Lovoltech™

Breakthrough Power JFET Technology

PWRLITE LU1014D

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

Features

- Superior gate charge x Rdson product (FOM)
- Trench Power JFET with low threshold voltage Vth.
- Device fully "ON" with Vgs = 0.7V
- Optimum for "Low Side" Buck Converters
- Excellent for high frequency dc/dc converters
- Optimized for Secondary Rectification in isolated DC-DC
- Low Rg and low Cds for high speed switching

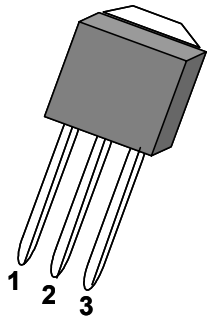
Description

The Power JFET transistor from Lovoltech is a device that presents a Low Rdson 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.

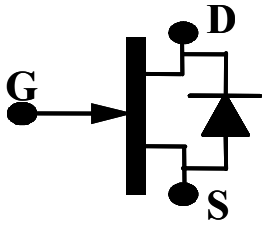
Applications

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

IPAK Lead-free Pin Assignments



Case TO251 (IPAK)



N – Channel PowerJFET with PN Diode

Pin Definitions

Pin Number	Pin Name	Pin Function Description
1	Gate	**Gate.** Transistor Gate
2, 4	Drain	**Drain.** Transistor Drain
3	Source	**Source.** Transistor Source

Product Summary		
V_{DS} (V)	Rdson (Ω)	I_D (A)
24V	0.0065	50[1]

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}, IL=60A_{PK}, L=0.3mH, R_G=100 Ω)	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°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 mA V_{GS}= -4 V		24	28		V
BV_{GDO}	Breakdown Voltage Gate to Drain	I_G = -50µA			-32	-28	V
BV_{GSO}	Breakdown Voltage Gate to Source	I_G = -50µA			-14	-12	V
$R_{DS(ON)}$)	Drain to Source On Resistance[2]	I_G = 40 mA, I_D=10A I_G = 10 mA, I_D=10A I_G = 5 mA, I_D=10A			4.6 4.8 4.9	6.5 7.0	mΩ mΩ
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS}=0.1 V, I_D=250µA			-1		V
TCV_{GSTH}	Temperature Coefficient of Gate Threshold Voltage	V_{DS}=0.1 V, I_D=250µA			-2.6		mV/°C
	Dynamic						
Q_{Gsync}	Total Gate Charge Sync JFET	ΔV_{Drive} =5V,V_{DS}=0.1V (Fig. 2)			9.8		nC
Q_G	Total Gate Charge	ΔV_{Drive} =5V, I_D=10A,V_{DS}=15V			12.4		nC
Q_{GD}	Gate to Drain Charge	V_{DS}=13.5V to V_{DS}=1.5V			8.1		nC
Q_{GS}	Gate to Source Charge	V_{GS} =-4.5V to V_{DS}=13.5V			4.3		nC
Q_{SW}	Switching Charge	V_{GS} =-2V to V_{DS}=1.5V			9.1		nC
R_G	Gate Resistance				0.7		Ω
$T_{D(ON)}$)	Turn-on Delay Time	V_{DD}=15V, I_D=10A V_{Drive} = 5 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}=10V, V_{GS}= -5 V, 1MHz. (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=20V, Vgs = -4V				0.3	mA
V_F	Forward Voltage	I_F = 1 A			812		mV
V_F	Forward Voltage	I_F = 10 A			932		mV
V_F	Forward Voltage	I_F = 20 A			1010		mV
Qrr	Reverse Recovery Charge	I_s = 10 A di/dt = 100A/us,			7		nC
Trr	Reverse Recovery Time	I_s = 10 A di/dt = 100A/us,			13.3		ns

Notes:

1. Current is limited by bondwire; with an Rthjc = 1.8 °C/W the chip is able to carry 80A.
2. Pulse width <= 500µs, duty cycle < = 2%

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Typical Operating Characteristics

(T_A = +25°C, unless otherwise noted.)

