

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	$I_D$ $T_A = 25^\circ\text{C}$
50V	1.8Ω @ $V_{GS} = 10\text{V}$	500mA
	2.0Ω @ $V_{GS} = 4.5\text{V}$	450mA

## Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Lead Free By Design/RoHS Compliant (Note 1)
- "Green" Device (Note 2)
- Qualified to AEC-Q101 Standards for High Reliability

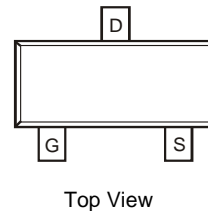
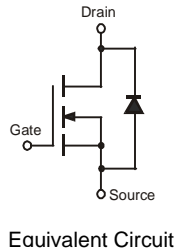
## Description and Applications

This new generation MOSFET has been designed to minimize the on-state resistance ( $R_{DS(on)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Backlighting
- DC-DC Converters
- Power management functions

## Mechanical Data

- Case: SOT23
- Case Material: Molded Plastic "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish annealed over Alloy 42 leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Weight: 0.008 grams (approximate)

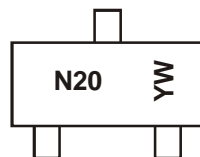


## Ordering Information (Note 3)

Part Number	Case	Packaging
BSN20-7	SOT23	3000/Tape & Reel

- Notes:
1. No purposefully added lead.
  2. Diodes Inc.'s "Green" policy can be found on our website at <http://www.diodes.com>.
  3. For packaging details, go to our website at <http://www.diodes.com>

## Marking Information



N20 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: W = 2009)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2009	2010	2011	2012	2013	2014	2015
Code	W	X	Y	Z	A	B	C

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

## Maximum Ratings

Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{DSS}$	50	V
Gate-Source Voltage			$V_{GSS}$	$\pm 20$	V
Continuous Drain Current @ $T_{SP} = 25^{\circ}\text{C}$ (Note 4)	Steady State	$T_A = 25^{\circ}\text{C}$	$I_D$	500	mA
		$T_A = 100^{\circ}\text{C}$		300	
Pulsed Drain Current @ $T_{SP} = 25^{\circ}\text{C}$ (Notes 4 & 5)			$I_{DM}$	1.2	A

## Thermal Characteristics

Characteristic	Symbol	Value	Units
Power Dissipation, @ $T_A = 25^{\circ}\text{C}$ (Note 4)	$P_D$	600	mW
Thermal Resistance, Junction to Ambient @ $T_A = 25^{\circ}\text{C}$ (Note 4)	$R_{\theta JA}$	200	$^{\circ}\text{C}/\text{W}$
Power Dissipation, @ $T_{SP} = 25^{\circ}\text{C}$ (Note 4)	$P_D$	920	mW
Thermal Resistance, @ $T_{SP} = 25^{\circ}\text{C}$ (Note 4)	$R_{\theta JSP}$	136	$^{\circ}\text{C}/\text{W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^{\circ}\text{C}$

## Electrical Characteristics @ $T_A = 25^{\circ}\text{C}$ unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 6)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	50	-	-	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current $T_J = 25^{\circ}\text{C}$	$I_{DSS}$	-	-	0.5	$\mu\text{A}$	$V_{DS} = 50\text{V}, V_{GS} = 0\text{V}$
Gate-Body Leakage	$I_{GSS}$	-	-	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 6)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	0.4	1.0	1.5	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(on)}$	-	1.3	1.8	$\Omega$	$V_{GS} = 10\text{V}, I_D = 0.22\text{A}$ $V_{GS} = 4.5\text{V}, I_D = 0.1\text{A}$
			1.6	2.0		
Forward Transfer Admittance	$ Y_{fs} $	40	320	-	mS	$V_{DS} = 10\text{V}, I_D = 0.1\text{A}$
Diode Forward Voltage	$V_{SD}$	-	1.0	1.5	V	$V_{GS} = 0\text{V}, I_S = 180\text{mA}$
Source (diode forward) Current	$I_S$	-	-	194	mA	$T_{SP} = 25^{\circ}\text{C}$
Peak Source (diode forward) Current	$I_{SM}$	-	-	1.2	A	$T_{SP} = 25^{\circ}\text{C}$ (Notes 3 & 4)
<b>DYNAMIC CHARACTERISTICS (Note 7)</b>						
Input Capacitance	$C_{iss}$	-	21.8	40	pF	$V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	-	5.6	15	pF	
Reverse Transfer Capacitance	$C_{riss}$	-	3.3	10	pF	
Gate Resistance	$R_g$	-	49	-	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge	$Q_g$	-	800	-	pC	$V_{GS} = 10\text{V}, V_{DD} = 25\text{V},$ $I_D = 250\text{mA}$
Gate-Source Charge	$Q_{gs}$	-	100	-	pC	
Gate-Drain Charge	$Q_{gd}$	-	100	-	pC	
Turn-On Delay Time	$t_{D(on)}$	-	2.93	-	ns	$V_{DD} = 30\text{V}, V_{GEN} = 10\text{V},$ $R_L = 150\Omega, R_{GEN} = 50\Omega,$ $I_D = 0.2\text{A}$
Turn-On Rise Time	$t_r$	-	2.99	-	ns	
Turn-Off Delay Time	$t_{D(off)}$	-	9.45	-	ns	
Turn-Off Fall Time	$t_f$	-	8.3	-	ns	

