

Product Summary

BV _{DSS}	Max R _{DS(ON)}	Max I _D T _A = +25°C (Note 3)
60V	40mΩ @ V _{GS} = 10V	7.7A
	60mΩ @ V _{GS} = 4.5V	6.3A

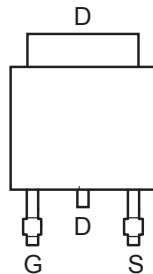
Description and Applications

This 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.

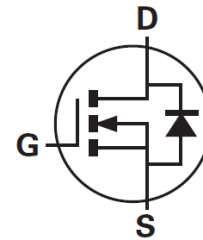
- DC-DC Converters
- Power Management Functions
- Disconnect Switches
- Motor Control



Top View



Pin Out -Top View



Equivalent Circuit

Features and Benefits

- Low On-Resistance
- Fast Switching Speed
- Low Gate Drive
- **Lead-Free Finish; RoHS compliant (Note 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Available (Note 4)**

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
- Terminals: Matte Tin Finish. Solderable per MIL-STD-202, Method 208
- Weight: 0.33 grams (approximate)

Ordering Information (Note 4 & 5)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXMN6A09KQTC	ZXMN6A09	13	16	2,500

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
 2. See http://www.diodes.com/quality/lead_free.html 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to http://www.diodes.com/quality/product_grade_definitions/.
 5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



ZXMN6A09 = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 10 = 2010)
 WW = Week (01 - 53)

