Lovoltech™

Breakthrough Power JFET Technology

PWRLITE LU1004D

High Performance N-Ch Vertical *POWERJFET™* with PN Diode

Features

- Trench Power JFET with low threshold voltage Vth.
- Device fully "ON" with Vgs = 0.7V
- Optimum for "Low Side" Buck Converters
- Optimized for Secondary Rectification in isolated DC-DC
- Low Rg and low Cds for high speed switching
- No "Body Diode"; extremely low Cds
- Added Fast Recovery Schottky Diode in same package

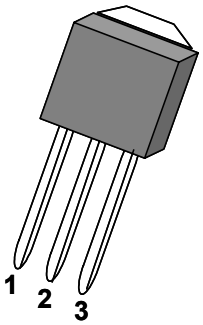
Applications

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

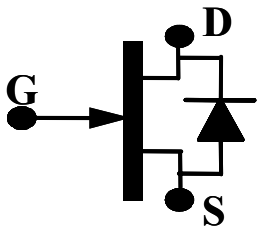
Description

The Power JFET transistor from Lovoltech is a device that presents a Low 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. The transistor "No Body Diode" provides a very low associated parasitic capacitance Cds. A Schottky Diode is added for applications where a freewheeling diode is required. Ringing is also reduced so that a lower voltage device may be a better solution.

IPAK 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	0.0045	50

Absolute Maximum Ratings

Parameter	Symbol	Ratings	Units
Drain-Source Voltage	V_{DS}	24	V
Gate-Source Voltage	V_{GS}	-10	V
Gate-Drain Voltage	V_{GD}	-28	V
Continuous Drain Current	I_D	50	A
Pulsed Drain Current	I_D	100	A
Single Pulse Drain-to-Source Avalanche Energy at 25°C (V_{DD}= 5V_{DC}, IL=60A_{PK}, L=0.3mH, R_G=100 Ω)	E_{AS}	220	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	80	W

Thermal Resistance

Symbol	Parameter		IPAK Ratings		Units
$R\Theta_{JA}$	Thermal Resistance Junction-to-Ambient		80		°C/W
$R\Theta_{JC}$	Thermal Resistance Junction-to-Case		1.6		°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			V
BV_{GDO}	Breakdown Voltage Gate to Drain	I_G = -50µA				-28	V
BV_{GSO}	Breakdown Voltage Gate to Source	I_G = -1 mA			-12	-10	V
$R_{DS(ON)}$)	Static Drain to Source[1] On Resistance (Current flows drain-to-source) See Fig. 1	I_G = 40 mA, I_D=10A I_G = 10 mA, I_D=10A I_G = 5 mA, I_D=10A			3.5 4.0 4.1	4.0 4.5	mΩ mΩ
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS}=0.1 V, I_D=250µA			-900		mV
	Dynamic						
Q_G	Total Gate Charge	ΔV_{Drive} =5V, I_D=10A,V_{DS}=15V			20		nC
Q_{GD}	Gate to Drain Charge				12		nC
Q_{GS}	Gate to Source Charge				1.5		nC
Q_{SW}	Switching Charge				13.5		nC
R_G	Gate Resistance				1		Ω
$T_{D(ON)}$)	Turn-on Delay Time	V_{DD}=16V, I_D=15A V_{Drive} = 5 V Clamped Inductive Load			5		ns
T_R	Rise Time				12		
$T_{D(OFF)}$	Turn-off Delay				2		
T_F	Fall Time				10		
C_{ISS}	Input Capacitance	V_{DS}=10V, V_{GS}= -5 V, 1MHz.			3000		pF
C_{OSS}	Output Capacitance				900		
C_{GS}	Gate-Source Capacitance				2250		
C_{GD}	Gate-Drain Capacitance				750		
C_{DS}	Drain-Source Capacitance				150		
	PN Diode						
I_R	Reverse Leakage	V_R=20V, Vgs = -4V			0.25	0.3	mA
V_F	Forward Voltage	I_F = 1 A			700		mV
V_F	Forward Voltage	I_F = 10 A			900		mV
V_F	Forward Voltage	I_F = 20 A			1100		mV
Qrr	Reverse Recovery Charge	I_s = 20 A di/dt = 100A/us,			20		nC

Notes:

1. Pulse width <= 500µs, duty cycle < = 2%

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Typical Operating Characteristics

