200V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)\ MAX}$	I_D $T_A = 25°C$
200V	750mΩ @ V_{GS} = 10V	2.3A
	780mΩ @ V_{GS} = 5V	2.2A

Description and Applications

This MOSFET features low on-resistance, fast switching and a high avalanche withstand capability, making it ideal for high-efficiency power management applications.

- SLIC line drivers for VoIP applications
- Transformer driving switch
- Power management functions
- Motor control
- Uninterrupted power supply

Features and Benefits

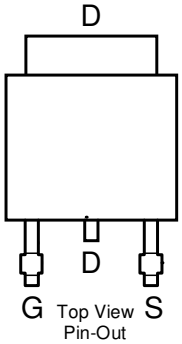
- 100% Unclamped Inductive Switch (UIS) test in production
- High avalanche energy pulse withstand capability
- Low gate drive voltage (Logic level capable)
- Low input capacitance
- Low on-resistance
- Fast switching speed
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony 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 or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

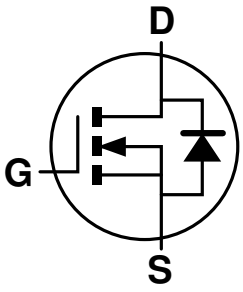
Mechanical Data

- Case: TO252
- Case Material: Molded Plastic "Green" Molding Compound, UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Matte Tin Finish Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.33 grams (Approximate)

TO252

Top View





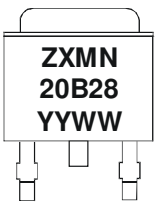
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Case	Packaging
ZXMN20B28KTC	TO252 (DPAK)	2,500/Tape & Reel

Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
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



ZXMN = Product Type Marking Code, Line 1
20B28 = Product Type Marking Code, Line 2
YYWW = Date Code Marking
YY = Year (ex: 21 = 2021)
WW = Week (01 to 53)

Maximum Ratings (@T_A = 25°C, unless otherwise specified)

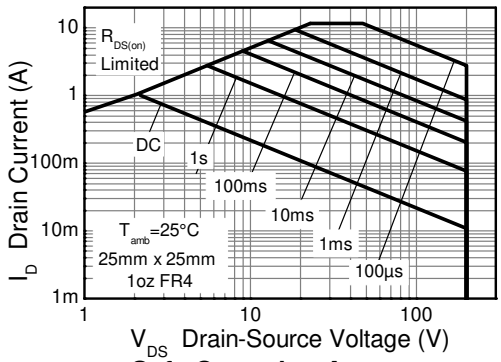
Characteristic			Symbol	Value	Unit
Drain-Source voltage			V_{DSS}	200	V
Gate-Source voltage			V_{GS}	±20	V
Single Pulsed Avalanche Energy		(Note 10)	E_{AS}	73	mJ
Single Pulsed Avalanche Current		(Note 10)	I_{AS}	5.5	A
Repetitive Avalanche Energy		(Note 7)	E_{AR}	4.5	mJ
Repetitive Avalanche Current		(Note 7)	I_{AR}	5.5	A
Continuous Drain current	V_{GS} = 10V	(Note 6) T_A = 70°C (Note 6) (Note 5)	I_D	2.3 1.8 1.5	A
Pulsed Drain current	V_{GS} = 10V	(Note 7)	I_{DM}	17.3	A
Continuous Source current (Body diode)		(Note 5)	I_S	2.3	A
Pulsed Source current (Body diode)		(Note 7)	I_{SM}	17.3	A

Thermal Characteristics (@ T_A = +25°C, unless otherwise specified.)

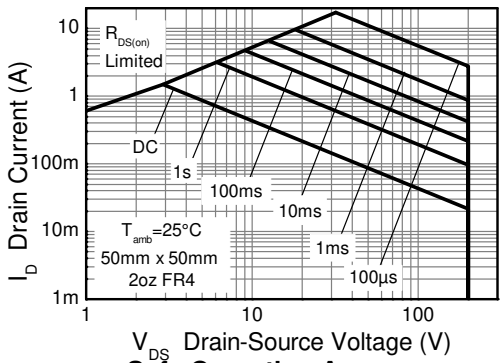
Characteristic		Symbol	Value	Unit
Power dissipation Linear derating factor	(Note 5)	P_D	4.3 34.4	W mW/°C
	(Note 6)		10.2 76.0	
	(Note 9)		2.2 17.4	
Thermal Resistance, Junction to Ambient	(Note 5)	$R_{\theta JA}$	29.1	°C/W
	(Note 6)		12.3	
	(Note 9)		57.3	
Thermal Resistance, Junction to Lead	(Note 8)	$R_{\theta JL}$	1.15	°C/W
Operating and storage temperature range		T_J, T_{STG}	-55 to 150	°C