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

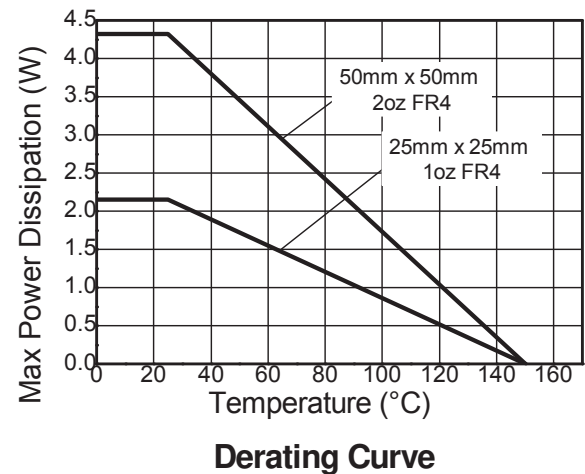
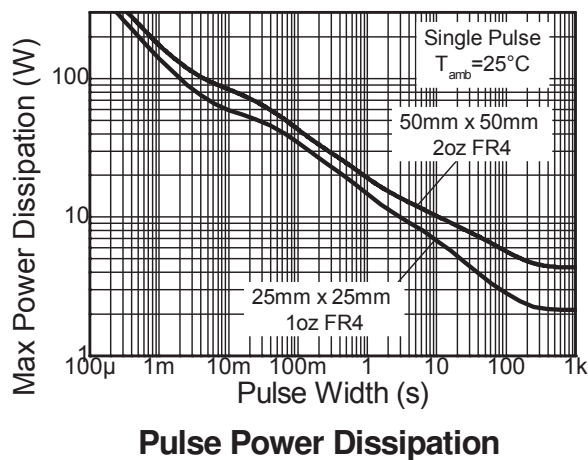
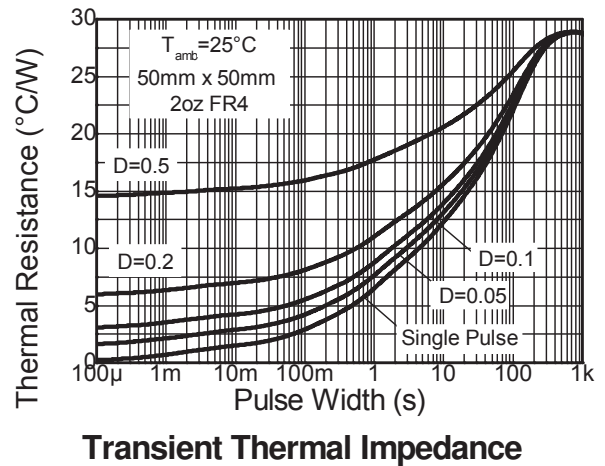
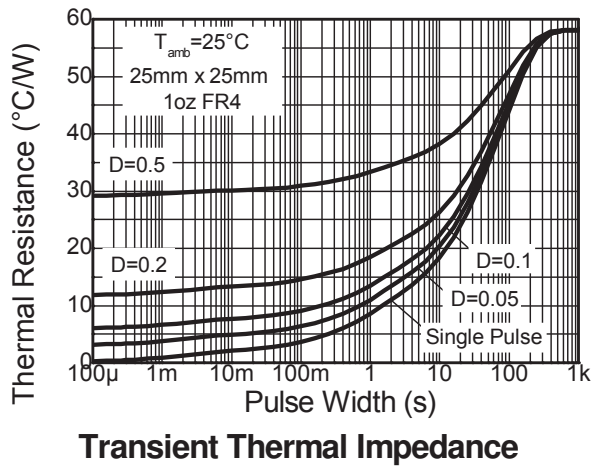
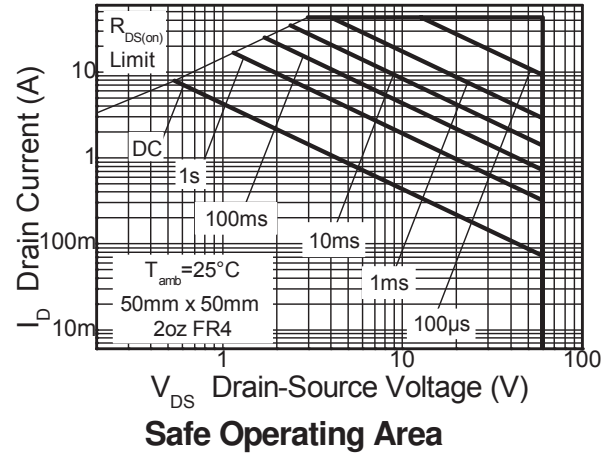
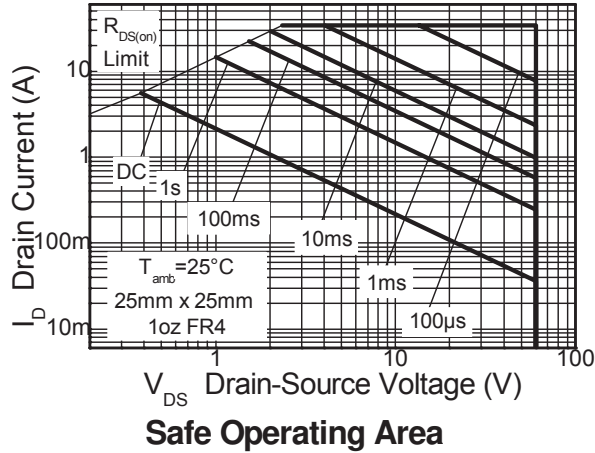
Characteristic		Symbol	Value	Unit	
Drain-Source Voltage		V_{DS}	60	V	
Gate-Source Voltage		V_{GS}	± 20	V	
Continuous Drain Current	$V_{GS} = 10\text{V}$	(Note 7)	11.8	A	
		$T_A = +70^\circ\text{C}$ (Note 7)	9.6		
		(Note 6)	7.7		
Pulsed Drain Current		(Note 8)	I_{DM}	43	A
Continuous Source Current (Body Diode)		(Note 7)	I_S	10.8	A
Pulsed Source Current (Body Diode)		(Note 8)	I_{SM}	43	A

