

LS4402

N-Channel Enhancement Mode Field Effect Transistor

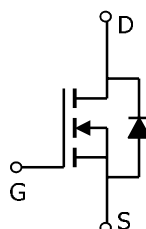
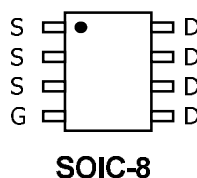


General Description

The LS4402 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.

Features

V_{DS} (V) = 30V
 I_D = 12A
 $R_{DS(ON)} < 14m\Omega$ ($V_{GS} = 10V$)
 $R_{DS(ON)} < 16m\Omega$ ($V_{GS} = 4.5V$)
 $R_{DS(ON)} < 22m\Omega$ ($V_{GS} = 2.5V$)



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current ^A	I_D	$T_A=25^\circ\text{C}$	12
		$T_A=70^\circ\text{C}$	10
Pulsed Drain Current ^B	I_{DM}	80	A
Power Dissipation	P_D	$T_A=25^\circ\text{C}$	3
		$T_A=70^\circ\text{C}$	2.1
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	$t \leq 10s$	23	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		Steady-State	48	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	12	16	$^\circ\text{C/W}$

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0V	30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =24V, V _{GS} =0V T _J =55°C			1 5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±12V			100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =250μA	0.6	0.8	1.2	V
I _{D(ON)}	On state drain current	V _{GS} =4.5V, V _{DS} =5V	60			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =12A T _J =125°C		11.1 16	14 19.2	mΩ
		V _{GS} =4.5V, I _D =10A		13.1	16	mΩ
		V _{GS} =2.5V, I _D =8A		21	26	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =5A	25	50		S
V _{SD}	Diode Forward Voltage	I _S =10A, V _{GS} =0V		0.8	1	V
I _S	Maximum Body-Diode Continuous Current				4.5	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		1630		pF
C _{oss}	Output Capacitance			201		pF
C _{riss}	Reverse Transfer Capacitance			142		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.8		Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =15V, I _D =12A		19		nC
Q _{gs}	Gate Source Charge			3.3		nC
Q _{gd}	Gate Drain Charge			5.2		nC
t _{D(on)}	Turn-On Delay Time	V _{GS} =10V, V _{DS} =15V, R _L =1.2Ω, R _{GEN} =3Ω		3		ns
t _r	Turn-On Rise Time			4.7		ns
t _{D(off)}	Turn-Off Delay Time			33.5		ns
t _f	Turn-Off Fall Time			6		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =10A, di/dt=100A/μs		21		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =10A, di/dt=100A/μs		11		nC

A: The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any a given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

