Breakthrough Power JFET Technology

PWRLITE LU1010DA

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

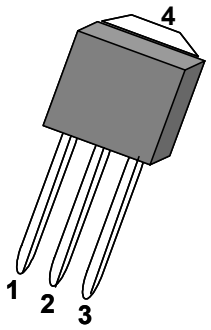
Description

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.

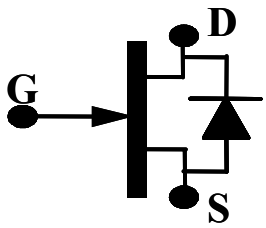
Applications

- 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	0.0045	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}	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		DPAK Ratings		Units
$R\Theta_{JA}$	Thermal Resistance Junction-to-Ambient		80		°C/W
$R\Theta_{JC}$	Thermal Resistance Junction-to-Case		1.56		°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			3.7 3.8 3.9	4.5 5.0	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			-2.8		mV/°C
	Dynamic						
Q_{Gsync}	Total Gate Charge Sync JFET	ΔV_{Drive}=5V,V_{DS}=0.1V			12.6		nC
Q_G	Total Gate Charge	ΔV_{Drive}=5V, I_D=10A,V_{DS}=15V			15		nC
Q_{GD}	Gate to Drain Charge	V_{DS}=13.5V to V_{DS}=1.5V			10.5		nC
Q_{GS}	Gate to Source Charge	V_{GS} =-4.5V to V_{DS}=13.5V			4.5		nC
Q_{SW}	Switching Charge	V_{GS} =-2V to V_{DS}=1.5V			11.4		nC
R_G	Gate Resistance				0.4		Ω
$T_{D(ON)}$)	Turn-on Delay Time	V_{DD}=15V, I_D=10A V_{Drive} = 5 V Resistive Load			6.7		ns
T_R	Rise Time				12.4		
$T_{D(OFF)}$	Turn-off Delay				9		
T_F	Fall Time				4.6		
C_{ISS}	Input Capacitance	V_{DS}=10V, V_{GS}= -5 V, 1MHz.			1465		pF
C_{OSS}	Output Capacitance				611		
C_{GS}	Gate-Source Capacitance				972		
C_{GD}	Gate-Drain Capacitance				493		
C_{DS}	Drain-Source Capacitance				118		
	PN Diode						
I_R	Reverse Leakage	V_R=20V, Vgs = -4V				0.3	mA
V_F	Forward Voltage	I_F = 1 A			800		mV
V_F	Forward Voltage	I_F = 10 A			900		mV
V_F	Forward Voltage	I_F = 20 A			960		mV
Qrr	Reverse Recovery Charge	I_s = 10 A di/dt = 100A/us,			9.5		nC
Trr	Reverse Recovery Time	I_s = 10 A di/dt = 100A/us,			14.6		ns

Notes:

1. Current is limited by bondwire; with an Rthjc = 1.56 °C/W the chip is able to carry 102A.
2. Pulse width <= 500µs, duty cycle < = 2%