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Power Dissipation Linear Derating Factor	(Note 6)	P_D	4.3	W mW/ $^\circ\text{C}$
			34.4	
	(Note 7)		10.1	
	(Note 9)		80.8	
Thermal Resistance, Junction to Ambient	(Note 6)	$R_{\theta JA}$	2.15	$^\circ\text{C/W}$
	(Note 7)		17.2	
	(Note 9)		29	
Thermal Resistance, Junction to Lead	(Note 10)	$R_{\theta JL}$	12.3	$^\circ\text{C/W}$
			58.1	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

- Notes:
6. 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.
 7. For a device surface mounted on FR4 PCB measured at $t \leq 10$ sec.
 8. Repetitive rating 50mm x 50mm x 1.6mm FR4 PCB, $D = 0.02$ and pulse width 300 μs . The pulse current is limited by the maximum junction temperature.
 9. For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
 10. Thermal resistance from junction to solder-point (at the end of the drain lead).

Thermal Characteristics

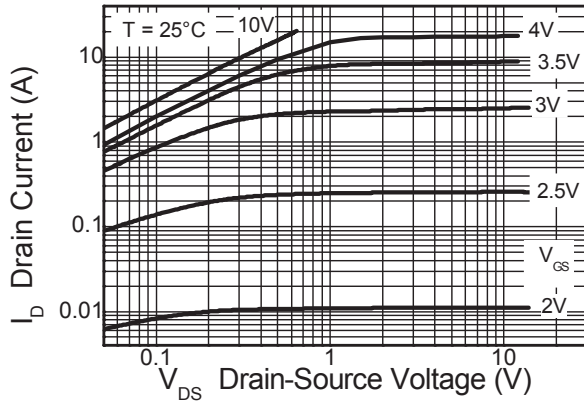


Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

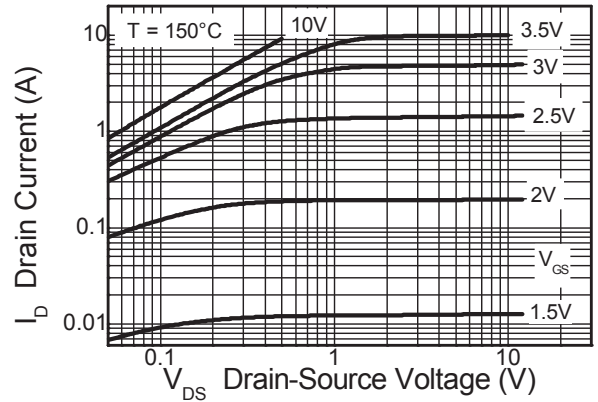
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	60	—	—	V	I _D = 250μA, V _{GS} = 0V
Zero Gate Voltage Drain Current	I _{DSS}	—	—	1	μA	V _{DS} = 60V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(th)}	1.0	—	3.0	V	I _D = 250μA, V _{DS} = V _{GS}
Static Drain-Source On-Resistance (Note 11)	R _{DS(on)}	—	—	40	mΩ	V _{GS} = 10V, I _D = 7.3A
				60		V _{GS} = 4.5V, I _D = 5.6A
Forward Transconductance (Notes 11 & 12)	g _{fs}	—	15	—	S	V _{DS} = 15V, I _D = 7.3A
Diode Forward Voltage (Note 11)	V _{SD}	—	0.85	0.95	V	I _S = 6.6A, V _{GS} = 0V, T _J = +25°C
Reverse recovery time (Note 12)	t _{rr}	—	25.6	—	ns	I _S = 3A, di/dt = 100A/μs
Reverse recovery charge (Note 12)	Q _{rr}	—	26.0	—	nC	T _J = +25°C
DYNAMIC CHARACTERISTICS (Note 12)						
Input Capacitance	C _{iss}	—	1426	—	pF	V _{DS} = 30V, V _{GS} = 0V f = 1MHz
Output Capacitance	C _{oss}	—	134	—	pF	
Reverse Transfer Capacitance	C _{rss}	—	64	—	pF	
Total Gate Charge (Note 13)	Q _g	—	15	—	nC	V _{GS} = 4.5V, V _{DS} = 30V, I _D = 5.6A
Total Gate Charge (Note 13)	Q _g	—	29	—	nC	V _{GS} = 10V, V _{DS} = 30V I _D = 7.3A
Gate-Source Charge (Note 13)	Q _{gs}	—	7.0	—	nC	
Gate-Drain Charge (Note 13)	Q _{gd}	—	4.7	—	nC	
Turn-On Delay Time (Note 13)	t _{D(on)}	—	4.8	—	ns	V _{DD} = 30V, V _{GS} = 10V I _D = 1A, R _G ≅ 6.0Ω
Turn-On Rise Time (Note 13)	t _r	—	4.6	—	ns	
Turn-Off Delay Time (Note 13)	t _{D(off)}	—	32.5	—	ns	
Turn-Off Fall Time (Note 13)	t _f	—	14.5	—	ns	

