N-CHANNEL ENHANCEMENT MODE FIELD MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D $T_A = 25°C$
50V	1.8Ω @ V_{GS} = 10V	500mA
	2.0Ω @ V_{GS} = 4.5V	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.

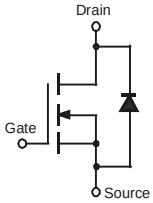
- Backlighting
- DC-DC Converters
- Power management functions

Mechanical Data

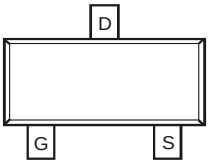
- Case: SOT23
- Case Material: Molded Plastic "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish annealed over Alloy 42 leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208
- Terminal Connections: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

SOT23

Top View



Equivalent Circuit



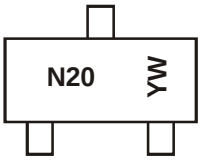
Top View

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}	±20	V
Continuous Drain Current @ T_{SP} = 25°C (Note 4)	Steady State	T_A = 25°C T_A = 100°C	I_D	500 300	mA
Pulsed Drain Current @ T_{SP} = 25°C (Notes 4 & 5)			I_{DM}	1.2	A

Thermal Characteristics

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

.

Electrical Characteristics @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	50	-	-	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current T_J = 25°C	I_{DSS}	-	-	0.5	µA	V_{DS} = 50V, V_{GS} = 0V
Gate-Body Leakage	I_{GSS}	-	-	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(th)}$	0.4	1.0	1.5	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	-	1.3 1.6	1.8 2.0	Ω	V_{GS} = 10V, I_D = 0.22A V_{GS} = 4.5V, I_D = 0.1A
Forward Transfer Admittance	$\|Y_{fs}\|$	40	320	-	mS	V_{DS} = 10V, I_D = 0.1A
Diode Forward Voltage	V_{SD}	-	1.0	1.5	V	V_{GS} = 0V, I_S = 180mA
Source (diode forward) Current	I_S	-	-	194	mA	T_{SP} = 25°C
Peak Source (diode forward) Current	I_{SM}	-	-	1.2	A	T_{SP} = 25°C (Notes 3 & 4)
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	-	21.8	40	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	-	5.6	15	pF	
Reverse Transfer Capacitance	C_{rss}	-	3.3	10	pF	
Gate Resistance	R_g	-	49	-	Ω	V_{DS} =0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge	Q_g	-	800	-	pC	V_{GS} = 10V, V_{DD} = 25V, I_D = 250mA
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} = 30V, V_{GEN} = 10V, R_L = 150Ω, R_{GEN} = 50Ω, I_D = 0.2A
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: 4. Device mounted on FR-4 PCB, with minimum recommended pad layout.
5. Repetitive rating, pulse width limited by junction temperature.
6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to production testing.

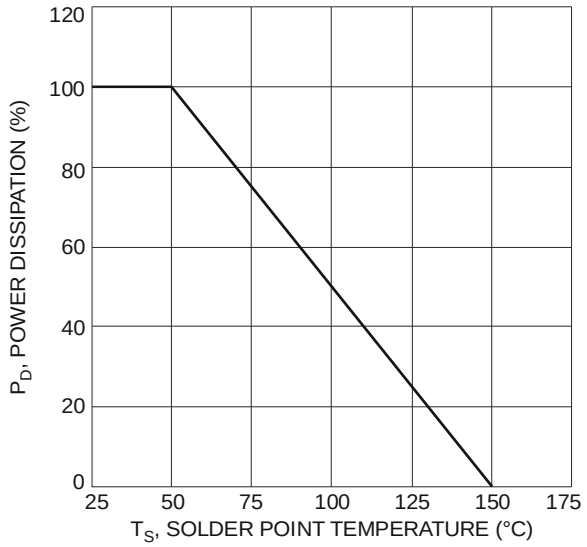


Fig 1. Normalized Total Power Dissipation as a Function of Solder Point Temperature