Notes:
5. For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
6. Same as note 2, except the device is measured at t ≤ 10 sec.
7. Same as note 2, except the device is operating in a repetitive state with pulse width and duty cycle limited by maximum junction temperature.
8. Thermal resistance from junction to solder-point (at the end of the drain lead).
9. For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with the high coverage single sided 1oz copper, in still air conditions; the device Is measured when operating in a steady-state condition.
10. UIS in production with L = 4.83mH, I_{AS} = 5.5A, R_G = 25Ω, V_{DD} = 100V, starting T_J = 25°C.

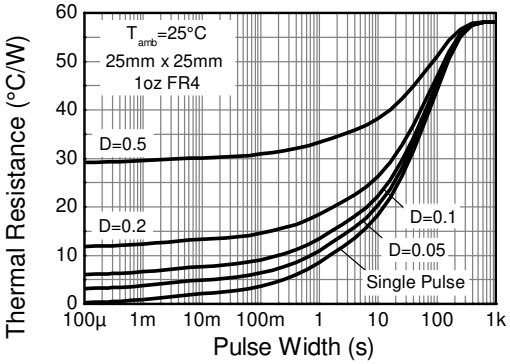
Thermal Characteristics



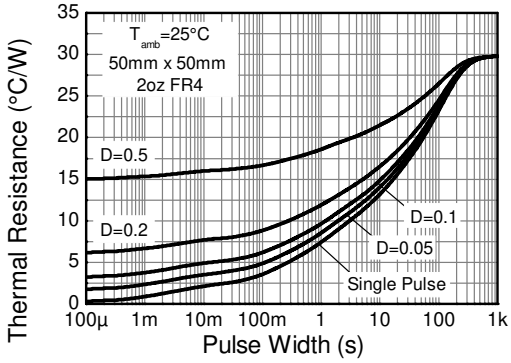
Safe Operating Area



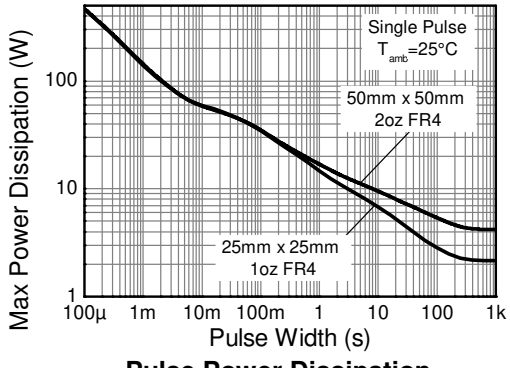
Safe Operating Area



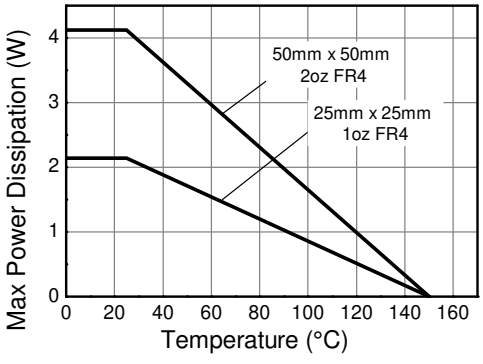
Transient Thermal Impedance



Transient Thermal Impedance



Pulse Power Dissipation



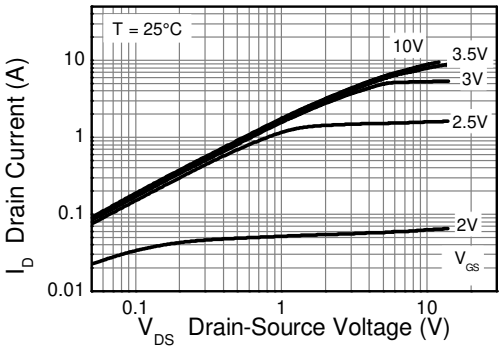
Derating Curve

Electrical Characteristics (@T_A = 25°C, unless otherwise specified.)

