

-4A, -20V P-CHANNEL MOSFET

DESCRIPTION:



The ALPMP3415A is an -4A, -20V P-Channel MOSFET and it has Excellent $R_{DS(ON)}$, low gate charge and low gate voltages. That the material of product compliance with RoHS requirement.

FEATURES:

- $V_{(BR)DSS} = -20V$, $I_D = -4A$
- $R_{DS(ON) TYP} = 33m\Omega$ @ $V_{GS} = -4.5V$, $I_D = -4A$
- $R_{DS(ON) TYP} = 45m\Omega$ @ $V_{GS} = -2.5V$, $I_D = -4A$
- $R_{DS(ON) TYP} = 63m\Omega$ @ $V_{GS} = -1.8V$, $I_D = -4A$
- Low gate charge
- Low gate Voltages
- ESD Protected gate
- Lead-free parts meet RoHS requirements

APPLICATIONS:

- PWM applications
- Load switch
- Power management

MECHANICAL CHARACTERISTICS

- Epoxy: UL94-V0 rated flame retardant.
- Case: Molded plastic, SOT-23
- Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
- Mounting Position: Any.

MAXIMUM RATINGS
MAXIMUM RATINGS @ $T_A = 25^\circ\text{C}$ unless otherwise specified

PARAMETER	SYMBOL	VALUE	UNIT
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	± 8	V
Continuous Drain Current ⁽²⁾	I_D	-4.0	A
Maximum Power Dissipation ⁽²⁾	P_D	1.5	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	83.3	$^\circ\text{C}/\text{W}$
Junction Temperature	T_J	+150	$^\circ\text{C}$
Operating Temperature Range	T_{OPR}	-45 to +125	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 to +150	$^\circ\text{C}$

Note:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.

ELECTRICAL CHARACTERISTICS @ TA = 25 °C unless otherwise specified

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP.	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = -250 \mu A$	$V_{(BR)DSS}$	-20			V
Zero gate voltage drain current	$V_{DS} = -16V, V_{GS} = 0V$	I_{DSS}			-1	μA
Gate-body leakage current	$V_{GS} = \pm 8V, V_{DS} = 0V$	I_{GSS}			± 10	μA
ON CHARACTERISTICS						
Gate-Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250 \mu A$	$V_{GS(th)}$	-0.3	-0.65	-1.0	V
Drain-Source On-Resistance ⁽¹⁾	$V_{GS} = -4.5V, I_D = -4A$	$R_{DS(ON)}$		33	50	m Ω
	$V_{GS} = -2.5V, I_D = -4A$			45	60	
	$V_{GS} = -1.8V, I_D = -2A$			63	100	
Forward transconductance ⁽²⁾	$V_{DS} = -5V, I_D = -4A$	g_{FS}	8			S

DYNAMIC CHARACTERISTICS ⁽³⁾						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP.	MAX	UNIT
Input Capacitance	$V_{DS} = -10V, V_{GS} = 0V, f = 1.0 \text{ MHz}$	C_{iss}		1450		pF
Output Capacitance	$V_{DS} = -10V, V_{GS} = 0V, f = 1.0 \text{ MHz}$	C_{oss}		205		pF
Reverse Transfer Capacitance	$V_{DS} = -10V, V_{GS} = 0V, f = 1.0 \text{ MHz}$	C_{rss}		106		pF
Gate Resistance	$V_{DS} = 0V, V_{GS} = 0V, f = 1.0 \text{ MHz}$	R_g		6.5		Ω

SWITCHING CHARACTERISTICS						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP.	MAX	UNIT
Turn-On Delay Time ⁽³⁾	$V_{DS} = -10V, V_{GS} = -4.5V, R_{GEN} = 3\Omega, R_L = 2.5\Omega$	$t_{d(on)}$		9.5		ns
Turn-On Rise time ⁽³⁾	$V_{DS} = -10V, V_{GS} = -4.5V, R_{GEN} = 3\Omega, R_L = 2.5\Omega$	t_r		17		ns
Turn-Off Delay Time ⁽³⁾	$V_{DS} = -10V, V_{GS} = -4.5V, R_{GEN} = 3\Omega, R_L = 2.5\Omega$	$t_{d(off)}$		94		ns
Turn-Off Fall time ⁽³⁾	$V_{DS} = -10V, V_{GS} = -4.5V, R_{GEN} = 3\Omega, R_L = 2.5\Omega$	t_f		35		ns
Total Gate Charge	$V_{DS} = -10V, V_{GS} = -4.5V, I_D = -4A$	Q_g		17.2		nC
Gate to Source Charge	$V_{DS} = -10V, V_{GS} = -4.5V, I_D = -4A$	Q_{gs}		1.3		nC
Gate to Drain Charge	$V_{DS} = -10V, V_{GS} = -4.5V, I_D = -4A$	Q_{gd}		4.5		nC

