DESCRIPTION

The MX5P04 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.

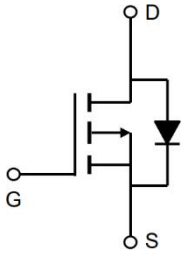
GENERAL FEATURES

- V_{DS}=-40V, I_D=-5A
  $R_{DS(ON)}$(Typ.)=65mΩ @ V_{GS}=-10V
  $R_{DS(ON)}$(Typ.)=85mΩ @ V_{GS}=-4.5V

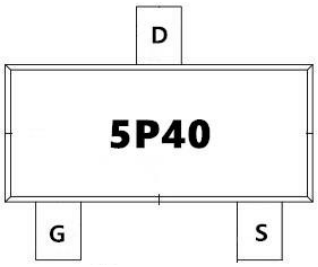
APPLICATION

- Battery protection
- Load switch
- Uninterruptible power supply

PINOUT



Schematic diagram



Marking and pin Assignment

SOT23-3L top view

ORDERING INFORMATION

Part Number	Marking	StorageTemperature	Package	Devices Per Reel
MX5P04	5P40	-55°C to 150°C	SOT23-3L	3000

ABSOLUTE MAXIMUM RATINGS(T_C=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-40	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous(V_{GS}=-10V, T_A=25°C)(Note1)	I_D	-5	A
Drain Current-Continuous(V_{GS}=-10V, T_A=70°C)(Note1)	I_D	-3.8	A
Pulsed Drain Current(Note2)	I_{DM}	-18	A
Single Pulse Avalanche Energy(Note3)	E_{AS}	21	mJ
Avalanche Current	I_{AS}	-20.5	A
Total Power Dissipation(T_A=25°C)(Note4)	P_D	1.5	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	°C
Thermal Resistance, Junction-to-Ambient(Note1)	$R_{\theta JA}$	85	°C/W
Thermal Resistance, Junction-to-Case(Note1)	$R_{\theta JC}$	50	°C/W

Note 1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.
Note 2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
Note 3.The power dissipation is limited by 150°C junction temperature
Note 4.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

ELECTRICAL CHARACTERISTICS(T_C=25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=-250μA	-40	-46	-	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=-24V,V_{GS}=0V,T_J=25°C	-	-	-1	μA
		V_{DS}=-24V,V_{GS}=0V,T_J=55°C	-	-	-5	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=-250μA	-1.0	-1.5	-2.5	V
Drain-Source On-State Resistance(Note 2)	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-3A	-	65	70	mΩ
		V_{GS}=-4.5V, I_D=-2A	-	85	100	mΩ
Forward Transconductance	g_{FS}	V_{DS}=-5V, I_D=-3A	-	5.8	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=-15V, V_{GS}=0V, F=1.0MHz	-	620	-	pF
Output Capacitance	C_{oss}		-	65	-	pF
Reverse Transfer Capacitance	C_{rss}		-	53	-	pF
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-20V, I_D=-3A, V_{GS}=-4.5V,R_G=3.3Ω	-	4.2	-	nS
Turn-on Rise Time	t_r		-	23	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	26.8	-	nS
Turn-Off Fall Time	t_f		-	20.6	-	nS
Total Gate Charge	Q_g	V_{DS}=-32V, I_D=-3A, V_{GS}=-4.5V	-	6.4	-	nC
Gate-Source Charge	Q_{gs}		-	2.1	-	nC
Gate-Drain Charge	Q_{gd}		-	2.5	-	nC
Drain-Source Diode Characteristics						
Continuous Source Current(Note1、3)	I_S	V_G=V_D=0V, Force Current	-	-	-3.2	A
Pulsed Source Current(Note2、3)	I_{SM}		-	-	-16.1	A
Diode Forward Voltage(Note2)	V_{SD}	V_{GS}=0V,I_S=-1A,T_J=25°C	-	-	-1	V

Note1. The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.
Note2. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
Note3. The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 1. Switching Time Waveform

