

PWRLITE LU1014D

High Performance N-Channel *POWERJFET™* with PN Diode



Features

- ❖ Superior gate charge x R_{ds(on)} product (FOM)
- ❖ Trench Power JFET with low threshold voltage V_{th}.
- ❖ Device fully “ON” with V_{gs} = 0.7V
- ❖ Optimum for “Low Side” Buck Converters
- ❖ Excellent for high frequency dc/dc converters
- ❖ Optimized for Secondary Rectification in isolated DC-DC
- ❖ Low R_g and low C_{ds} for high speed switching

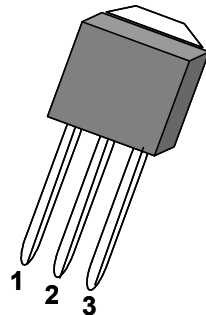
Applications

- ❖ DC-DC Converters
- ❖ Synchronous Rectifiers
- ❖ PC Motherboard Converters
- ❖ Step-down power supplies
- ❖ VRM Modules

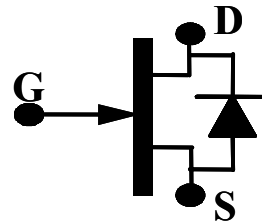
Description

The Power JFET transistor from Lovoltech is a device that presents a Low R_{ds(on)} allowing for improved efficiencies in DC-DC switching applications. The device is designed with a low threshold such that drivers can operate at 5V, which reduces the driver power dissipation and increases the overall efficiency. Lower threshold produces faster turn-on/turn-off, which minimizes the required dead time. A PN Diode is added for applications where a freewheeling diode is required. This product has tin plated leads.

IPAK Lead-free Pin Assignments



Case TO251 (IPAK)



N – Channel PowerJFET
with PN Diode

Pin Definitions

Pin Number	Pin Name	Pin Function Description	Product Summary		
			V _{DS} (V)	R _{ds(on)} (Ω)	I _D (A)
1	Gate	Gate. Transistor Gate	24V	0.0065	50 ¹
2, 4	Drain	Drain. Transistor Drain			
3	Source	Source. Transistor Source			

Absolute Maximum Ratings

Parameter	Symbol	Ratings	Units
Drain-Source Voltage	V _{DS}	24	V
Gate-Source Voltage	V _{GS}	-12	V
Gate-Drain Voltage	V _{GD}	-28	V
Continuous Drain Current	I _D	50 ¹	A
Pulsed Drain Current	I _D	100	A
Single Pulse Drain-to-Source Avalanche Energy at 25°C (V _{DD} =6V _{DC} , I _L =60A _{PK} , L=0.3mH, R _G =100Ω)	E _{AS}	200	mJ
Junction Temperature	T _J	-55 to 150°C	°C
Storage Temperature	T _{STG}	-65 to 150°C	°C
Lead Soldering Temperature, 10 seconds	T	260°C	°C
Power Dissipation (Derated at 25°C)	P _D	69	W

Thermal Resistance

Symbol	Parameter		DPAK Ratings	Units
$R\theta_{JA}$	Thermal Resistance Junction-to-Ambient		90	°C/W
$R\theta_{JC}$	Thermal Resistance Junction-to-Case		1.8	°C/W

Electrical Specifications

($T_A = +25^\circ\text{C}$, unless otherwise noted.)

