

**20V P-CHANNEL ENHANCEMENT MODE MOSFET**

**Product Summary**

$V_{(BR)DSS}$	$R_{DS(on)}$	$I_D$ $T_A = 25^\circ C$
-20V	600mΩ @ $V_{GS} = -4.5V$	-0.92A
	900mΩ @ $V_{GS} = -2.7V$	-0.75A

**Description and Applications**

This MOSFET utilizes a unique structure that combines the benefits of low on-resistance with fast switching speed, making it ideal for high-efficiency power management applications.

- DC - DC converters
- Power management functions
- Disconnect switches
- Motor control

**Features and Benefits**

- Fast switching speed
- Low on-resistance
- Low threshold
- Low gate drive
- "Lead Free", RoHS Compliant (Note 1)
- Halogen and Antimony Free. "Green" Device (Note 2)
- Qualified to AEC-Q101 Standards for High Reliability

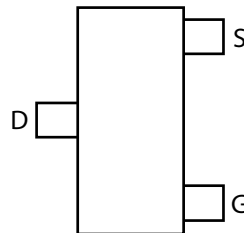
**Mechanical Data**

- Case: SOT23
- Case Material: Molded Plastic, UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish; Solderable per MIL-STD-202, Method 208
- Weight: 0.008 grams (approximate)

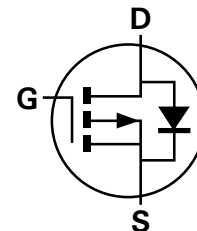
SOT23



Top View



Top View  
Pin Out



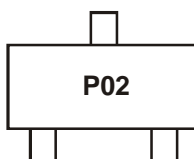
Equivalent Circuit

**Ordering Information** (Note 3)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXM61P02FTA	P02	7	8	3000 Units

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. No purposely added lead. Halogen and Antimony free.
  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**