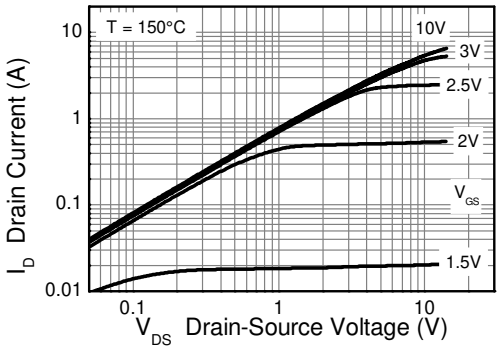
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 11)						
Drain-Source Breakdown Voltage	BV_{DSS}	200	—	—	V	I_D = 250μA, V_{GS} = 0V
Zero Gate Voltage Drain Current	I_{DSS}	—	—	500	nA	V_{DS} = 200V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 11)						
Gate Threshold Voltage	$V_{GS(th)}$	1	1.6	2.5	V	I_D = 250μA, V_{DS} = V_{GS}
Static Drain-Source On-Resistance (Note 12)	$R_{DS\ (ON)}$	—	0.650	0.750	Ω	V_{GS} = 10V, I_D = 2.75A
			0.670	0.780		V_{GS} = 5V, I_D = 2.75A
Forward Transconductance (Notes 12 & 13)	g_{fs}	—	6.13	—	S	V_{DS} = 30V, I_D = 2.75A
Diode Forward Voltage (Note 12)	V_{SD}	—	0.860	0.950	V	I_S = 5.5A, V_{GS} = 0V
Reverse recovery time (Note 13)	t_{rr}	—	177	—	ns	I_S = 6.5A, V_{GS} = 0V, di/dt = 100A/μs
Reverse recovery charge (Note 13)	Q_{rr}	—	1.4	—	μC	
DYNAMIC CHARACTERISTICS (Note 13)						
Input Capacitance	C_{iss}	—	358	—	pF	V_{DS} = 25V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	50	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	6.1	—	pF	
Total Gate Charge	Q_g	—	8.1	—	nC	V_{DS} = 120V, V_{GS} = 5V I_D = 6.5A
Gate-Source Charge	Q_{gs}	—	1.4	—	nC	
Gate-Drain Charge	Q_{gd}	—	3.9	—	nC	
Turn-On Delay Time (Note 14)	$t_{D(on)}$	—	17.8	—	ns	V_{DD} = 100V, V_{GS} = 5V I_D = 6.5A, $R_G \cong 25\Omega$
Turn-On Rise Time (Note 14)	t_r	—	76.9	—	ns	
Turn-Off Delay Time (Note 14)	$t_{D(off)}$	—	44.7	—	ns	
Turn-Off Fall Time (Note 14)	t_f	—	57.1	—	ns	

Notes:
11. Short duration pulse test used to minimize self-heating effect.
12. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%
13. For design aid only, not subject to production testing.
14. Switching characteristics are independent of operating junction temperatures.

