40V N And P-Channel Enhancement Mode MOSFET

Description

The NP4614BSR uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge . The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

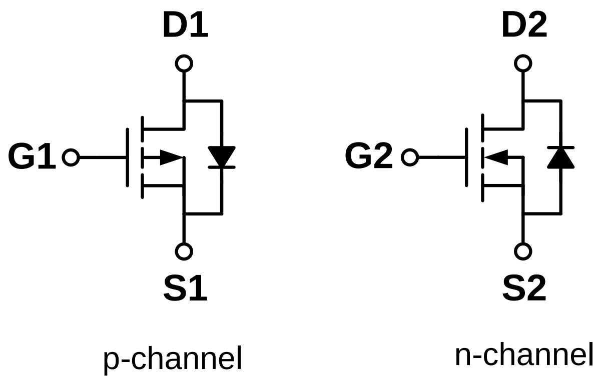
General Features

- **N-channel:**
  V_{DS} =40V，ID =10A
  $R_{DS(ON)}$=16mΩ (typical) @ VGS=10V
  $R_{DS(ON)}$=20mΩ (typical) @ VGS=4.5V
  P-Channel:
  V_{DS} =-40V，ID =-10A
  $R_{DS(ON)}$=37mΩ (typical) @ VGS=-10V
  $R_{DS(ON)}$=49mΩ (typical) @ VGS=-4.5V
- Excellent gate charge x $R_{DS(ON)}$ product(FOM)
- Very low on-resistance $R_{DS(ON)}$
- 150 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

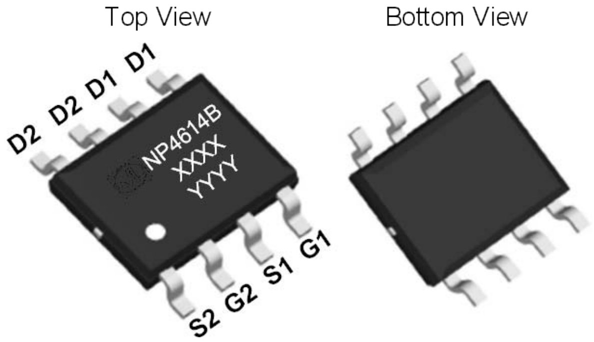
Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

Schematic diagram



Marking and pin assignment



XXXX—Wafer Information

YYYY—Quality Code

Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP4614BSR-G	-55°C to +150°C	SOP-8	4000

Absolute Maximum Ratings (TA=25℃ unless otherwise noted)

Parameter	Symbol	Limit		Unit
		N	P	
Drain-source voltage	V_{DS}	40	-40	V
Gate-source voltage	V_{GS}	±20	±20	V
Maximum power dissipation	P_D	2.0	2.0	W
Operating junction Temperature range	T_j	-55—150	-55—150	℃

Drain Current-Continuous (Silicon Limited)	T_A=25°C	I_D	10	-10	A
	T_A=75°C		8.5	-9	
Pulsed Drain Current (Package Limited)		I_{DM}	32	-24	A
Avalanche Current [C]		I_{AS}, I_{AR}	16	20	A
Avalanche energy L=0.1mH[C]		E_{AS}, E_{AR}	12	25	mJ
Power Dissipation [B]	T_A=25°C	P_D	2	2	W
	T_A=75°C		1.3	1.3	
Junction and Storage Temperature Range		T_J, T_{STG}	-55—150		℃

Thermal Characteristics

Parameter		Symbol	Device	Typ	Max	Unit
Maximum Junction-to-Ambient[A]	≤ 10s	$R_{\theta JA}$	n-ch	48	62.5	℃/W
Maximum Junction-to-Ambient[A]	Steady-State		n-ch	74	110	
Maximum Junction-to-Lead[B]	Steady-State	$R_{\theta JC}$	n-ch	35	60	
Maximum Junction-to-Ambient[A]	≤ 10s	$R_{\theta JA}$	p-ch	48	62.5	
Maximum Junction-to-Ambient[A]	Steady-State		p-ch	74	110	
Maximum Junction-to-Lead[B]	Steady-State	$R_{\theta JC}$	p-ch	35	60	

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

B: The R qJA is the sum of the thermal impedence from junction to lead R qJL and lead to ambient.