P02 = Product Type Marking Code

**Maximum Ratings** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

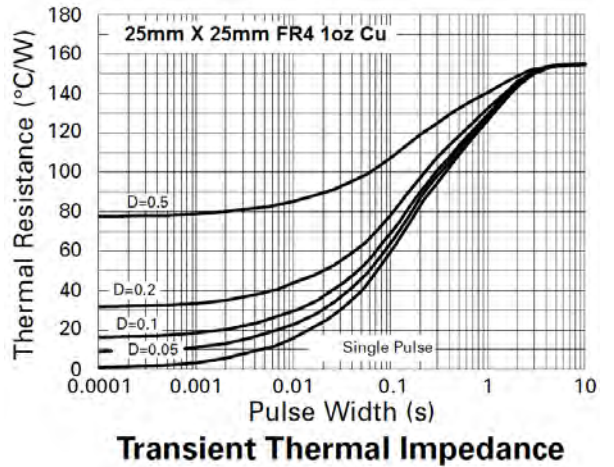
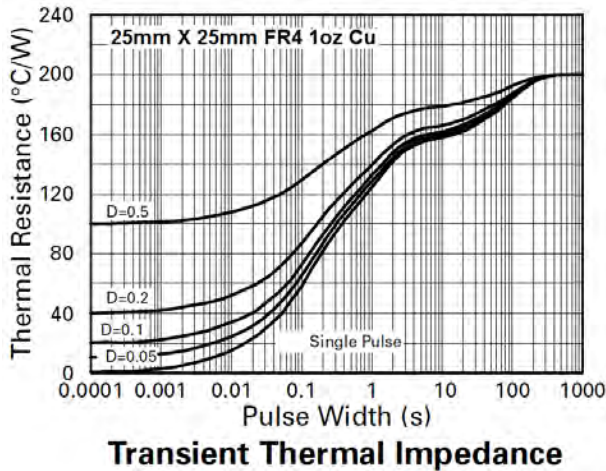
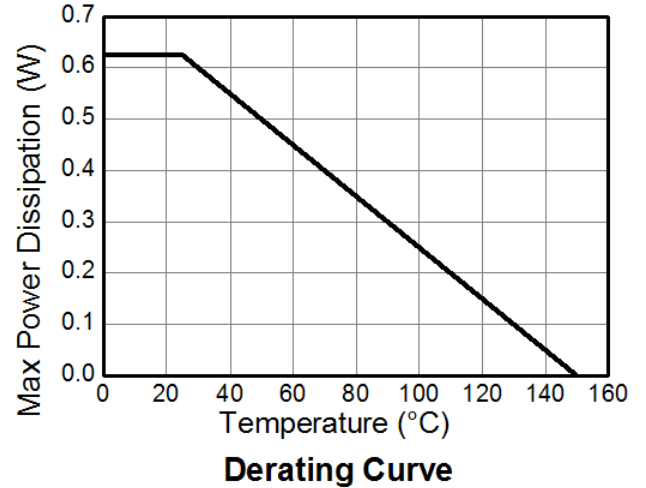
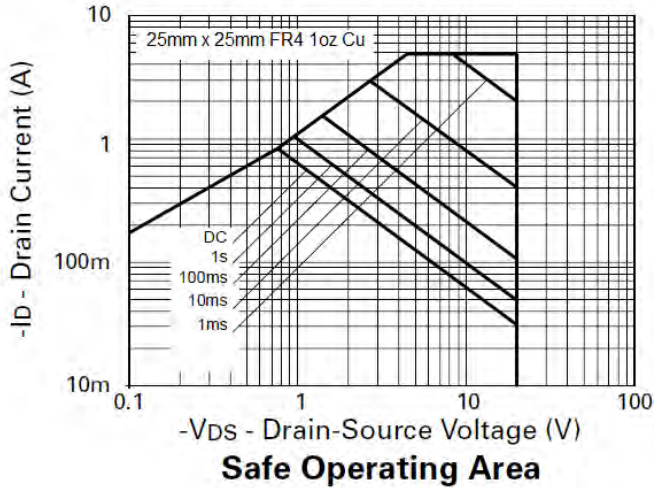
Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{DSS}$	-20	V
Gate-Source Voltage			$V_{GS}$	$\pm 12$	V
Continuous Drain Current	$V_{GS} = 4.5\text{V}$	$T_A = 25^\circ\text{C}$ (Note 5)	$I_D$	-0.9	A
		$T_A = 70^\circ\text{C}$ (Note 5)		-0.7	
Pulsed Drain Current (Note 6)			$I_{DM}$	-4.9	A
Continuous Source Current (Body Diode) (Note 5)			$I_S$	-0.9	A
Pulsed Source Current (Body Diode) (Note 6)			$I_{SM}$	-4.9	A

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

Characteristic		Symbol	Value	Unit
Power Dissipation (Note 4)		$P_D$	625	mW
Linear Derating Factor			5	mW/ $^\circ\text{C}$
Power Dissipation (Note 5)		$P_D$	806	mW
Linear Derating Factor			6.4	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient (Note 4)		$R_{\theta JA}$	200	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\theta JA}$	155	$^\circ\text{C}/\text{W}$
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

- Notes:
4. For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions
  5. For a device surface mounted on FR4 PCB measured at  $t \leq 5$  secs.
  6. Repetitive rating 25mm x 25mm FR4 PCB,  $D=0.05$  pulse width=10 $\mu\text{s}$  - pulse current limited by maximum junction temperature.