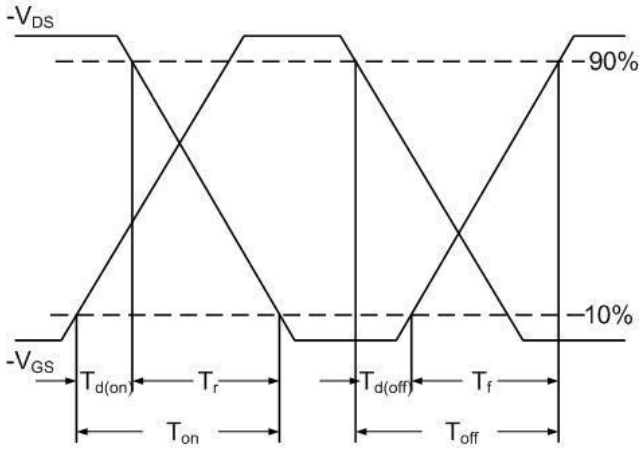


Figure 2. Gate Charge Waveform

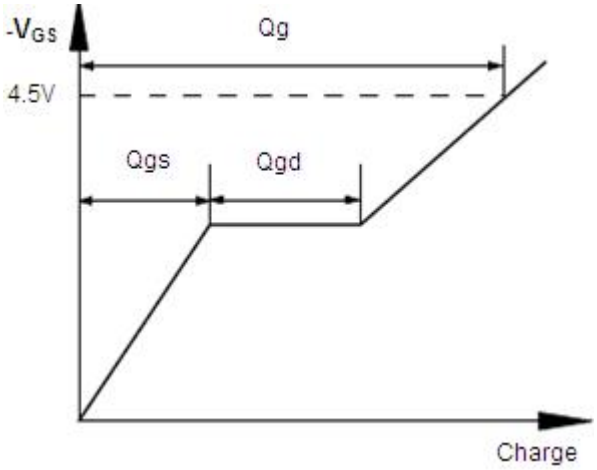


Figure 3. Output Characteristics

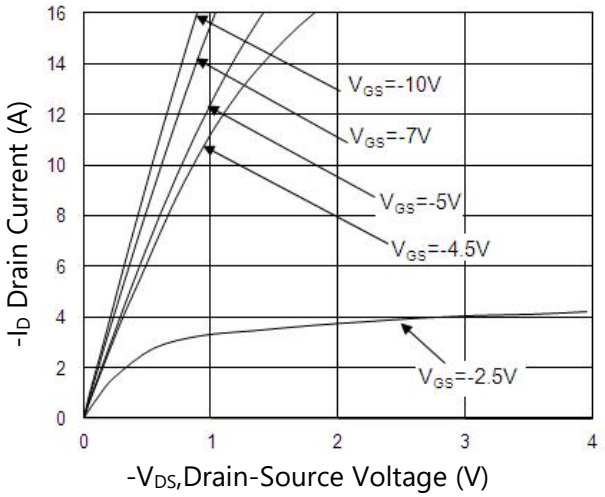


Figure 4. On-Resistance vs. V_{GS}

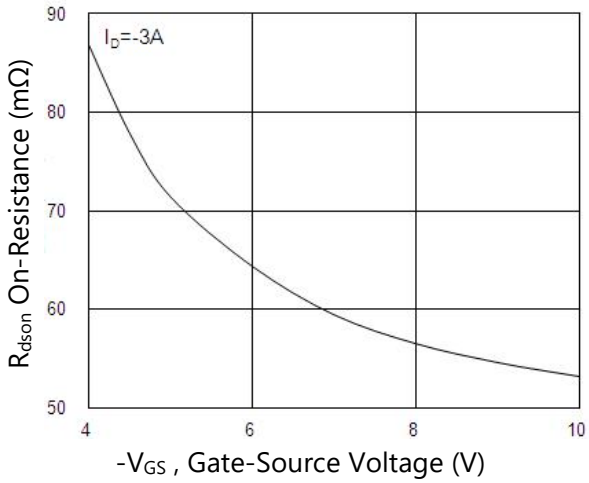


Figure 5. Forward Characteristics of Reverse

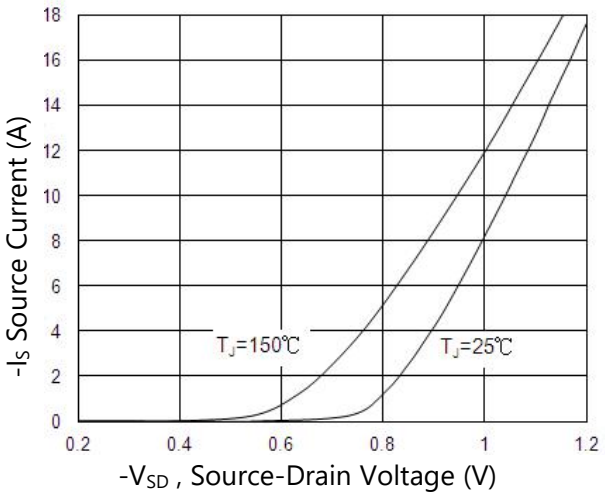
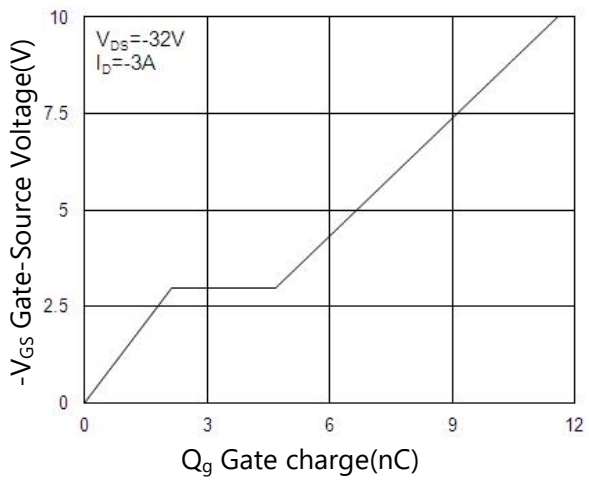


