

# BSR58LT1

## JFET Chopper Transistor N-Channel – Depletion

### Features

- Pb-Free Package is Available

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain–Gate Voltage	$V_{DG}$	–40	Vdc
Gate–Source Voltage	$V_{GS}$	–35	Vdc
Gate Current	$I_G$	50	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	350 2.8	mW mW/ $^\circ\text{C}$
Lead Temperature	$T_L$	300	$^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	–65 to +150	$^\circ\text{C}$

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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#### OFF CHARACTERISTICS

Gate–Source Breakdown Voltage ( $I_G = -1.0 \mu\text{Adc}$ )	$V_{(BR)GSS}$	40	–	Vdc
Gate Reverse Current ( $V_{GS} = -15 \text{ Vdc}$ )	$I_{GSS}$	–	–1.0	nAdc
Gate Source Cutoff Voltage ( $V_{DS} = 5.0 \text{ Vdc}$ , $I_D = 1.0 \mu\text{Adc}$ )	$V_{GS(off)}$	–0.8	–4.0	Vdc
Drain–Cutoff Current ( $V_{DS} = 5.0 \text{ Vdc}$ , $V_{GS} = -10 \text{ Vdc}$ )	$I_{D(off)}$	–	1.0	nAdc

#### ON CHARACTERISTICS

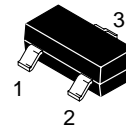
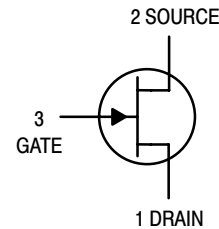
Zero–Gate–Voltage Drain Current (Note 1) ( $V_{DS} = 15 \text{ Vdc}$ )	$I_{DSS}$	8.0	80	mAdc
Static Drain–Source On Resistance ( $V_{DS} = 0.1 \text{ Vdc}$ )	$r_{DS(on)}$	–	60	$\Omega$
Drain Gate and Source Gate On–Capacitance ( $V_{DS} = V_{GS} = 0$ , $f = 1.0 \text{ MHz}$ )	$C_{dg(on)}$ + $C_{sg(on)}$	–	28	pF
Drain Gate Off–Capacitance ( $V_{GS} = -10 \text{ Vdc}$ , $f = 1.0 \text{ MHz}$ )	$C_{dg(off)}$	–	5.0	pF
Source Gate Off–Capacitance ( $V_{GS} = -10 \text{ Vdc}$ , $f = 1.0 \text{ MHz}$ )	$C_{sg(off)}$	–	5.0	pF

1. Pulse Width = 300  $\mu\text{s}$ , Duty Cycle = 3.0%.



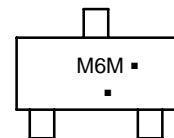
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SOT-23  
CASE 318  
STYLE 10

### MARKING DIAGRAM



M6 = Device Code

M = Date Code\*

▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

### ORDERING INFORMATION

Device	Package	Shipping†
BSR58LT1	SOT-23	3000/Tape & Reel
BSR58LT1G	SOT-23 (Pb-Free)	3000/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