**Thermal Characteristics**

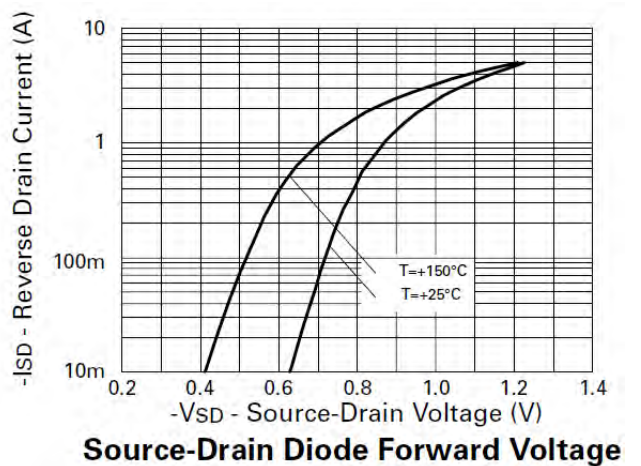
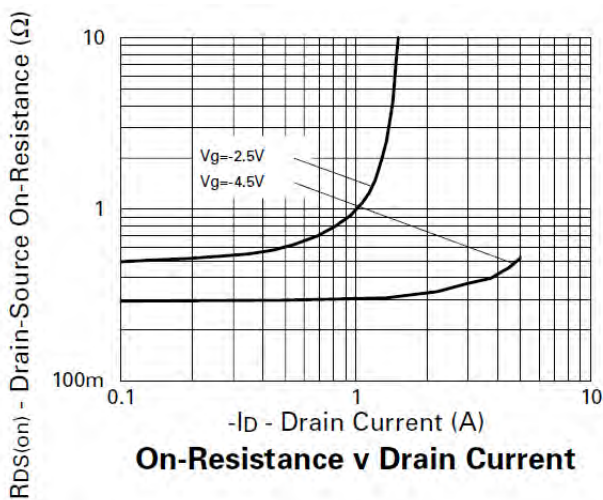
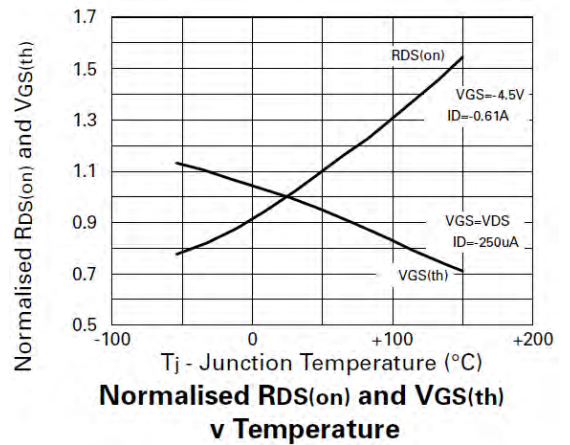
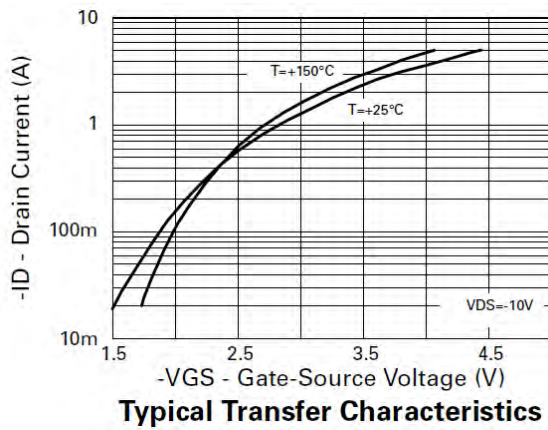
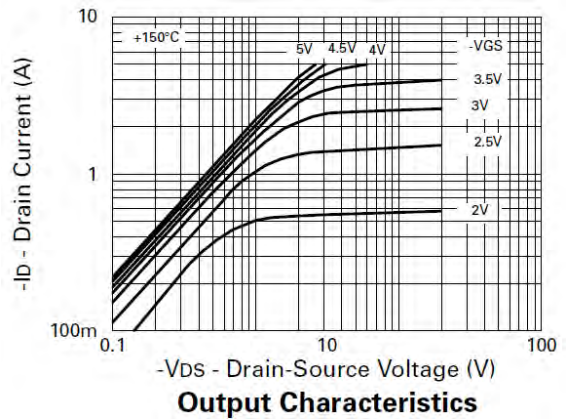
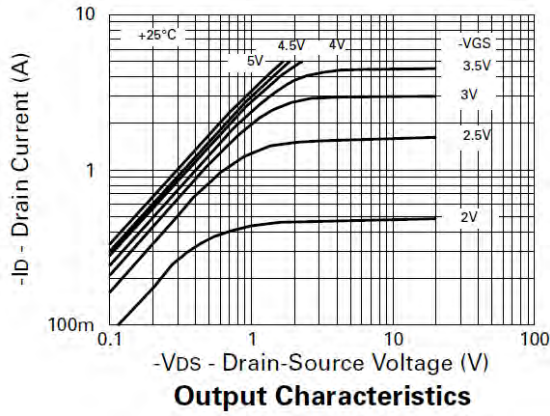