Typical Operating Characteristics

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

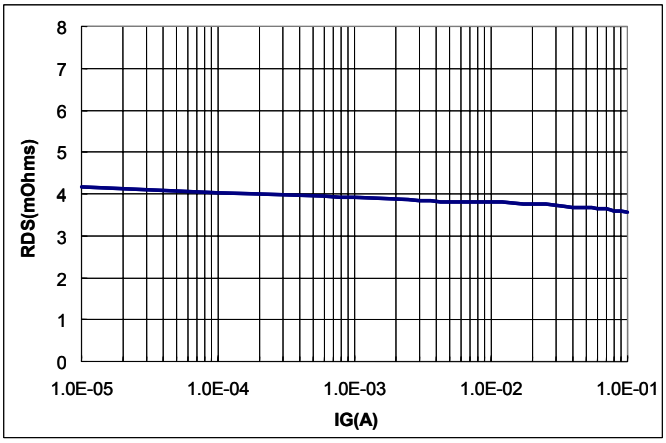


Figure 1 – R_{DSON} vs Gate Current at I_D – 10A

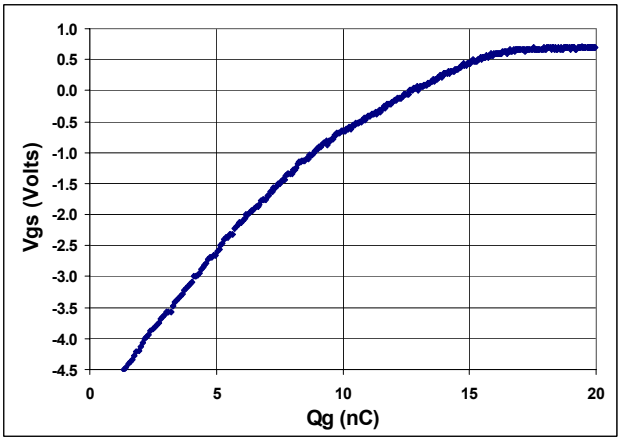


Figure 2 – Gate Charge for V_{DS} = 0.1V

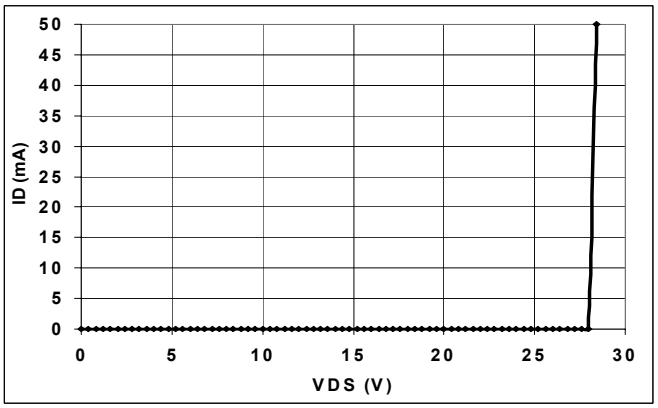


Figure 3 – Breakdown Voltage Vds vs Id

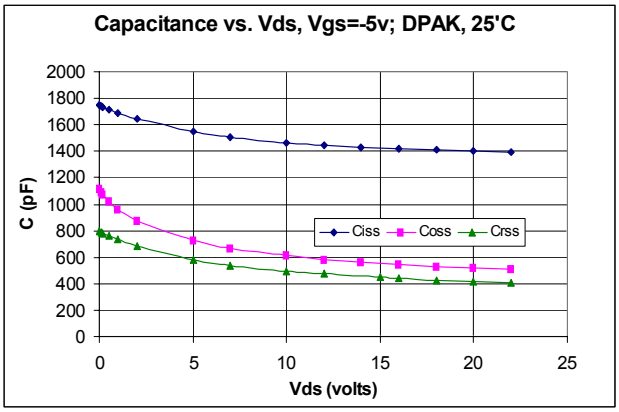


Figure 4 – Capacitance vs Drain Voltage Vds

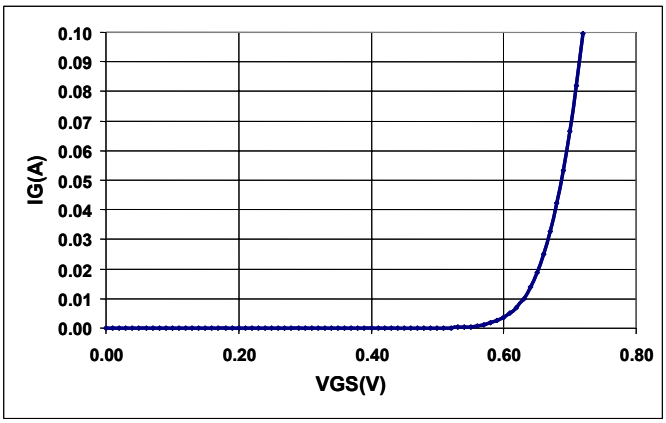


Figure 5 – I_G vs Gate Voltage V_{GS}

