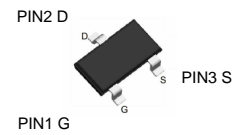


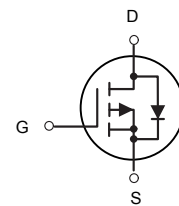
The 5P04 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.


**SOT23-3L**
**General Features**
 $V_{DS} = -40V$   $I_D = -5.0A$ 
 $R_{DS(ON)} < 70m\Omega @ V_{GS} = -10V$ 
**Application**

Battery protection

Load switch

Uninterruptible power supply



P-Channel MOSFET

**Absolute Maximum Ratings (TA=25°C unless otherwise noted)**

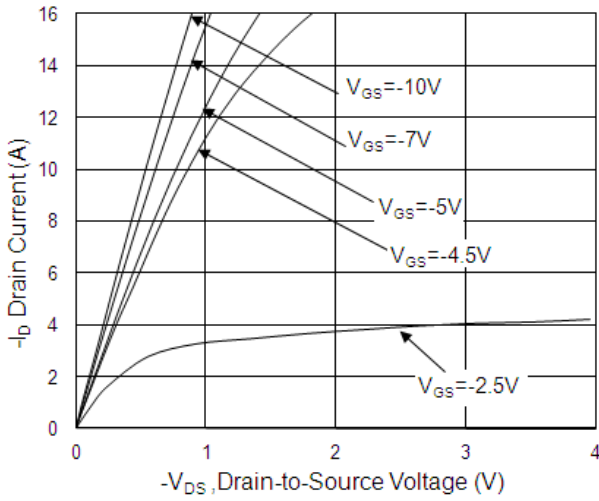
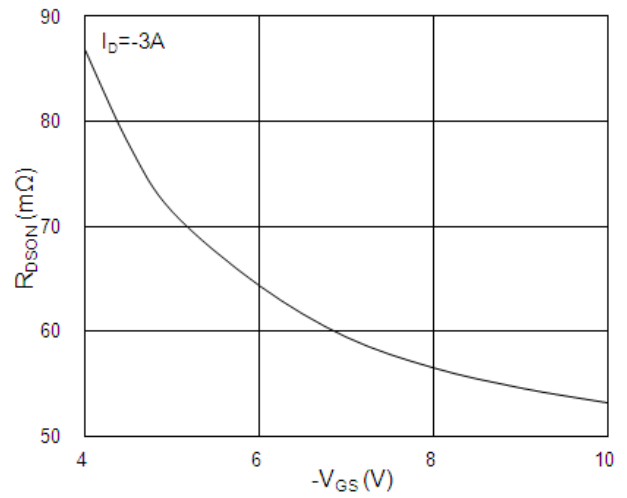
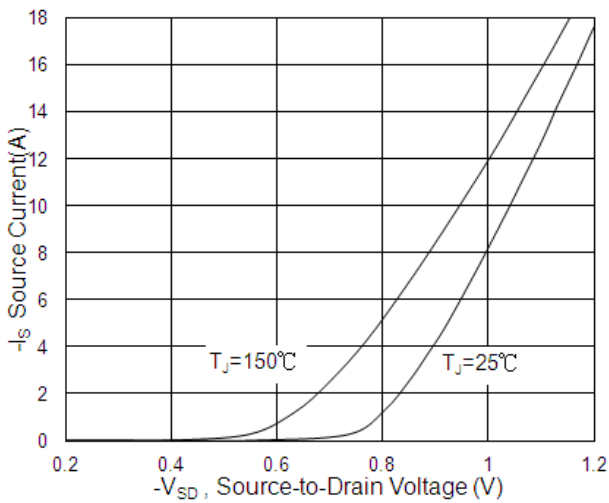
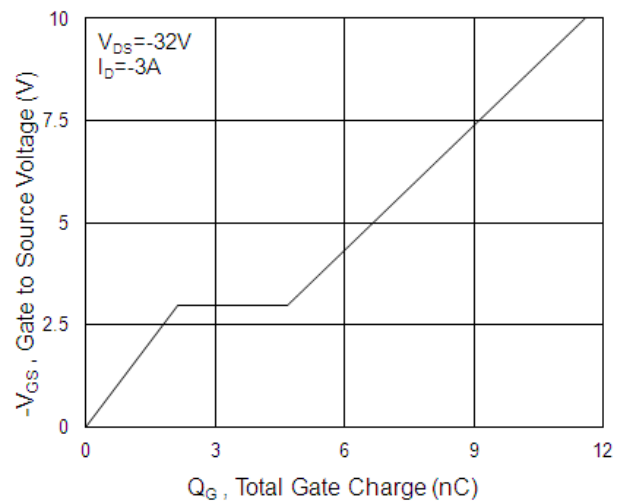
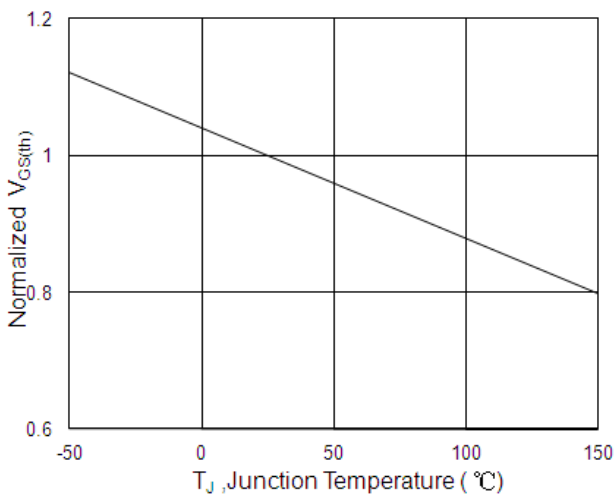
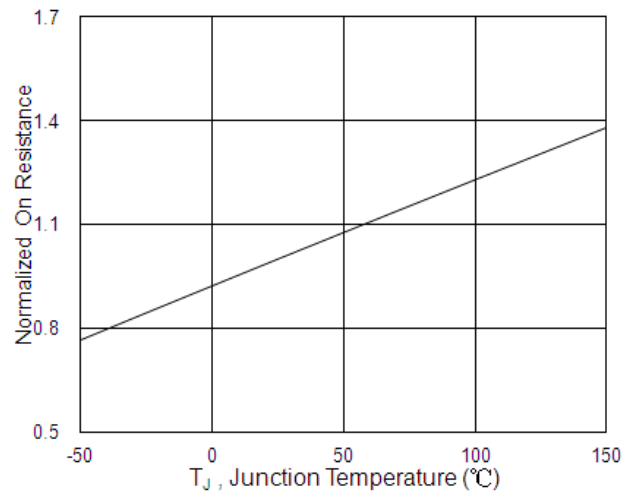
Symbol	Parameter	Rating		Units
		10s	Steady State	
$V_{DS}$	Drain-Source Voltage	-40		V
$V_{GS}$	Gate-Source Voltage	$\pm 20$		V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-3.7	-3.2	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-3.0	-2.6	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-16.1		A
$P_D @ T_A = 25^\circ C$	Total Power Dissipation <sup>3</sup>	1.32	1	W
$P_D @ T_A = 70^\circ C$	Total Power Dissipation <sup>3</sup>	0.84	0.64	W
$T_{STG}$	Storage Temperature Range	-55 to 150		°C
$T_J$	Operating Junction Temperature Range	-55 to 150		°C
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup>	125		°C/W
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup> (t ≤ 10s)	95		°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	80		°C/W

