AT4P1SP020ESA

P-Channel Enhancement Mode MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	I_D
-20V	40mΩ@-4.5V	-4.1A
	56mΩ@-2.5V	

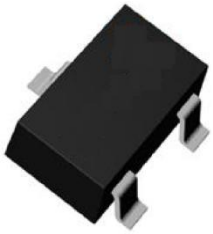
Feature

- Excellent $R_{DS(ON)}$
- Low Gate Charge

Application

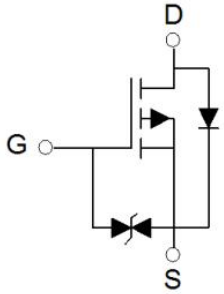
- Load Switch
- PWM Application
- Power Management

Package

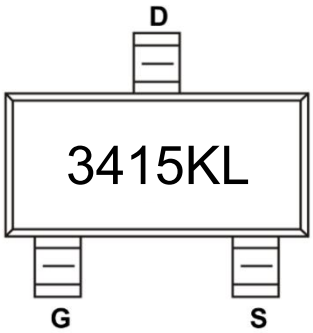


SOT-23

Circuit diagram



Marking



Absolute maximum ratings (T_A=25℃ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	±10	V
Continuous Drain Current	I_D	-4.1	A
Continuous Drain Current (T_A=100℃)	I_D (100℃)	-2.9	A
Power Dissipation	P_D	0.9	W
Thermal Resistance Junction to Ambient[1]	$R_{\theta JA}$	138	℃/W
Operating Junction Temperature	T_J	-55 ~ +150	℃
Storage Temperature	T_{STG}	-55 ~ +150	℃

Electrical characteristics (T_J=25 °C unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} =0V, I_D =-250μA	-20			V
Zero gate voltage drain current	I_{DSS}	V_{DS} =-20V, V_{GS} =0V			-1	μA
Gate-body leakage current	I_{GSS}	V_{DS} =0V, V_{GS} =±10V			±10	μA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =-250μA	-0.5	-0.7	-0.9	V
Drain-source on-resistance[2]	$R_{DS(on)}$	V_{GS} =-4.5V, I_D =-4A		23.8	40	mΩ
		V_{GS} =-2.5V, I_D =-3A		32.2	56	
Dynamic characteristics[3]						
Input Capacitance	C_{iss}	V_{DS} =-10V, V_{GS} =0V, f =1MHz		893		pF
Output Capacitance	C_{oss}			91		
Reverse Transfer Capacitance	C_{rss}			52		
Total Gate Charge	Q_g	V_{DS} =-10V, V_{GS} =-4.5V I_D =-4A		9		nC
Gate-Source Charge	Q_{gs}			1.6		
Gate-Drain Charge	Q_{gd}			1.5		
Turn-on delay time	$t_{d(on)}$	V_{DS} =-10V, V_{GS} =-10V, I_D =-4A R_G =1Ω		12		nS
Turn-on rise time	t_r			35		
Turn-off delay time	$t_{d(off)}$			30		
Turn-off fall time	t_f			10		
Source-Drain Diode characteristics						
Diode Forward Current	I_S				-4	A
Diode Forward voltage	V_{SD}	V_{GS} =0V, I_S =-4A			-1.2	V
Reverse Recovery Time	T_{rr}	I_F =-4A, di/dt =-40A/us		173		nS
Reverse Recovery Charge	Q_{rr}			64		nC

Notes:

1) $R_{\theta JA}$ is measured with the device mounted on a 1inch² pad of 2oz copper FR4 PCB.

2) Pulse Test: Pulse Width ≤300μs, Duty Cycle ≤0.5%.

3) Guaranteed by design, not subject to production testing.