N-Channel Electrical Characteristics (T$_J$=25℃ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0V, I_D=250μA	40	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS}=40V, V_{GS}=0V	-	-	1	μA
Gate-body leakage	I_{GSS}	V_{DS}=0V, V_{GS}=±20V	-	-	±100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	1.0	1.35	2.0	V
Drain-source on-state resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=10A	-	16	17	mΩ
		V_{GS}=4.5V, I_D=10A	-	20	25	
Forward transconductance	gfs	V_{DS}=5V, I_D=10A	-	15	-	S
Dynamic Characteristics						
Input capacitance	C_{ISS}	V_{DS}=20V ,V_{GS}=0V f=1.0MHz	-	972	-	pF
Output capacitance	C_{OSS}		-	74	-	
Reverse transfer capacitance	C_{RSS}		-	62	-	
Gate resistance	Rg	V_{GS}=0V, V_{DS}=0V, f=1.0MHz	-	1.1	-	Ω
Switching Characteristics						
Turn-on delay time	$t_{D(ON)}$	V_{DS}=20V V_{GS}=10V R_L=1.8Ω R_{GEN}=3Ω	-	4	-	ns
Rise time	tr		-	3	-	
Turn-off delay time	$t_{D(OFF)}$		-	15	-	
Fall time	tf		-	2	-	
Total gate charge	Qg	V_{DS}=20V,I_D=10A V_{GS}=10V	-	19.8	-	nC
Gate-source charge	Qgs		-	3	-	
Gate-drain charge	Qgd		-	3.4	-	