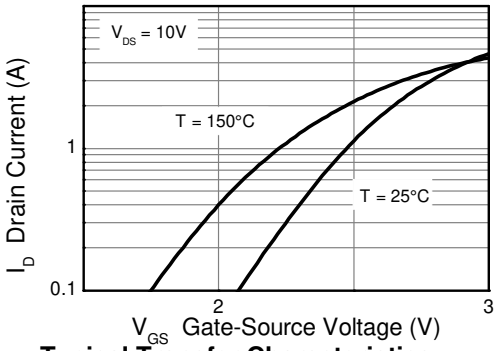
Typical Characteristics



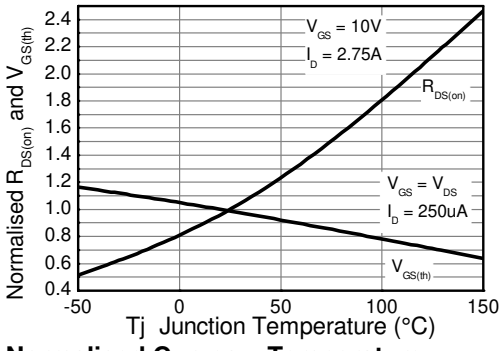
Output Characteristics



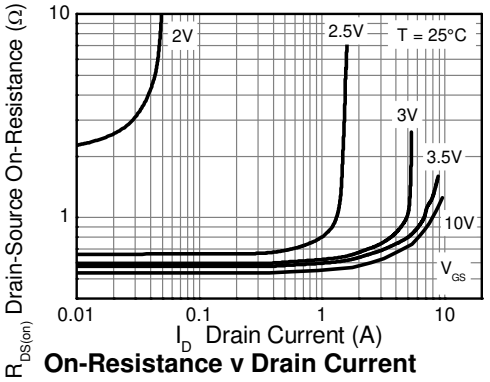
Output Characteristics



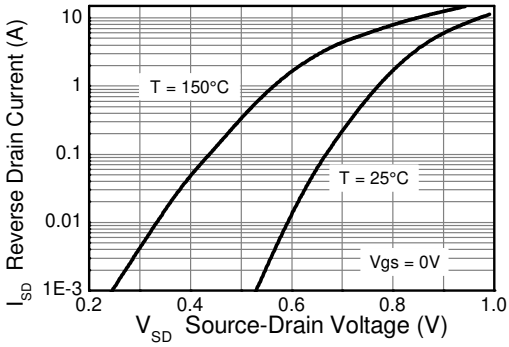
Typical Transfer Characteristics



Normalised Curves v Temperature

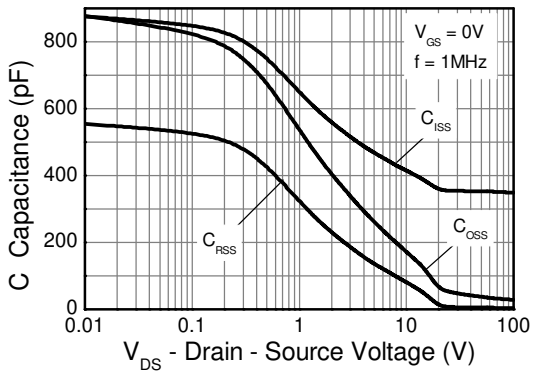


On-Resistance v Drain Current

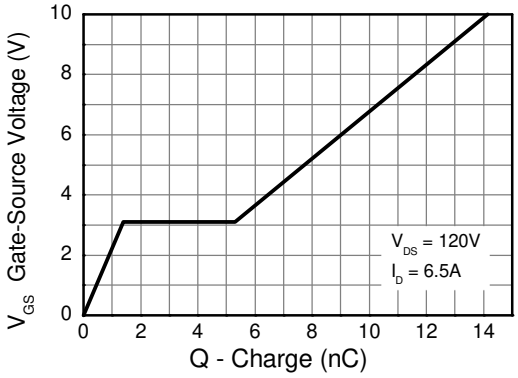


Source-Drain Diode Forward Voltage

Typical Characteristics (continued)

