

### Description

The LMTL5N10 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

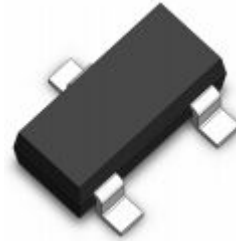
$V_{DS} = 100V$   $I_D = 5A$

$R_{DS(ON)} < 125m\Omega$  @  $V_{GS}=10V$

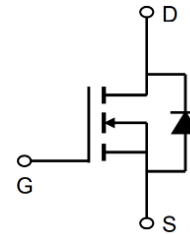
### Application

- Battery protection
- Load switch
- Uninterruptible power supply

### Dimensions SOT-23



### Pin Configuration



### Package Marking and Ordering Information

Device	Device Marking	Device Package	Reel Size	Tape width	Quantity
LMTL5N10	MA6	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	100	V
$V_{GS}$	Gate-Source Voltage	±20	V
$I_D@T_A=25^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup>	5	A
$I_D@T_A=70^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup>	3.2	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	16	A
$P_D@T_A=25^\circ C$	Total Power Dissipation <sup>3</sup>	3.1	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(steady state) <sup>1</sup>	100	°C/W
$R_{\theta JA}$	Thermal Resistance Junction-ambient( $t < 10s$ ) <sup>1</sup>	40	°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	100	108	---	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =4A	---	105	125	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A	---	120	145	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.2	1.7	2.5	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =80V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =80V, V <sub>GS</sub> =0V, T <sub>J</sub> =85°C	---	---	50	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	2.3	4.6	
Q <sub>g</sub>	Total Gate Charge (10V)	V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =4A	---	3.57	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	0.76	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	0.71	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3 I <sub>D</sub> =1A	---	11	---	ns
T <sub>r</sub>	Rise Time		---	6	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	30	---	
T <sub>f</sub>	Fall Time		---	4	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =50V, V <sub>GS</sub> =0V, f=1MHz	---	182	---	pF
C <sub>oss</sub>	Output Capacitance		---	30	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	3.6	---	
I <sub>s</sub>	Continuous Source Current <sup>1,4</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	2	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	---	---	1.2	V

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> 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