Typical Performance Characteristics

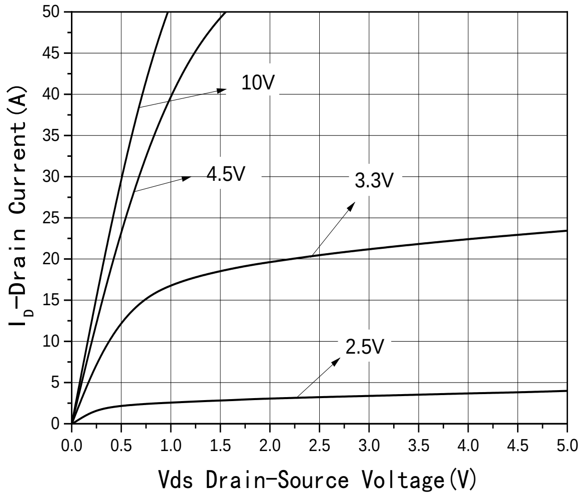


Fig1 Output Characteristics

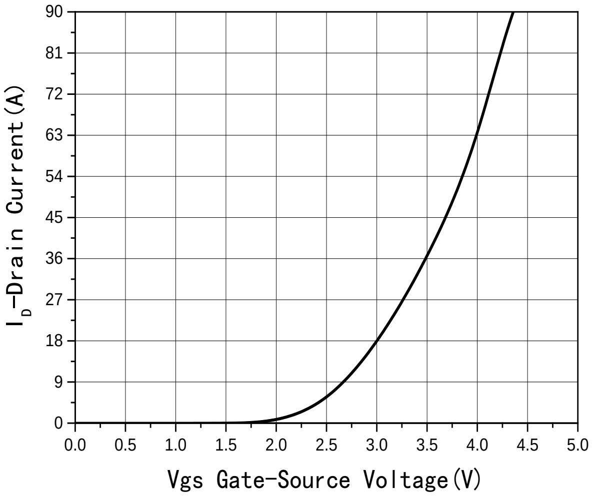


Fig2 Transfer Characteristics

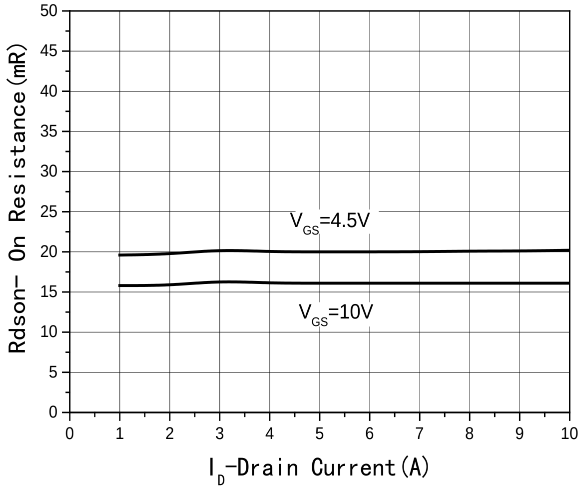


Fig3 Rdson-Drain current

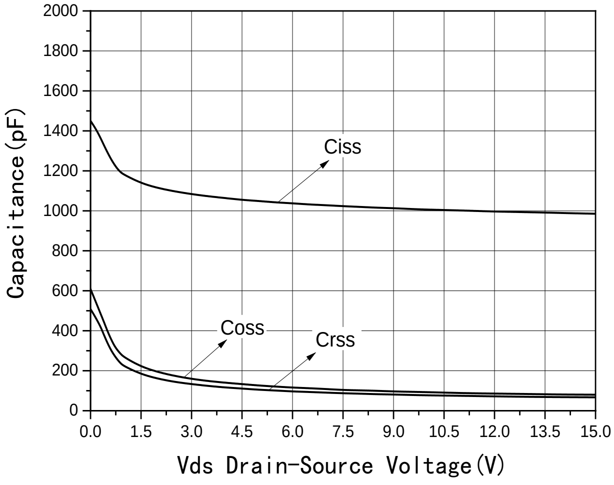


Fig4 Capacitance vs Vds

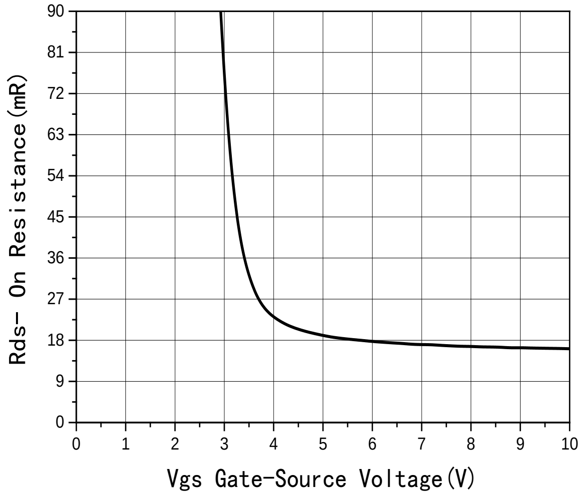


Fig5 Rdson-Gate Drain voltage

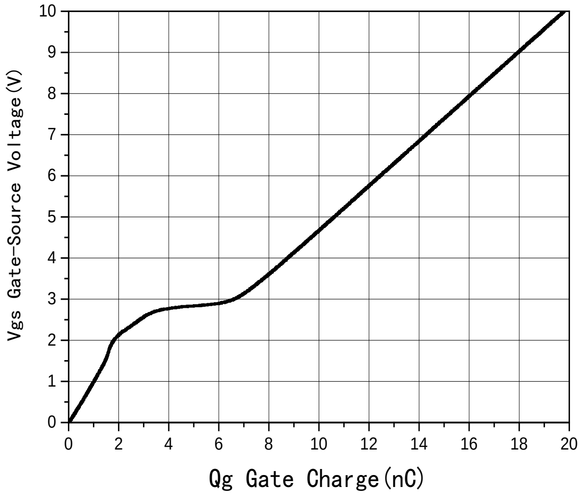


Fig6 Gate Charge

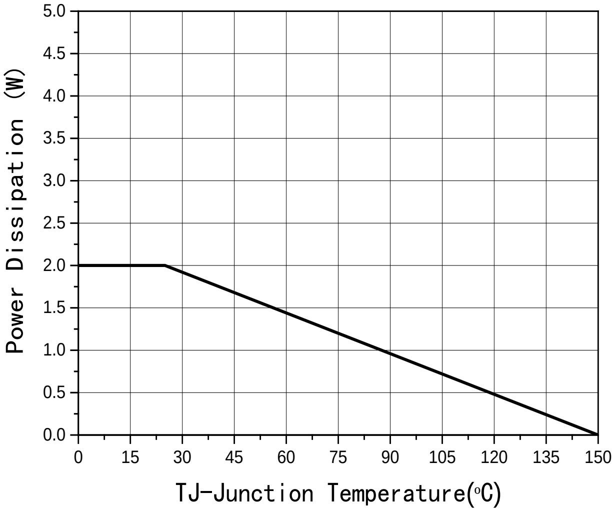


Fig7 Power De-rating

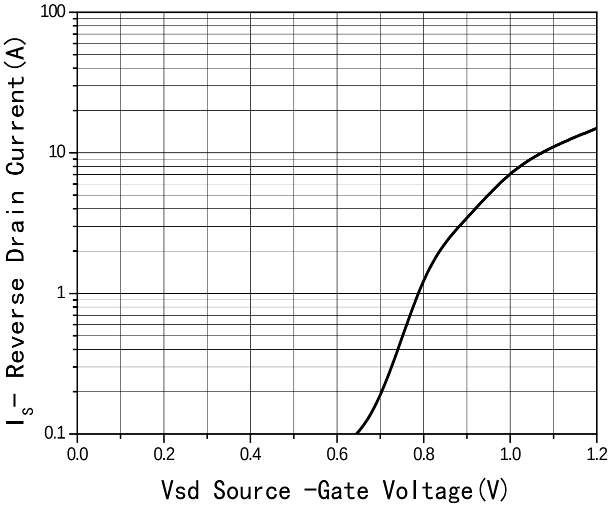


Fig8 Source-Drain Diode Forward

P-Channel Electrical Characteristics (T_J=25℃ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0V, I_D=-250μA	-40	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS}=-40V, V_{GS}=0V	-	-	-1	μA