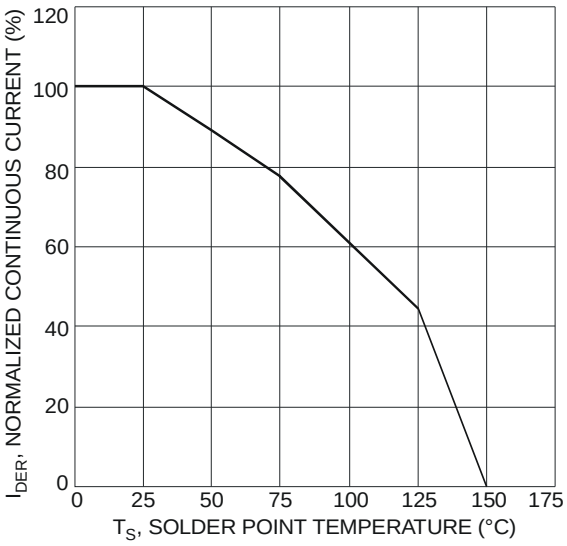


Fig 2. Normalized Continuous Current vs. Solder Point Temperature

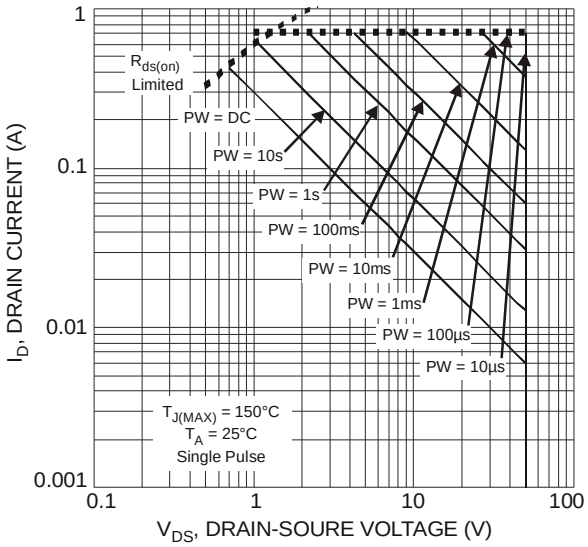


Fig. 3 SOA, Safe Operation Area

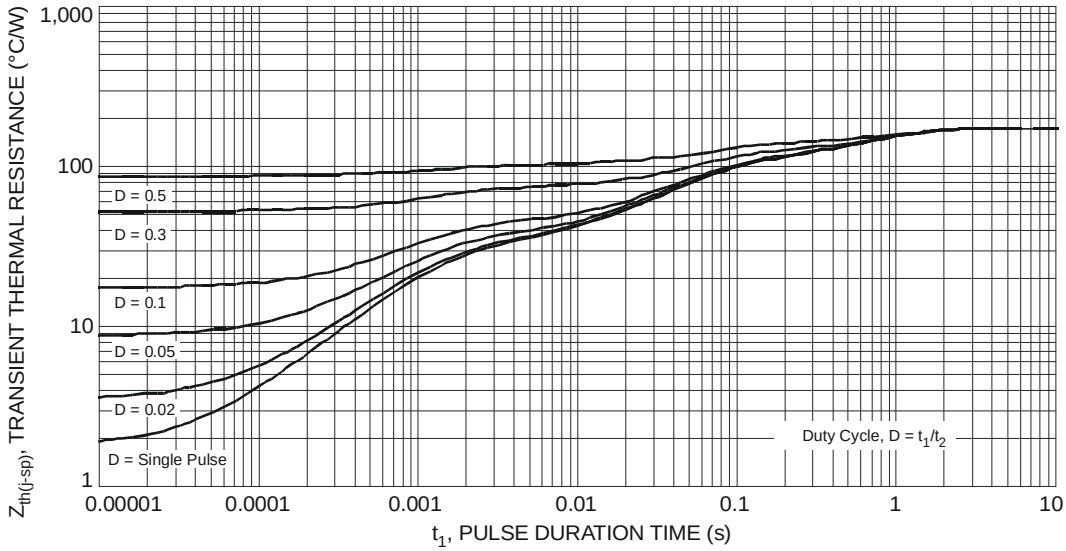


Fig. 4 Transient Thermal Response

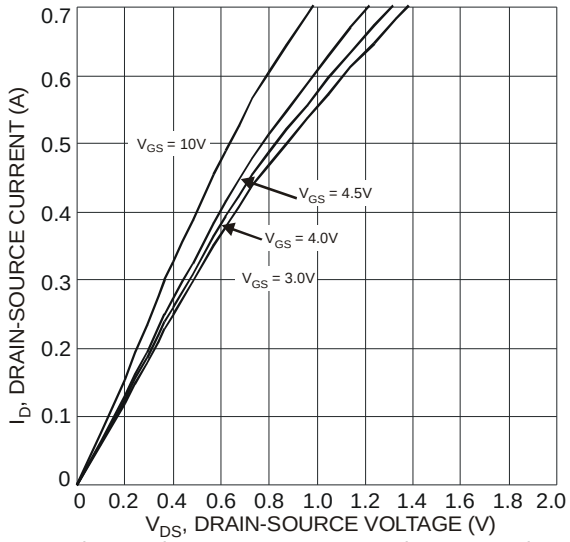