TYPICAL SWITCHING CHARACTERISTICS

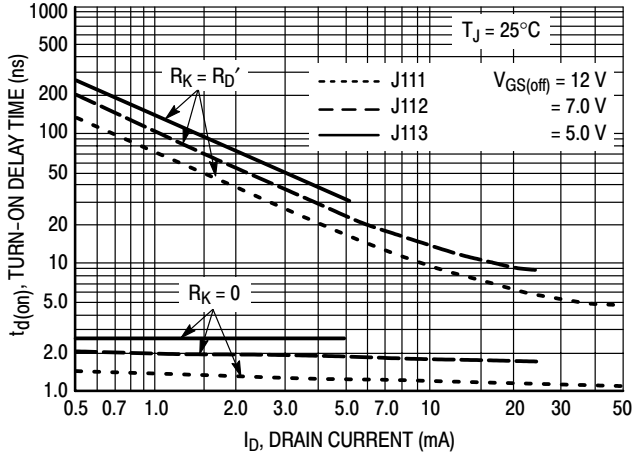


Figure 1. Turn-On Delay Time

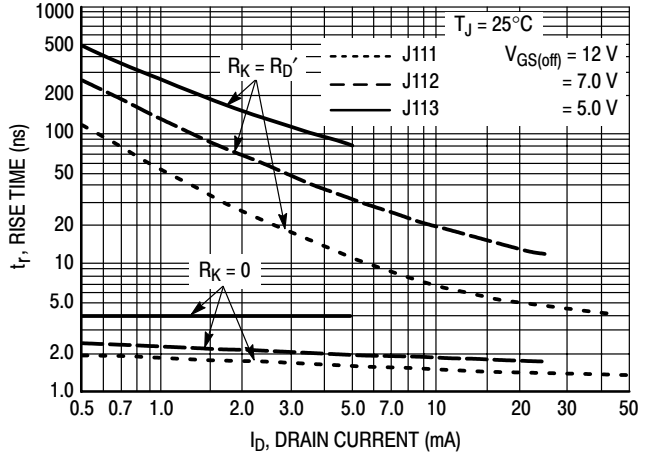


Figure 2. Rise Time

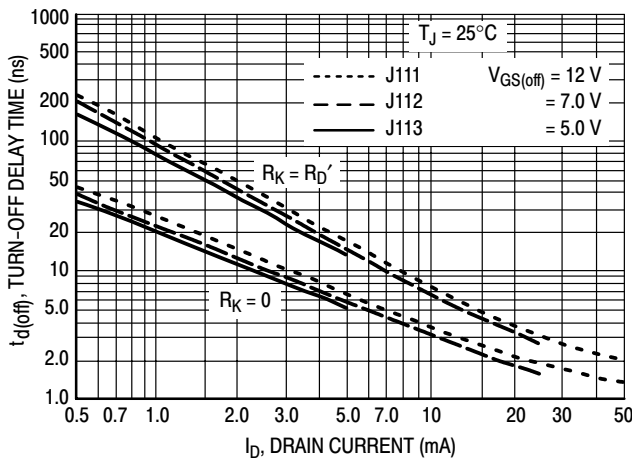


Figure 3. Turn-Off Delay Time

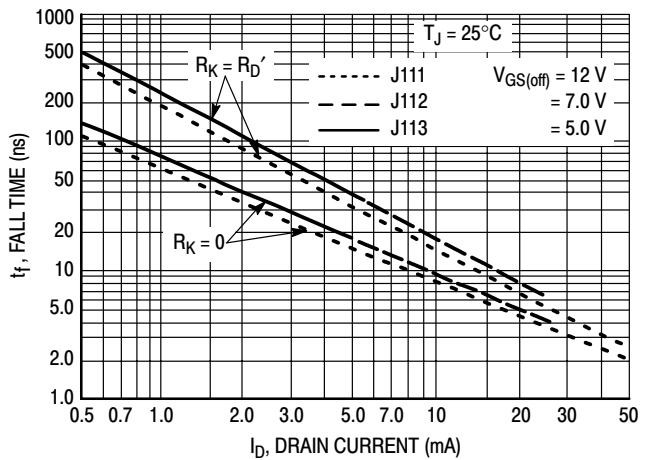


Figure 4. Fall Time

NOTE 1

The switching characteristics shown above were measured using a test circuit similar to Figure 5. At the beginning of the switching interval, the gate voltage is at Gate Supply Voltage ( $-V_{GG}$ ). The Drain-Source Voltage ( $V_{DS}$ ) is slightly lower than Drain Supply Voltage ( $V_{DD}$ ) due to the voltage divider. Thus Reverse Transfer Capacitance ( $C_{rss}$ ) or Gate-Drain Capacitance ( $C_{gd}$ ) is charged to  $V_{GG} + V_{DS}$ .

During the turn-on interval, Gate-Source Capacitance ( $C_{gs}$ ) discharges through the series combination of  $R_{GEN}$  and  $R_K$ .  $C_{gd}$  must discharge to  $V_{DS(on)}$  through  $R_G$  and  $R_K$  in series with the parallel combination of effective load impedance ( $R'_D$ ) and Drain-Source Resistance ( $r_{ds}$ ). During the turn-off, this charge flow is reversed.

Predicting turn-on time is somewhat difficult as the channel resistance  $r_{ds}$  is a function of the gate-source voltage. While  $C_{gs}$  discharges,  $V_{GS}$  approaches zero and  $r_{ds}$  decreases. Since  $C_{gd}$  discharges through  $r_{ds}$ , turn-on time is non-linear. During turn-off, the situation is reversed with  $r_{ds}$  increasing as  $C_{gd}$  charges.

The above switching curves show two impedance conditions; 1)  $R_K$  is equal to  $R_D$ , which simulates the switching behavior of cascaded stages where the driving source impedance is normally the load impedance of the previous stage, and 2)  $R_K = 0$  (low impedance) the driving source impedance is that of the generator.