Figure 6. Gate-charge Characteristics



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 7. $V_{GS(th)}$ vs Junction Temperature

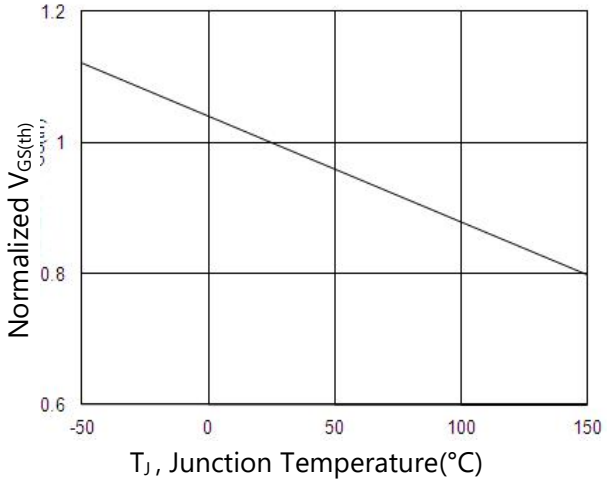


Figure 8. R_{DSON} vs Junction Temperature

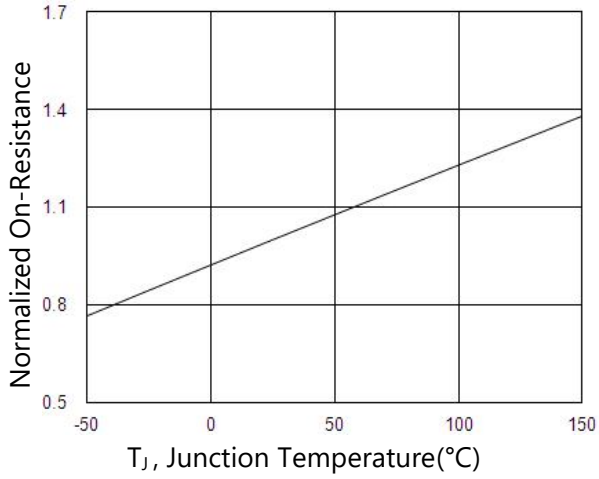


Figure 9. Capacitance vs V_{DS}

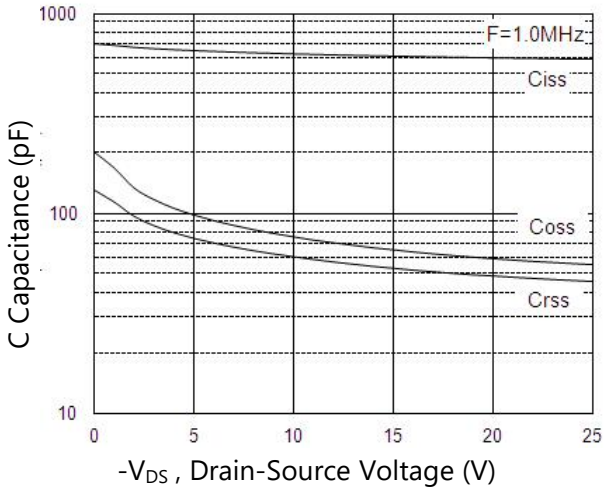


Figure 10. Safe Operating Area

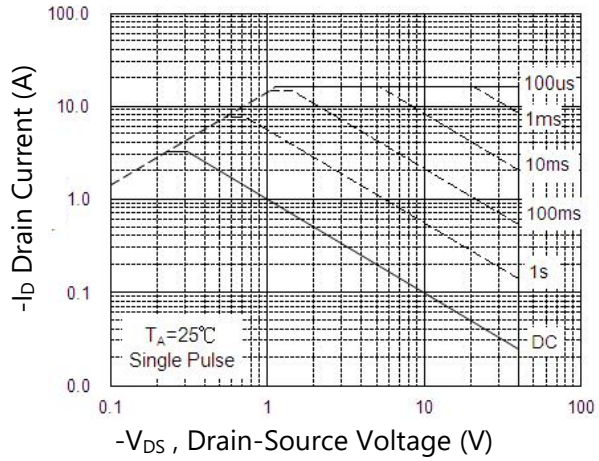
