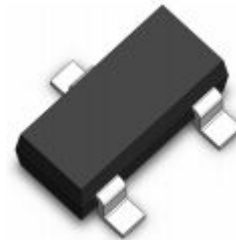


### Description

The LMTL5P02 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.

### Dimensions SOT-23



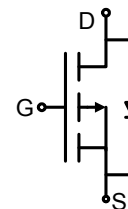
### General Features

$V_{DS} = -20V$   $I_D = -4.9A$   
 $R_{DS(ON)} < 38m\Omega$  @  $V_{GS} = -4.5V$

### Application

- Battery protection
- Load switch
- Uninterruptible power supply

### Pin Configuration



### Package Marking and Ordering Information

Device	Device Marking	Device Package	Reel Size	Tape width	Quantity
LMTL5P02	A5SHB	SOT-23	Ø180mm	8 mm	3000 units

### Absolute Maximum Ratings (TC=25°C unless otherwise noted)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-4.9	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-3.9	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-14	A
$P_D @ T_A = 25^\circ C$	Total Power Dissipation <sup>3</sup>	1.31	W
$P_D @ T_A = 70^\circ C$	Total Power Dissipation <sup>3</sup>	0.84	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>	120	°C/W
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup> (t ≤ 10s)	95	°C/W

**Electrical Characteristics (T<sub>J</sub>=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	-20	---	---	V
∂BV <sub>DSS</sub> /∂T <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =-1mA	---	-0.014	---	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> =-4.9A	---	32	38	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-3.4A	---	45	55	
		V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-2A	---	65	85	
V <sub>GS(th)</sub>	Gate Threshold Voltage		-0.4	---	-1.0	V
∂V <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	---	3.95	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	-1	uA
		V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	-5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-3A	---	12.8	---	S
Q <sub>g</sub>	Total Gate Charge (-4.5V)		---	10.2	14.3	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =-15V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A	---	1.89	2.6	
Q <sub>gd</sub>	Gate-Drain Charge		---	3.1	4.3	
T <sub>d(on)</sub>	Turn-On Delay Time		---	5.6	11.2	ns
T <sub>r</sub>	Rise Time	V <sub>DD</sub> =-10V, V <sub>GS</sub> =-4.5V,	---	40.8	73	
T <sub>d(off)</sub>	Turn-Off Delay Time	R <sub>G</sub> =3.3, I <sub>D</sub> =-3A	---	33.6	67	
T <sub>f</sub>	Fall Time		---	18	36	
C <sub>iss</sub>	Input Capacitance		---	857	1200	pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz	---	114	160	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	108	151	
I <sub>S</sub>	Continuous Source Current <sup>1,4</sup>		---	---	-4.9	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,4</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	-14	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
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =-3A, di/dt=100A/μs,	---	21.8	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge	T <sub>J</sub> =25°C	---	6.9	---	nC

Note :

1 .The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ 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

