

N-CHANNEL ENHANCEMENT MODE FIELD MOSFET
Product Summary

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

Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](https://www.diodes.com/contact-us) or your local Diodes representative.
<https://www.diodes.com/quality/product-definitions/>

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.

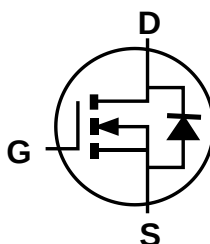
- Backlighting
- DC-DC Converters
- Power Management Functions

Mechanical Data

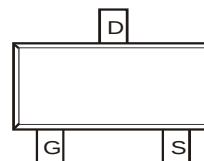
- Case: SOT23
- Case Material: Molded Plastic "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208 **e3**
- Terminal Connections: See Diagram
- Weight: 0.008 grams (Approximate)



Top View



Internal Schematic

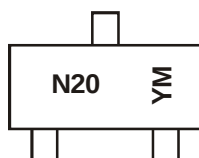


Top View

Ordering Information (Note 4)

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

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information


N20 = Product Type Marking Code
 YM = Date Code Marking
 Y or $\bar{Y}$ = Year (ex: G = 2019)
 M = Month (ex: 9 = September)

Date Code Key

Year	2009	-	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Code	W	-	G	H	I	J	K	L	M	N	O	P
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 (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V _{DSS}	50	V
Gate-Source Voltage			V _{GSS}	±20	V
Continuous Drain Current @ T _{SP} = +25°C (Note 5)	Steady State	T _A = +25°C T _A = +100°C	I _D	500 300	mA
Pulsed Drain Current @ T _{SP} = +25°C (Notes 5 & 6)			I _{DM}	1.2	A

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation, @T _A = +25°C (Note 5)	P _D	600	mW
Thermal Resistance, Junction to Ambient @T _A = +25°C (Note 5)	R _{θJA}	200	°C/W
Power Dissipation, @T _{SP} = +25°C (Note 5)	P _D	920	mW
Thermal Resistance, @T _{SP} = +25°C (Note 5)	R _{θJSP}	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 7)						
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 7)						
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
DYNAMIC CHARACTERISTICS (Note 8)						
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:
- 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.

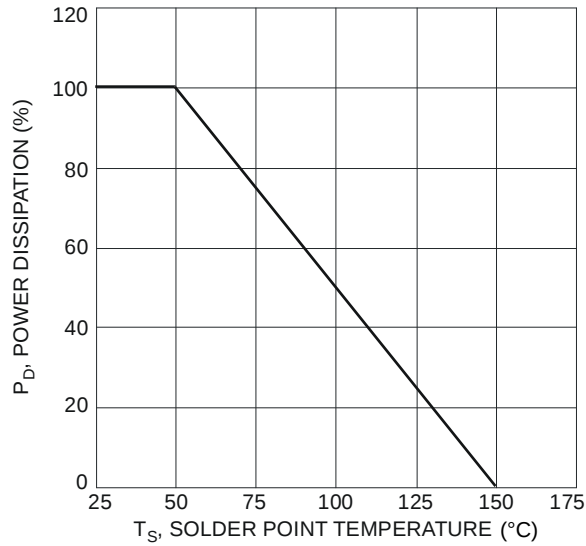


Fig 1. Normalized Total Power Dissipation as a Function of Solder Point Temperature