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

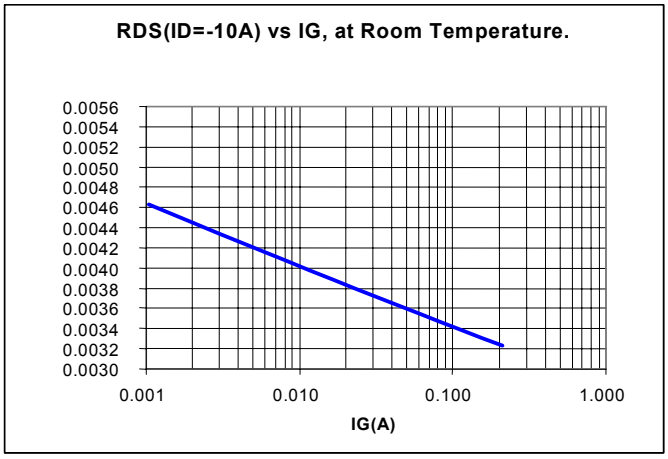

Figure 1 – R_{DSON} vs Gate Current at I_D – 10A

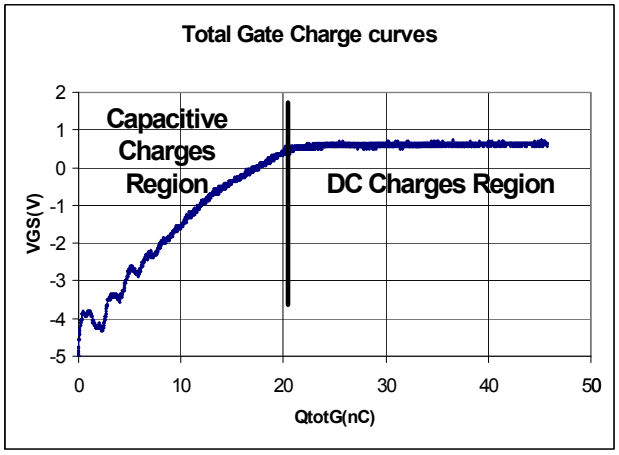

Figure 2 – Total Gate Charge

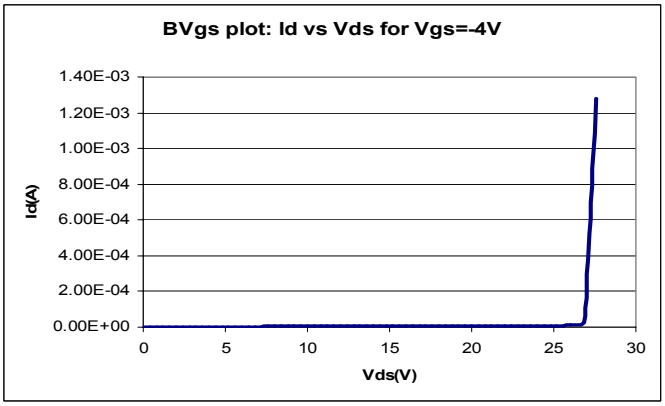

Figure 3 – Breakdown Voltage Vds vs Id

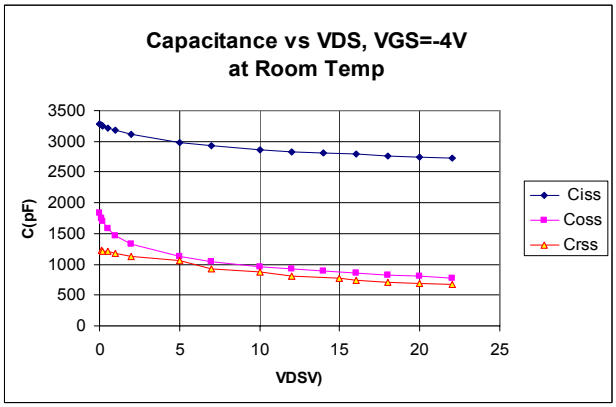

Figure 4 – Capacitance vs Drain Voltage Vds

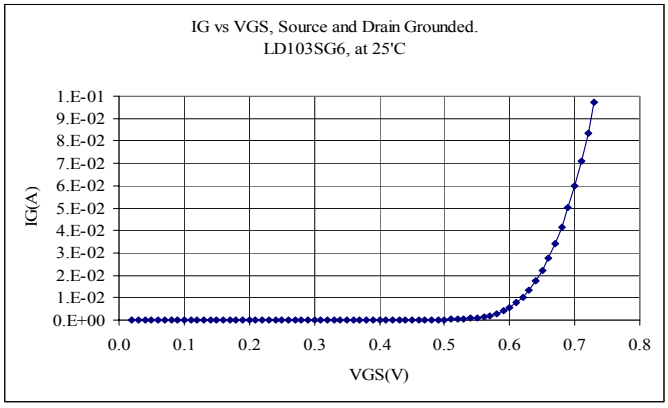

Figure 5 – I_G vs Gate Voltage V_{GS}