The ϕ denotes a specification which apply over the full operating temperature range.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Static						
BV_{DSX}	Breakdown Voltage Drain to Source	$I_D = 0.5 \text{ mA}$ $V_{GS} = -4 \text{ V}$	24	28		V
BV_{GDO}	Breakdown Voltage Gate to Drain	$I_G = -50\mu\text{A}$		-32	-28	V
BV_{GSO}	Breakdown Voltage Gate to Source	$I_G = -50\mu\text{A}$		-14	-12	V
$R_{DS(ON)}$	Drain to Source On Resistance ²	$I_G = 40 \text{ mA}, I_D = 10 \text{ A}$ $I_G = 10 \text{ mA}, I_D = 10 \text{ A}$ $I_G = 5 \text{ mA}, I_D = 10 \text{ A}$		4.6 4.8 4.9	6.5 7.0	mΩ mΩ
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = 0.1 \text{ V}, I_D = 250\mu\text{A}$		-1		V
TCV_{GSTH}	Temperature Coefficient of Gate Threshold Voltage	$V_{DS} = 0.1 \text{ V}, I_D = 250\mu\text{A}$		-2.6		mV/°C
Dynamic						
Q_{Gsync}	Total Gate Charge Sync JFET	$\Delta V_{Drive} = 5 \text{ V}, V_{DS} = 0.1 \text{ V}$ (Fig. 2)		9.8		nC
Q_G	Total Gate Charge	$\Delta V_{Drive} = 5 \text{ V}, I_D = 10 \text{ A}, V_{DS} = 15 \text{ V}$		12.4		nC
Q_{GD}	Gate to Drain Charge	$V_{DS} = 13.5 \text{ V}$ to $V_{DS} = 1.5 \text{ V}$		8.1		nC
Q_{GS}	Gate to Source Charge	$V_{GS} = -4.5 \text{ V}$ to $V_{DS} = 13.5 \text{ V}$		4.3		nC
Q_{SW}	Switching Charge	$V_{GS} = -2 \text{ V}$ to $V_{DS} = 1.5 \text{ V}$		9.1		nC
R_G	Gate Resistance			0.7		Ω
$T_{D(ON)}$	Turn-on Delay Time	$V_{DD} = 15 \text{ V}, I_D = 10 \text{ A}$ $V_{Drive} = 5 \text{ V}$ Resistive Load		5.5		ns
T_R	Rise Time			12.6		
$T_{D(OFF)}$	Turn-off Delay			10.3		
T_F	Fall Time			6.6		
C_{ISS}	Input Capacitance	$V_{DS} = 10 \text{ V}, V_{GS} = -5 \text{ V}, 1 \text{ MHz}$. (see Fig. 4)		1147		pF
C_{OSS}	Output Capacitance			467		
C_{GS}	Gate-Source Capacitance			784		
C_{GD}	Gate-Drain Capacitance			363		
C_{DS}	Drain-Source Capacitance			104		
PN Diode						
I_R	Reverse Leakage	$V_R = 20 \text{ V}, V_{GS} = -4 \text{ V}$			0.3	mA
V_F	Forward Voltage	$I_F = 1 \text{ A}$		812		mV
V_F	Forward Voltage	$I_F = 10 \text{ A}$		932		mV
V_F	Forward Voltage	$I_F = 20 \text{ A}$		1010		mV
Q_{rr}	Reverse Recovery Charge	$I_s = 10 \text{ A}$ di/dt = 100A/us,		7		nC
T_{rr}	Reverse Recovery Time	$I_s = 10 \text{ A}$ di/dt = 100A/us,		13.3		ns

Notes:

- Current is limited by bondwire; with an $R_{thjc} = 1.8 \text{ }^\circ\text{C/W}$ the chip is able to carry 80A.
- Pulse width $\leq 500\mu\text{s}$, duty cycle $\leq 2\%$

Typical Operating Characteristics

($T_A = +25^\circ\text{C}$, unless otherwise noted.)