Gate-body leakage	I_{GSS}	V_{DS}=0V, V_{GS}=±20V	-	-	±100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=-250μA	-1.0	-1.35	-2.0	V
Drain-source on-state resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-10A	-	37	44	mΩ
		V_{GS}=-4.5V, I_D=-10A	-	49	60	
Forward transconductance	gfs	V_{DS}=-5V, I_D=-10A	-	18	-	S
Dynamic Characteristics						
Input capacitance	C_{ISS}	V_{DS}=-20V ,V_{GS}=0V f=1.0MHz	-	1068	-	pF
Output capacitance	C_{OSS}		-	87	-	
Reverse transfer capacitance	C_{RSS}		-	72	-	
Gate resistance	Rg	V_{GS}=0V, V_{DS}=0V, f=1.0MHz	-	4	-	Ω
Switching Characteristics						
Turn-on delay time	$t_{D(ON)}$	V_{DS}=-20V V_{GS}=-10V R_L=2.3Ω R_{GEN}=3Ω	-	10	-	ns
Rise time	tr		-	5.5	-	
Turn-off delay time	$t_{D(OFF)}$		-	3.6	-	
Fall time	tf		-	4.6	-	
Total gate charge	Qg	V_{DS}=-20V,I_D=-10A V_{GS}=-10V	-	19	-	nC
Gate-source charge	Qgs		-	3.7	-	
Gate-drain charge	Qgd		-	2.7	-	