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP.	MAX	UNIT
Drain Forward Voltage ⁽²⁾	$I_S = -1A, V_{GS} = 0V$	V_{DS}			-1	V

Note:

1. Repetitive rating, pulse width limited by junction temperature.
2. Pulse test: pulse width $\leq 300 \mu s$, Duty cycle $\leq 2\%$.
3. These parameters have no way to verify.

TYPICAL DEVICE RATING AND CHARACTERISTICS CURVES ($T_A = 25^\circ\text{C}$ unless otherwise noted)

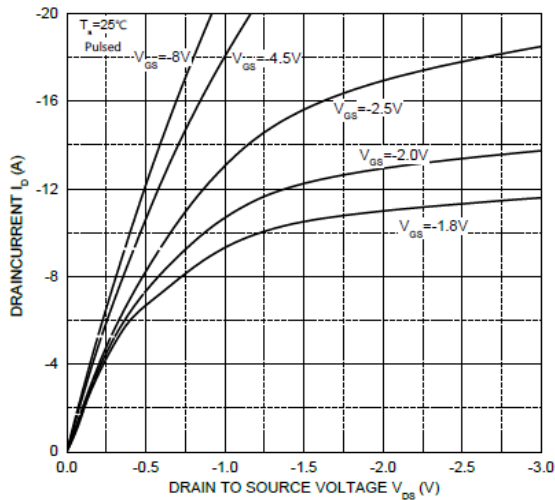