Typical Characteristics

Figure 1: Power De-rating

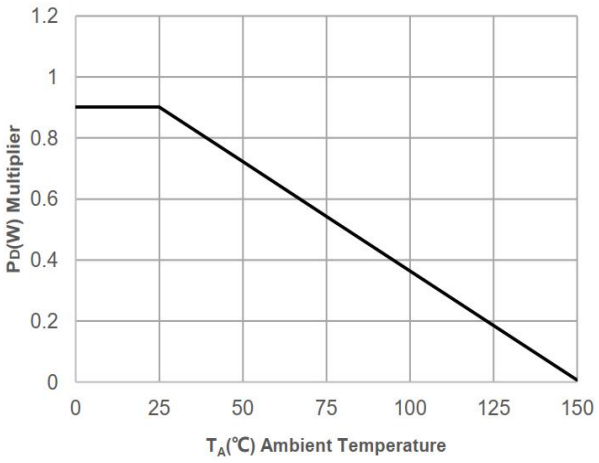


Figure 2: Current De-rating

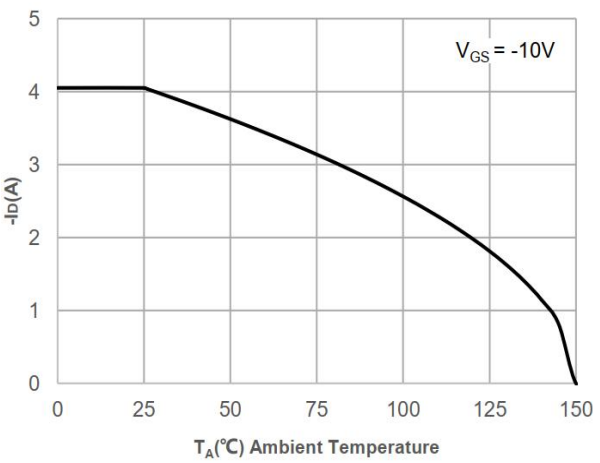


Figure 3: Normalized Maximum Transient Thermal Impedance

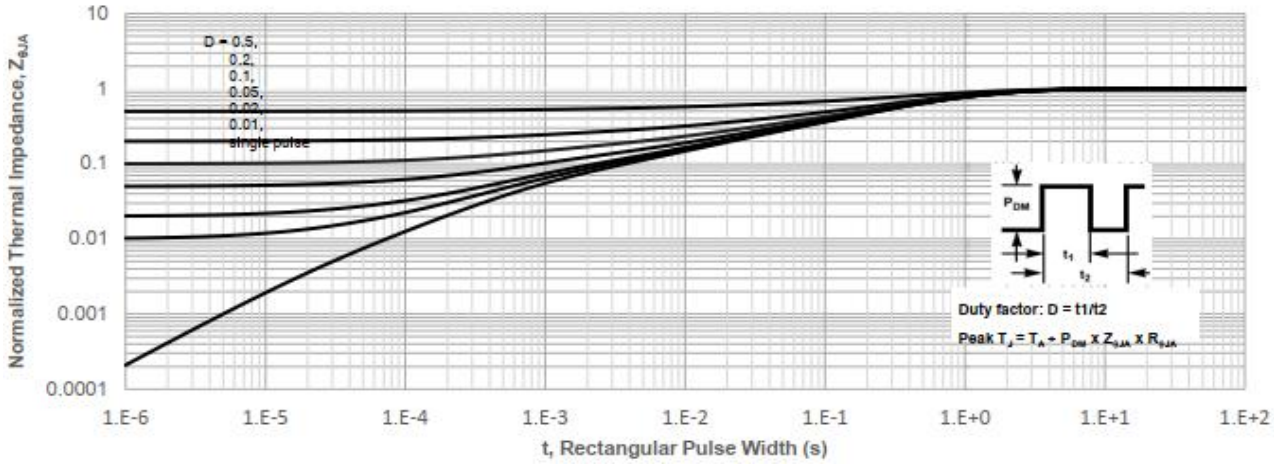
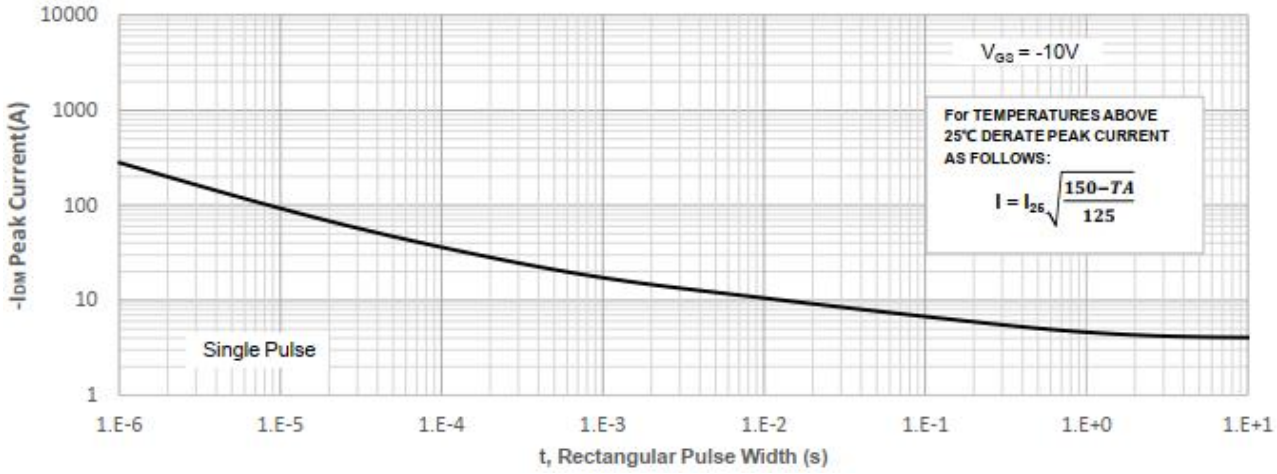