**Electrical Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-20	—	—	V	I <sub>D</sub> = -250μA, V <sub>GS</sub> = 0V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-0.1	μA	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.7	—	—	V	I <sub>D</sub> = -250μA, V <sub>DS</sub> = V <sub>GS</sub>
Static Drain-Source On-Resistance (Note 7)	R <sub>DS(on)</sub>	—	—	0.6	Ω	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -0.61A V <sub>GS</sub> = -2.7V, I <sub>D</sub> = -0.31A
				0.9		
Forward Transconductance (Notes 7 and 9)	g <sub>fs</sub>	0.56	—	—	S	V <sub>DS</sub> = -10V, I <sub>D</sub> = -0.31A
Diode Forward Voltage (Note 7)	V <sub>SD</sub>	—	—	-0.95	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = -0.61A, V <sub>GS</sub> = 0V
Reverse Recovery Time (Note 9)	t <sub>rr</sub>	—	14.9	—	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = -0.61A,
Reverse Recovery Charge (Note 9)	Q <sub>rr</sub>	—	5.6	—	nC	di/dt = 100A/μs
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	150	—	pF	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	70	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	30	—		
Turn-On Delay Time (Note 8)	t <sub>d(on)</sub>	—	2.9	—	ns	V <sub>DD</sub> = -110V, I <sub>D</sub> = -0.93A, R <sub>G</sub> ≅ 6.2Ω, R <sub>D</sub> ≅ 11Ω,
Turn-On Rise Time (Note 8)	t <sub>r</sub>	—	6.7	—		
Turn-Off Delay Time (Note 8)	t <sub>d(off)</sub>	—	11.2	—		
Turn-Off Fall Time (Note 8)	t <sub>f</sub>	—	10.1	—	nC	V <sub>DS</sub> = -16V, V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -0.61A
Total Gate Charge (Note 8)	Q <sub>g</sub>	—	3.5	—		
Gate-Source Charge (Note 8)	Q <sub>gs</sub>	—	0.5	—		
Gate-Drain Charge (Note 8)	Q <sub>gd</sub>	—	1.5	—		

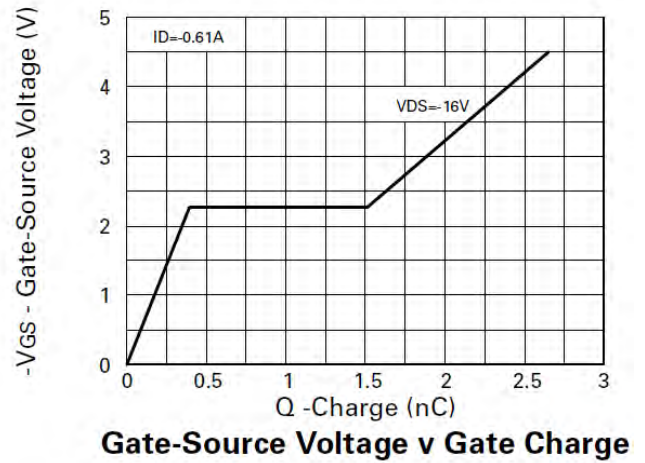
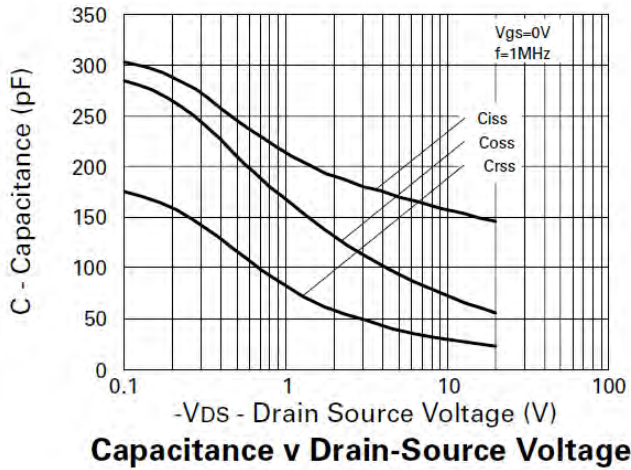
- Notes:
7. Measured under pulsed conditions. Pulse width = 300μs. Duty cycle ≤ 2%.
  8. Switching characteristics are independent of operating junction temperature.
  9. For design aid only, not subject to production testing.