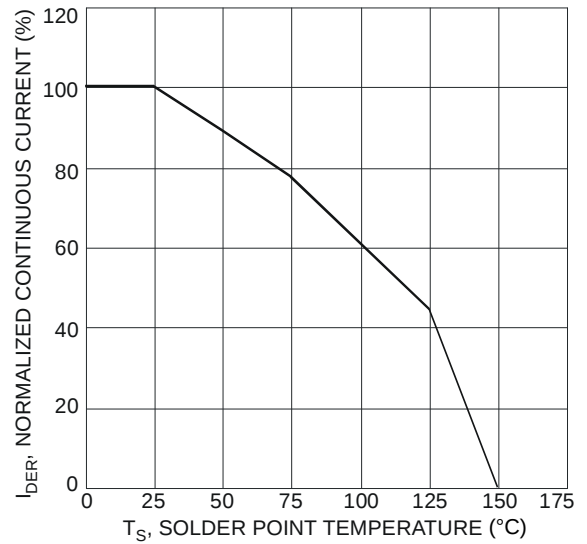


Fig 2. Normalized Continuous Current vs. Solder Point Temperature

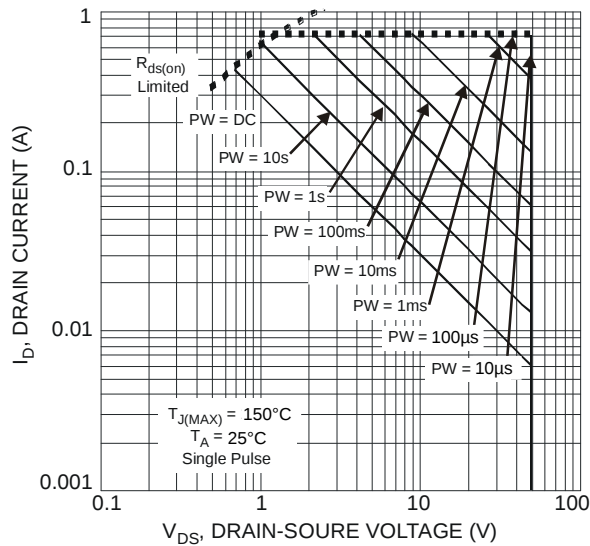


Fig. 3 SOA, Safe Operation Area

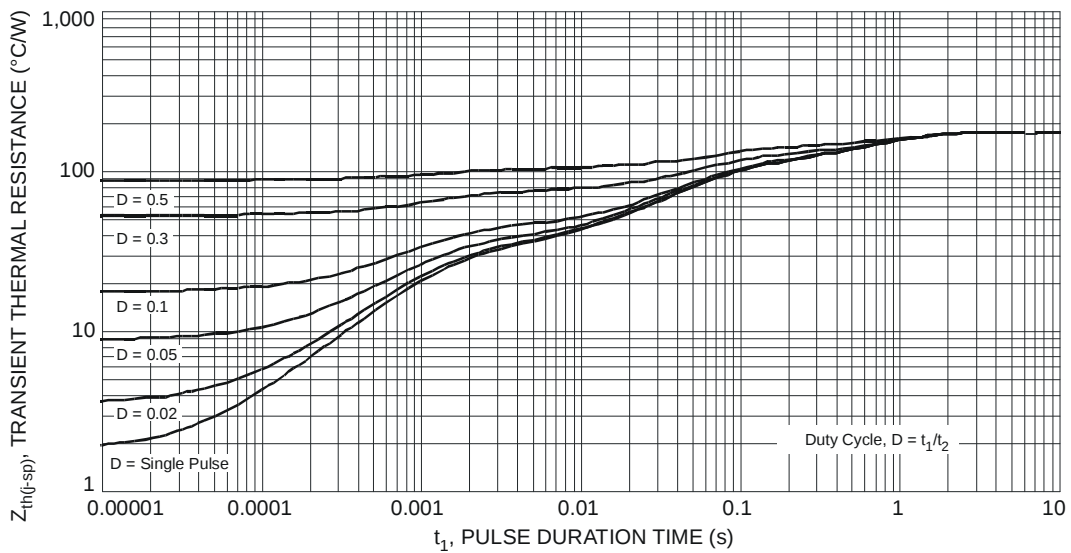


Fig. 4 Transient Thermal Response

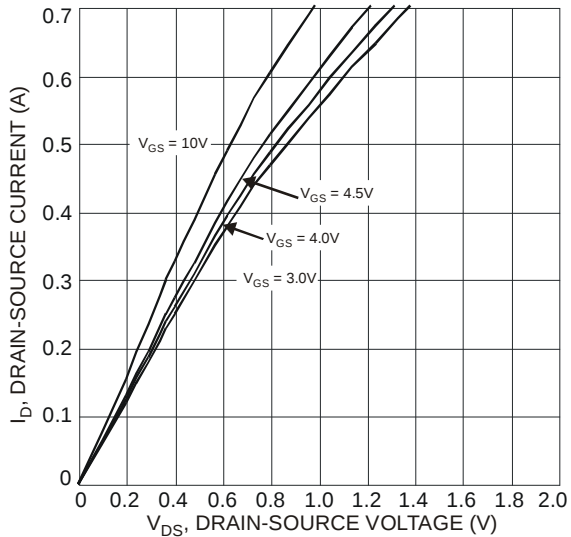