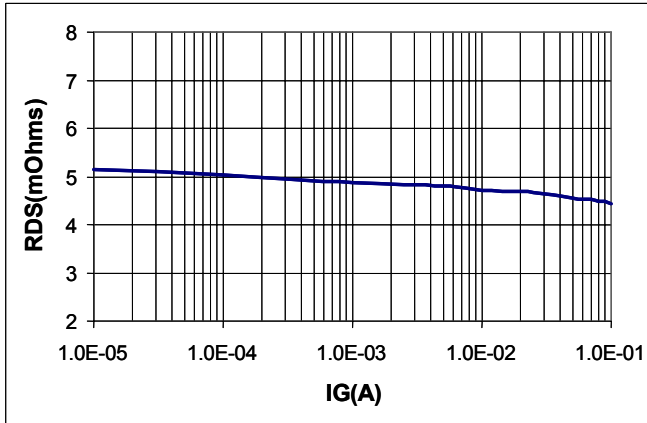


Figure 1 – $R_{DS(on)}$ vs Gate Current at $I_D = 10\text{A}$

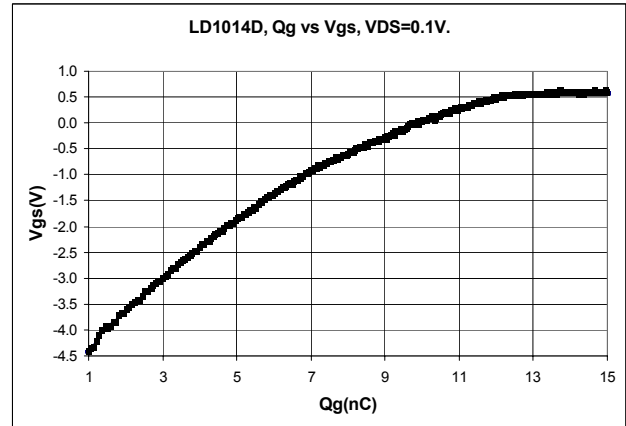


Figure 2 – Gate Charge $Q_{g_{sync}}$ for $V_{DS}=0.1\text{V}$

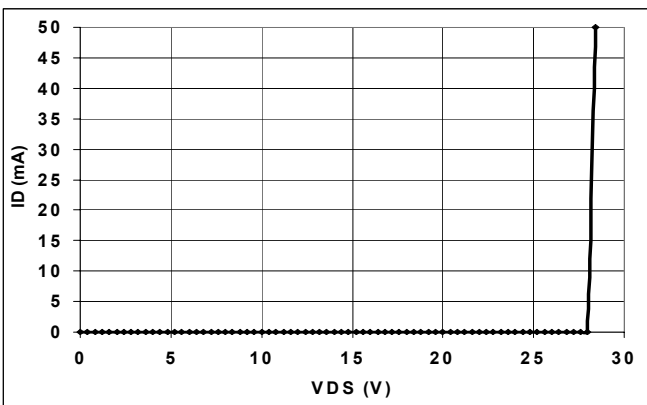


Figure 3 – Breakdown Voltage V_{DS} vs I_D

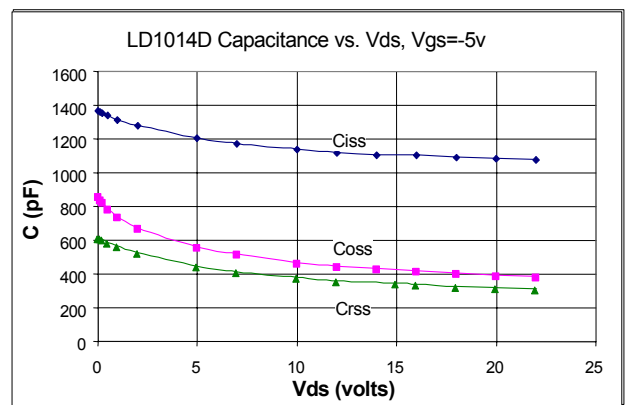


Figure 4 – Capacitance vs Drain Voltage V_{DS}

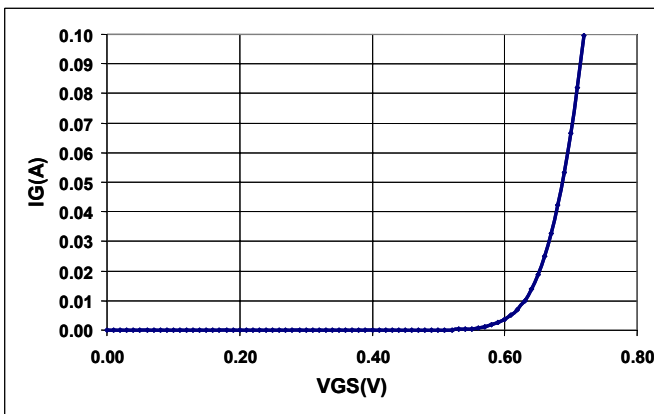


Figure 5 – I_G vs Gate Voltage V_{GS}

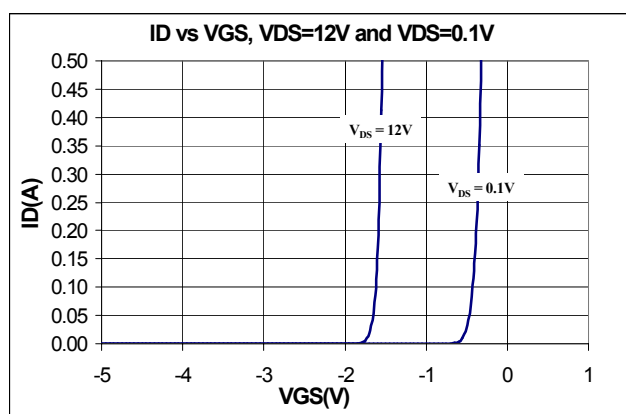


Figure 6 – Transfer Characteristic

Typical Operating Characteristics

($T_A = +25^\circ\text{C}$, unless otherwise noted.)