- Notes:
- Device mounted on FR-4 PCB, with minimum recommended pad layout.
  - Repetitive rating, pulse width limited by junction temperature.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

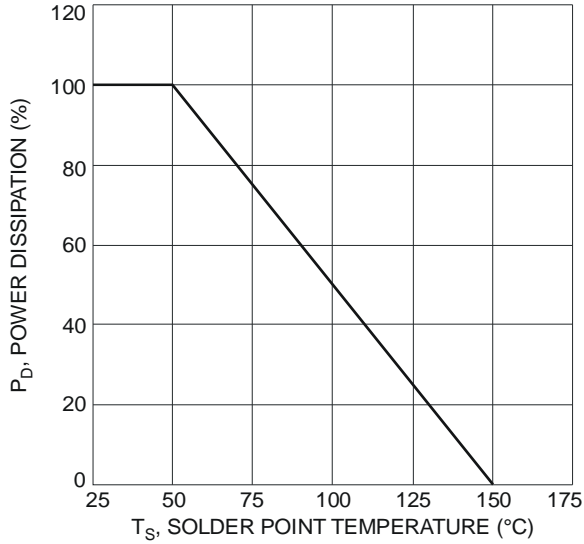


Fig 1. Normalized Total Power Dissipation as a Function of Solder Point Temperature