- Notes:
11. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%
 12. For design aid only, not subject to production testing.
 13. Switching characteristics are independent of operating junction temperatures.

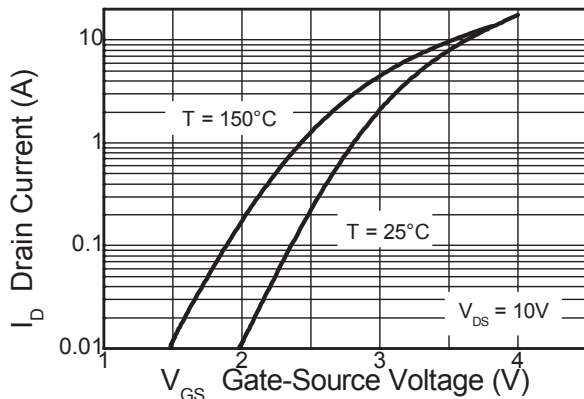
Typical Characteristics



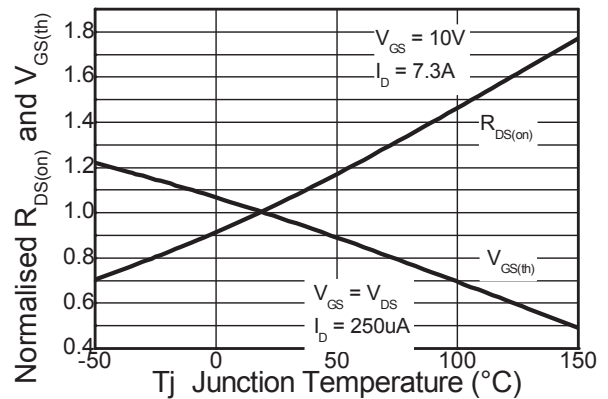
Output Characteristics



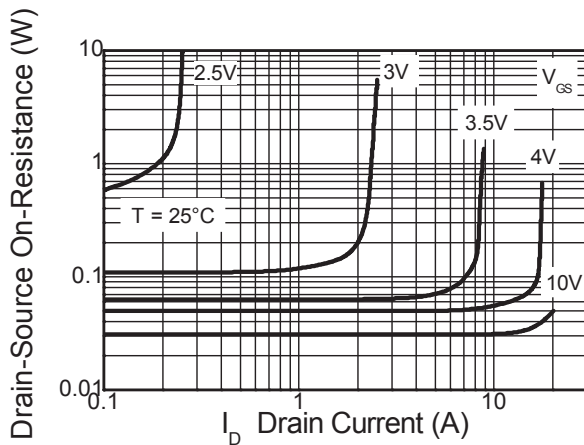
Output Characteristics