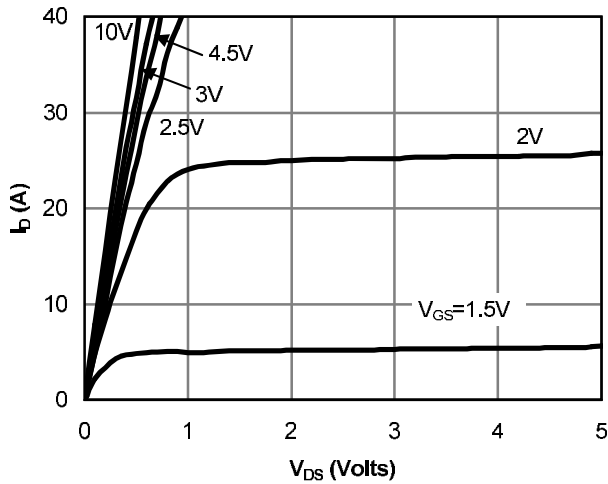


Fig 1: On-Region Characteristics

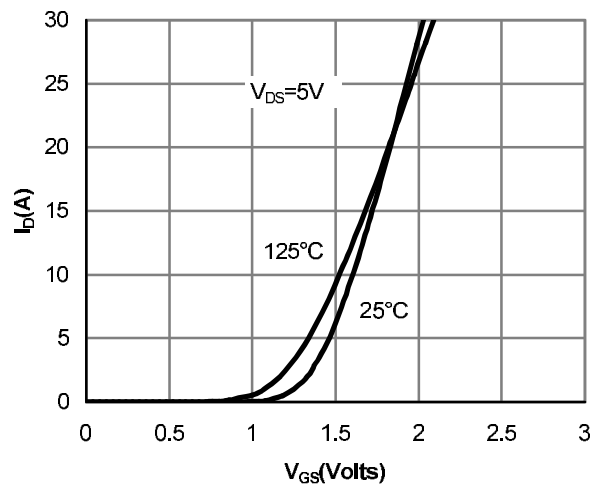


Figure 2: Transfer Characteristics

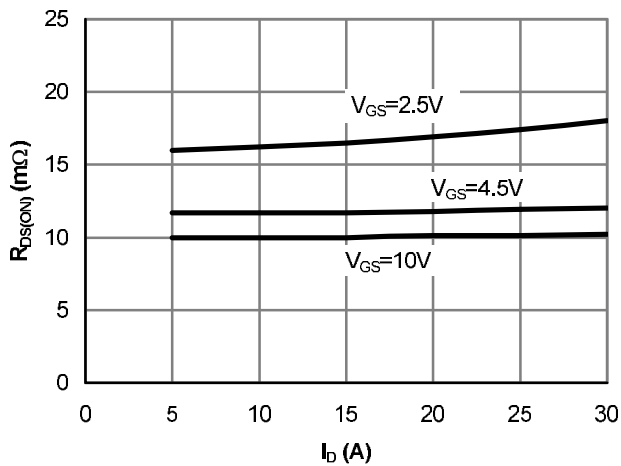


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

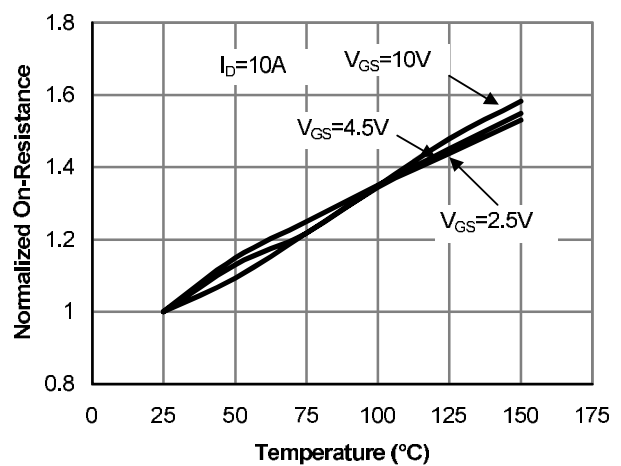


Figure 4: On-Resistance vs. Junction Temperature

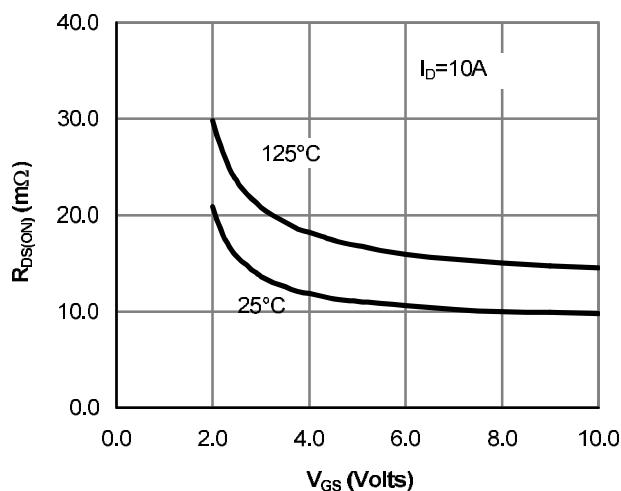


