

LPM9014

N-Channel Enhancement Mode Field Effect Transistor

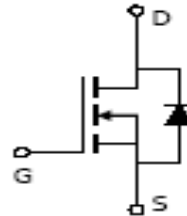
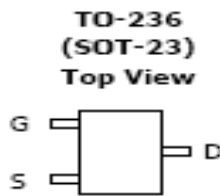
General Description

The LPM9014 uses advanced trench technology to provide excellent RDS(ON), low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications. *Standard Product LPM9014 is Pb-free (meets ROHS & Sony 259 specifications). LPM9014L is a Green Product ordering option. LPM9014 and LPM9014L are electrically identical.*

Features

- VDS (V) = 20V
- ID = 4.2A
- RDS(ON) < 50mΩ (VGS = 4.5V)
- RDS(ON) < 63mΩ (VGS = 2.5V)
- RDS(ON) < 87mΩ (VGS = 1.8V)

Pin Configurations



Absolute Maximum Ratings $T_A=25^{\circ}\text{C}$ unless otherwise noted			
Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 8	V
Continuous Drain Current ^A	I_D	$T_A=25^{\circ}\text{C}$	4.2
		$T_A=70^{\circ}\text{C}$	3.2
Pulsed Drain Current ^B	I_{DM}	15	A
Power Dissipation ^A	P_D	$T_A=25^{\circ}\text{C}$	1.4
		$T_A=70^{\circ}\text{C}$	0.9
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^{\circ}\text{C}$

Thermal Characteristics					
Parameter	Symbol	Typ	Max	Units	
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	$t \leq 10\text{s}$	70	90	$^{\circ}\text{C/W}$
Maximum Junction-to-Ambient ^A		Steady-State	100	125	$^{\circ}\text{C/W}$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	63	80	$^{\circ}\text{C/W}$	

Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=16\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 8\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	0.4	0.6	1	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$, $V_{DS}=5\text{V}$	15			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=4.5\text{V}$, $I_D=4.2\text{A}$ $T_J=125^\circ\text{C}$		41 58	50 70	m Ω
		$V_{GS}=2.5\text{V}$, $I_D=3.7\text{A}$		52	63	m Ω
		$V_{GS}=1.8\text{V}$, $I_D=3.2\text{A}$		67	87	m Ω
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=4.2\text{A}$		11		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		0.76	1	V
I_S	Maximum Body-Diode Continuous Current				2	A
DYNAMIC PARAMETERS						
C_{ISS}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=10\text{V}$, $f=1\text{MHz}$		436		pF
C_{OSS}	Output Capacitance			66		pF
C_{RSS}	Reverse Transfer Capacitance			44		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		3		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=4.5\text{V}$, $V_{DS}=10\text{V}$, $I_D=4.2\text{A}$		6.2		nC
Q_{gs}	Gate Source Charge			1.6		nC
Q_{gd}	Gate Drain Charge			0.5		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=5\text{V}$, $V_{DS}=10\text{V}$, $R_L=2.7\Omega$, $R_{GEN}=6\Omega$		5.5		ns
t_r	Turn-On Rise Time			6.3		ns
$t_{D(off)}$	Turn-Off Delay Time			40		ns
t_f	Turn-Off Fall Time			12.7		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=4\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		12.3		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=4\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		3.5		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any a given application depends on the user's specific board design. The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

D: The static characteristics in Figures 1 to 6,12,14 are obtained using 80 μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