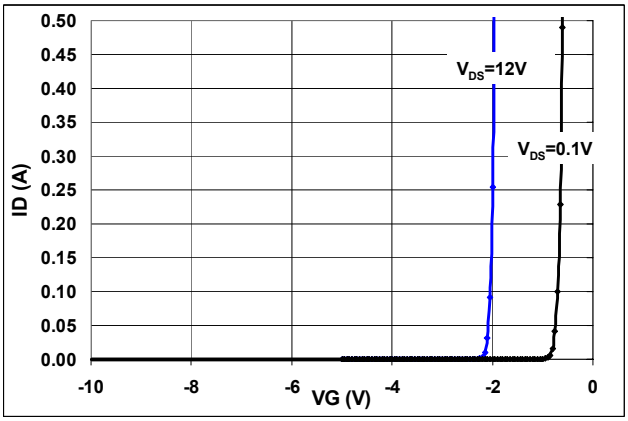


Figure 6 – Transfer Characteristic

Typical Operating Characteristics

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

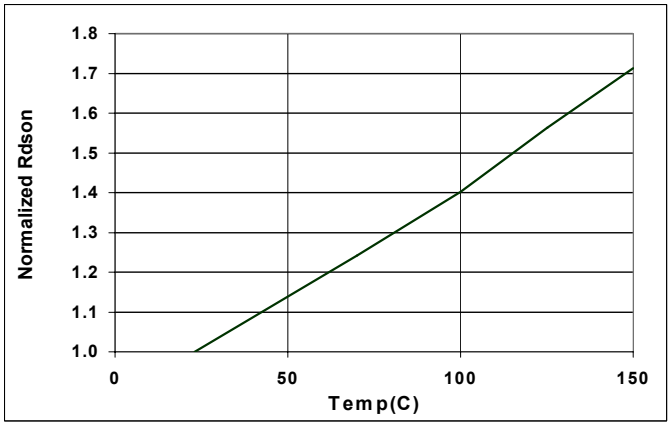


Figure 7 – R_{DSON} =f(T); I_D = -10A; I_G = 50mA

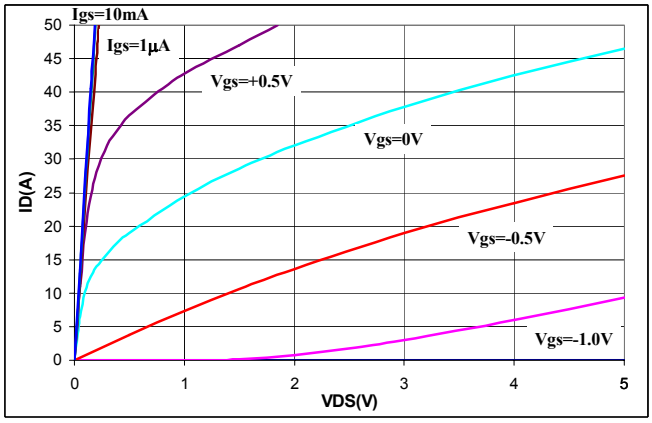


Figure 8 – I_D vs V_{DS} Characteristics

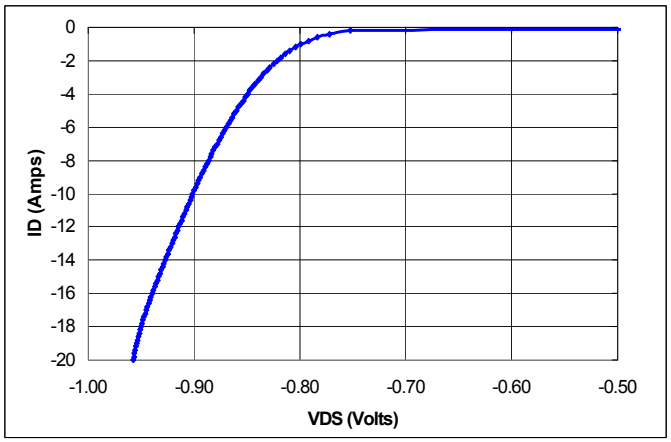


Figure 9 – PN Diode Voltage vs Current

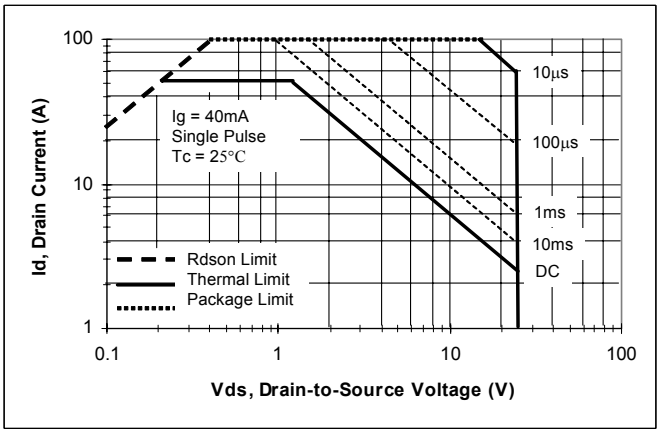


Figure 10 – Safe Operating Area