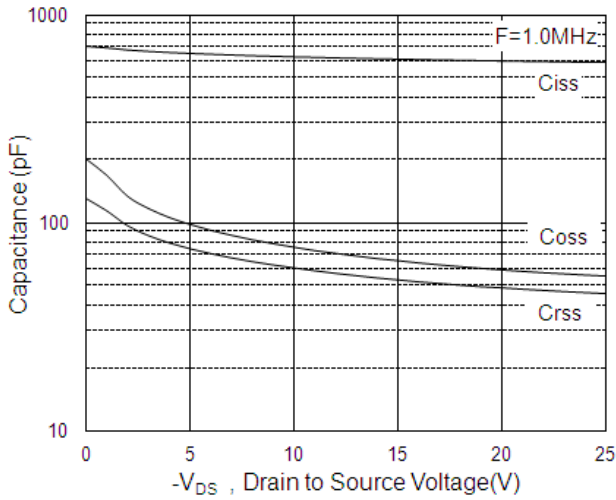
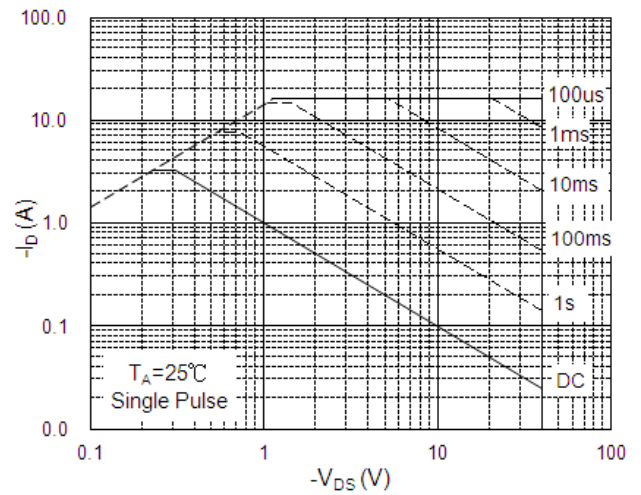
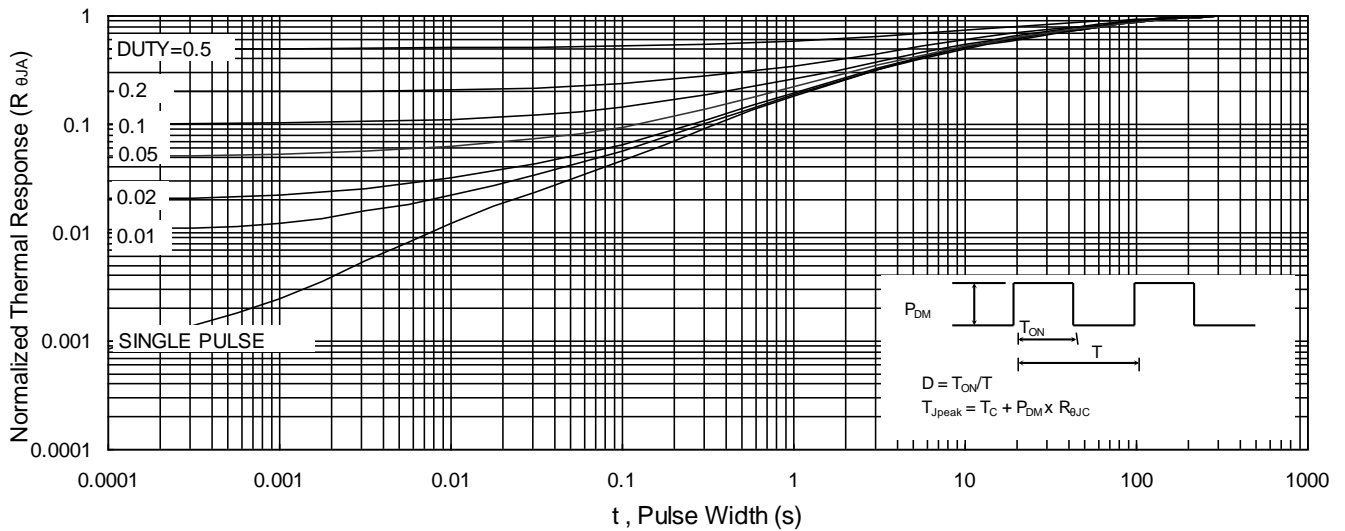
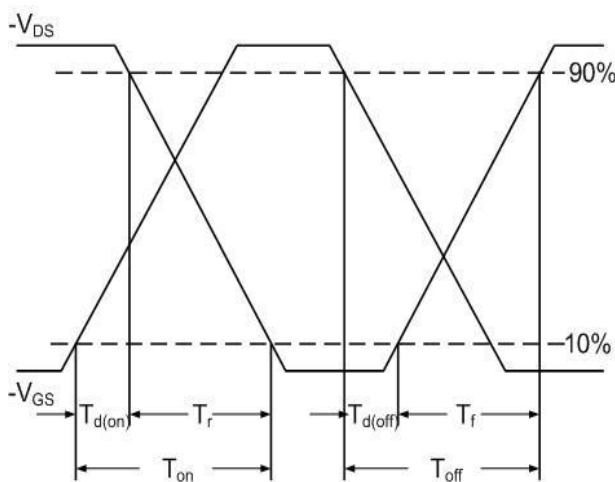
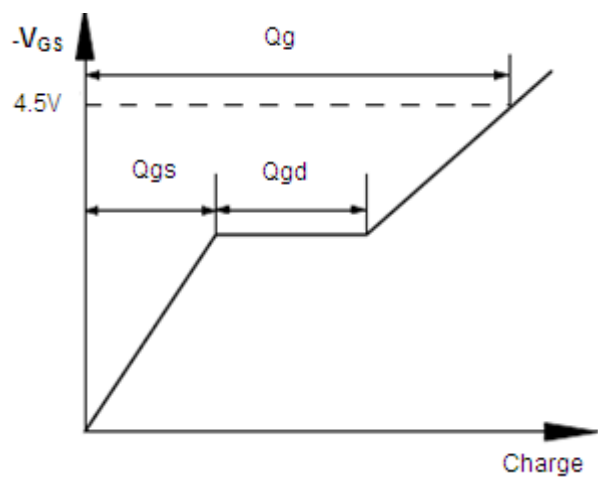
**Electrical Characteristics** (TA=25°C unless otherwise noted)