Figure 4: Peak Current Capacity



Typical Characteristics

Figure 5: Output Characteristics

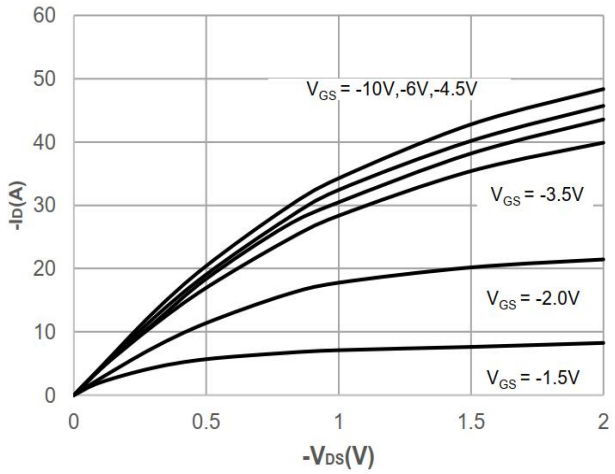


Figure 6: Typical Transfer Characteristics

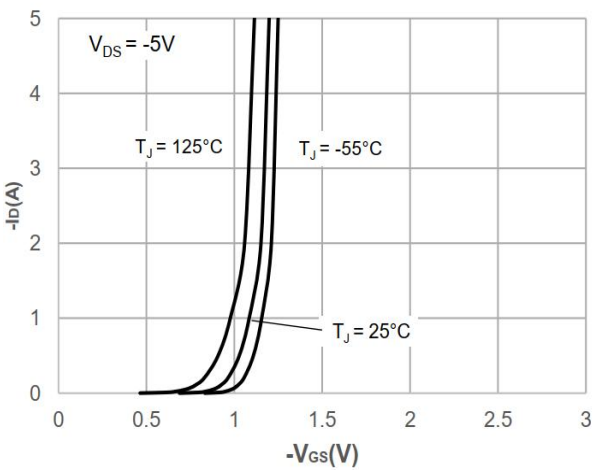


Figure 7: On-resistance vs. Drain Current