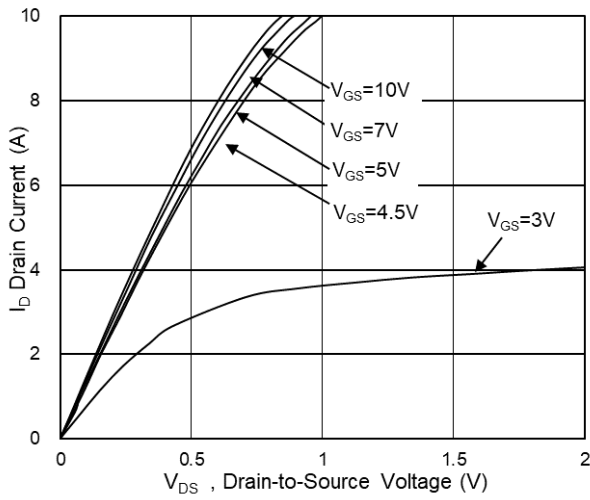


Fig.1 Typical Output Characteristics

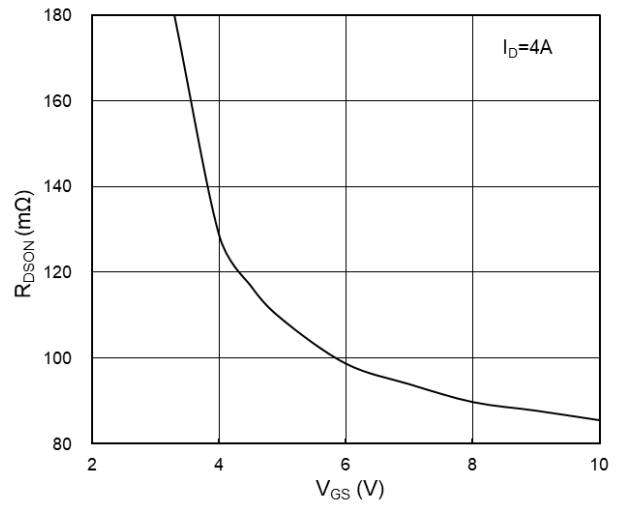


Fig.2 On-Resistance vs G-S Voltage

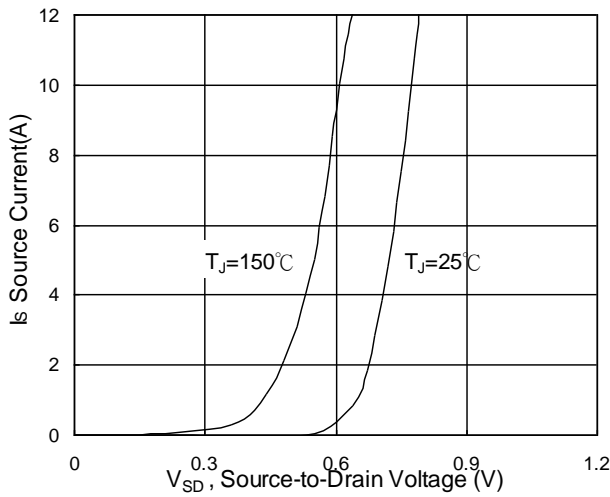


Fig.3 Source Drain Forward Characteristics

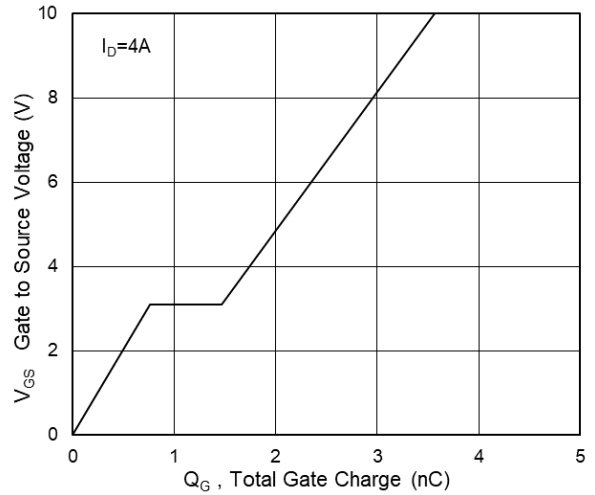


Fig.4 Gate-Charge Characteristics

