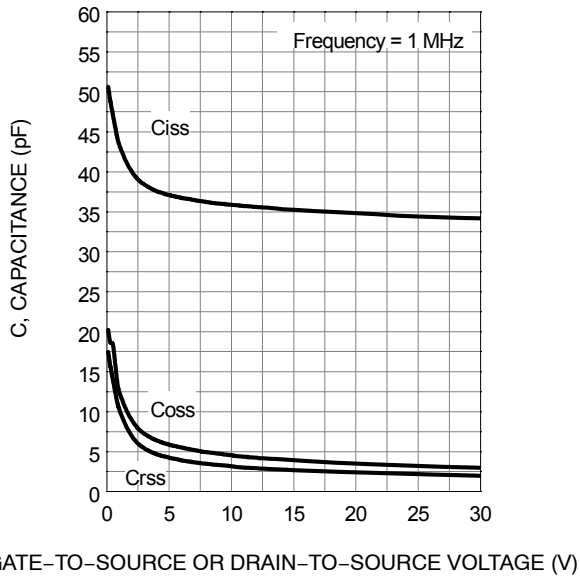


Figure 7. Capacitance Variation

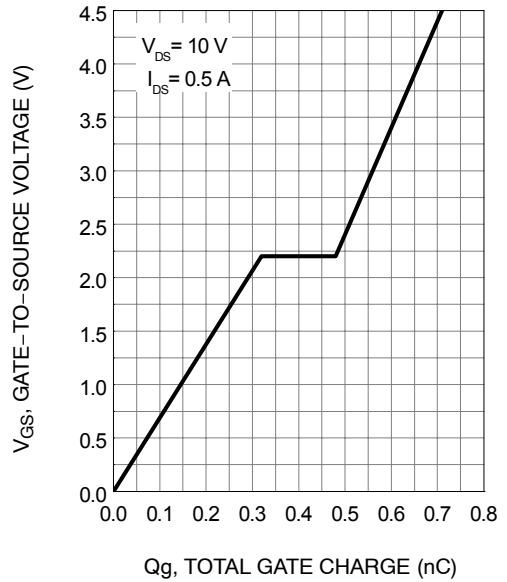


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

TYPICAL ELECTRICAL CHARACTERISTICS

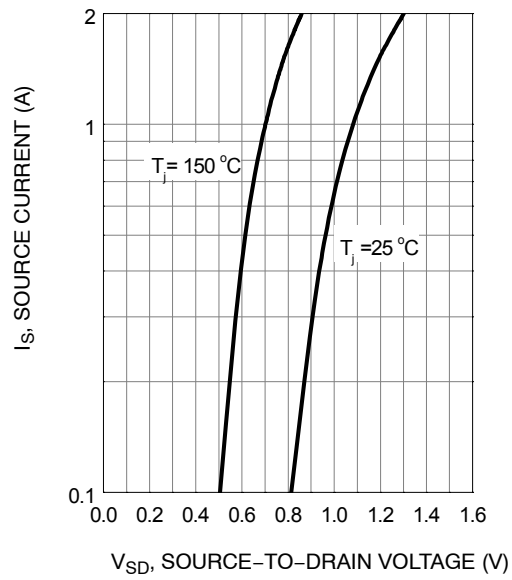
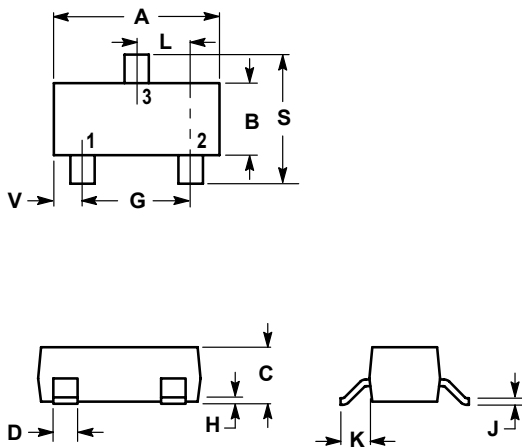


Figure 9. Diode Forward Voltage vs. Current

SOT-23

Dimension Outline:



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M,1982
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

Soldering Footprint:

