

# Small Signal MOSFET

## 380 mAmps, 60 Volts

### Dual N-Channel SC88

#### FEATURES

- ESD Protected
- Low  $R_{DS(on)}$
- Surface Mount Package
- This is a Pb-Free Device
- We declare that the material of product are Halogen Free and compliance with RoHS requirements.
- S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

#### APPLICATIONS

- Low Side Load Switch
- Level Shift Circuits
- DC-DC Converter
- Portable Applications i.e. DSC, PDA, Cell Phone, etc.

#### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise stated)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	60	V
Gate-to-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current (Note 1) Steady State	$I_D$	$T_A = 25^\circ\text{C}$	320
		$T_A = 85^\circ\text{C}$	230
$t < 5\text{ s}$	$I_D$	$T_A = 25^\circ\text{C}$	380
		$T_A = 85^\circ\text{C}$	270
Power Dissipation (Note 1) Steady State	$P_D$		300
		$t < 5\text{ s}$	420
Pulsed Drain Current ( $t_p = 10\ \mu\text{s}$ )	$I_{DM}$	1.5	A
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$
Source Current (Body Diode)	$I_S$	300	mA
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	260	$^\circ\text{C}$
Gate-Source ESD Rating (HBM, Method 3015)	ESD	2000	V

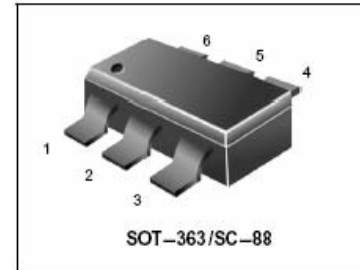
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - $t \leq 5\text{ s}$ (Note 1)	$R_{\theta JA}$	300	

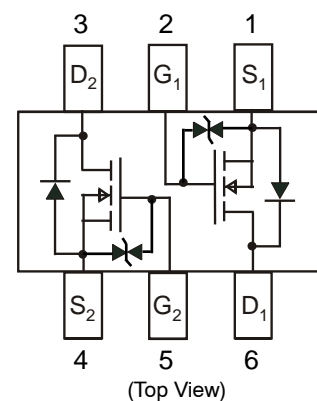
1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces)

**L2N7002KDW1T1G**  
**S-L2N7002KDW1T1G**



$V_{(BR)DSS}$	$R_{DS(on)}\text{ MAX}$	$I_D\text{ MAX}$ (Note 1)
60 V	2.3 $\Omega$ @ 10 V	380 mA
	2.7 $\Omega$ @ 5.0 V	

#### Simplified Schematic



#### ORDERING INFORMATION

Device	Marking	Shipping
L2N7002KDW1T1G S-L2N7002KDW1T1G	72K	3000 Tape & Reel

L2N7002KDW1T1G , S-L2N7002KDW1T1G

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			71		mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 60\text{ V}$	$T_J = 25^\circ\text{C}$		1	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$		500	
		$V_{GS} = 0\text{ V}, V_{DS} = 50\text{ V}$	$T_J = 25^\circ\text{C}$			100
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 10$	$\mu\text{A}$

**ON CHARACTERISTICS** (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.0		2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			4.0		mV/ $^\circ\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 500\text{ mA}$			2.3	$\Omega$
		$V_{GS} = 5.0\text{ V}, I_D = 50\text{ mA}$			2.7	
Forward Transconductance	$g_{FS}$	$V_{DS} = 5\text{ V}, I_D = 200\text{ mA}$	80			mS

**CHARGES AND CAPACITANCES**

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 25\text{ V}$		34		$\mu\text{F}$
Output Capacitance	$C_{OSS}$			3		
Reverse Transfer Capacitance	$C_{RSS}$			2.2		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}; I_D = 500\text{ mA}$		0.71		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.1		
Gate-to-Source Charge	$Q_{GS}$			0.32		
Gate-to-Drain Charge	$Q_{GD}$			0.16		

