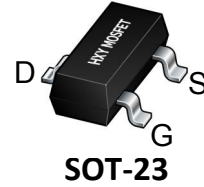




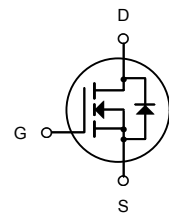
## Description

The IRLML0040TRPBF 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

$V_{DS} = 40V$   $I_D = 5A$   
 $R_{DS(ON)} < 38m\Omega @ V_{GS}=10V$   
 $R_{DS(ON)} < 52m\Omega @ V_{GS}=4.5V$



N-Channel MOSFET

## Application

Battery protection  
 Load switch  
 Uninterruptible power supply

## Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
IRLML0040TRPBF	SOT-23	2318	3000

## Absolute Maximum Ratings ( $T_C=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	40	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D$	Drain Current – Continuous ( $T_C=25^\circ C$ )	5	A
	Drain Current – Continuous ( $T_C=70^\circ C$ )	4.2	A
$P_D$	Power Dissipation ( $T_C=25^\circ C$ )	1.56	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance Junction to ambient	80	$^\circ C/W$



Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	40	--	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current(T <sub>A</sub> =25°C)	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T <sub>A</sub> =125°C)	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V	--	--	100	uA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	--	--	±100	nA
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.7	1.2	2.0	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance②	V <sub>GS</sub> =10V, I <sub>D</sub> =5A	--	30	38	mΩ
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance②	V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A	--	36	52	mΩ
<b>Dynamic Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz	--	340	--	pF
C <sub>oss</sub>	Output Capacitance		--	60	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	30	--	pF
R <sub>g</sub>	Gate Resistance	f=1MHz		7.8		Ω
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =20V I <sub>D</sub> =5A, V <sub>GS</sub> =10V	--	5.8	--	nC
Q <sub>gs</sub>	Gate Source Charge		--	0.4	--	nC
Q <sub>gd</sub>	Gate Drain Charge		--	2	--	nC
<b>Switching Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
t <sub>d(on)</sub>	Turn on Delay Time	V <sub>DD</sub> =20V, I <sub>D</sub> =3.5A, R <sub>G</sub> =1Ω, V <sub>GS</sub> =4.5V	--	4.1	--	ns
t <sub>r</sub>	Turn on Rise Time		--	11.6	--	ns
t <sub>d(off)</sub>	Turn Off Delay Time		-	24	--	ns
t <sub>f</sub>	Turn Off Fall Time		--	7.6	--	ns
<b>Source Drain Diode Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
I <sub>SD</sub>	Source drain current(Body Diode)	T <sub>A</sub> =25°C	--	--	1.75	A
V <sub>SD</sub>	Forward on voltage②	T <sub>J</sub> =25°C, I <sub>SD</sub> =3.5A, V <sub>GS</sub> =0V	--	0.79	1.2	V

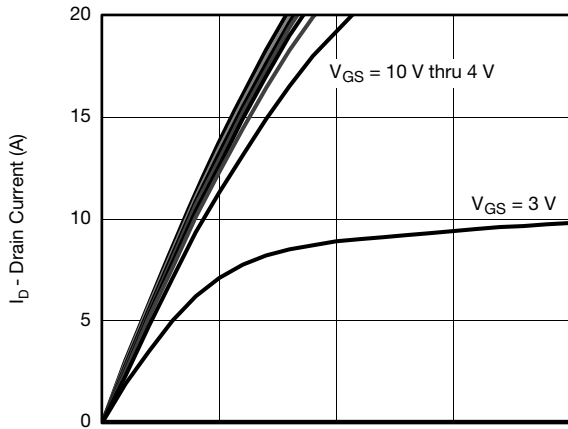
Notes:

① Pulse width limited by maximum allowable junction temperature

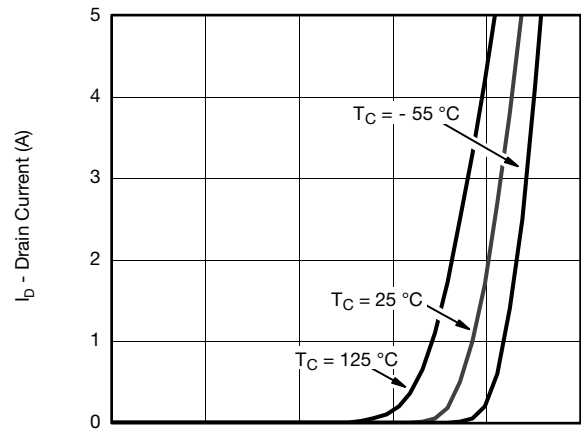
② Pulse test ; Pulse width≤300μs, duty cycle≤2%.