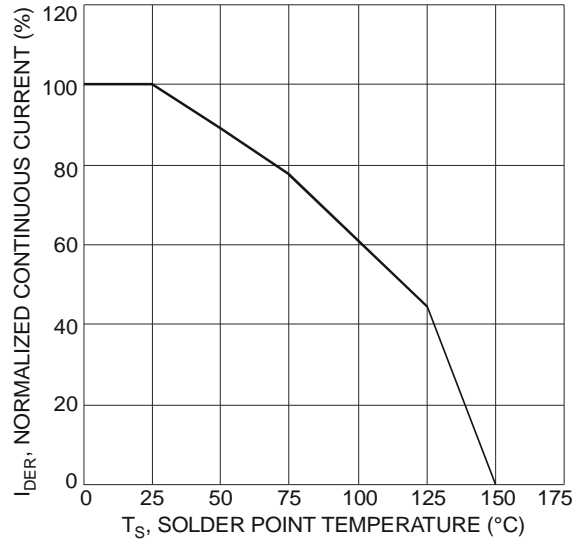


Fig 2. Normalized Continuous Current vs. Solder Point Temperature

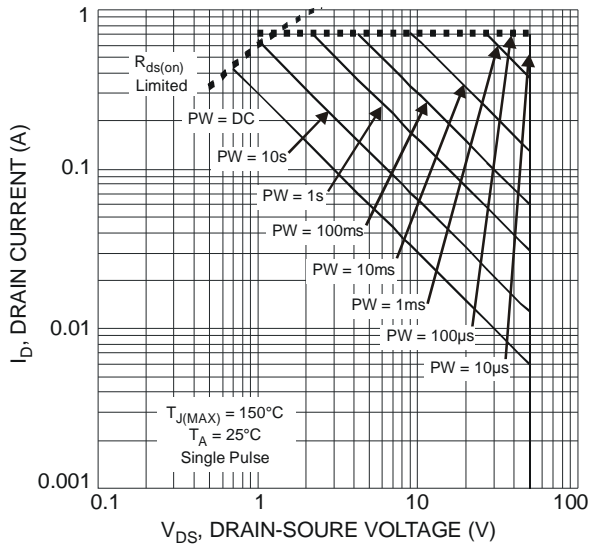


Fig 3 SOA, Safe Operation Area

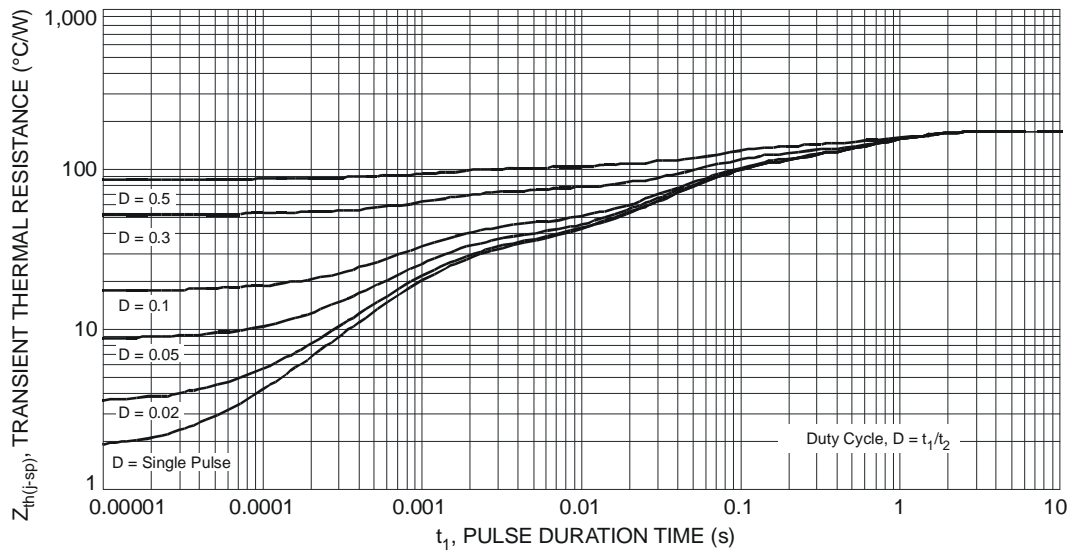


Fig. 4 Transient Thermal Response

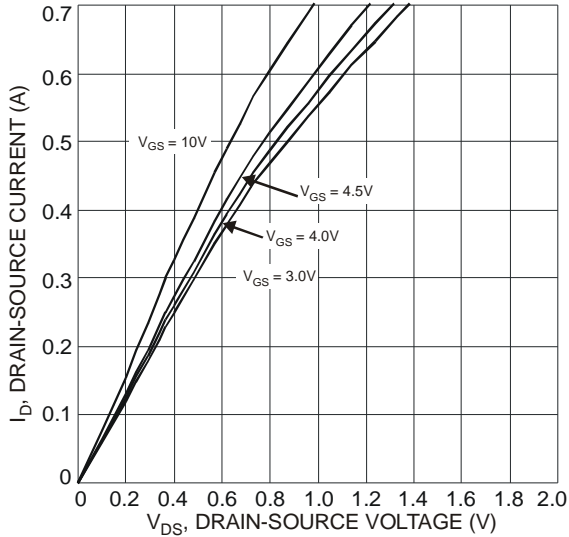


Fig. 5 Drain-Source Current vs. Drain-Source Voltage

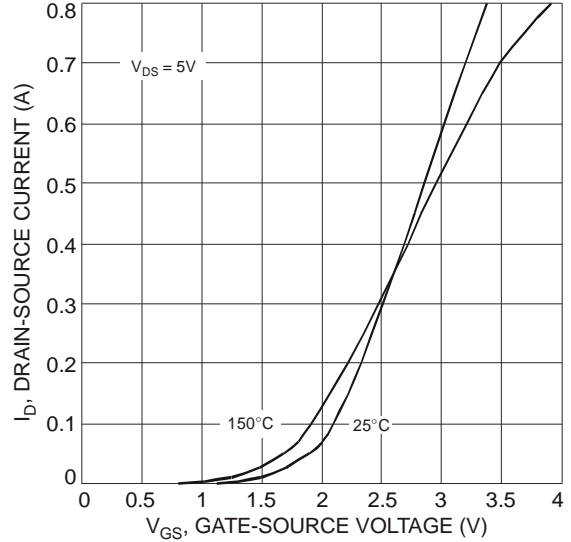


Fig. 6 Transfer Characteristics

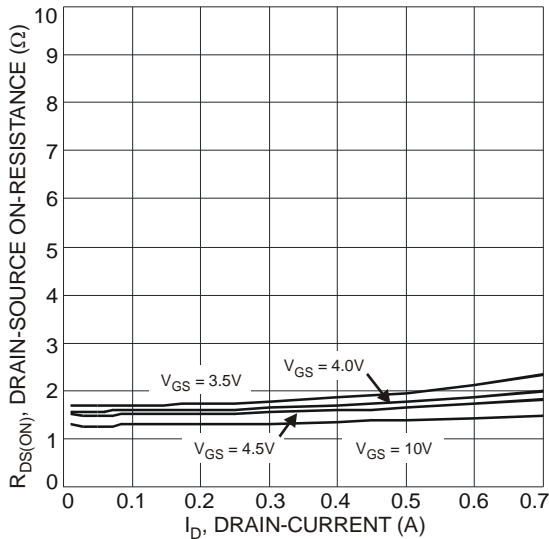