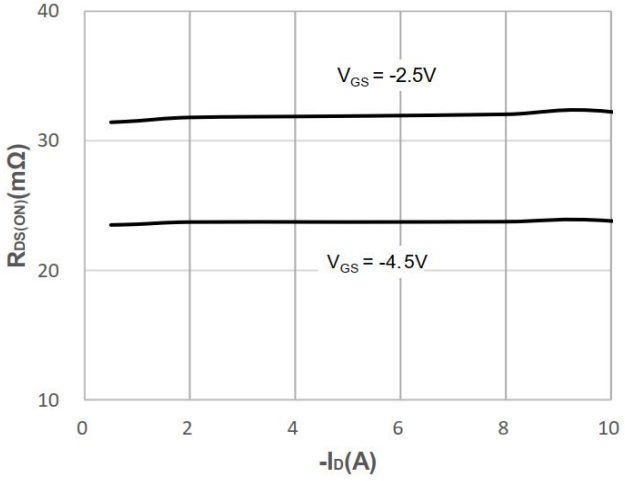


Figure 8: Body Diode Characteristics

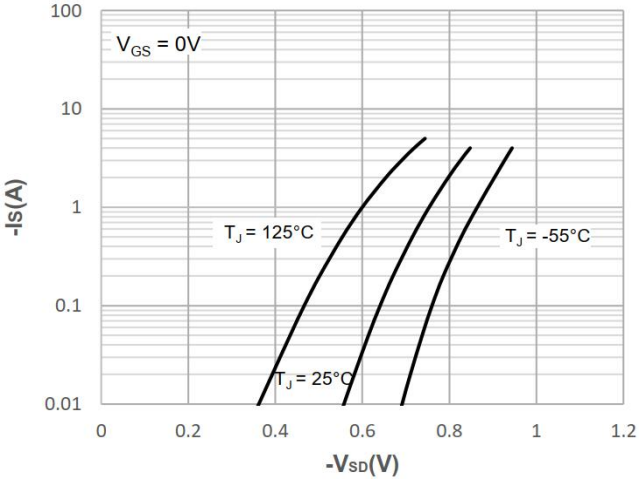


Figure 9: Gate Charge Characteristics

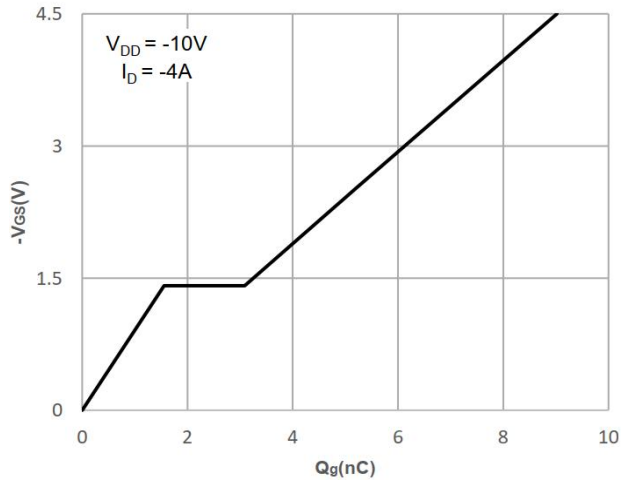
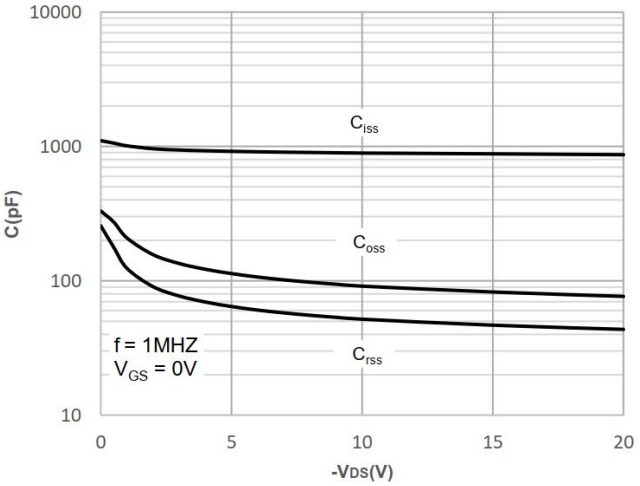