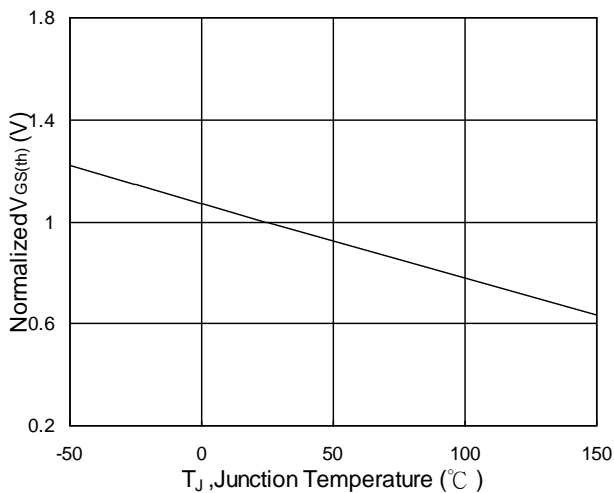


Fig.5 Normalized  $V_{GS(th)}$  vs  $T_J$

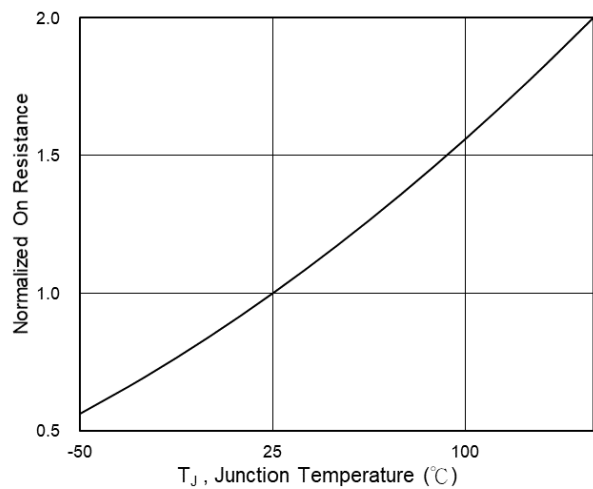
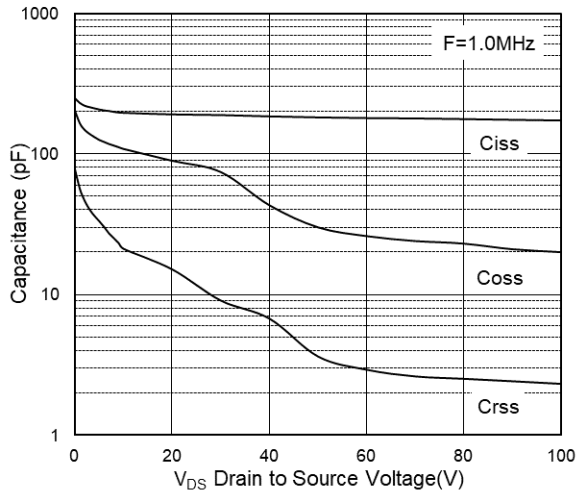
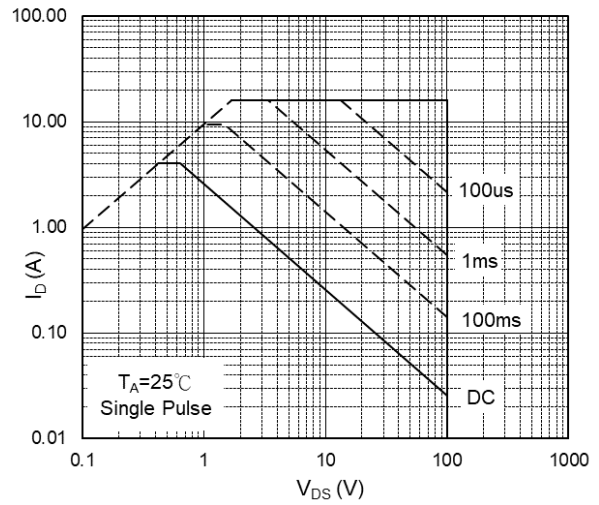


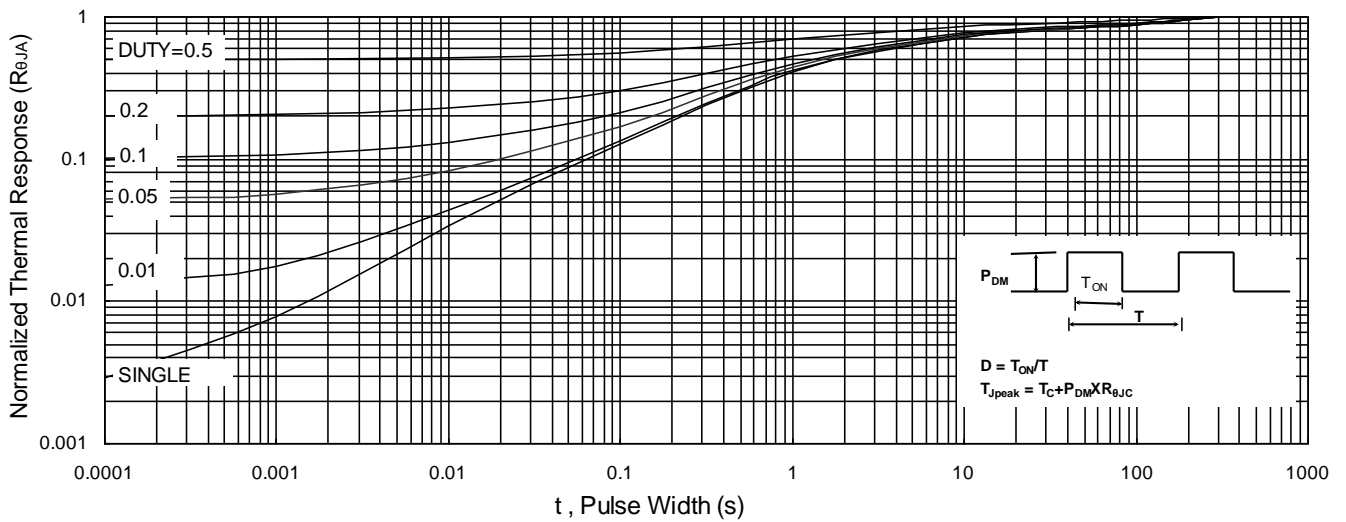
Fig.6 Normalized  $R_{DS(on)}$  vs  $T_J$