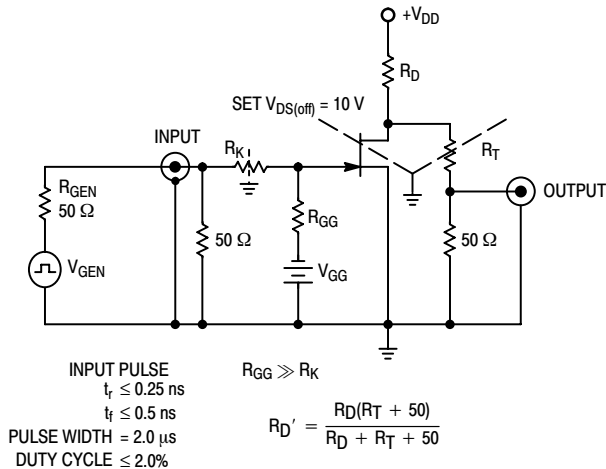


Figure 5. Switching Time Test Circuit

# BSR58LT1

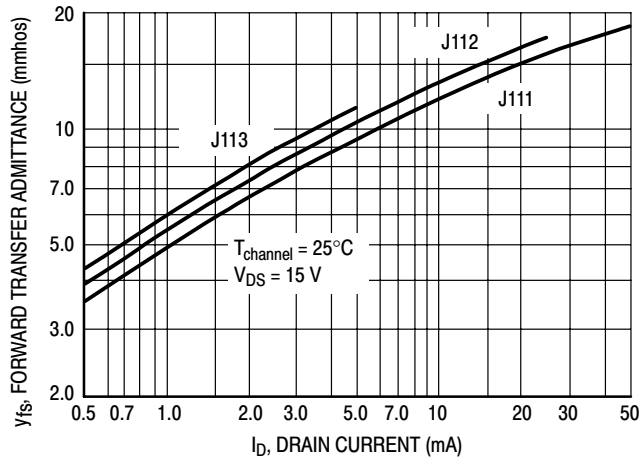


Figure 6. Typical Forward Transfer Admittance

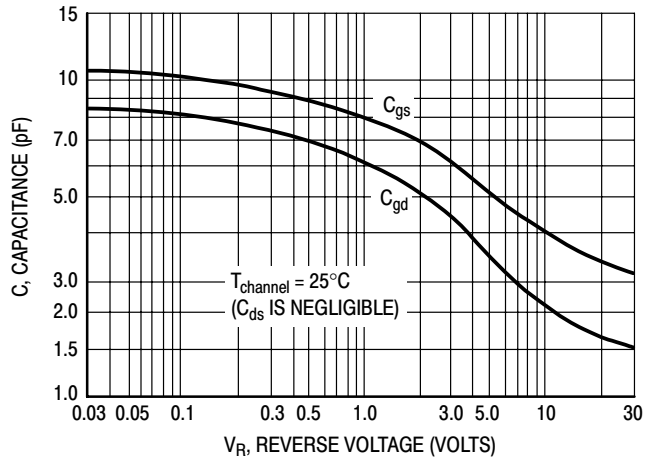


Figure 7. Typical Capacitance

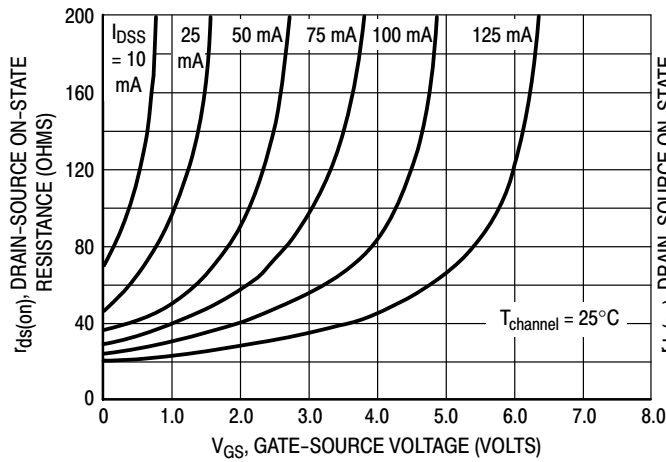


Figure 8. Effect of Gate-Source Voltage On Drain-Source Resistance

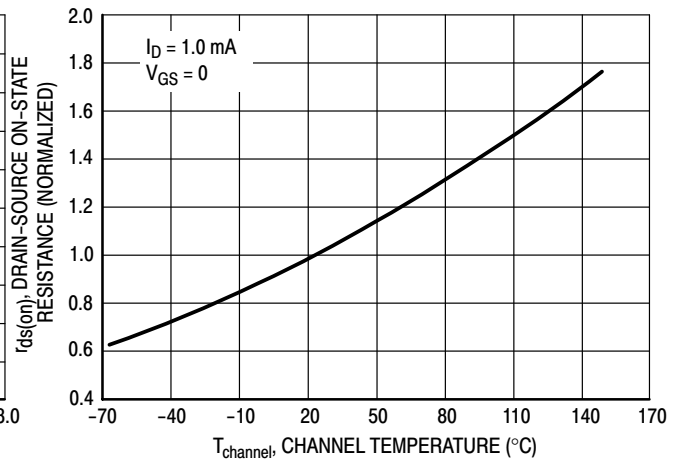


Figure 9. Effect of Temperature On Drain-Source On-State Resistance

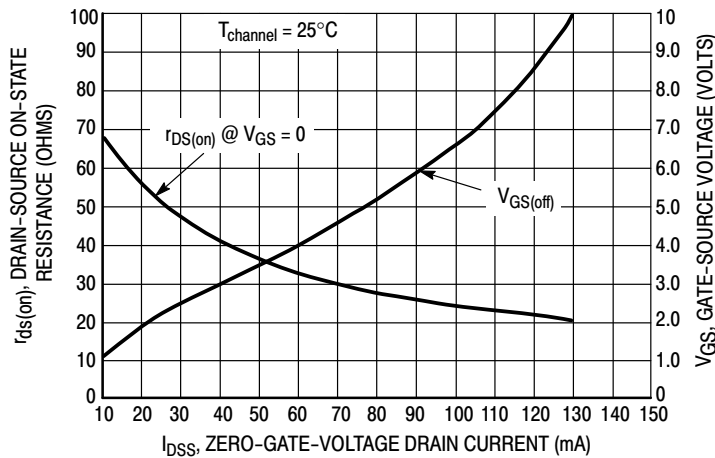


Figure 10. Effect of  $I_{DSS}$  On Drain-Source Resistance and Gate-Source Voltage

## NOTE 2

The Zero-Gate-Voltage Drain Current ( $I_{DSS}$ ), is the principle determinant of other J-FET characteristics. Figure 10 shows the relationship of Gate-Source Off Voltage ( $V_{GS(off)}$ ) and Drain-Source On Resistance ( $r_{ds(on)}$ ) to  $I_{DSS}$ . Most of the devices will be within  $\pm 10\%$  of the values shown in Figure 10. This data will be useful in predicting the characteristic variations for a given part number.