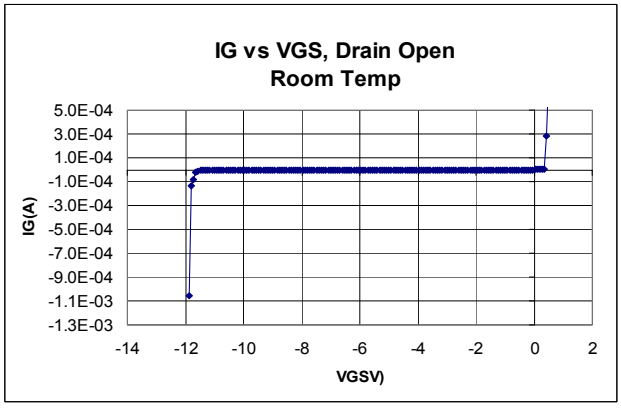

Figure 6 – Typical Gate Voltage Characteristic

Typical Operating Characteristics

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

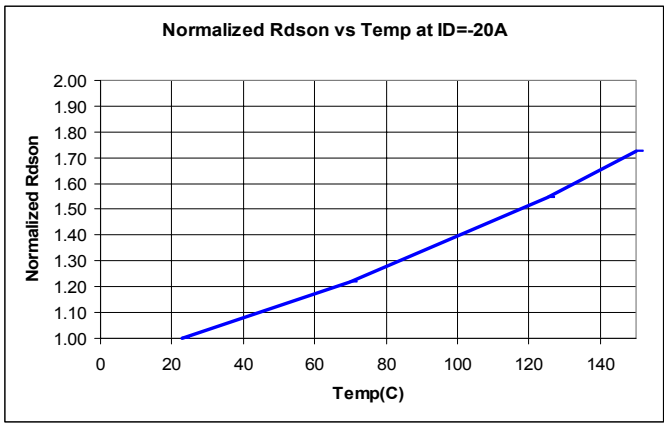

Figure 7 – R_{DSON} Temperature Coefficient

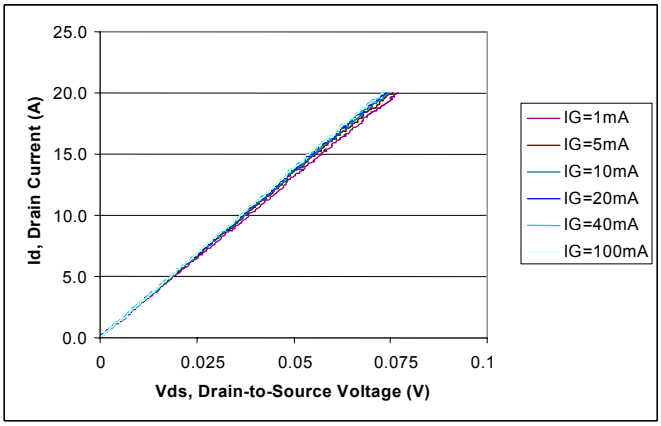

Figure 8 – On-Region Characteristics

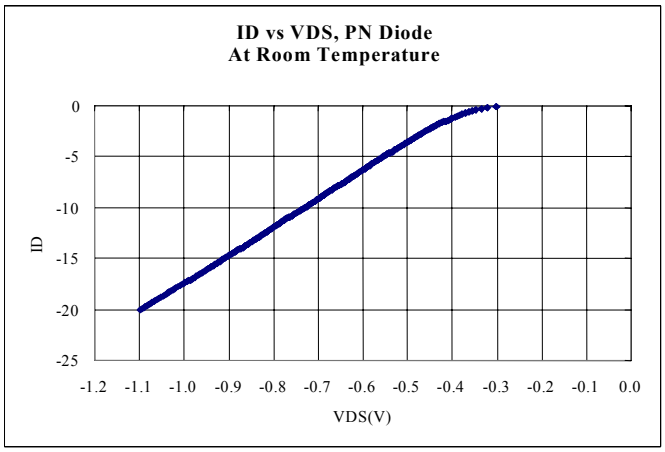

Figure 9 – Diode Voltage vs Current