Figure 5: On-Resistance vs. Gate-Source Voltage

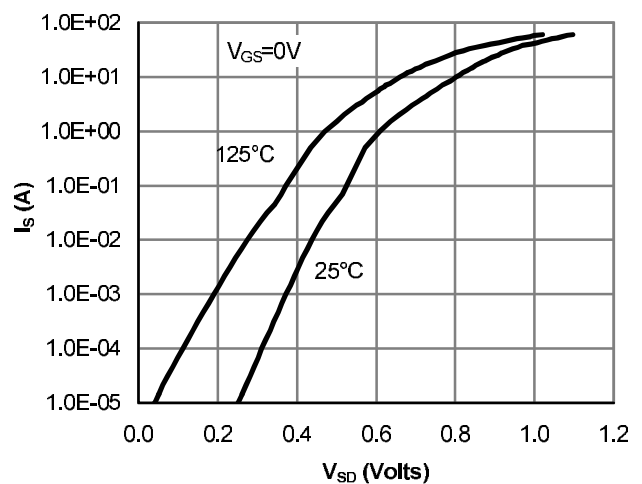


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

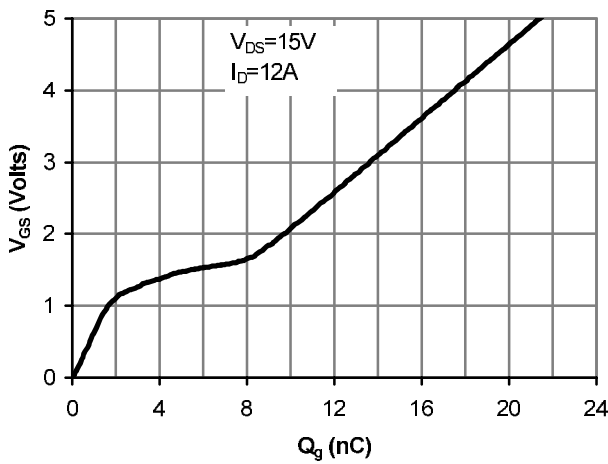


Figure 7: Gate-Charge Characteristics

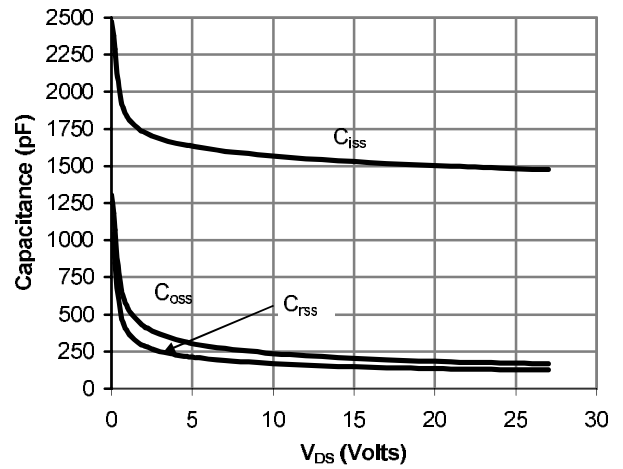


Figure 8: Capacitance Characteristics

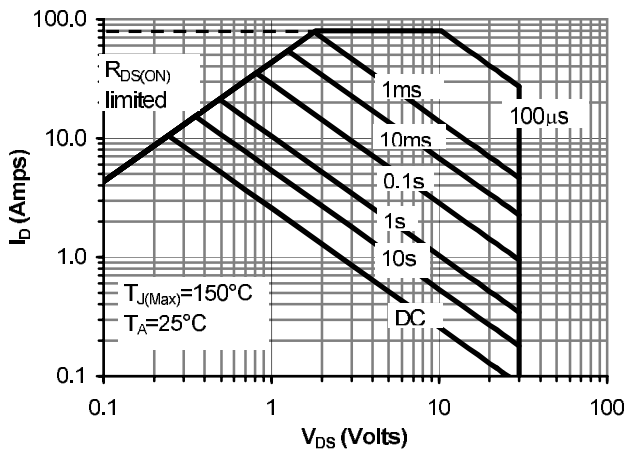


