

PWRLITE LD1003S

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



Features

- ❖ Trench Power JFET with low threshold voltage V_{th} .
- ❖ Device fully "ON" with $V_{gs} = 0.7V$
- ❖ Optimum for "Low Side" Buck Converters
- ❖ Optimized for Secondary Rectification in isolated DC-DC
- ❖ Low R_g and low C_{ds} for high speed switching
- ❖ No "Body Diode"; extremely low C_{ds}
- ❖ Added Fast Recovery Schottky Diode in same package

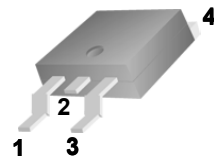
Applications

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

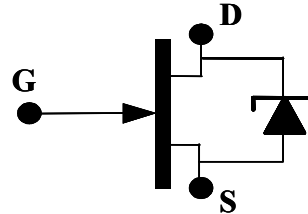
Description

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. The transistor "No Body Diode" provides a very low associated parasitic capacitance C_{ds} . 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.

DPAK Pin Assignments



Case TO252
DPAK (LD1003S)
(Surface Mount)



N – Channel JFET
And Schottky 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	0.0045	50
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}	-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 ($V_{DD}=5V_{DC}$, $I_L=60A_{PK}$, $L=0.3mH$, $R_G=100\Omega$)	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		1.6	°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			V
BV_{GDO}	Breakdown Voltage Gate to Drain	$I_G = -50 \mu\text{A}$			-28	V
BV_{GSO}	Breakdown Voltage Gate to Source	$I_G = -1 \text{ mA}$		-12	-10	V
$R_{DS(ON)}$	Static Drain to Source ¹ On Resistance (Current flows drain-to-source) See Fig. 1	$I_G = 40 \text{ mA}, I_D = 10 \text{ A}$ $I_G = 10 \text{ mA}, I_D = 10 \text{ A}$ $I_G = 5 \text{ mA}, I_D = 10 \text{ A}$		3.0 3.5 3.6	4.0 5.5	$\text{m}\Omega$ $\text{m}\Omega$
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = 0.1 \text{ V}, I_D = 250 \mu\text{A}$	-1200	-800	-600	mV
Dynamic						
Q_G	Total Gate Charge	$\Delta V_{Drive} = 5 \text{ V}, I_D = 10 \text{ A}, V_{DS} = 15 \text{ V}$		23		nC
Q_{GD}	Gate to Drain Charge			14		nC
Q_{GS}	Gate to Source Charge			1.8		nC
Q_{SW}	Switching Charge			15		nC
R_G	Gate Resistance			0.5		Ω
$T_{D(ON)}$	Turn-on Delay Time	$V_{DD} = 16 \text{ V}, I_D = 15 \text{ A}$ $V_{Drive} = 5 \text{ V}$ 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	$V_{DS} = 10 \text{ V}, V_{GS} = -5 \text{ V}, 1 \text{ MHz.}$		3200		pF
C_{OSS}	Output Capacitance			900		
C_{GS}	Gate-Source Capacitance			2250		
C_{GD}	Gate-Drain Capacitance			750		
C_{DS}	Drain-Source Capacitance			150		
Schottky Diode						
I_R	Reverse Leakage	$V_R = 20 \text{ V}, V_{GS} = -4 \text{ V}$		0.25	0.3	mA
V_F	Forward Voltage	$I_F = 1 \text{ A}$		300		mV
V_F	Forward Voltage	$I_F = 10 \text{ A}$		700		mV
V_F	Forward Voltage	$I_F = 20 \text{ A}$		900		mV
Q_{RR}	Reverse Recovery Charge	$I_s = 20 \text{ A}, di/dt = 100 \text{ A/us}$		8		nC

Notes:

1. Pulse width $\leq 500 \mu\text{s}$, duty cycle $\leq 2\%$

Typical Operating Characteristics

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

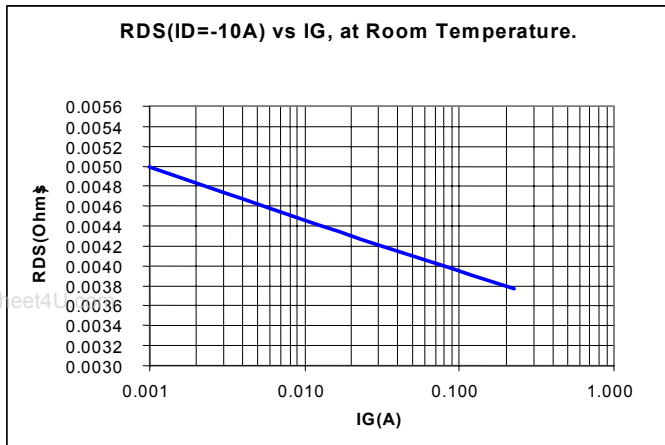


Figure 1 – $R_{DS(on)}$ vs Gate Current at $I_D = 10\text{A}$

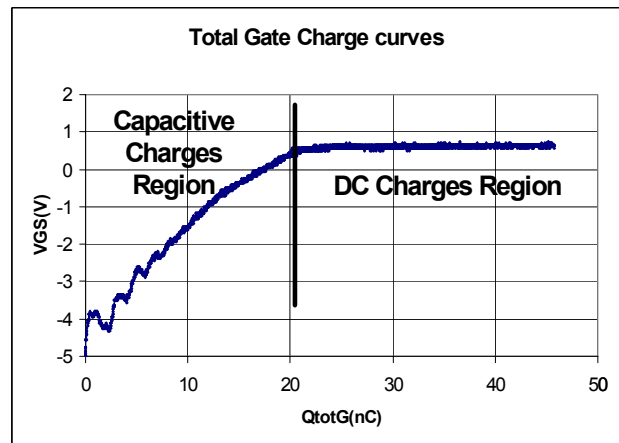


Figure 2 – Total Gate Charge

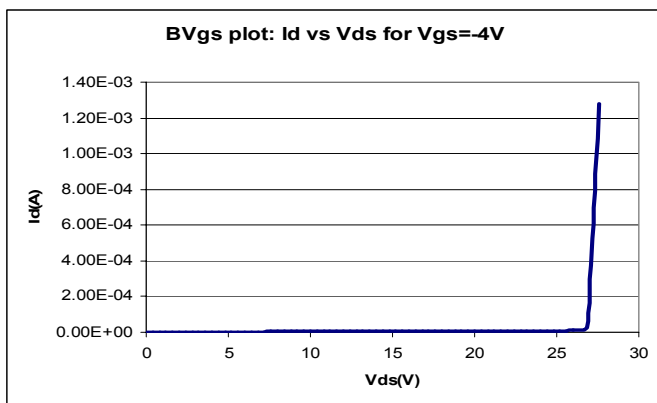


Figure 3 – Breakdown Voltage V_{ds} vs I_d

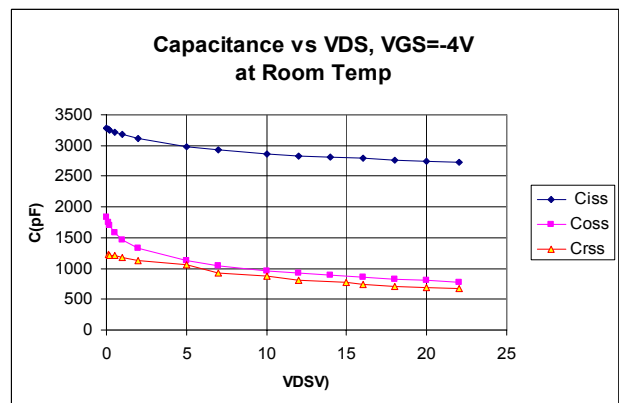


Figure 4 – Capacitance vs Drain Voltage V_{ds}

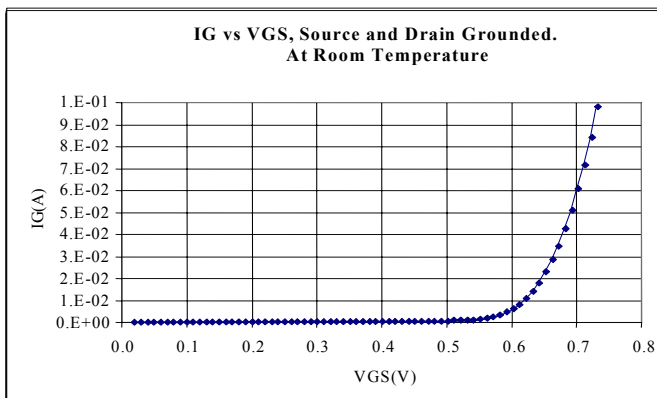


Figure 5 – I_G vs Gate Voltage V_{GS}

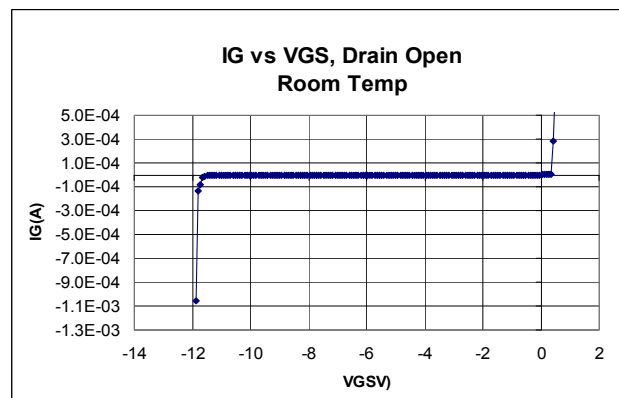


Figure 6 – Typical Gate Voltage Characteristic