Fig.1 OUTPUT CHARACTERISTICS

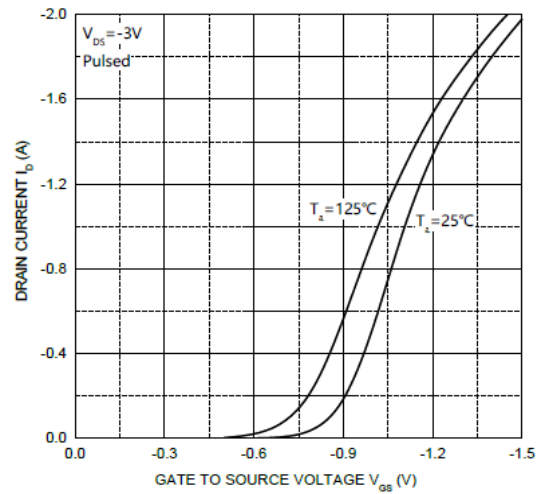


Fig.2 TRANSFER CHARACTERISTICS

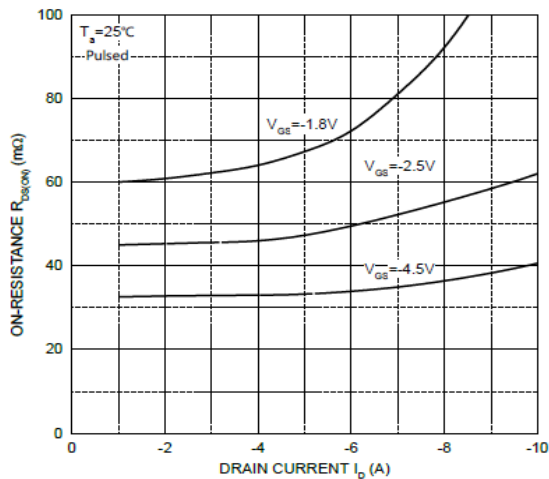


Fig.3 $R_{DS(ON)}$ Vs. I_D

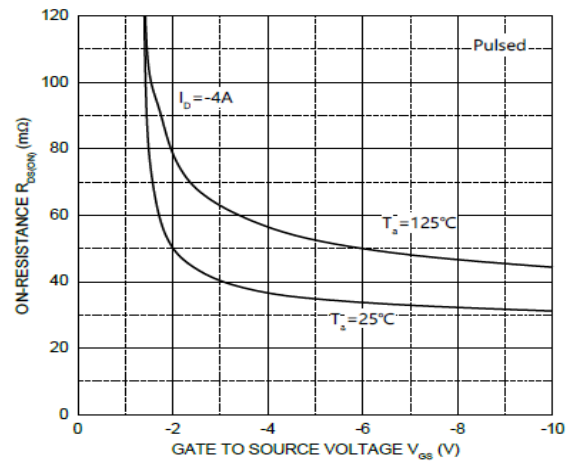


Fig.4 $R_{DS(ON)}$ Vs. V_{GS}

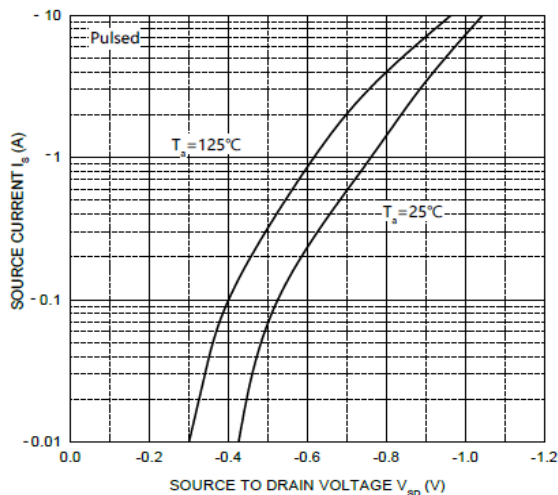


Fig.5 I_S Vs. V_{SD}

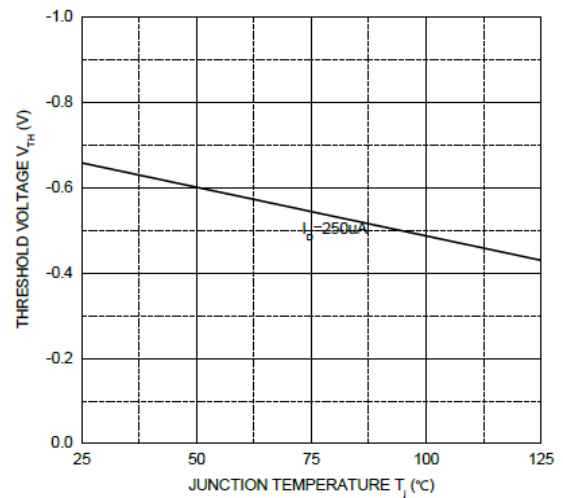
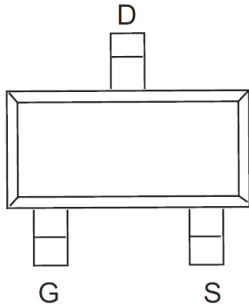
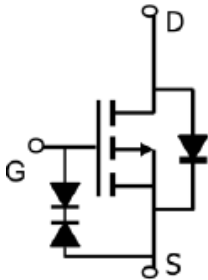