Fig. 7 Drain-Source On-Resistance vs. Drain-Current

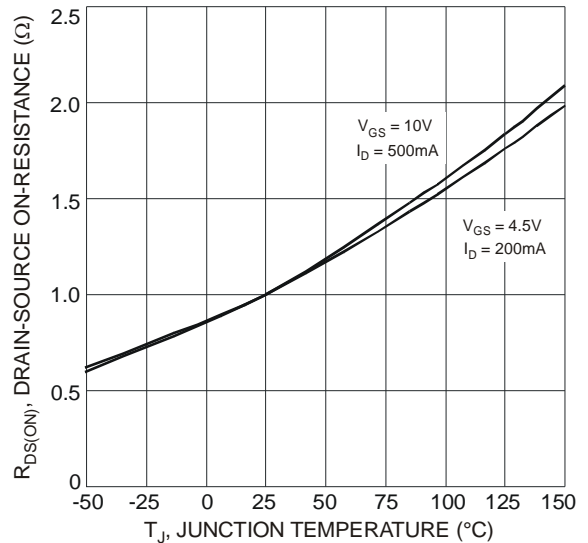


Fig. 8 Drain-Source On-Resistance vs. Junction Temperature

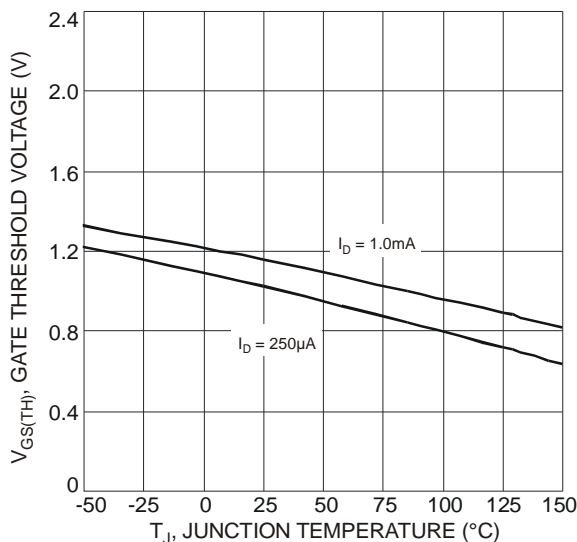


Fig. 9 Gate Threshold Voltage vs. Junction Temperature

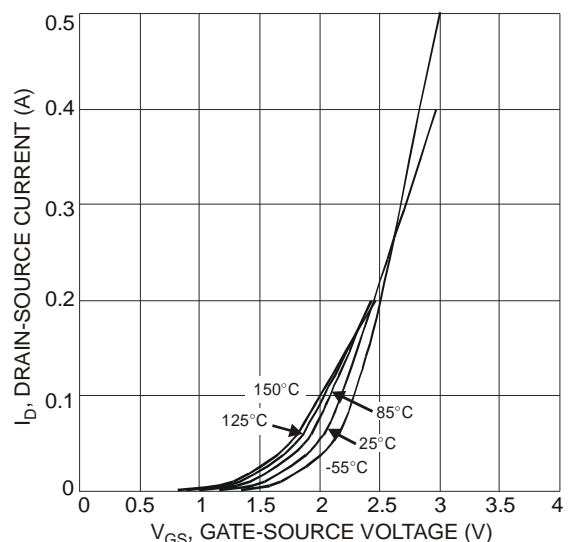


Fig. 10 Transfer Characteristics

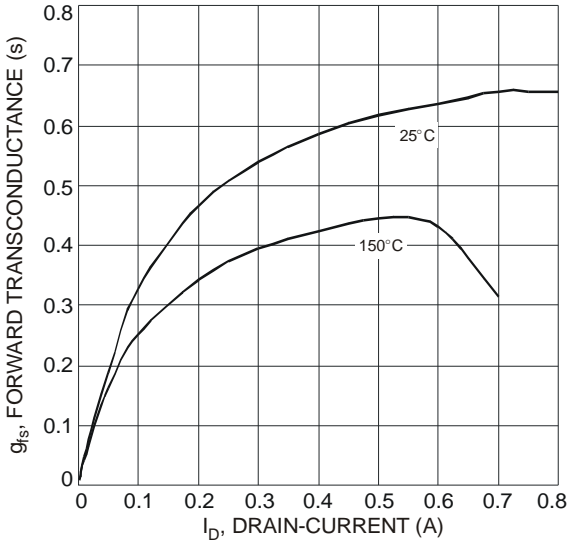


Fig. 11 Typical Transfer Characteristic

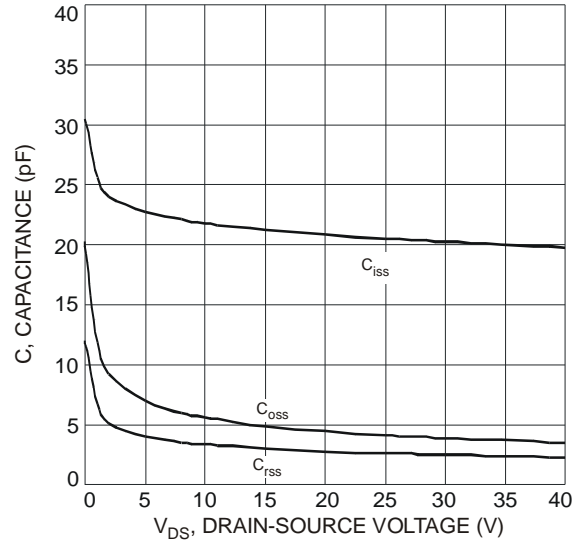