Typical Operating Characteristics

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

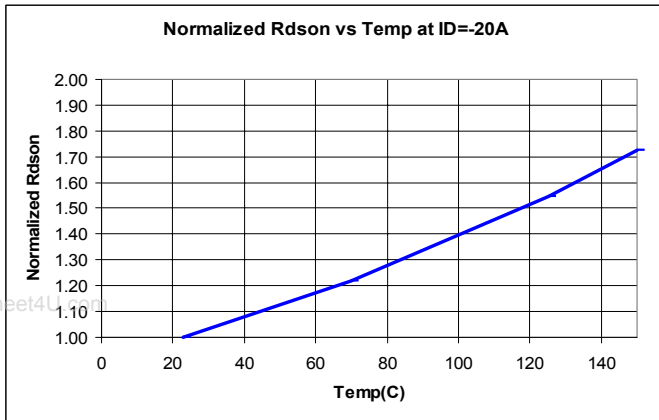


Figure 7 – $R_{DS(ON)}$ Temperature Coefficient

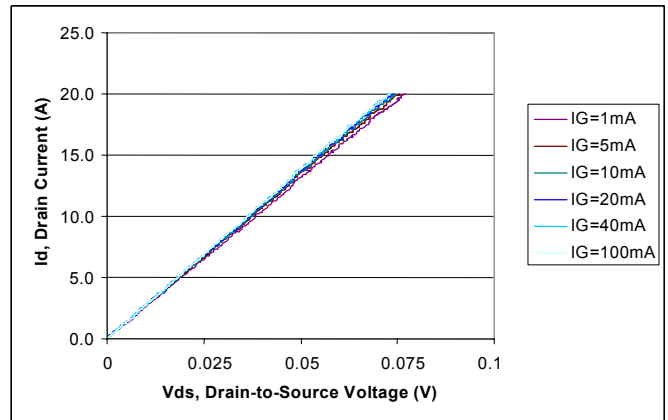


Figure 8 – On-Region Characteristics

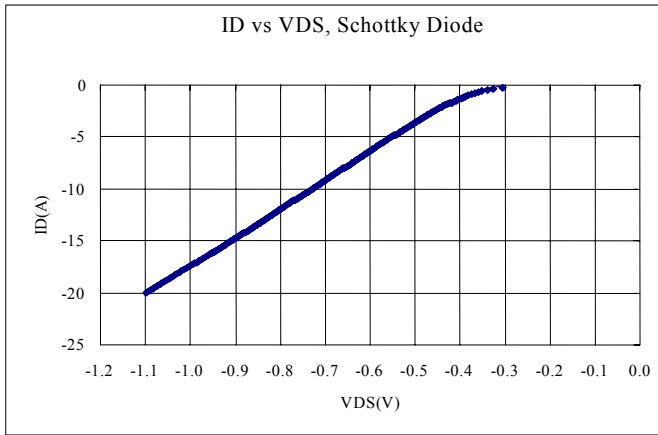


Figure 9 – Diode Voltage vs Current

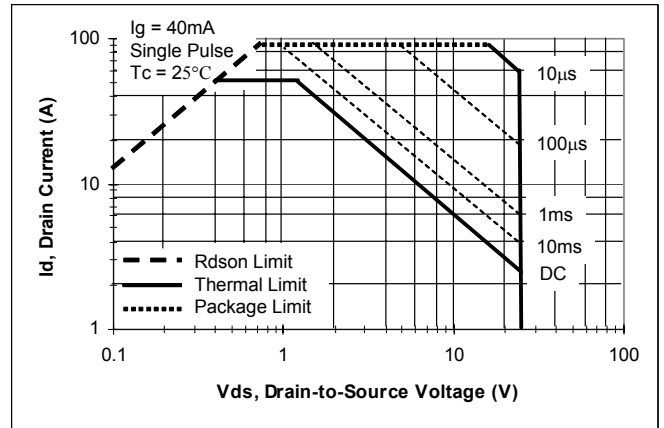


Figure 10 – Safe Operating Area

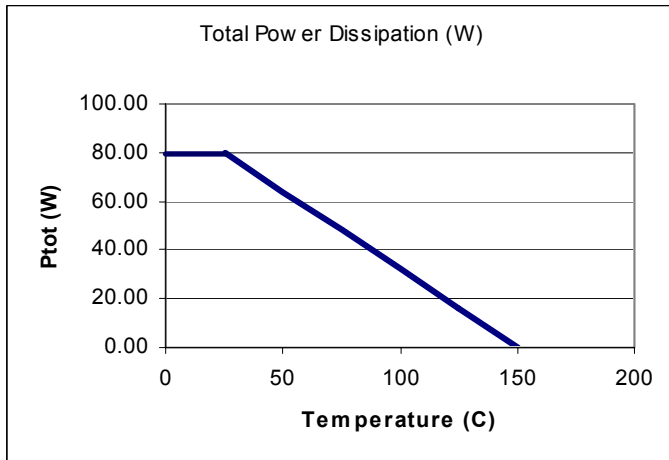


Figure 11 – Total Power Dissipation

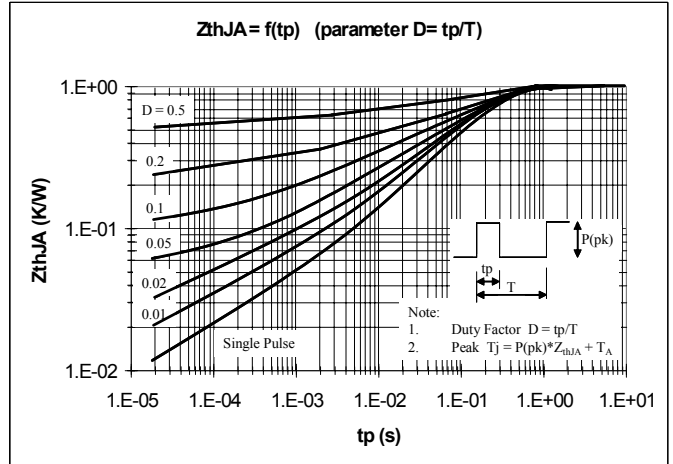


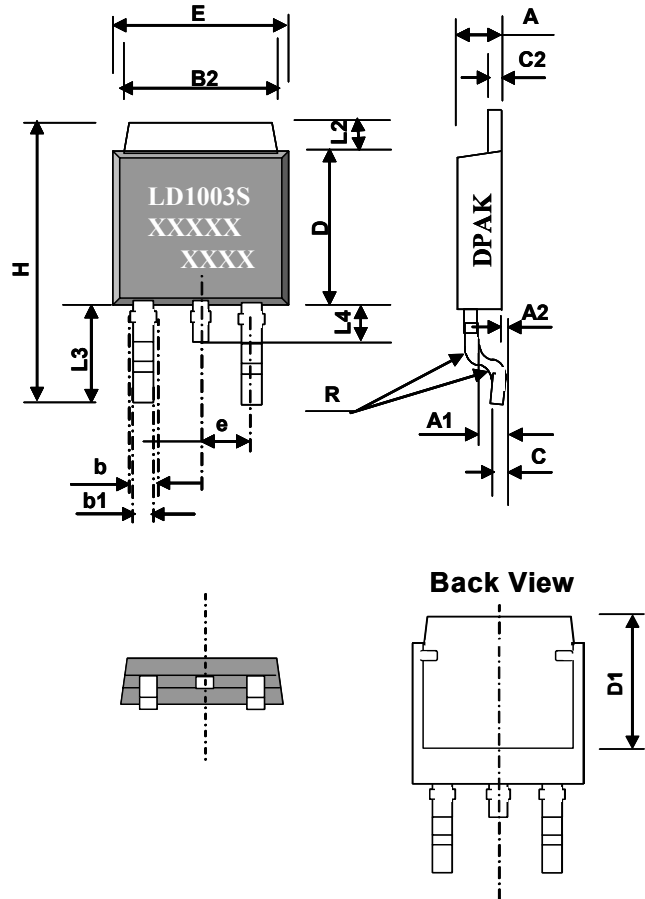
Figure 12 – Normalized Thermal Response

Ordering Information

Product Number	PN Marking	Package	Notes:
LD1003S	LD1003S	TO252 (DPAK)	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	
A2	0.03	0.13		0.001	0.005	
b	0.76	1.14		0.030	0.045	
b1	0.55	0.90		0.022	0.035	
B2	5.20	5.46		0.205	0.215	
C	0.45	0.60		0.017	0.023	
C2	0.45	0.58		0.017	0.023	
D	5.97	6.22		0.235	0.245	
D1	5.30			0.208		
E	6.35	6.73		0.250	0.265	
e	2.28			0.090		
H	9.35	10.42		0.368	0.410	
L2	0.88	1.27		0.035	0.050	
L3	1.86	3.57		0.073	0.140	
L4	0.64	1.02		0.025	0.040	
R	0.20			0.008		
Alternate						
D	5.40	5.60		0.213	0.220	
L2	1.25	1.75		0.049	0.069	
L3	2.60	2.80		0.102	0.110	
H	9.65	9.75		0.380	0.384	


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- 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.