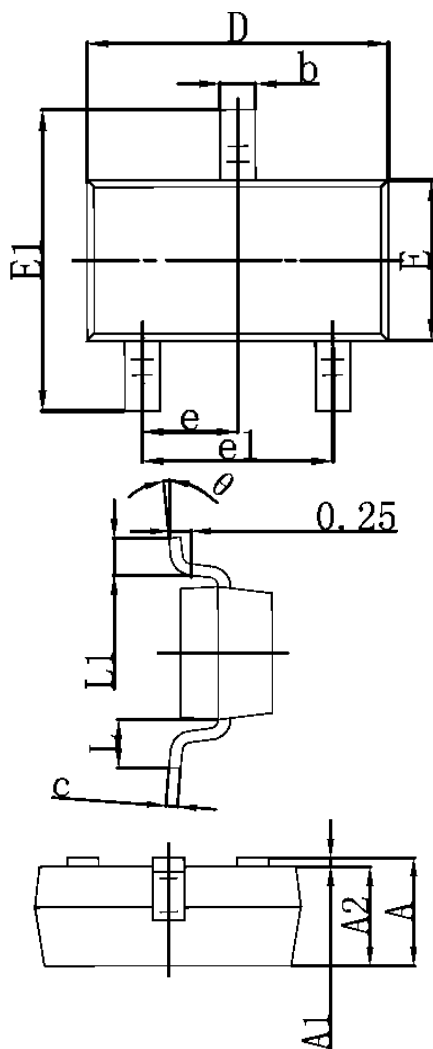
Fig.6 THRESHOLD VOLTAGE

PINNING INFORMATION

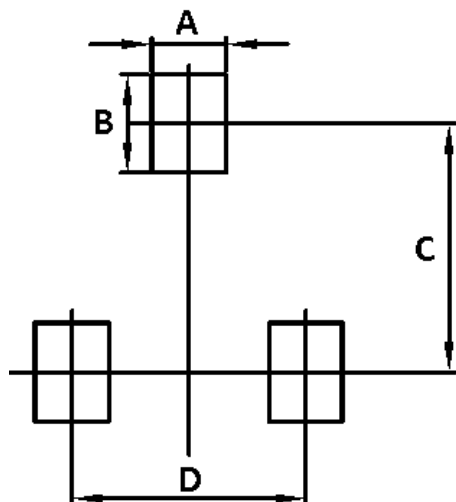
PIN	SIMPLIFIED OUTLINE	SCHEMATIC DIAGRAM
Pin D Drain Pin G Gate Pin S Source		

PACKAGE INFORMATION

SOT-23



SUGGESTED SOLDER PAD LAYOUT



OUTLINE DIMENSIONS				
SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.15	0.035	0.045
A1	0.00	0.10	0.000	0.004
A2	0.90	1.05	0.035	0.041
b	0.30	0.50	0.012	0.020
c	0.08	0.15	0.003	0.006
D	2.80	3.00	0.110	0.118
E	1.20	1.40	0.047	0.055
E1	2.25	2.55	0.089	0.100
e	0.95 TYP.		0.037 TYP.	
e1	1.80	2.00	0.071	0.079
L	0.55 REF.		0.022 REF.	
L1	0.30	0.50	0.012	0.020
θ	0°	8°	0°	8°

OUTLINE DIMENSIONS		
SYMBOL	MILLIMETERS	INCHES
A	0.60	0.024
B	0.80	0.031
C	2.02	0.080
D	1.90	0.075

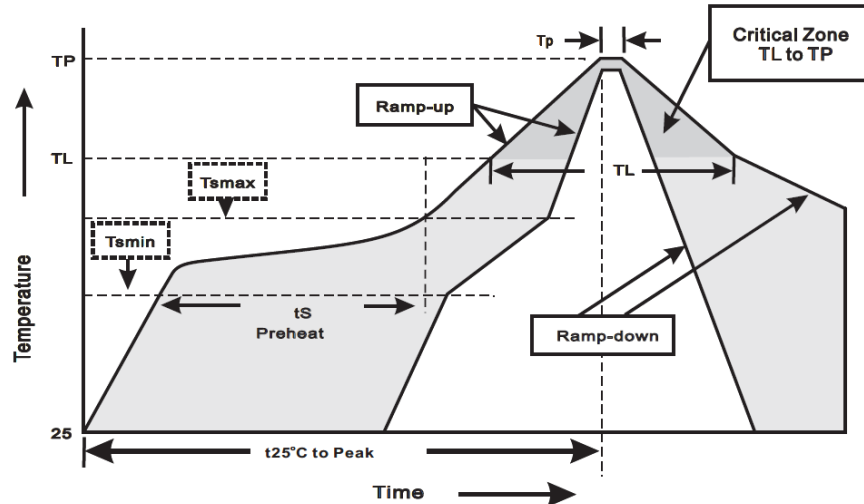
Note:

1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$
3. The pad layout is for reference purposes only.

SOLDERING PARAMETERS

SUGGESTED THERMAL PROFILES FOR SOLDERING PROCESSES

1. Storage environment: Temperature=5 °C~40 °C Humidity=55% ±25%
2. Reflow soldering of surface-mount devices



3. Reflow soldering

PROFILE FEATURE	SOLDERING CONDITION
Average ramp-up rate (T_L to T_P)	<3 °C/sec
Preheat	
- Temperature Min (T_{smin})	150 °C
- Temperature Max (T_{smax})	200 °C
- Time (min to max) (t_s)	60 ~ 120 sec
T_{smax} to T_L	
- Ramp-upRate	<3 °C/sec
Time maintained above:	
- Temperature (T_L)	217 °C
- Time(t_L)	60 ~ 260 sec
Peak Temperature (T_P)	255 °C-0/+5 °C
Time within 5 °C of actual Peak Temperature(t_P)	10 ~ 30 sec
Ramp-down Rate	<6 °C/sec
Time 25 °C to Peak Temperature	<6 minutes



beyond boundaries...

ALPMP3415A

SOT-23

CUSTOMER NOTE:

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