Fig. 5 Drain-Source Current vs. Drain-Source Voltage

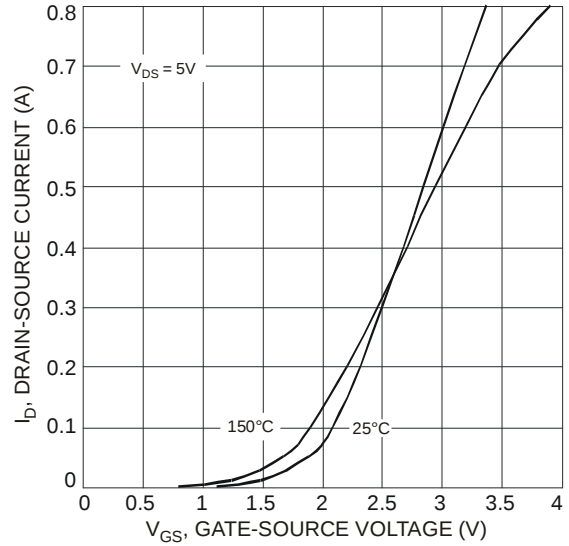


Fig. 6 Transfer Characteristics

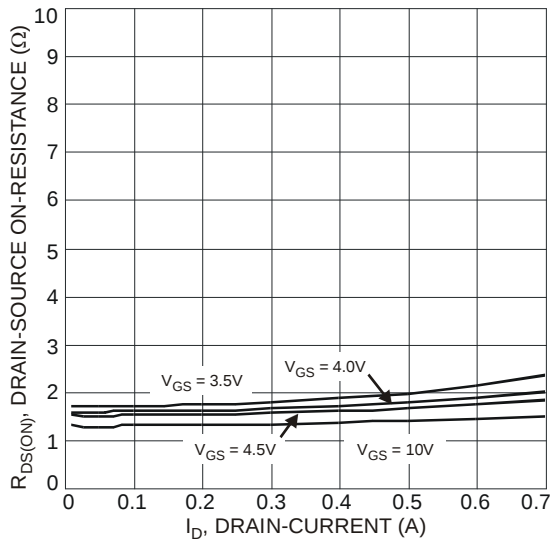


Fig. 7 Drain-Source On-Resistance vs. Drain-Current

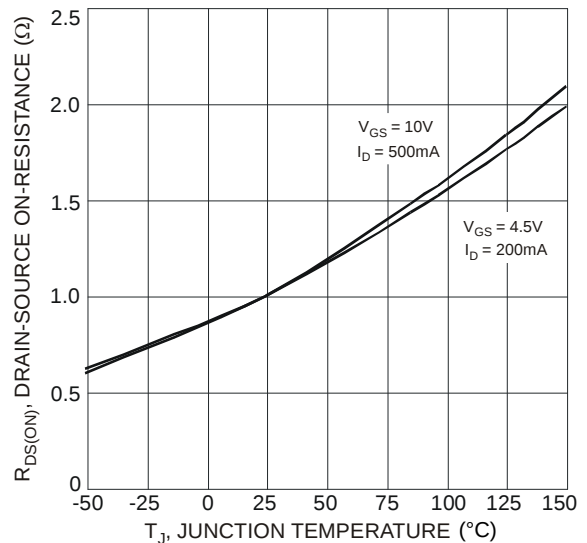