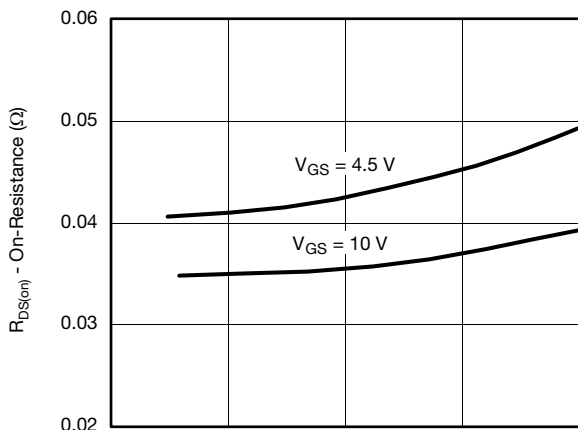
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



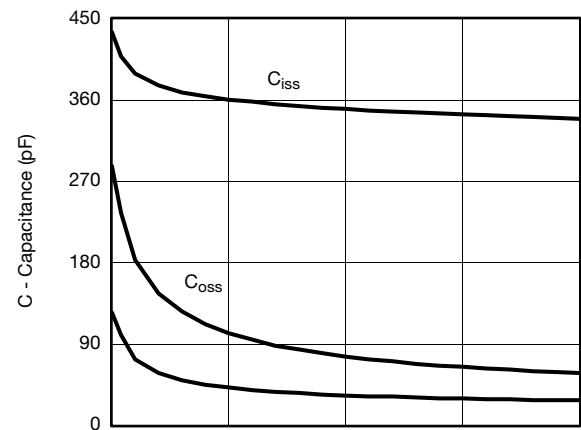
$V_{DS}$  - Drain-to-Source Voltage (V)  
**Output Characteristics**



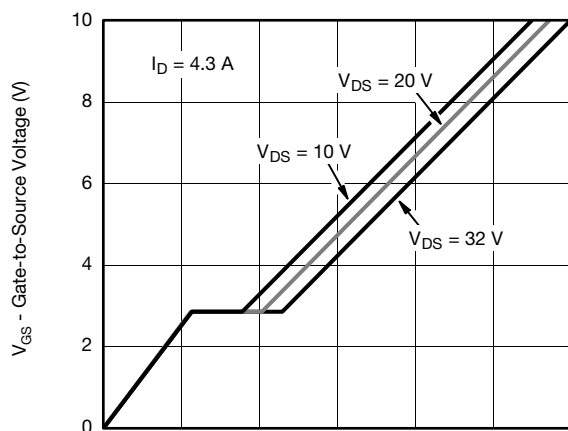
$V_{GS}$  - Gate-to-Source Voltage (V)  
**Transfer Characteristics**



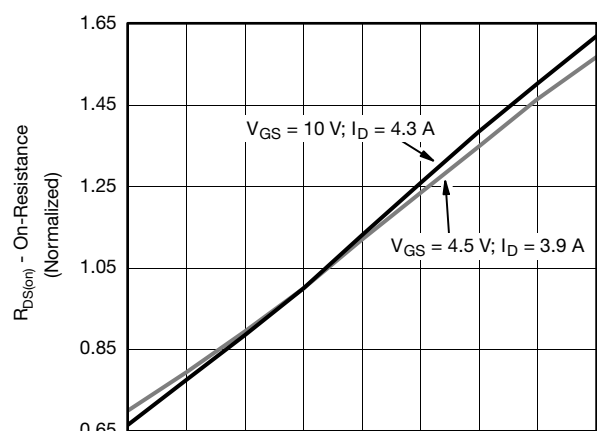
$I_D$  - Drain Current (A)  
**On-Resistance vs. Drain Current and Gate Voltage**



$V_{DS}$  - Drain-to-Source Voltage (V)  
**Capacitance**



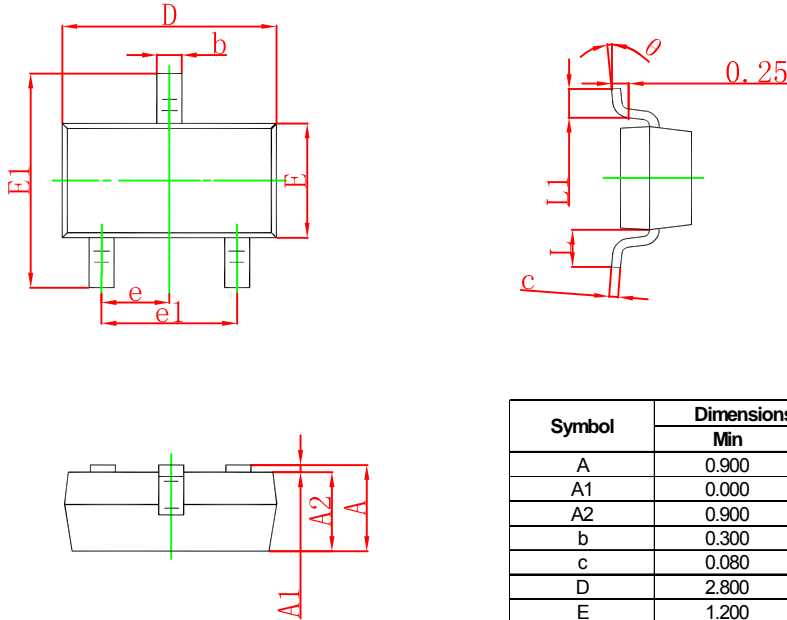
$Q_g$  - Total Gate Charge (nC)  
**Gate Charge**



$T_J$  - Junction Temperature ( $^\circ\text{C}$ )  
**On-Resistance vs. Junction Temperature**

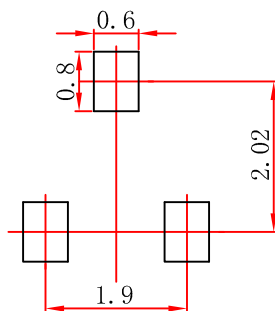


### SOT-23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
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	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

### SOT-23 Suggested Pad Layout



**Note:**

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.



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