Figure 10: Capacitance Characteristics



Typical Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

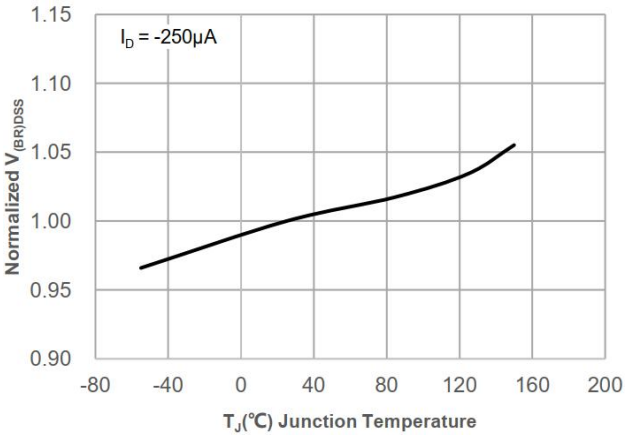


Figure 12: Normalized on Resistance vs. Junction Temperature

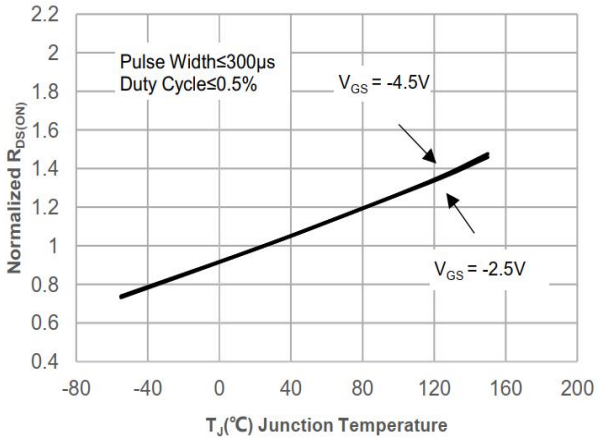


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

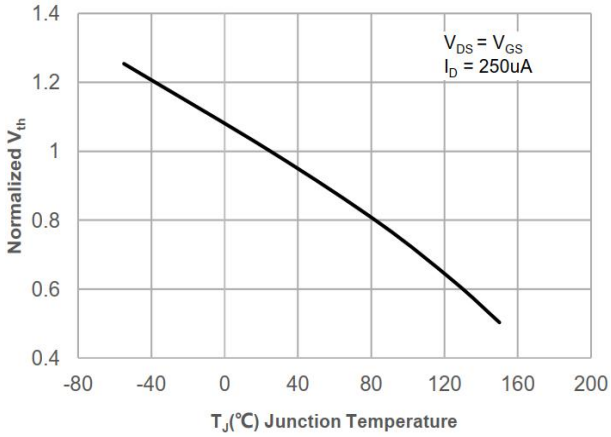


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

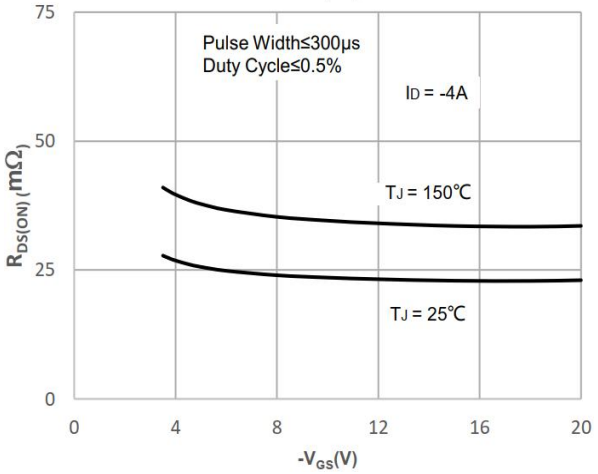