**SWITCHING CHARACTERISTICS,  $V_{GS} = V$**  (Note 3)

Turn-On Delay Time	$t_{d(ON)}$	$V_{DS} = 10\text{ V}, V_{GEN} = 10\text{ V}, I_D = 500\text{ mA}$		3.8		ns
Rise Time	$t_r$			3.4		
Turn-Off Delay Time	$t_{d(OFF)}$			19		
Fall Time	$t_f$			12		

**DRAIN-SOURCE DIODE CHARACTERISTICS**

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 115\text{ mA}$	$T_J = 25^\circ\text{C}$		1.4	V
			$T_J = 85^\circ\text{C}$		0.7	

2. Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$
3. Switching characteristics are independent of operating junction temperatures

L2N7002KDW1T1G , S-L2N7002KDW1T1G

TYPICAL ELECTRICAL CHARACTERISTICS

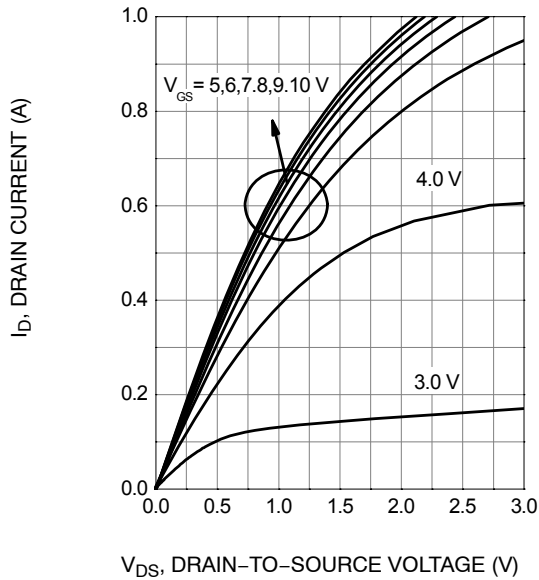


Figure 1. On-Region Characteristics

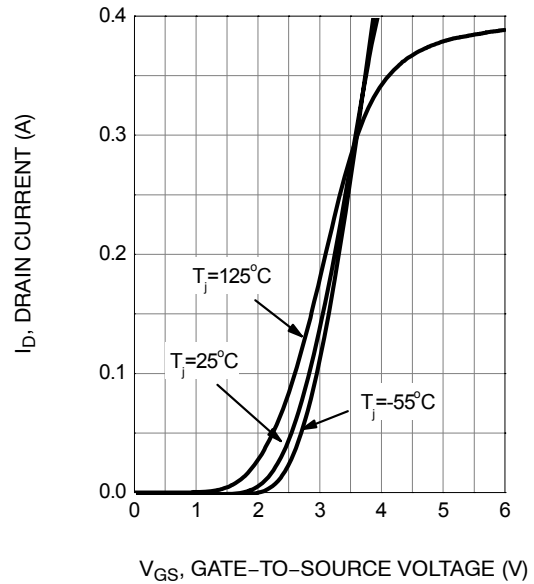


Figure 2. Transfer Characteristics

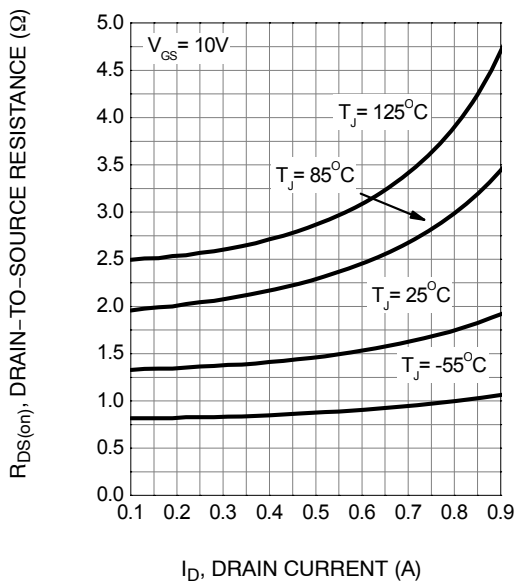


Figure 3. On-Resistance vs. Drain Current and Temperature

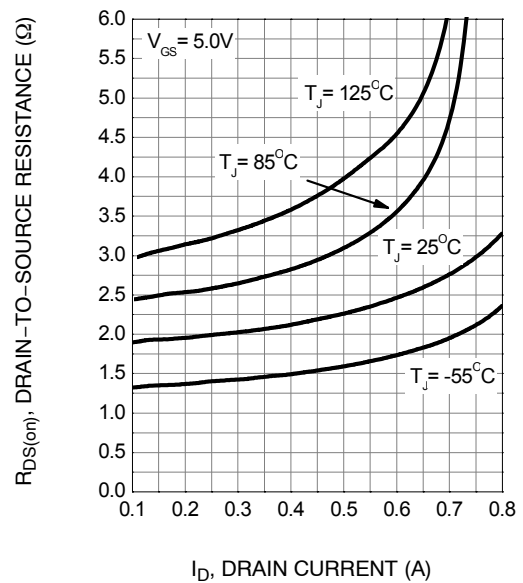


Figure 4. On-Resistance vs. Drain Current and Temperature

L2N7002KDW1T1G , S-L2N7002KDW1T1G

TYPICAL ELECTRICAL CHARACTERISTICS

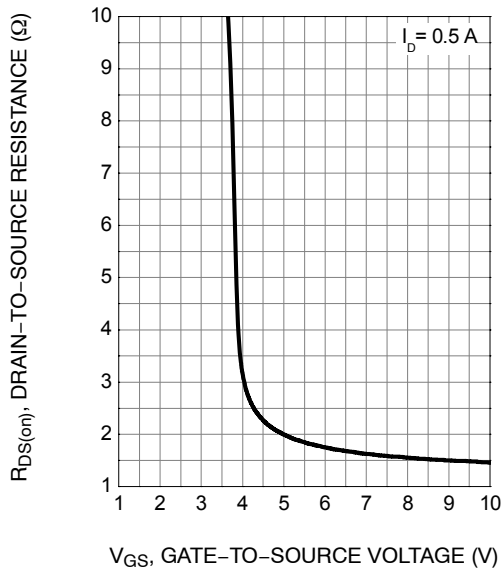


Figure 5. On-Resistance vs. Gate-to-Source Voltage

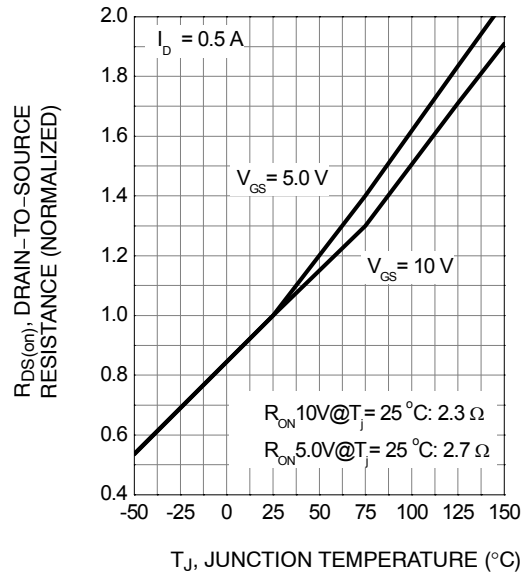


Figure 6. On-Resistance Variation with Temperature

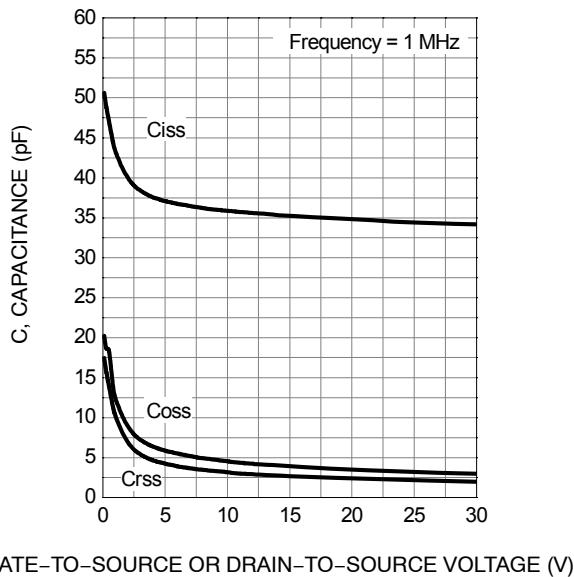


Figure 7. Capacitance Variation

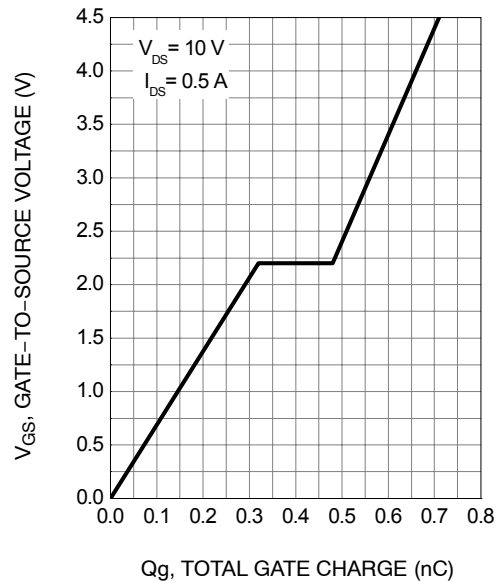
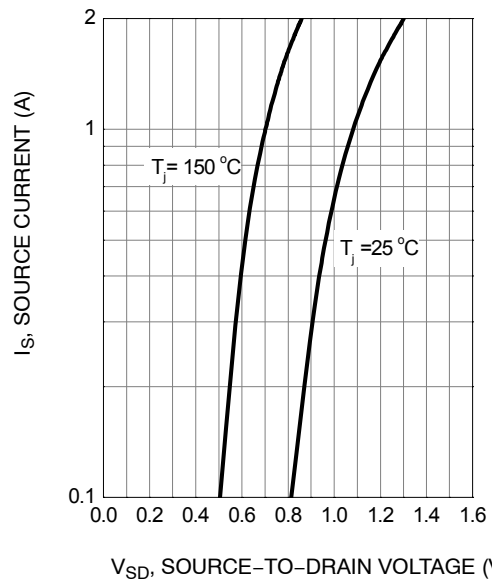
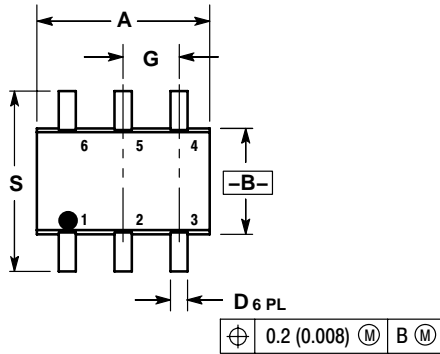


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

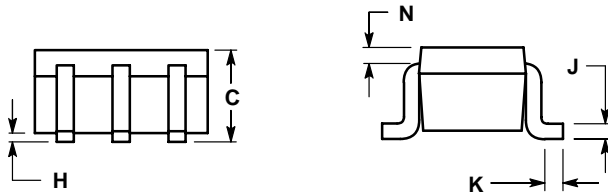
**L2N7002KDW1T1G , S-L2N7002KDW1T1G****TYPICAL ELECTRICAL CHARACTERISTICS****Figure 9. Diode Forward Voltage vs. Current**

**L2N7002KDW1T1G , S-L2N7002KDW1T1G**
**SC-88 (SOT-363)**


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026	BSC	0.65	BSC
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008	REF	0.20	REF
S	0.079	0.087	2.00	2.20


**SOLDERING FOOTPRINT\***