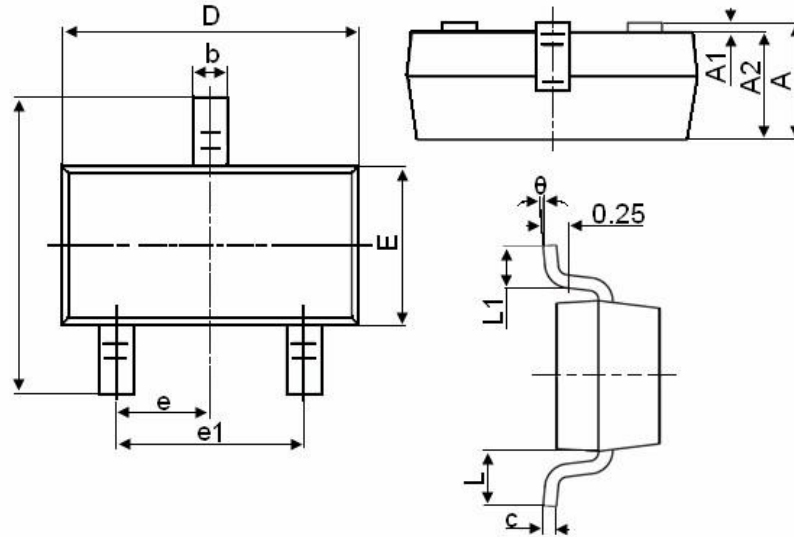
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V , I <sub>D</sub> =-250uA	-40	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C , I <sub>D</sub> =-1mA	---	-0.018	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =-4.5V , I <sub>D</sub> =-3A	---	---	70	mΩ
		V <sub>GS</sub> =-2.5V , I <sub>D</sub> =-2A	---	---	100	
V <sub>GS(th)</sub>	Gate Threshold Voltage		-1.0	---	-2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	---	2.5	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-24V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C	---	---	-1	uA
		V <sub>DS</sub> =-24V , V <sub>GS</sub> =0V , T <sub>J</sub> =55°C	---	---	-5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V , V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-5V , I <sub>D</sub> =-3A	---	5.8	---	S
Q <sub>g</sub>	Total Gate Charge (-4.5V)		---	6.4	---	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =-32V , V <sub>GS</sub> =-4.5V , I <sub>D</sub> =-3A	---	2.1	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	2.5	---	
T <sub>d(on)</sub>	Turn-On Delay Time		---	4.2	---	ns
T <sub>r</sub>	Rise Time	V <sub>DD</sub> =-20V , V <sub>GS</sub> =-4.5V , R <sub>G</sub> =3.3 , I <sub>D</sub> =-3A	---	23	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	26.8	---	
T <sub>f</sub>	Fall Time		---	20.6	---	
C <sub>iss</sub>	Input Capacitance		---	620	---	pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> =-15V , V <sub>GS</sub> =0V , f=1MHz	---	65	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	53	---	
I <sub>S</sub>	Continuous Source Current <sup>1,4</sup>	V <sub>G</sub> =V <sub>D</sub> =0V , Force Current	---	---	-3.2	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,4</sup>		---	---	-16.1	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V , I <sub>S</sub> =-1A , T <sub>J</sub> =25°C	---	---	-1	V

Note :

- 1.The data tested by surface mounted on a 1 inch FR-4 board with 20Z copper.
- 2 .The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The power dissipation is limited by 150°C junction temperature
- 4.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.

**Typical Characteristics**

**Fig.1 Typical Output Characteristics**

**Fig.2 On-Resistance vs. G-S Voltage**

**Fig.3 Forward Characteristics Of Reverse**

**Fig.4 Gate-Charge Characteristics**

**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$** 

**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**


**Fig.7 Capacitance**

**Fig.8 Safe Operating Area**

**Fig.9 Normalized Maximum Transient Thermal Impedance**

**Fig.10 Switching Time Waveform**

**Fig.11 Gate Charge Waveform**

**SOT23-3L Package Information**


Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°