**Typical Characteristics**

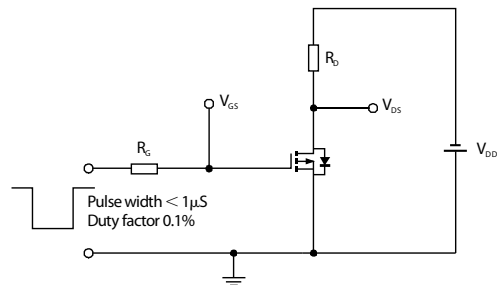
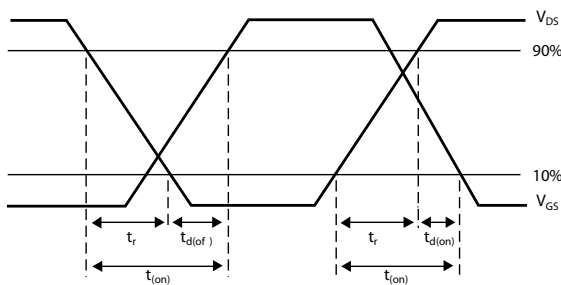
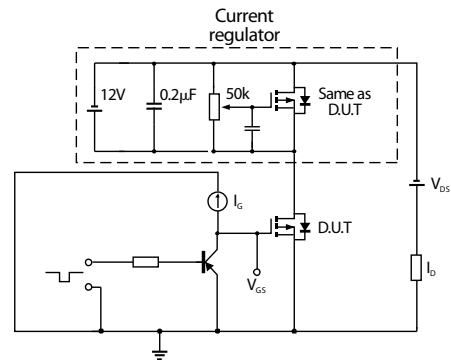
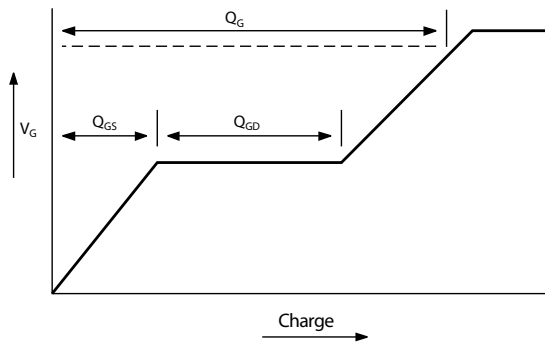




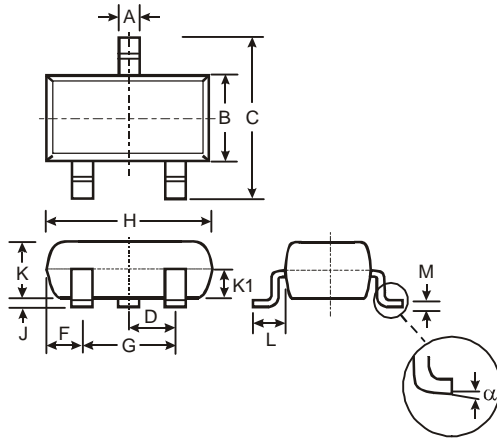
**Typical Characteristics - continued**



**Test Circuits**

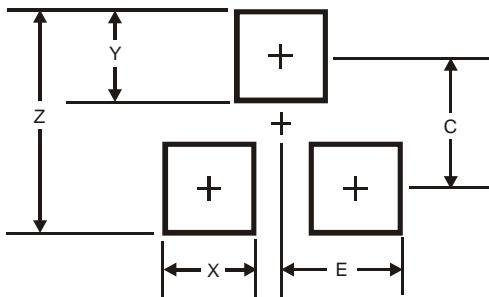


**Package Outline Dimensions**



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

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