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

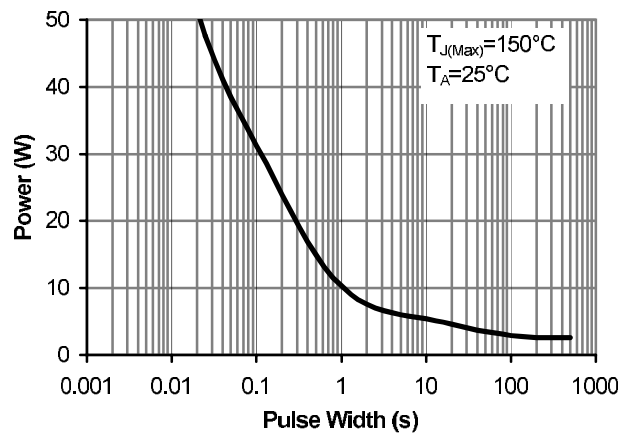


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

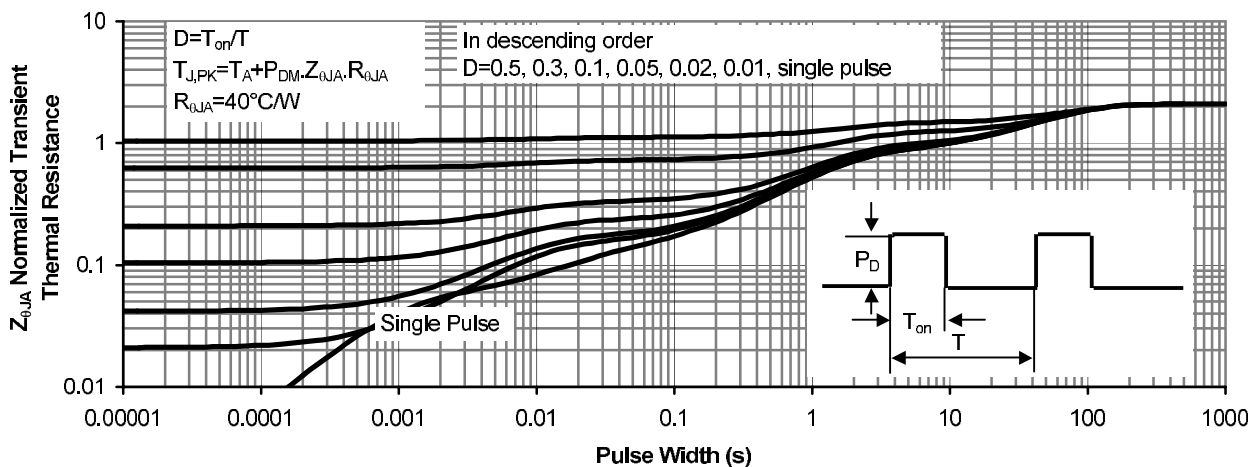
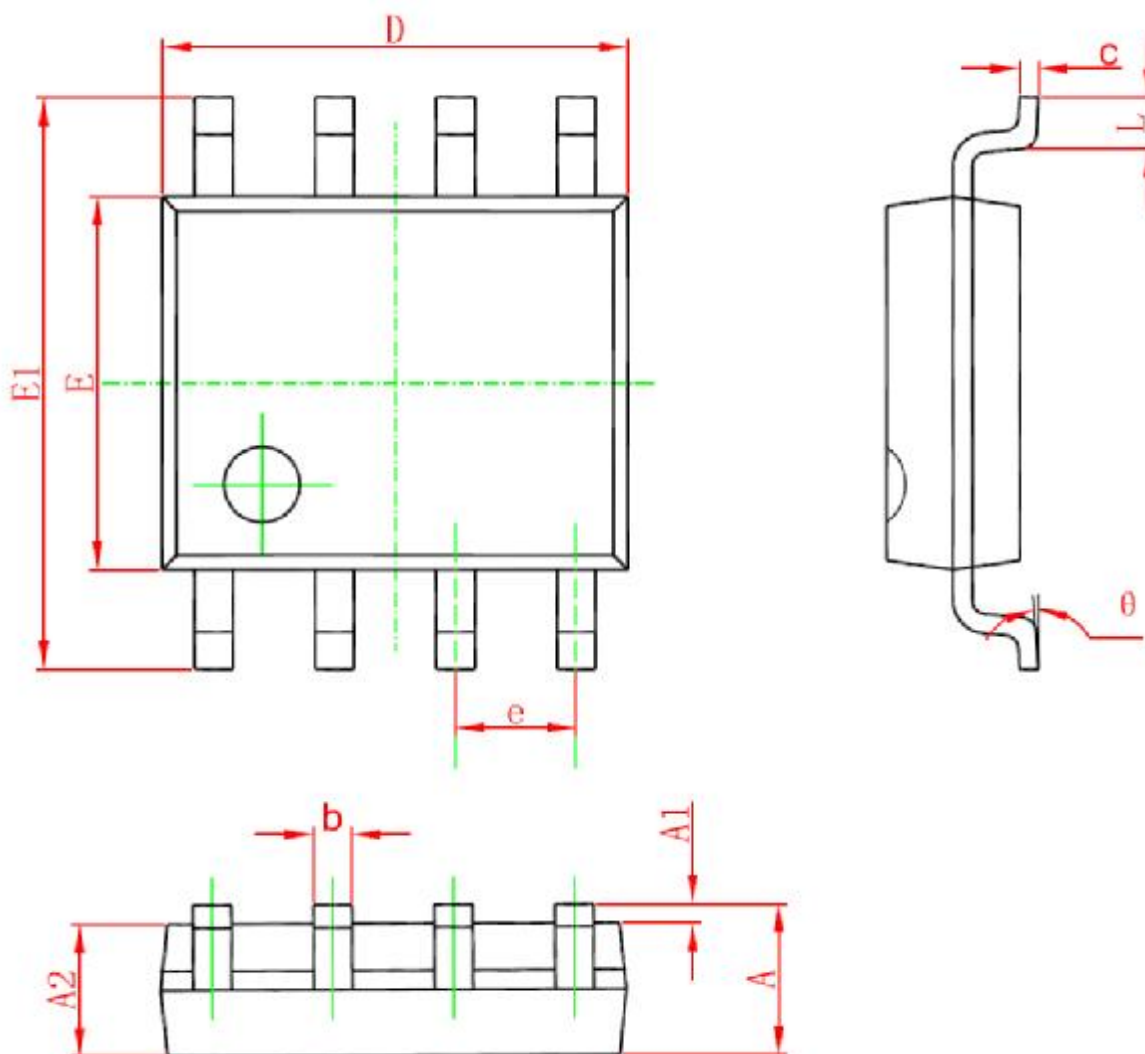


Figure 11: Normalized Maximum Transient Thermal Impedance

SOP-8 PACKAGE IN FORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°