Fig. 5 Drain-Source Current vs. Drain-Source Voltage

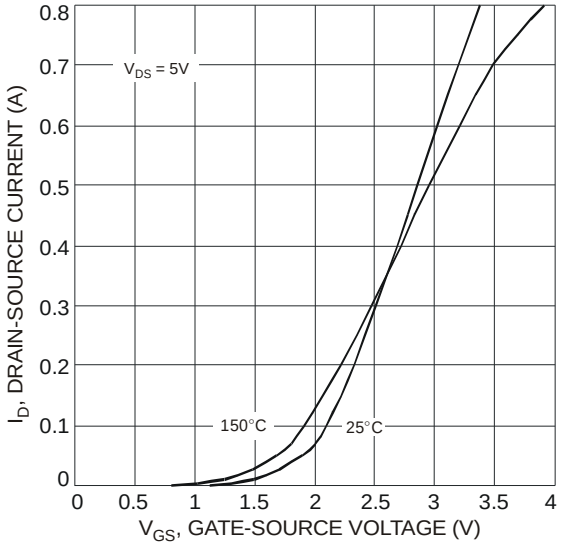


Fig. 6 Transfer Characteristics

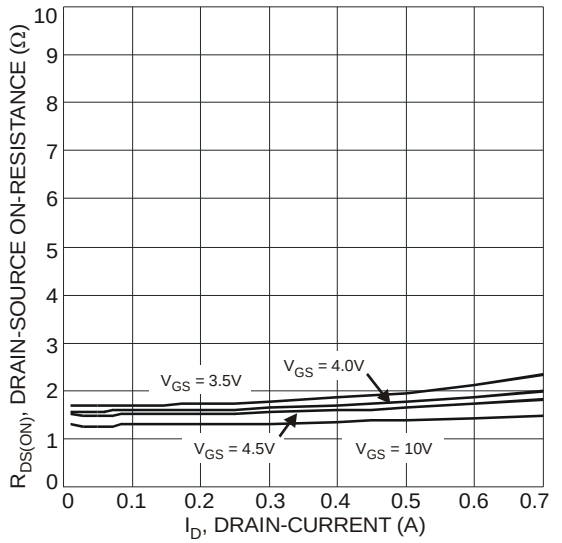


Fig. 7 Drain-Source On-Resistance vs. Drain-Current

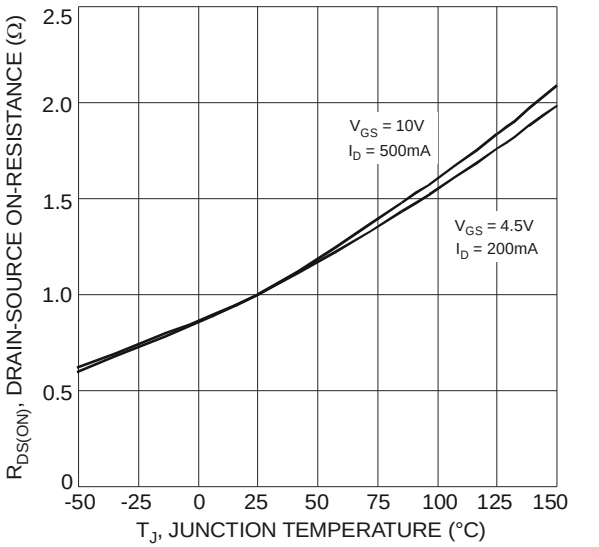


Fig. 8 Drain-Source On-Resistance vs. Junction Temperature