Typical Performance Characteristics

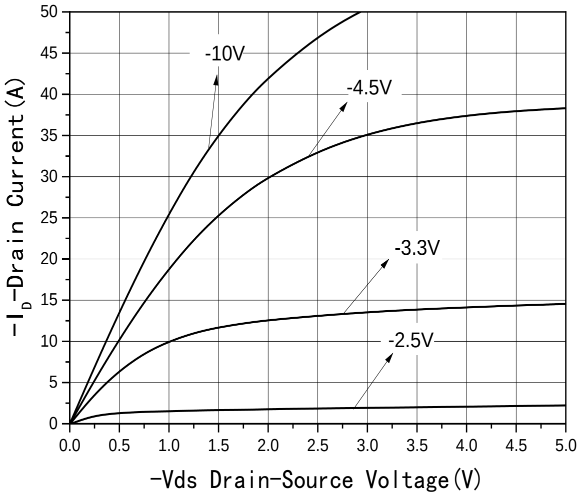


Fig1 Output Characteristics

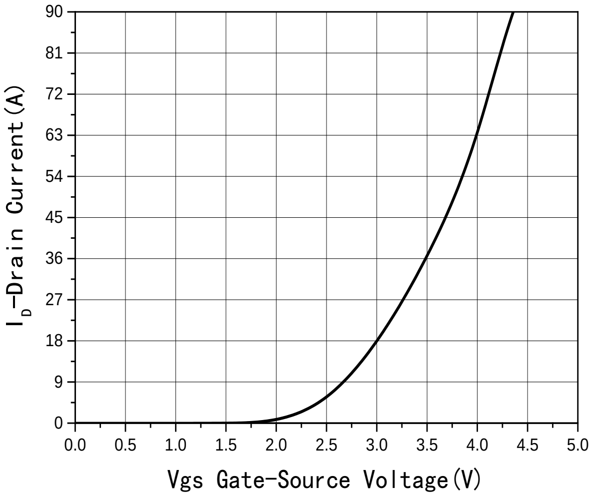


Fig2 Transfer Characteristics

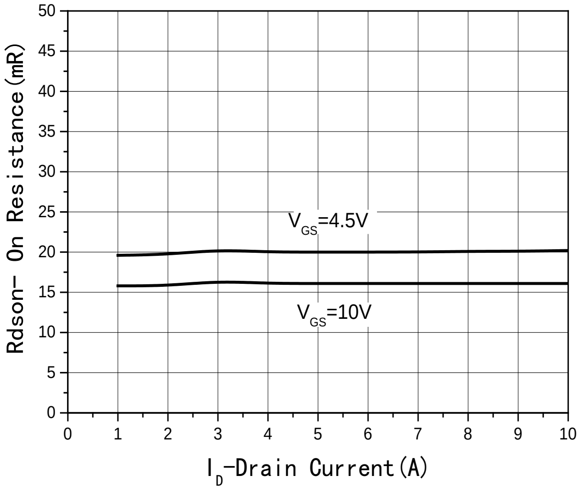


Fig3 Rdson-Drain current

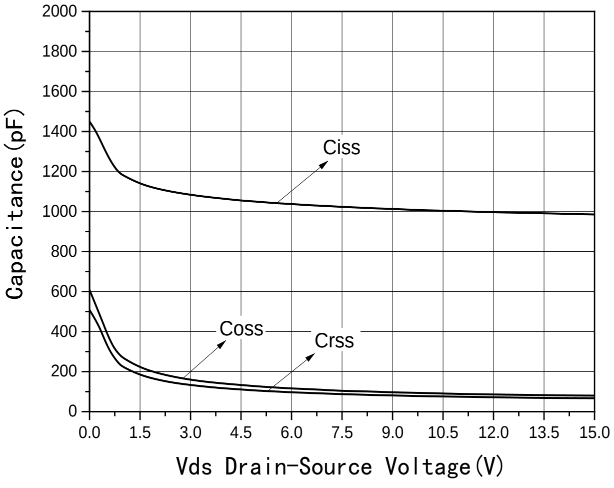


Fig4 Capacitance vs Vds