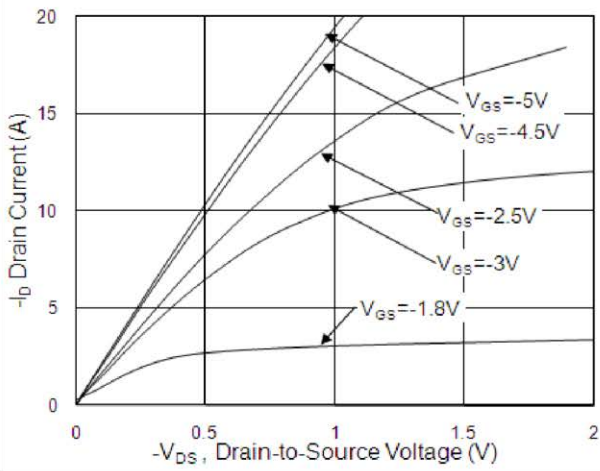


Fig.1 Typical Output Characteristics

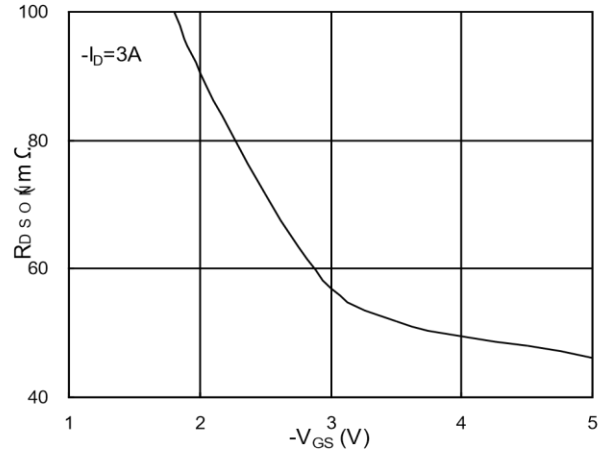


Fig.2 On-Resistance vs. G-S Voltage

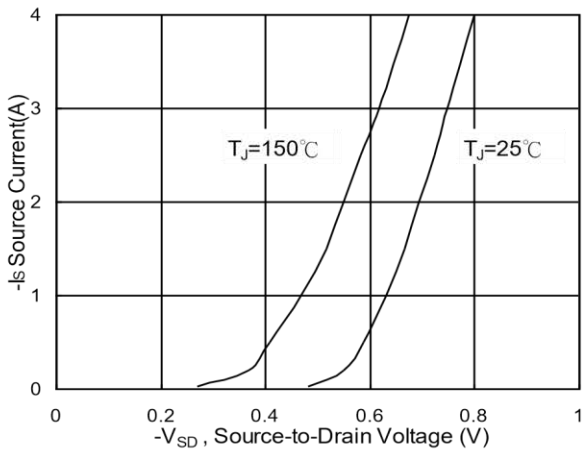


Fig.3 Forward Characteristics of Reverse

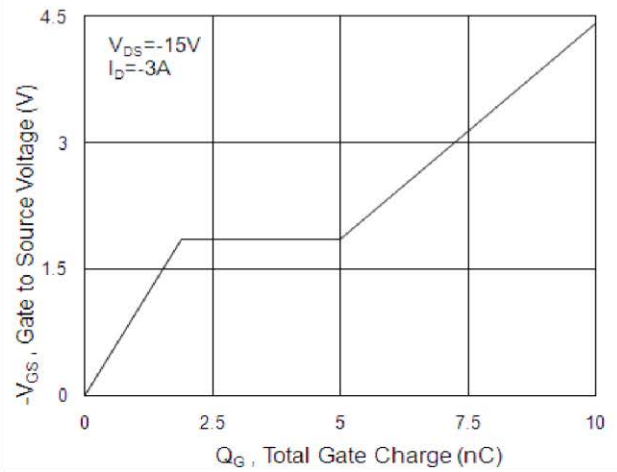


Fig.4 Gate-charge Characteristics