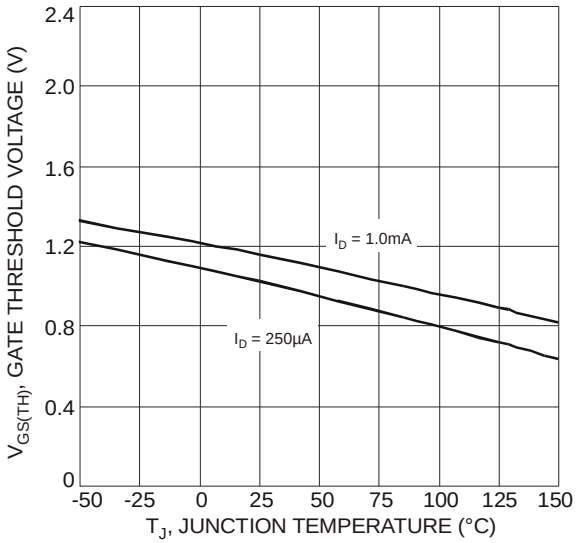


Fig. 9 Gate Threshold Voltage vs. Junction Temperature

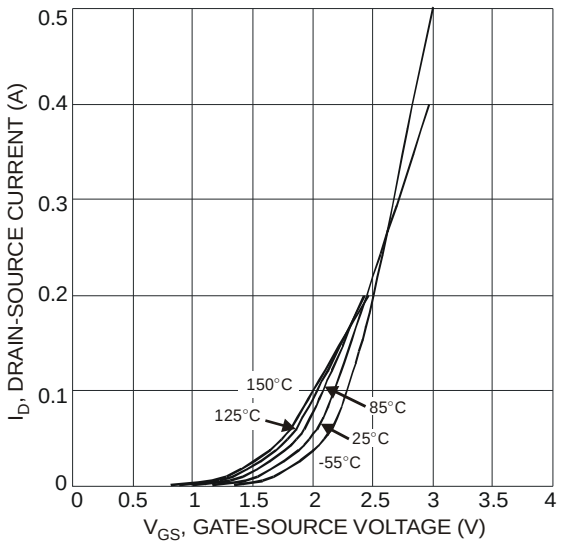


Fig. 10 Transfer Characteristics

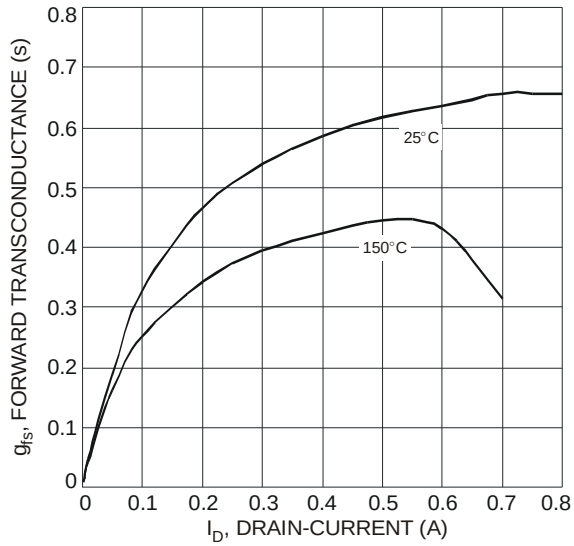


Fig. 11 Typical Transfer Characteristic

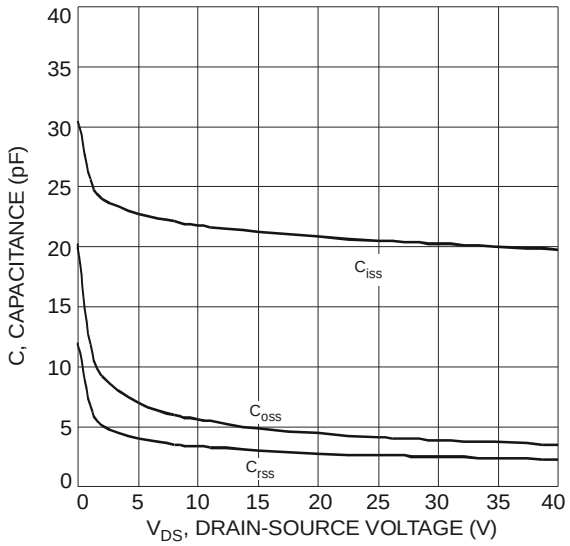


Fig. 12 Capacitance vs. Drain-Source Voltage