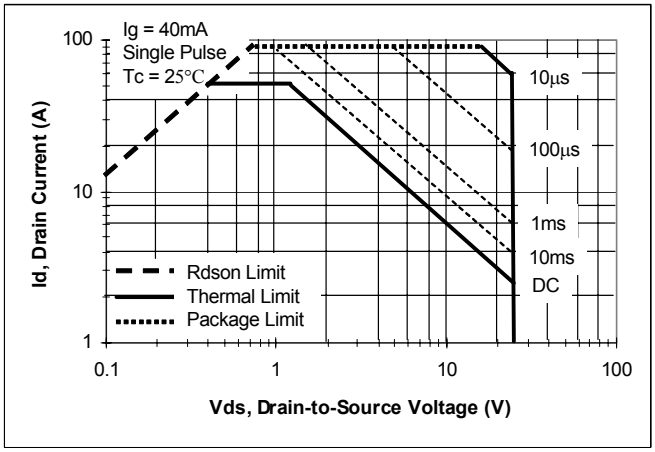

Figure 10 – Safe Operating Area

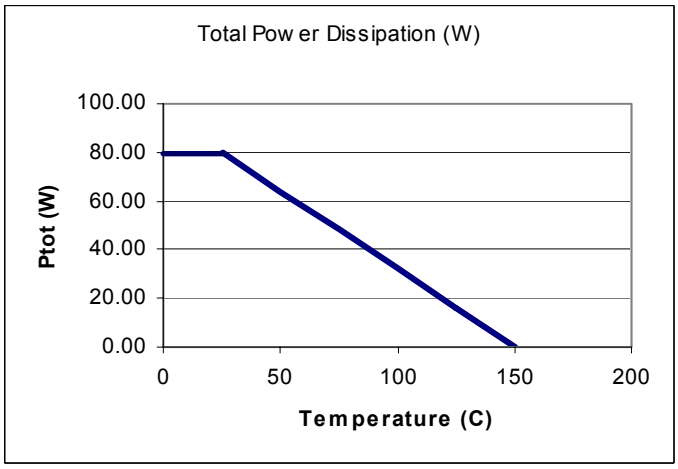

Figure 11 – Total Power Dissipation

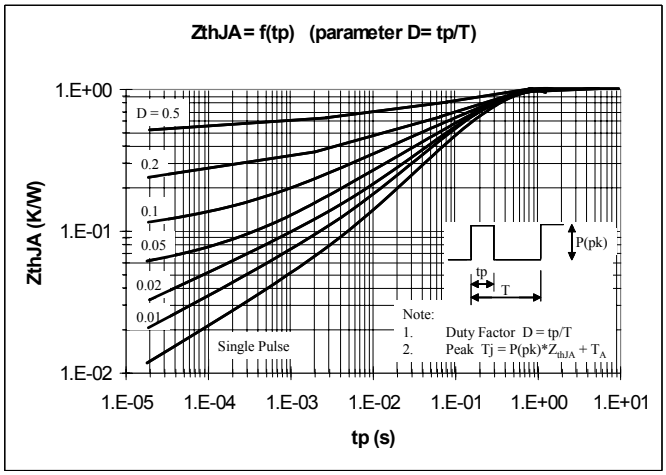

Figure 12 – Normalized Thermal Response

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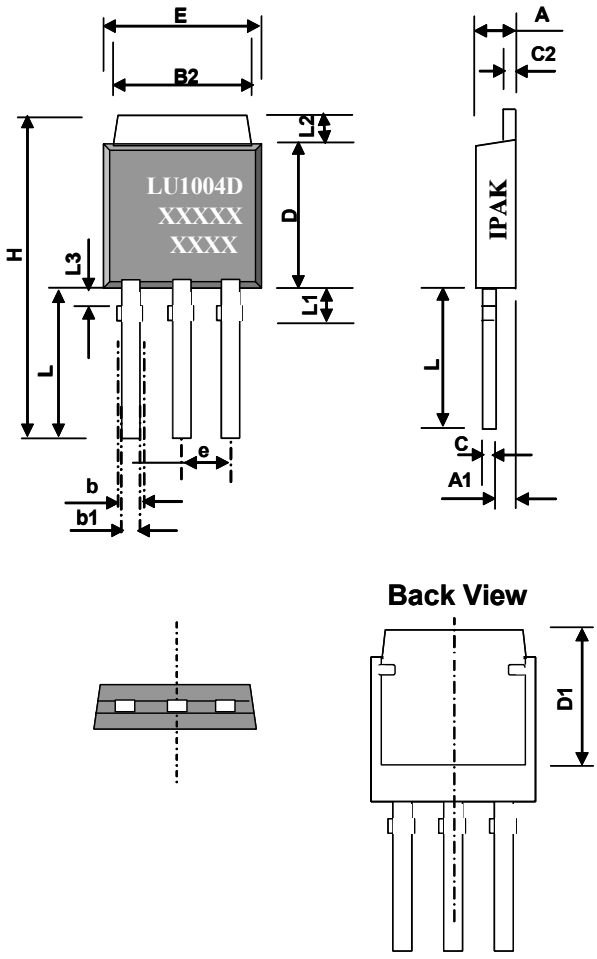
Ordering Information

Product Number	PN Marking	Package	Notes:
LU1004D	LU1004D	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.