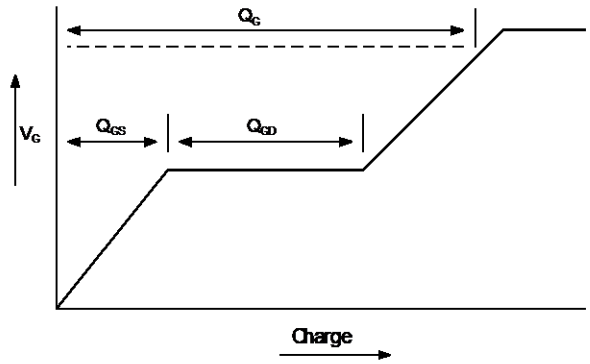


Capacitance v Drain-Source Voltage

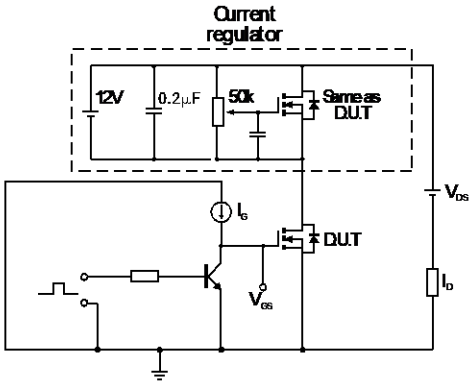


Gate-Source Voltage v Gate Charge

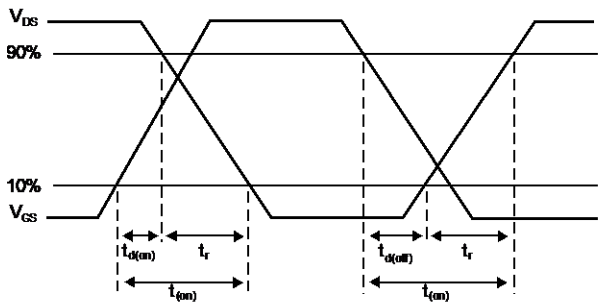
Test Circuits



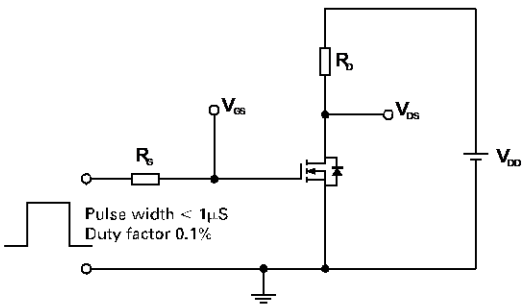
Basic gate charge waveform



Gate charge test circuit



Switching time waveforms

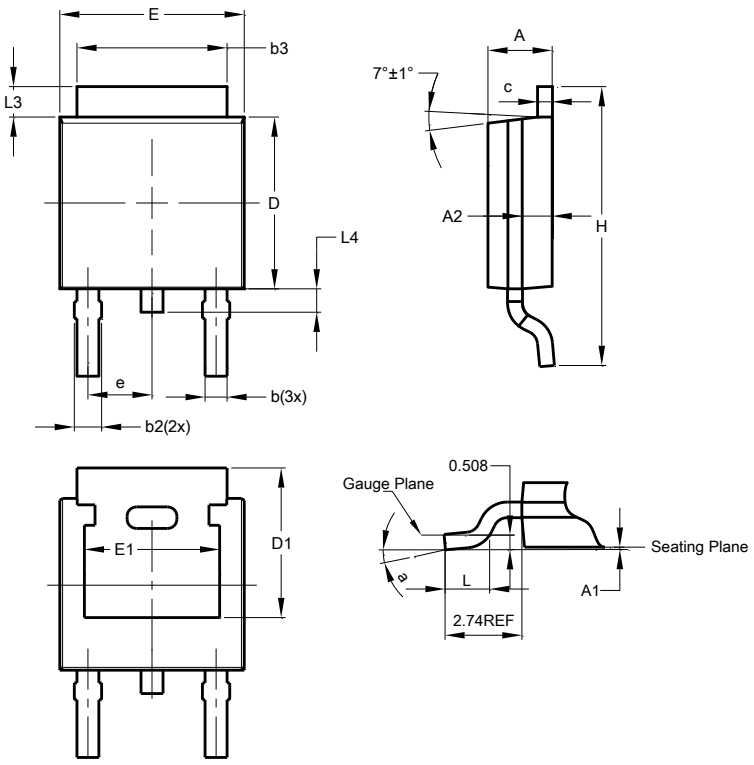


Switching time test circuit

Package Outline Dimensions

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

TO252 (DPAK)

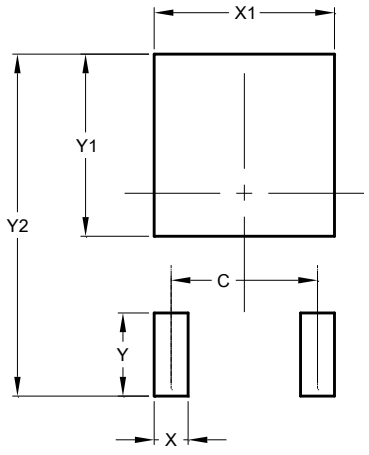


TO252 (DPAK)			
Dim	**Min**	**Max**	**Typ**
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	-
All Dimensions in mm			

Suggested Pad Layout

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

TO252 (DPAK)



Dimensions	Value (in mm)
C	4.572
X	1.060
X1	5.632
Y	2.600
Y1	5.700
Y2	10.700

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