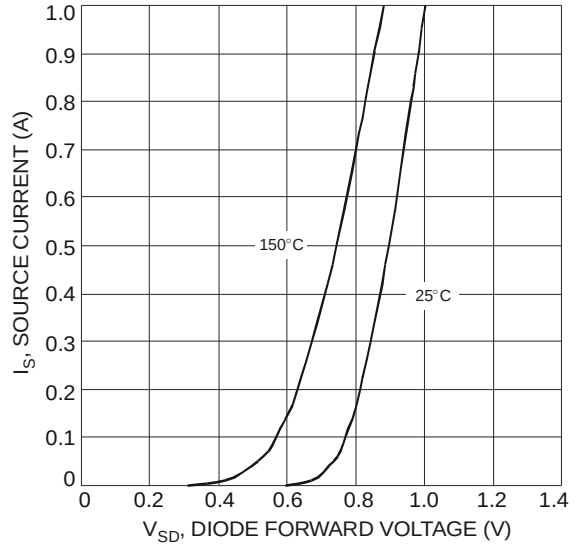
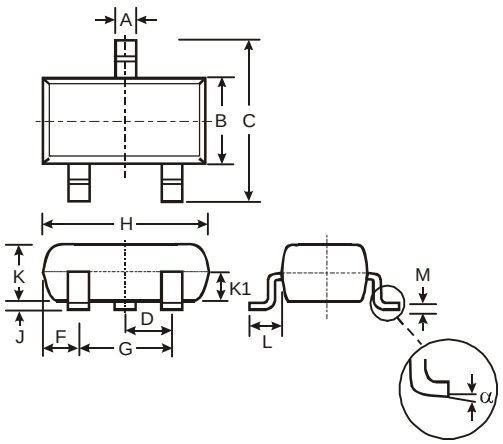


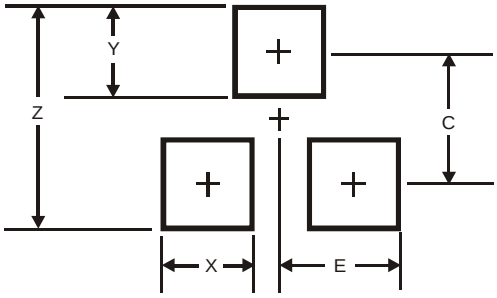
Fig. 13 Source Current vs. Diode Forward Voltage

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



Dimensions	Value (in mm)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35