Fig. 8 Drain-Source On-Resistance vs. Junction Temperature

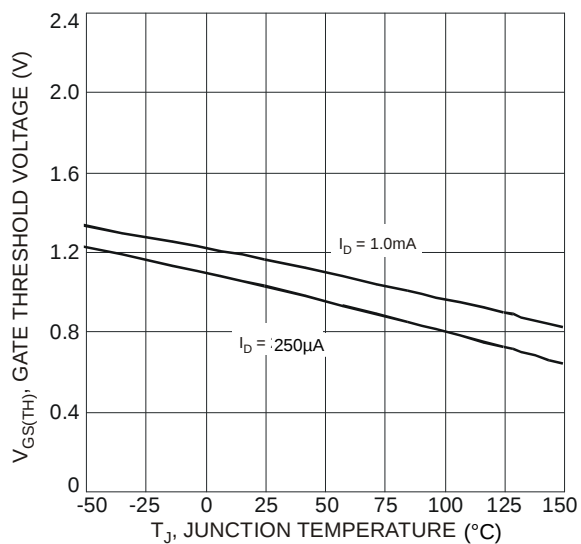


Fig. 9 Gate Threshold Voltage vs. Junction Temperature

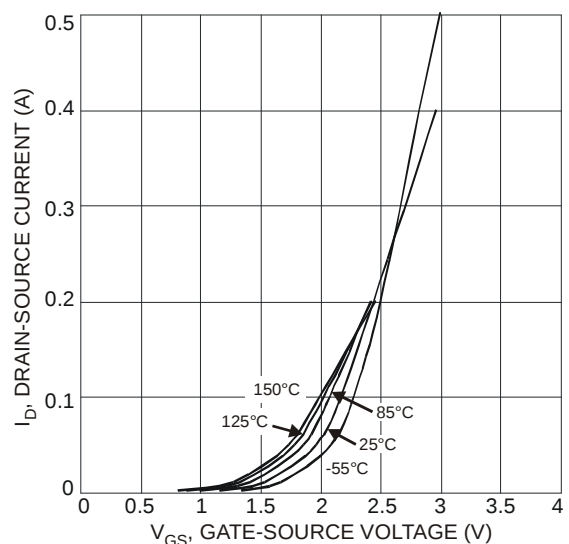
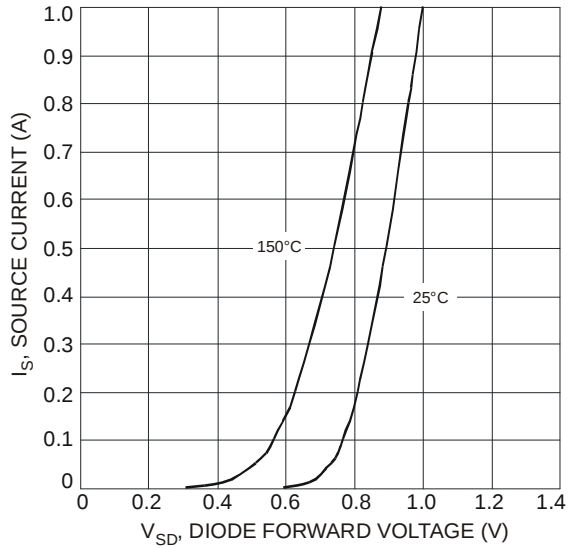
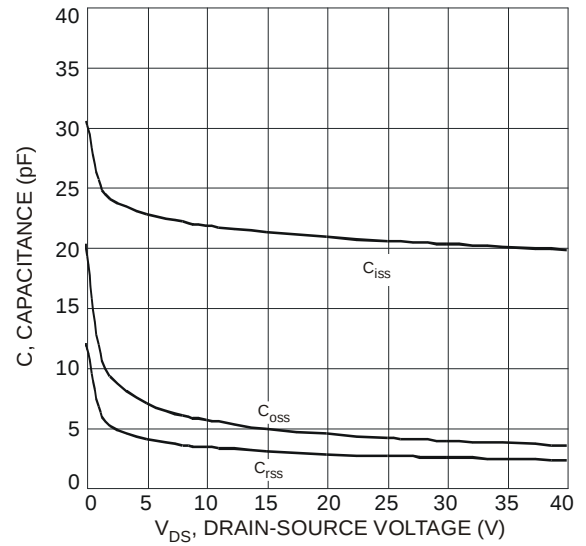
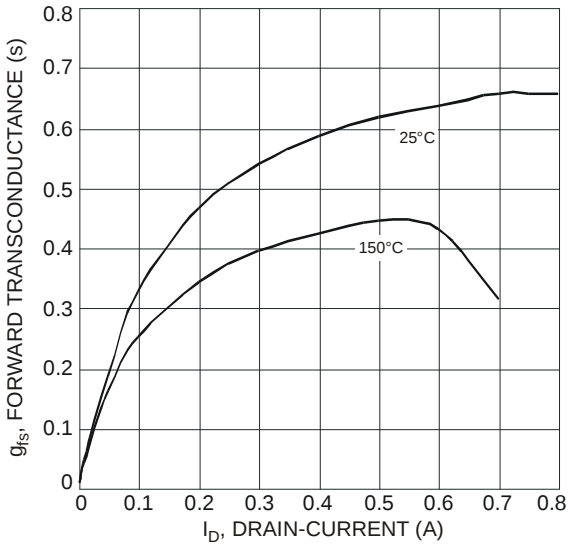