For example:

Unknown

$r_{ds(on)}$  and  $V_{GS}$  range for an J112

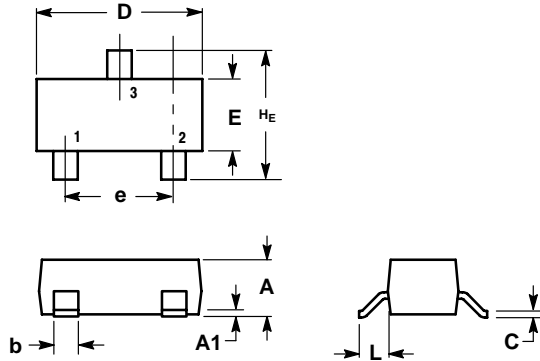
The electrical characteristics table indicates that an J112 has an  $I_{DSS}$  range of 25 to 75 mA. Figure 10, shows  $r_{ds(on)} = 52\ \Omega$  for  $I_{DSS} = 25\text{ mA}$  and  $30\ \Omega$  for  $I_{DSS} = 75\text{ mA}$ .

The corresponding  $V_{GS}$  values are 2.2 V and 4.8 V.

# BSR58LT1

## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-08  
ISSUE AL



NOTES:

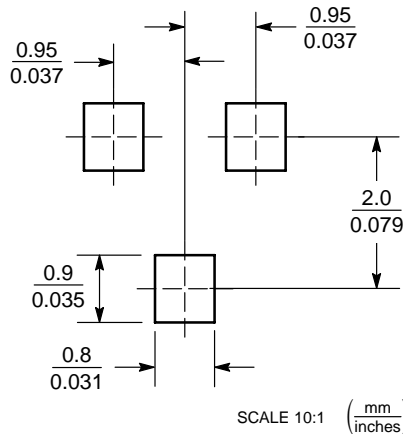
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.081
L	0.35	0.54	0.69	0.014	0.021	0.029
HE	2.10	2.40	2.64	0.083	0.094	0.104

STYLE 10:

1. DRAIN
2. SOURCE
3. GATE

### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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