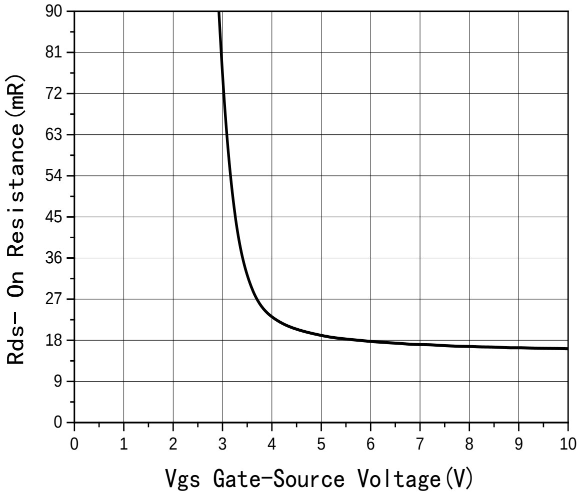


Fig5 Rdson-Gate Drain voltage

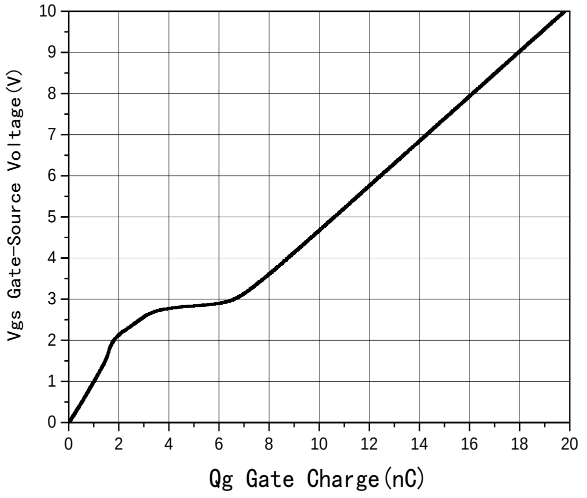


Fig6 Gate Charge

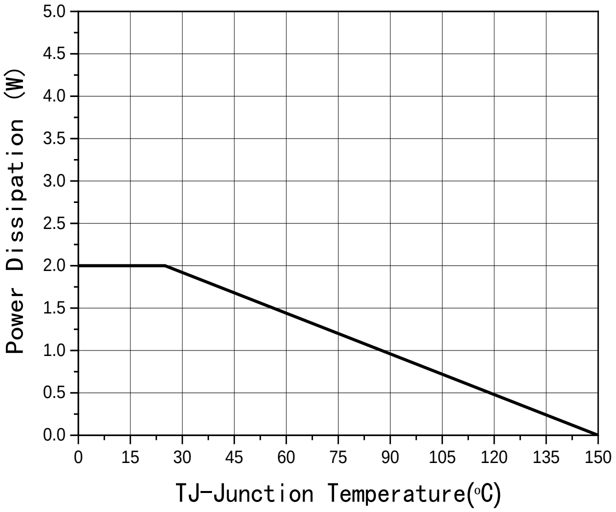


Fig7 Power De-rating

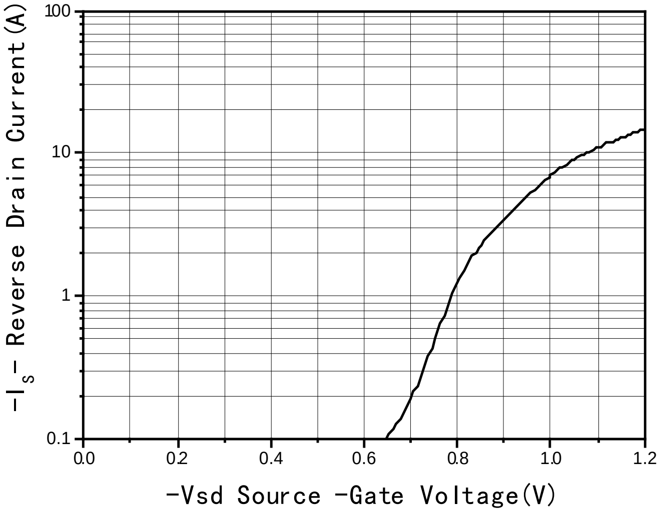
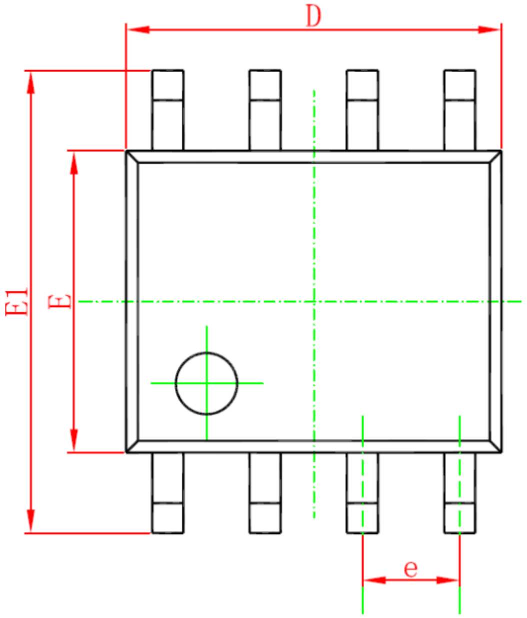
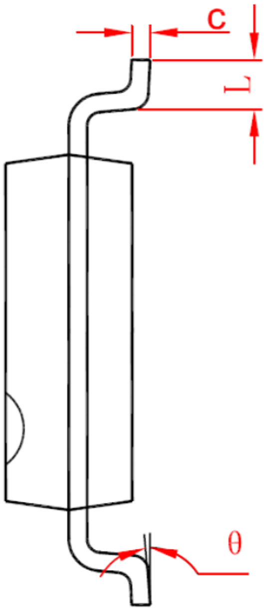