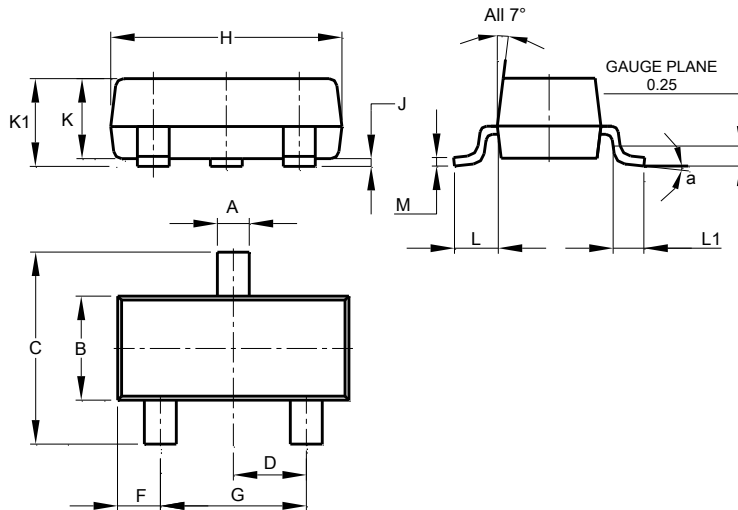
Fig. 10 Transfer Characteristics



Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT23

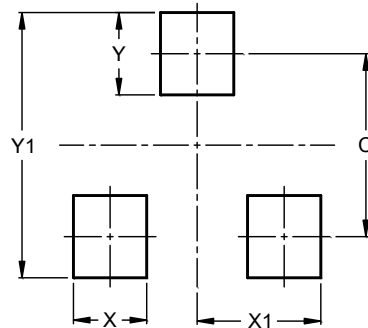


SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--
All Dimensions in mm			

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT23



Dimensions	Value (in mm)
C	2.0
X	0.8
X1	1.35
Y	0.9
Y1	2.9

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