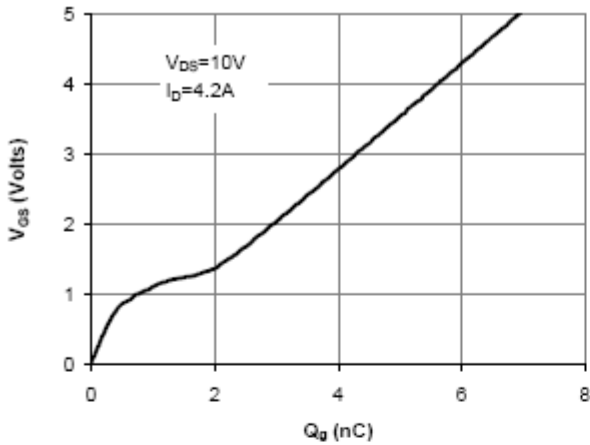


Figure 7: Gate-Charge Characteristics

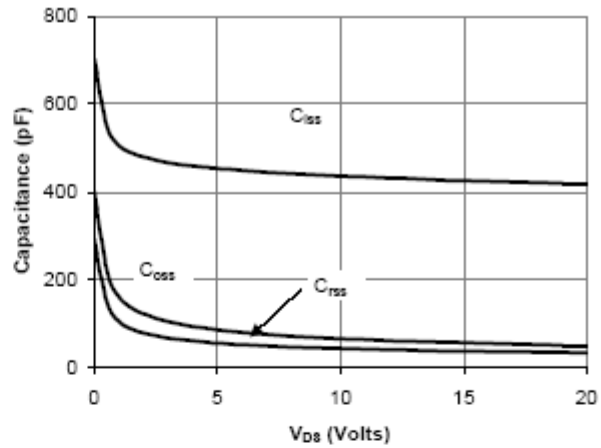


Figure 8: Capacitance Characteristics

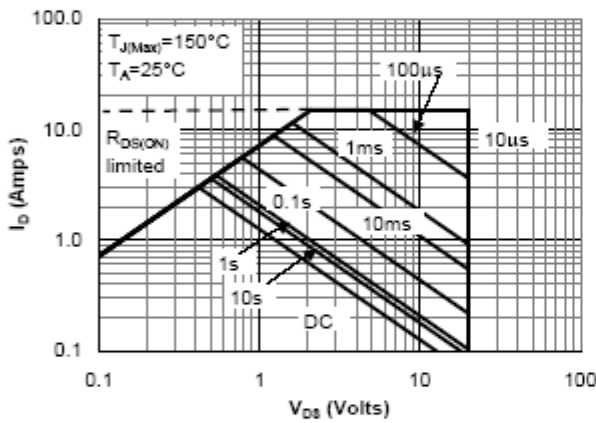


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

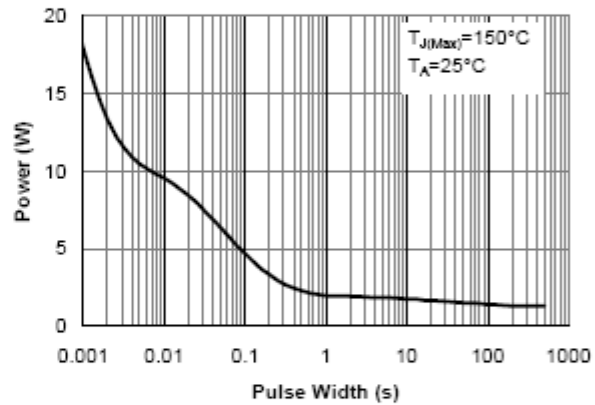


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

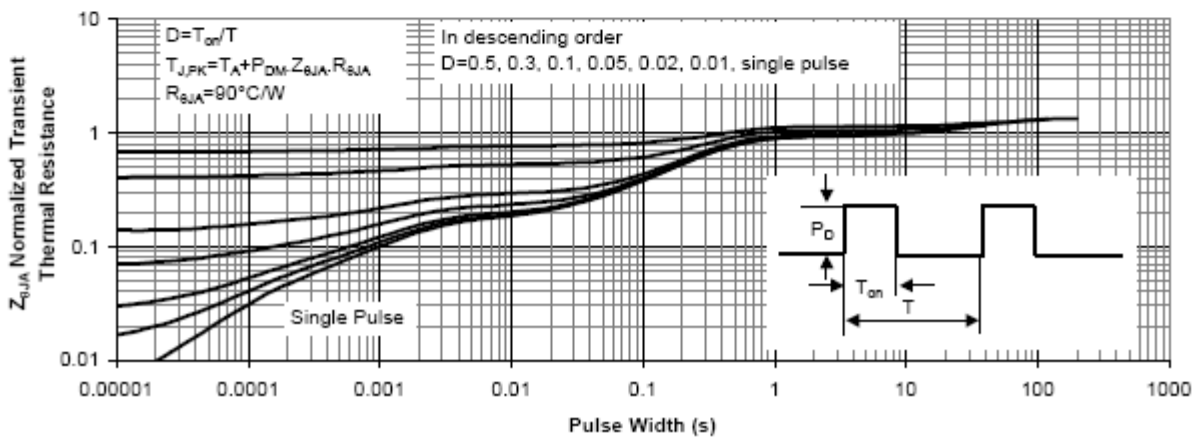


Figure 11: Normalized Maximum Transient Thermal Impedance