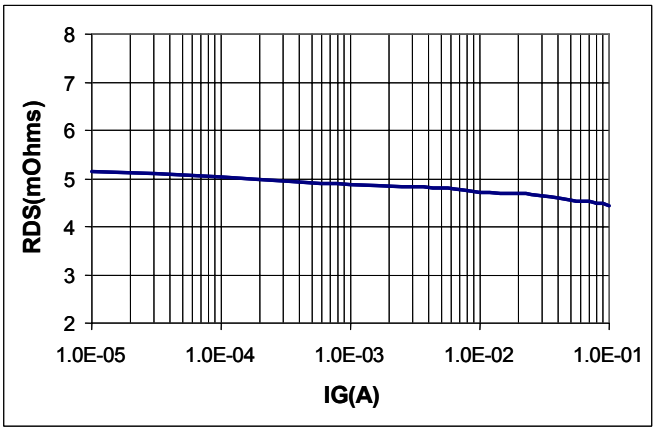

Figure 1 – R_{DSON} vs Gate Current at I_D – 10A

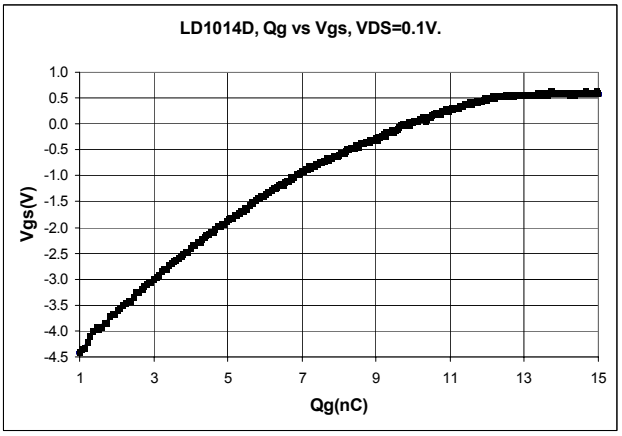

Figure 2 – Gate Charge Qg_{sync} for V_{DS}=0.1V

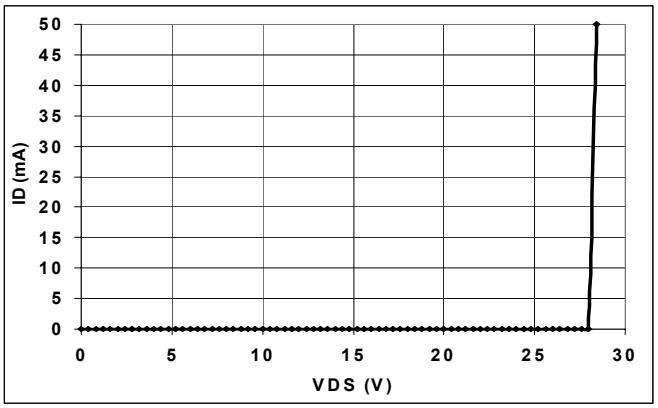

Figure 3 – Breakdown Voltage Vds vs Id

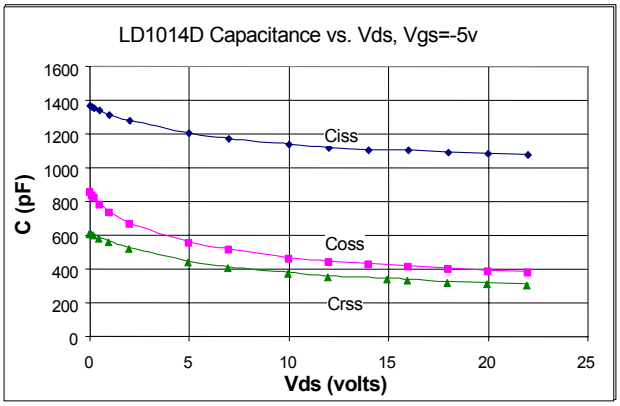

Figure 4 – Capacitance vs Drain Voltage Vds

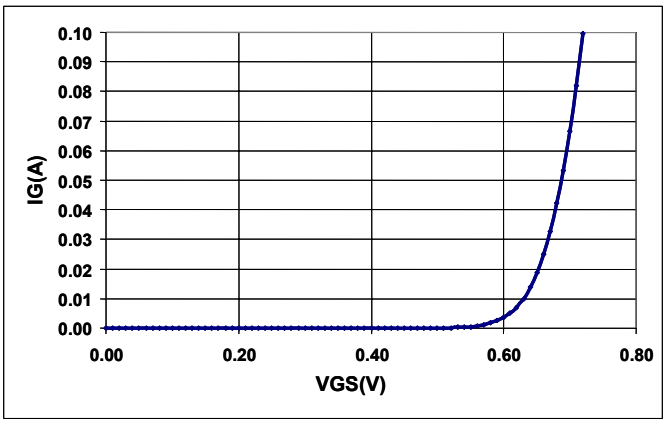

Figure 5 – I_G vs Gate Voltage V_{GS}

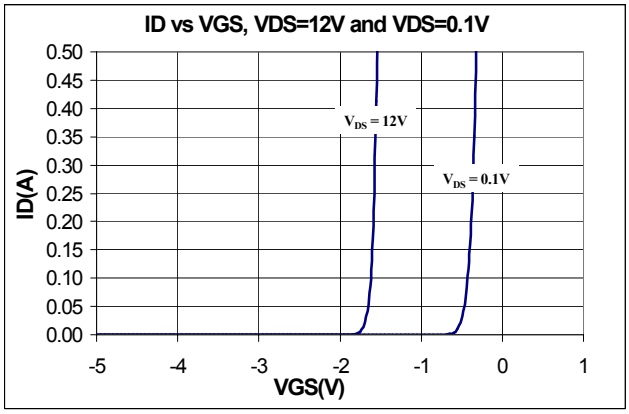

Figure 6 – Transfer Characteristic

Typical Operating Characteristics

(T_A = +25°C, unless otherwise noted.)