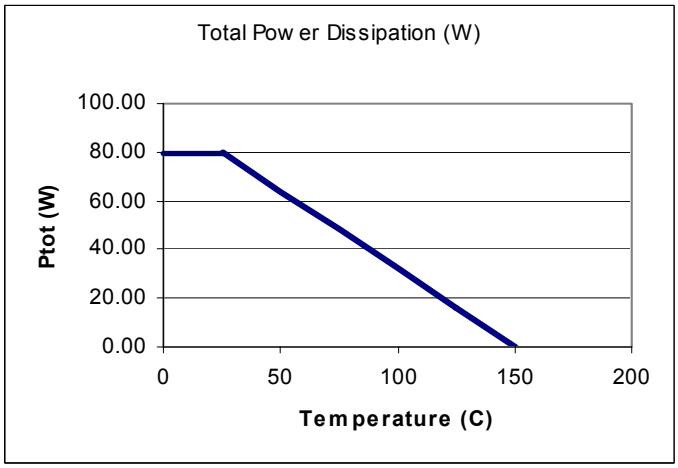


Figure 11 – Total Power Dissipation

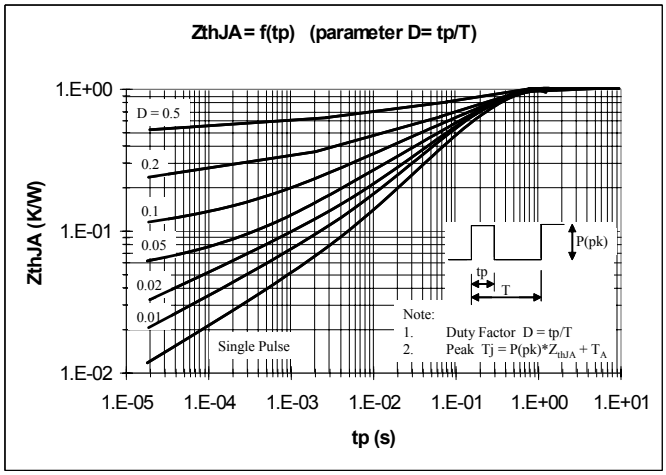


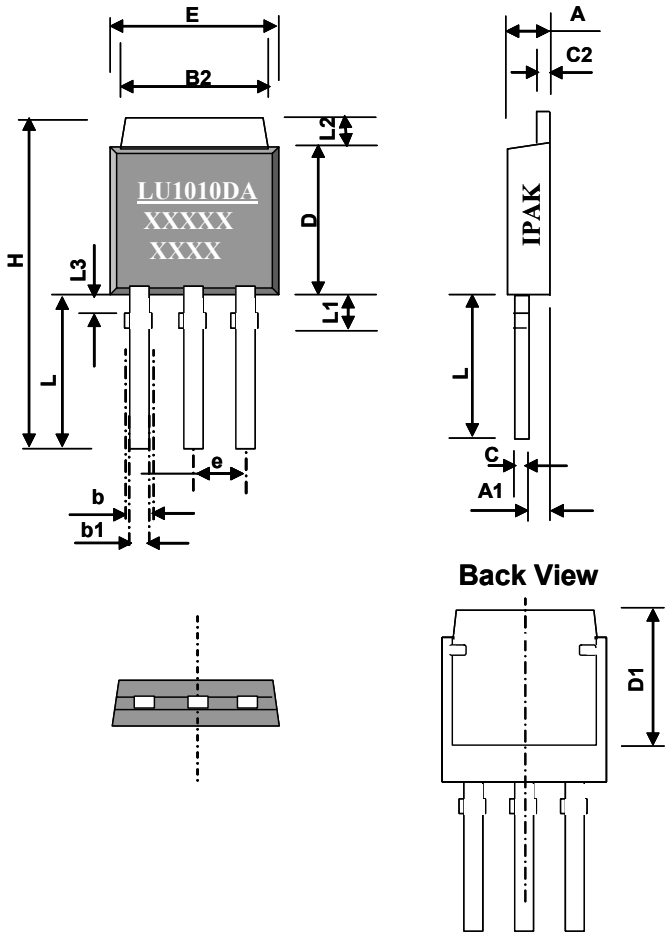
Figure 12 – Normalized Thermal Response

Ordering Information

Product Number	PN Marking	Package	Notes:
LU1010DA	LU1010DA	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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Datasheet Identification	Product Status	Definition
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