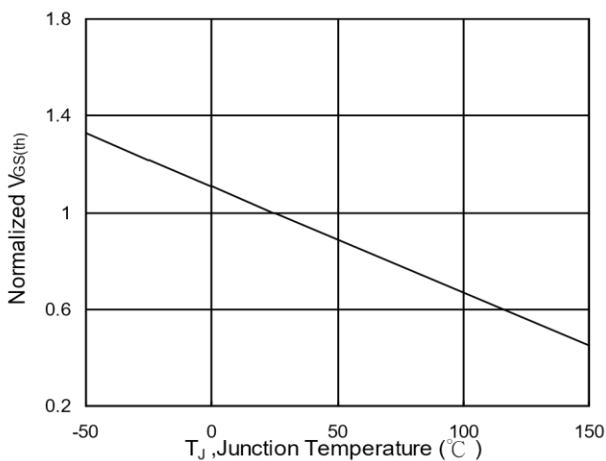


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

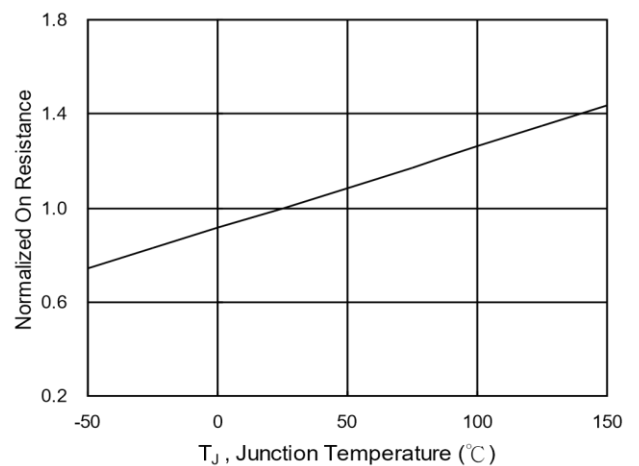
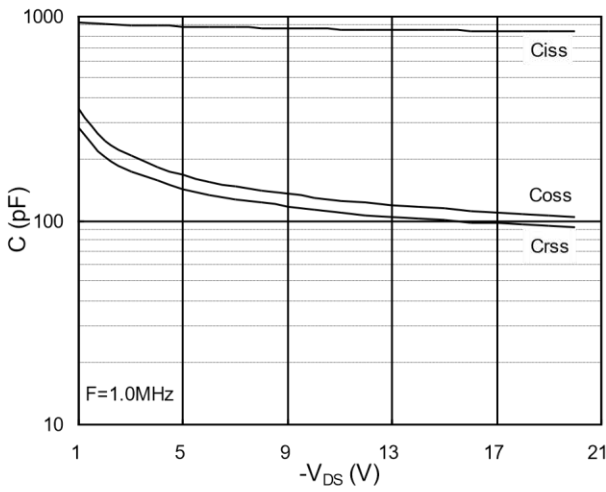
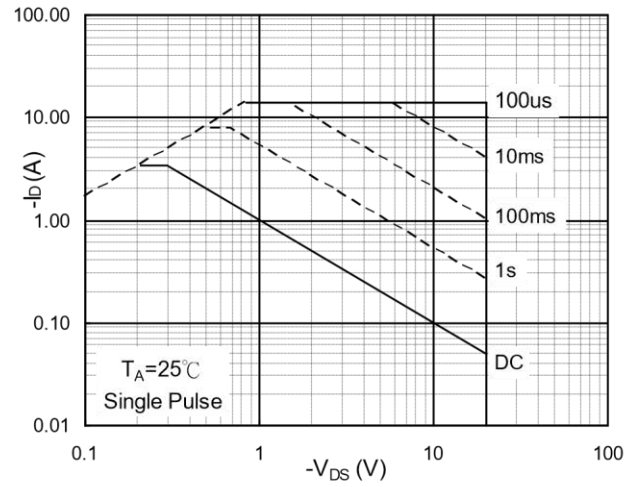


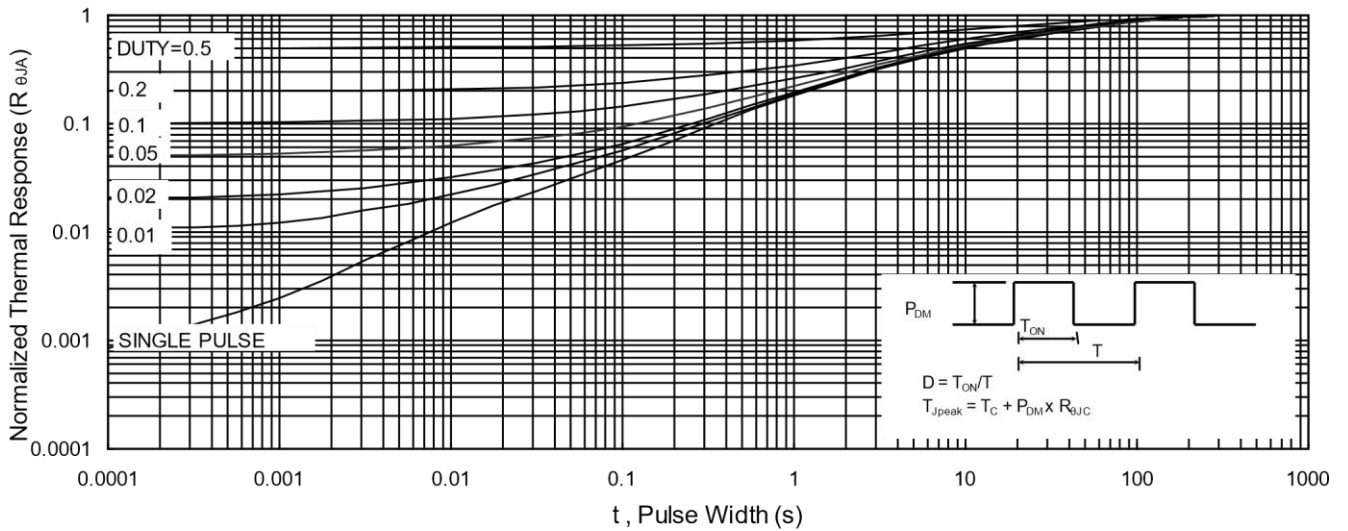
Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$