Fig. 12 Capacitance vs. Drain-Source Voltage

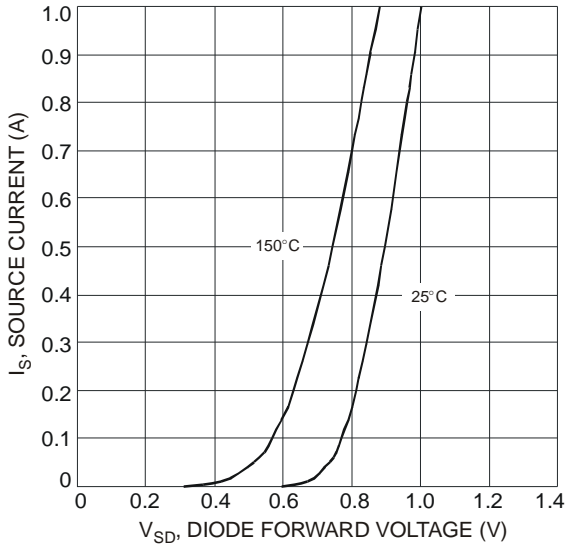
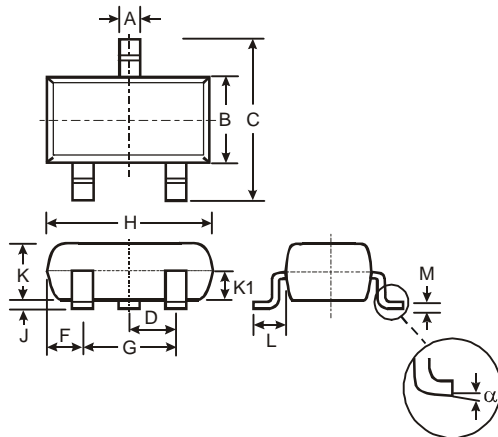


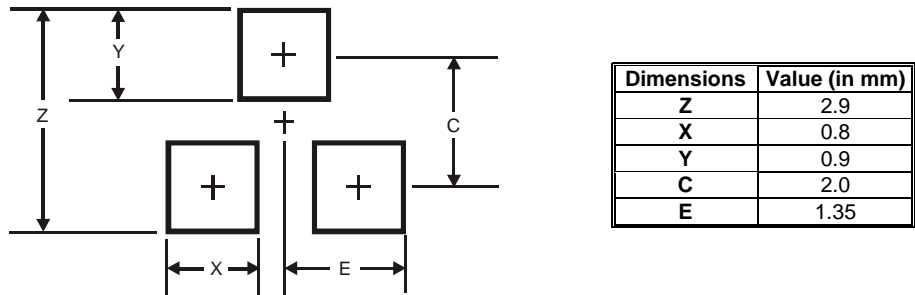
Fig. 13 Source Current vs. Diode Forward Voltage

**Package Outline Dimensions**



SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.903	1.10	1.00
K1	-	-	0.400
L	0.45	0.61	0.55
M	0.085	0.18	0.11
α	0°	8°	-
All Dimensions in mm			

## Suggested Pad Layout



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