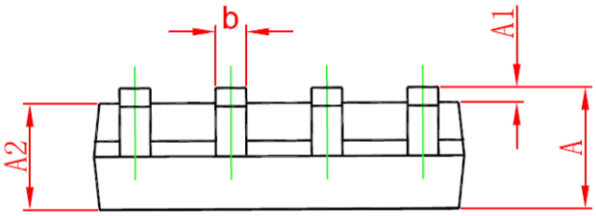
Fig8 Source-Drain Diode Forward

Package Information

- **SOP-8**



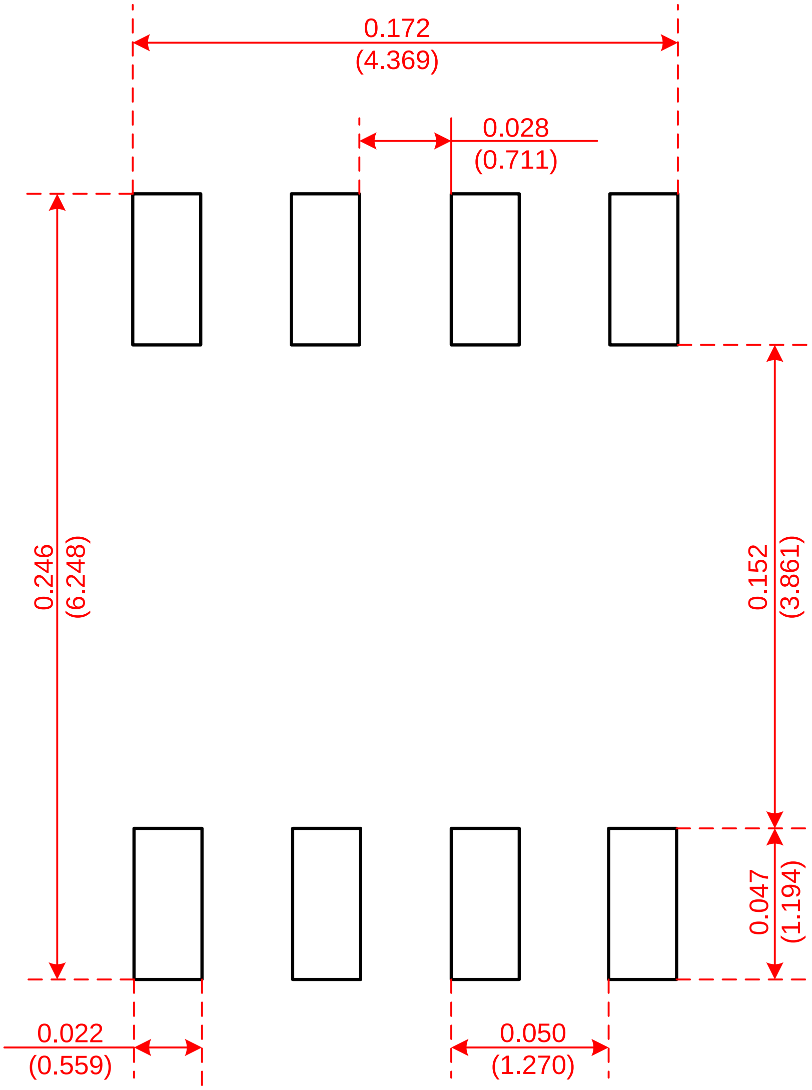




Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)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

Recommended Minimum Pads

- **SOP-8**



Recommended Minimum Pads
Dimensions in Inches/(mm)