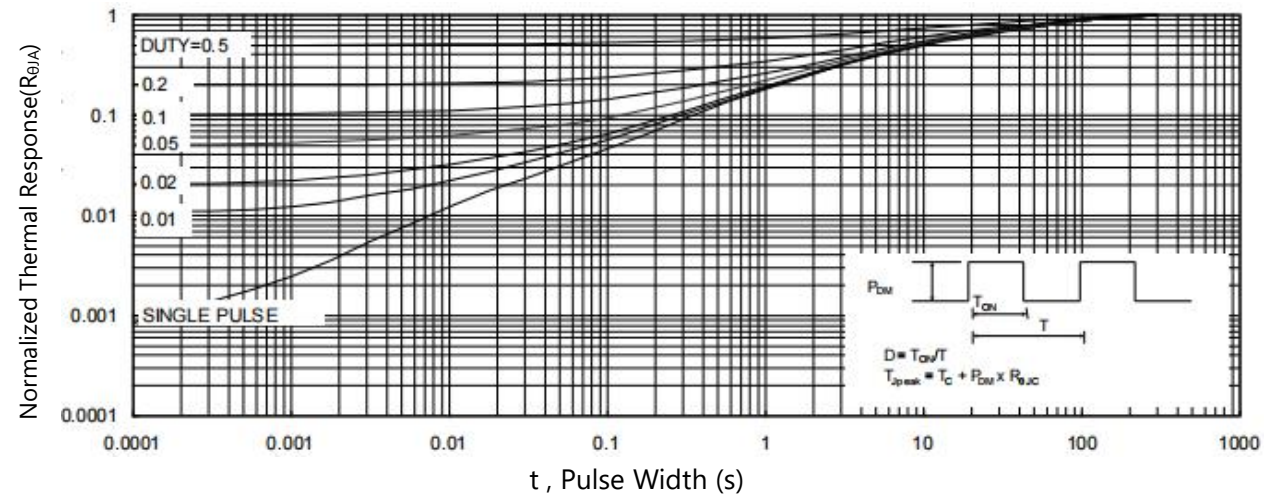
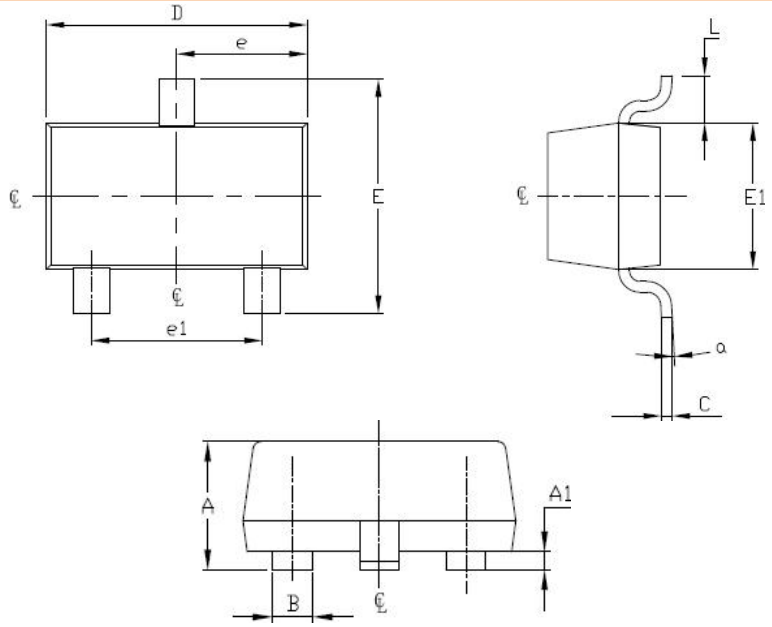


Figure 11. Normalized Maximum Transient Thermal Impedance



PACKAGE INFORMATION

SOT23-3L



Symbol	Dimensions InMillimeters		
	Min.	Typ.	Max.
A	0.9	1.0	1.1
A1	0.00	0.06	0.1
B	0.3	0.4	0.5
C	0.07	0.09	0.18
D	2.8	2.9	3.04
E	2.1	2.33	2.64
E1	1.2	1.3	1.4
e	1.4	1.45	1.5
e1	1.80	1.90	2.00
L	0.45	0.54	0.63
α	0°	2.5°	7°