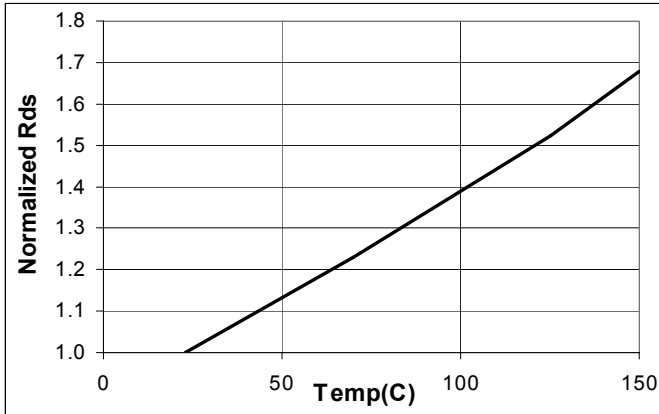


Figure 7 – $R_{DS(on)} = f(T)$; $I_D = -10\text{A}$; $I_G = 40\text{mA}$

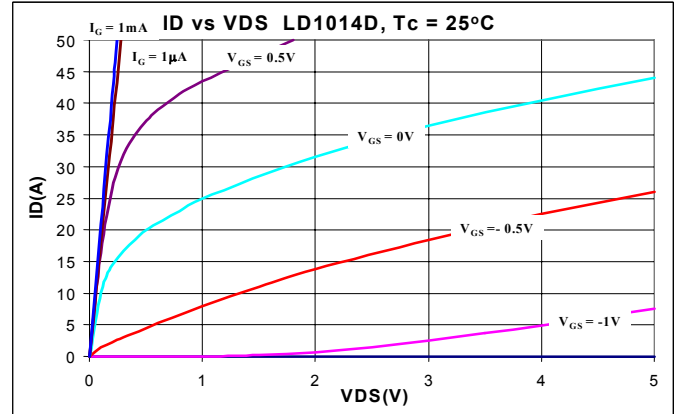


Figure 8 – I_D vs V_{DS} Characteristics

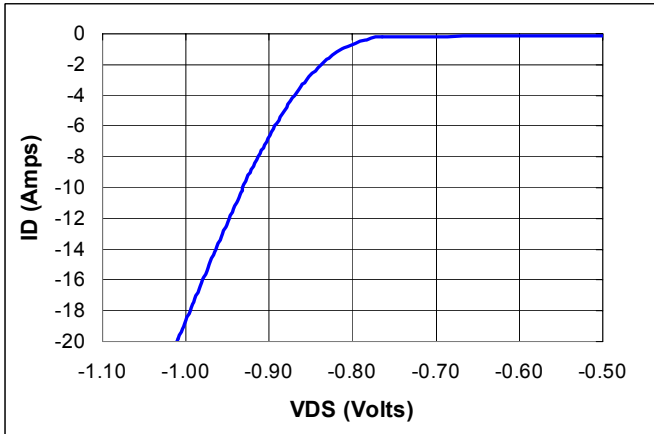


Figure 9 – PN Diode Voltage vs Current

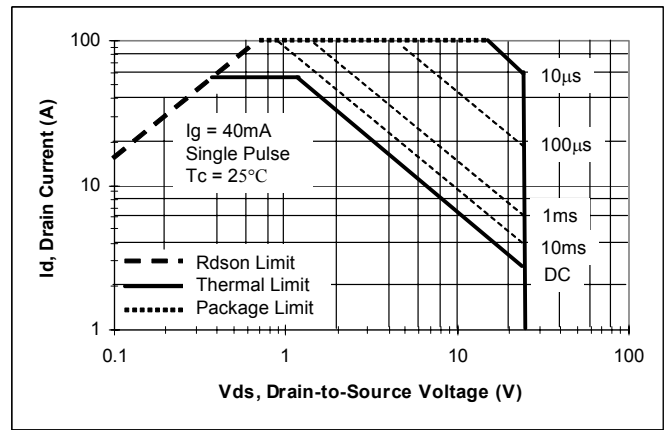


Figure 10 – Safe Operating Area

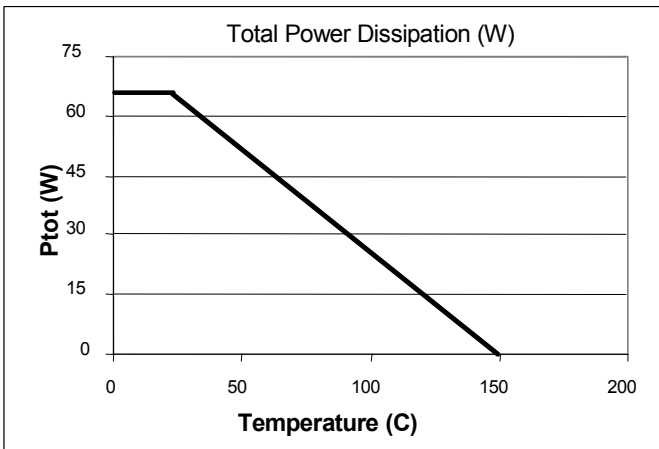


Figure 11 – Total Power Dissipation

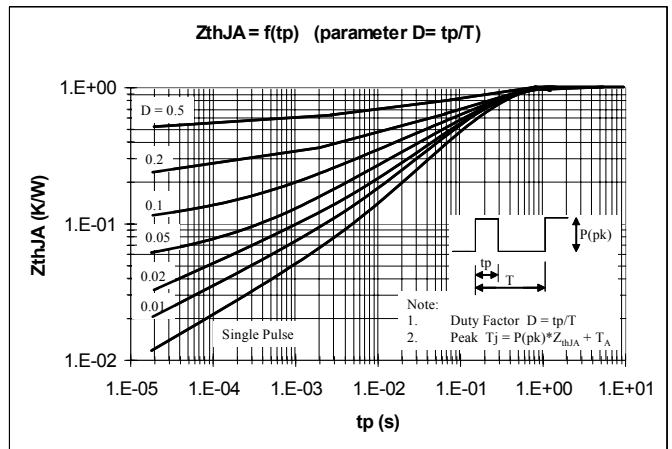


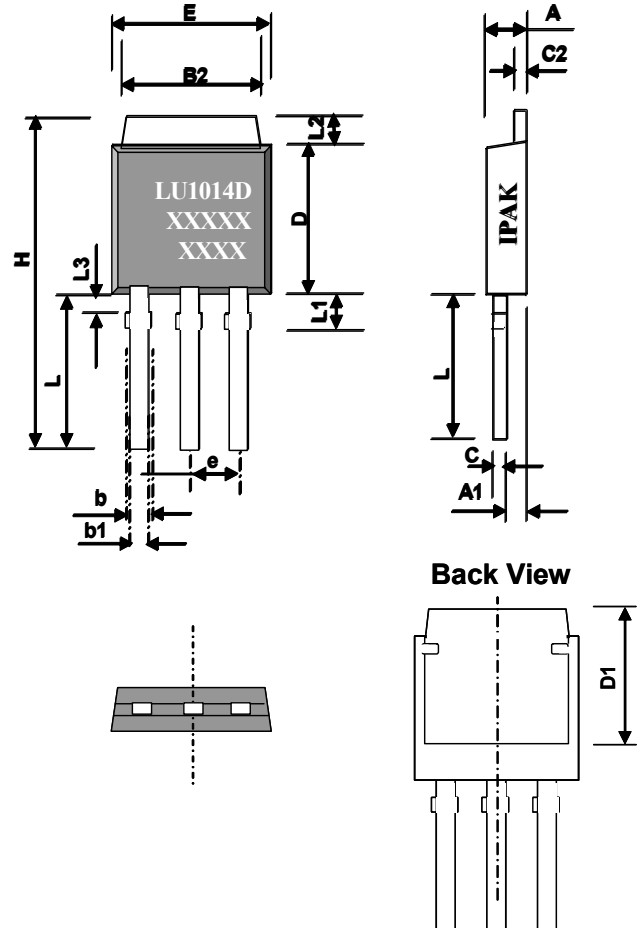
Figure 12 – Normalized Thermal Response

Ordering Information

Product Number	PN Marking	Package	Notes:
LU1014D	LU1014D	TO251 (IPAK)	This product is Pb-Free and has Tin Plated leads

Package and Marking Information

DIMENSIONS						
DIM.	mm.			inch		
	TYP.	MIN.	MAX.	TYP.	MIN.	MAX.
A		2.19	2.40	0.086	0.094	
A1		0.89	1.14	0.035	0.045	
b		0.76	1.14	0.030	0.045	
b1		0.64	0.90	0.025	0.035	
B2		5.20	5.46	0.205	0.215	
C		0.45	0.60	0.017	0.023	
C2		0.45	0.60	0.017	0.023	
D		5.97	6.22	0.235	0.244	
D1	5.64			0.222		
E		6.35	6.73	0.250	0.265	
e	2.28			0.090		
H	13.19	13.06	13.32	0.514	0.525	
L		5.95	7.6	0.234	0.300	
L1		2.03	2.29	0.079	0.090	
L3		0.63	1.14	0.025	0.045	


Life Support Policy

LOVOLTECH's PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF LOVOLTECH, Inc. As used herein:

- Life support devices or systems are devices or systems which (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in a significant injury of the user.
- A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

Datasheet Identification	Product Status	Definition
Advance Information	In definition or in Design	This datasheet contains the design specifications for product development. Specifications may change without notice.
Preliminary	Initial Production	This datasheet contains preliminary data; additional and application data will be published at a later date. Lovoltech, Inc. reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	In Production	This datasheet contains final specifications. Lovoltech reserves the right to make changes at any time without notice in order to improve the design.