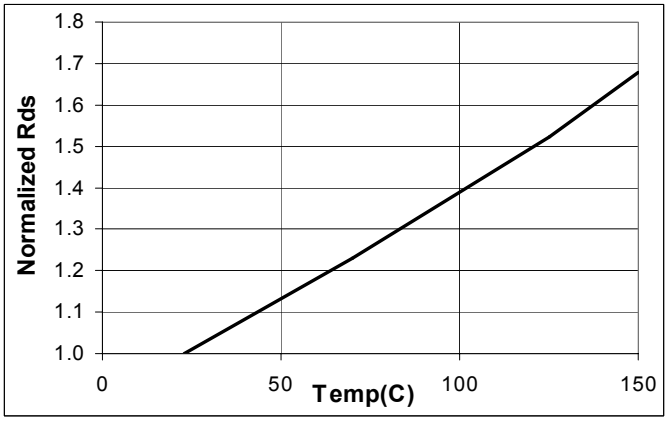

Figure 7 – R_{DSON} =f(T); I_D = -10A; I_G = 40mA

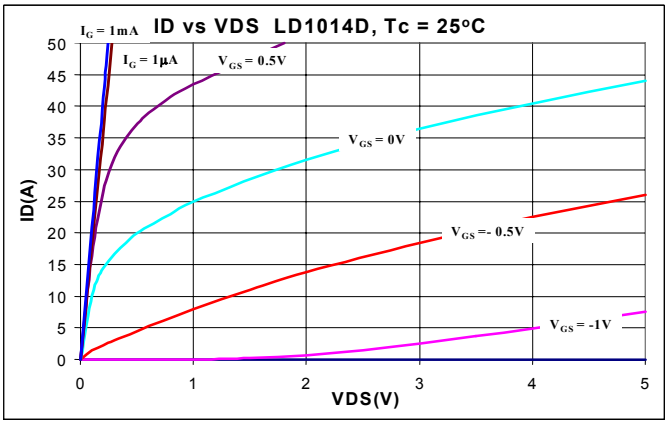

Figure 8 – I_D vs V_{DS} Characteristics

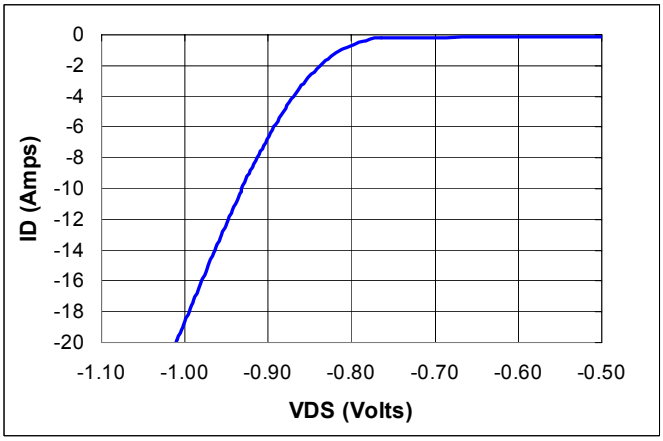

Figure 9 – PN Diode Voltage vs Current

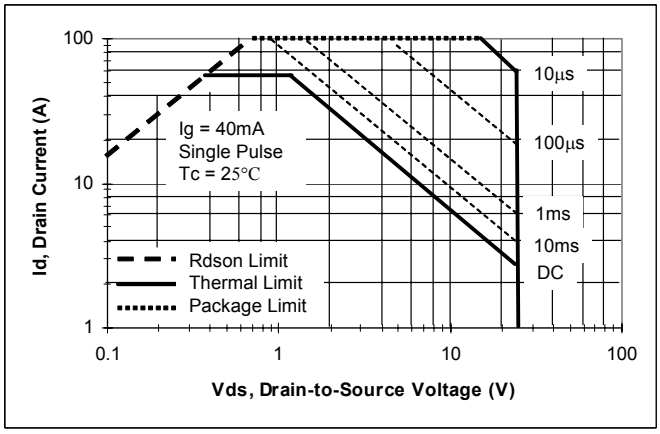

Figure 10 – Safe Operating Area

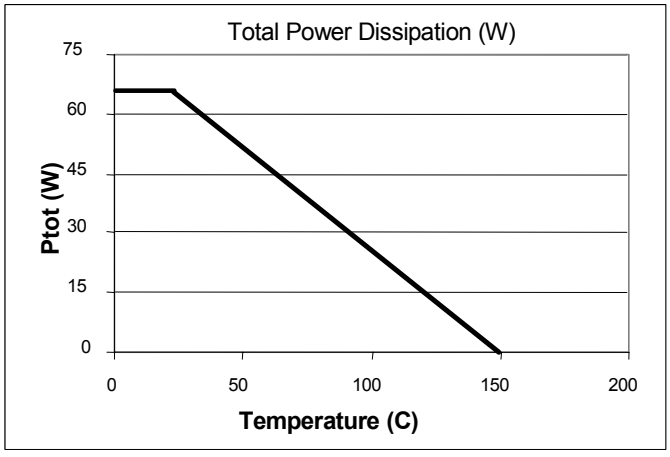