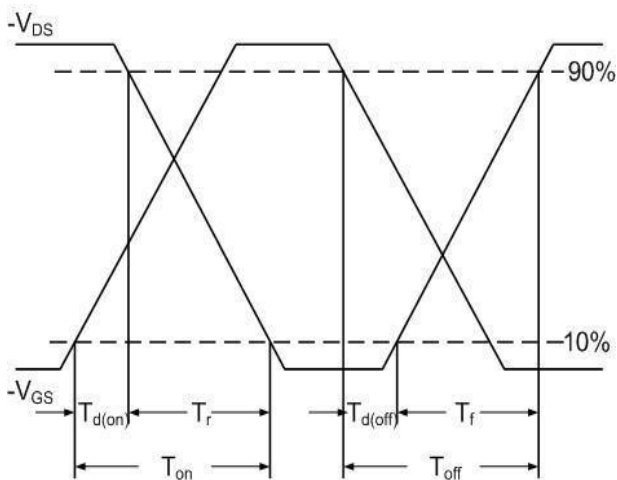
**Fig.7 Capacitance**



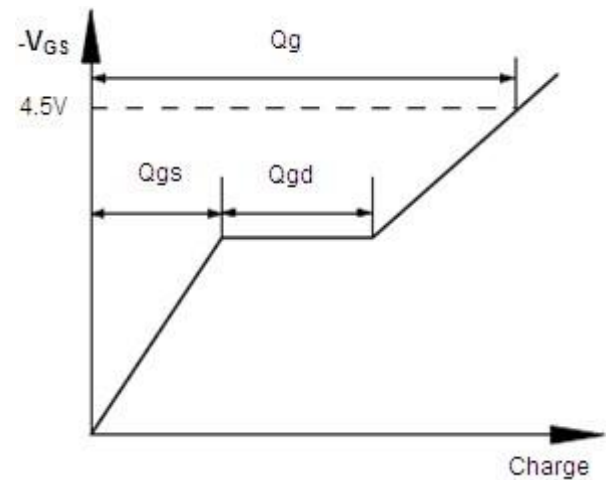
**Fig.8 Safe Operating Area**



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

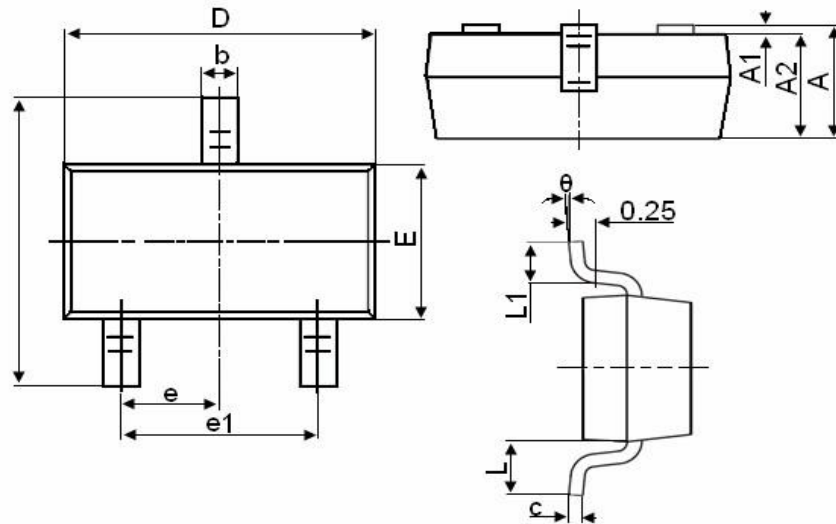


**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**

Package Mechanical Data-SOT-23



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
theta	0°	8°