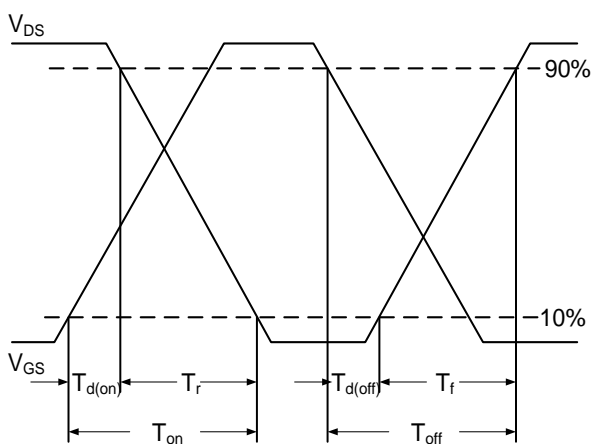
**Fig.7 Capacitance**



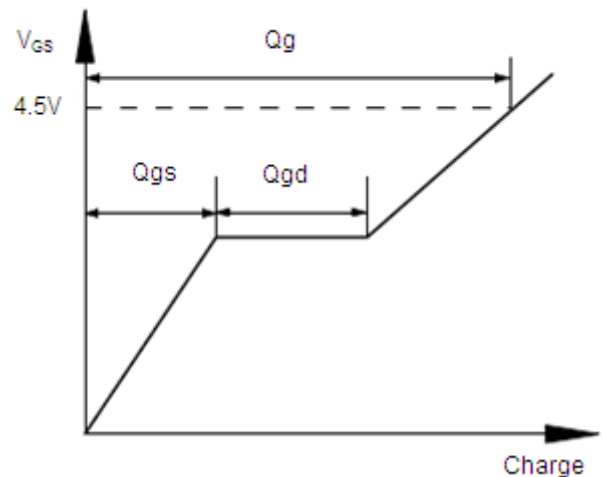
**Fig.8 Safe Operating Area**



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

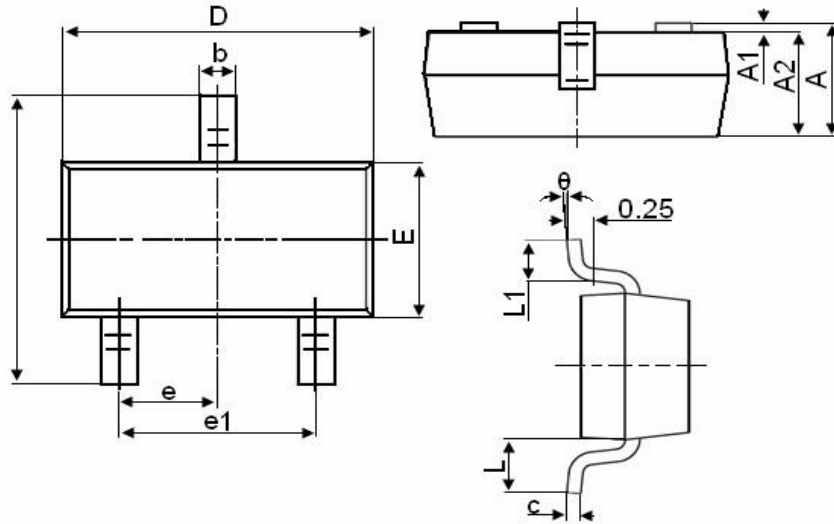


**Fig.10 Switching Time Waveform**



**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
θ	0°	8°