Figure 11 – Total Power Dissipation

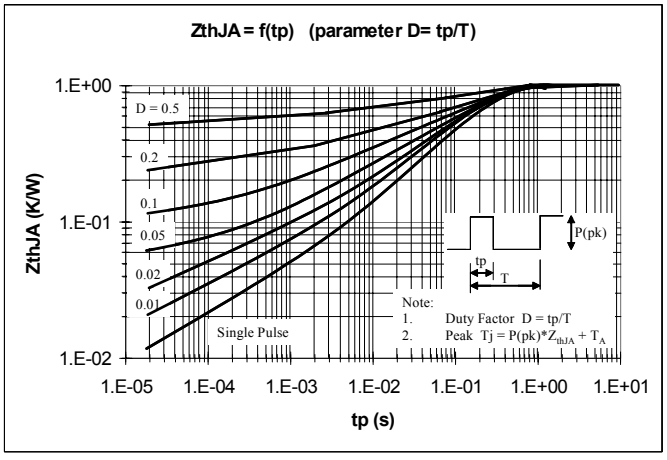

Figure 12 – Normalized Thermal Response

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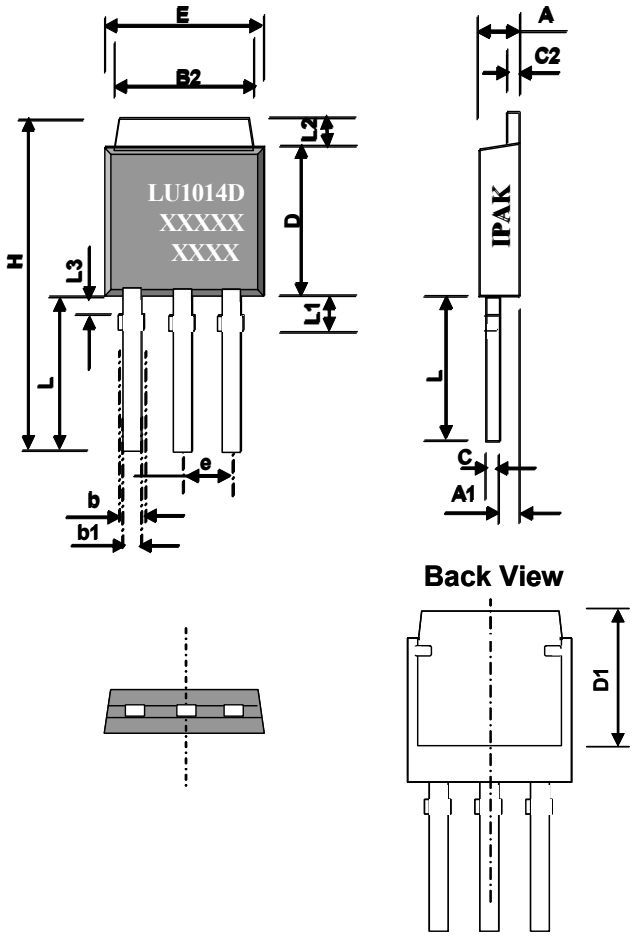
Ordering Information

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



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2. 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.