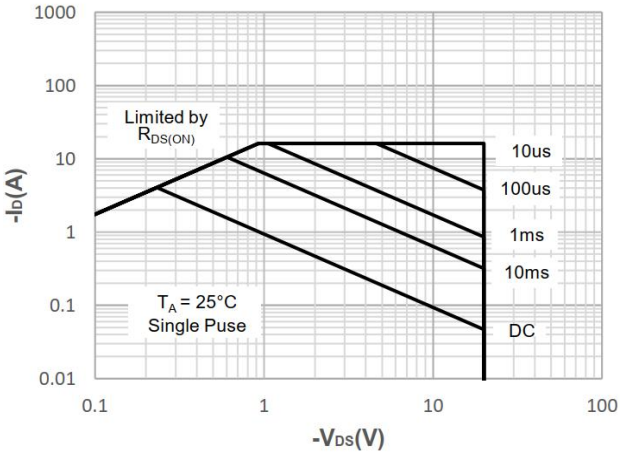
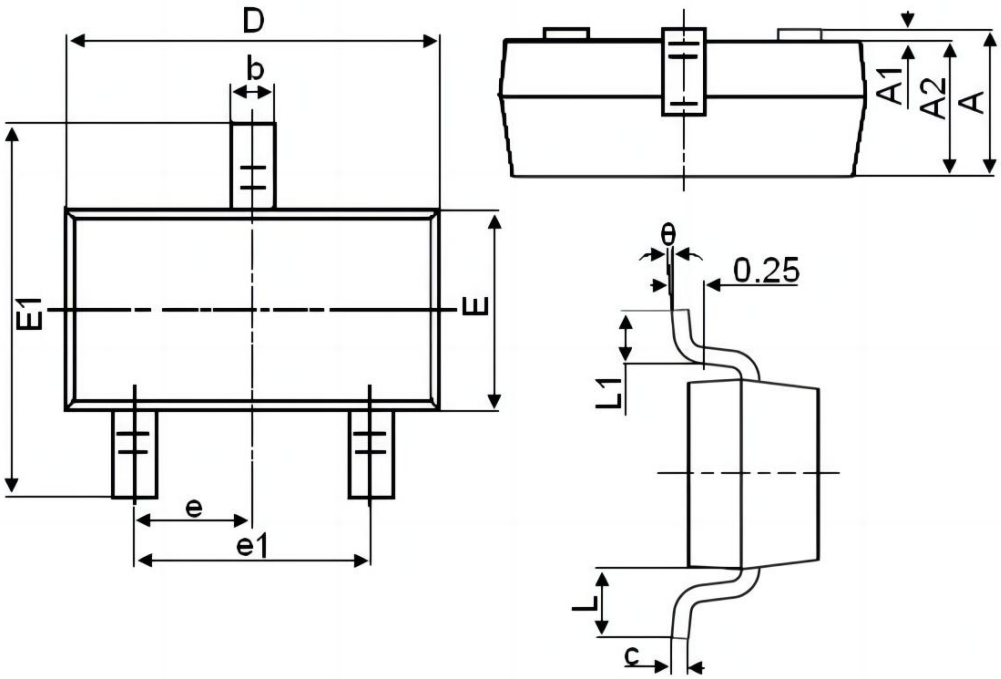


Figure 15: Maximum Safe Operating Area



SOT-23 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.200	0.035	0.047
A1	0.000	0.100	0.000	0.004
A2	0.900	1.100	0.035	0.043
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.300	2.500	0.091	0.098
e	0.950 TYP.		0.037 TYP.	
e1	1.900 REF.		0.075 REF.	
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	10°	0°	10°