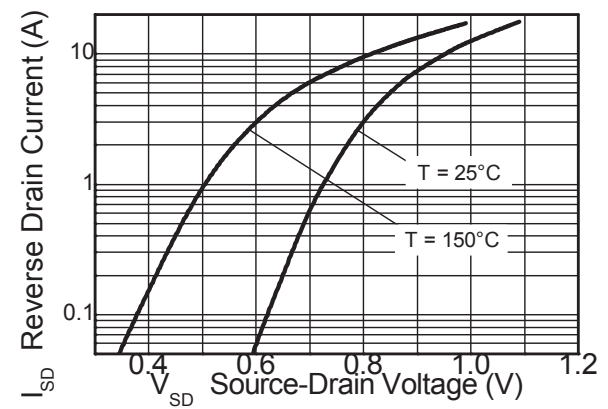
Typical Transfer Characteristics



Normalised Curves v Temperature

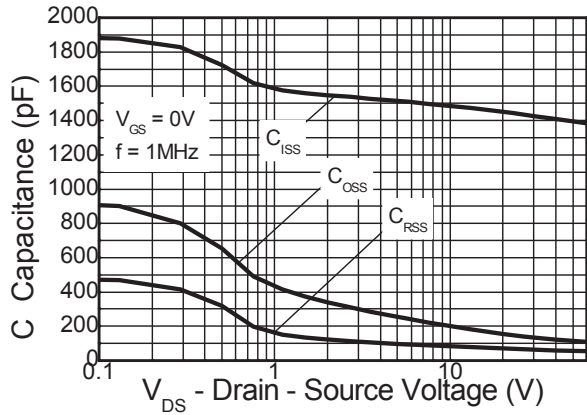


On-Resistance v Drain Current

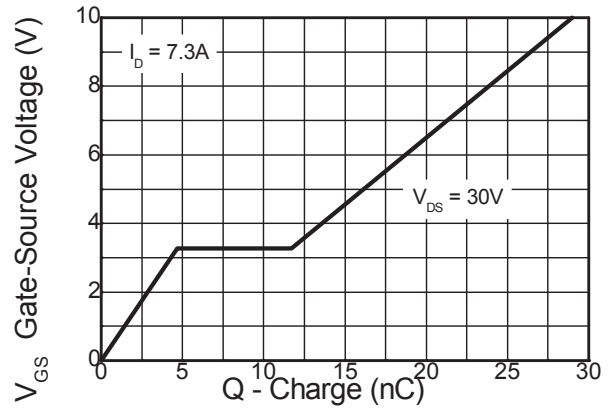


Source-Drain Diode Forward Voltage

Typical Characteristics (cont.)

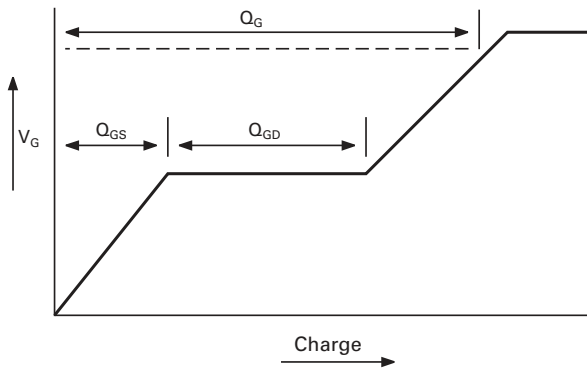


Capacitance v Drain-Source Voltage

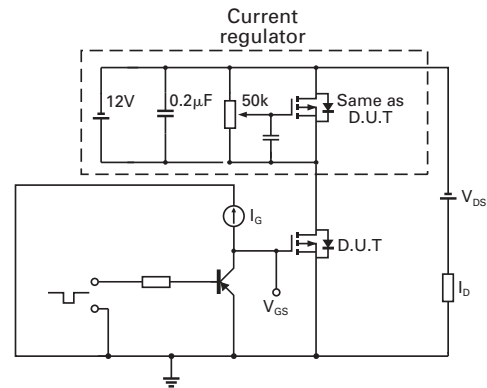


Gate-Source Voltage v Gate Charge

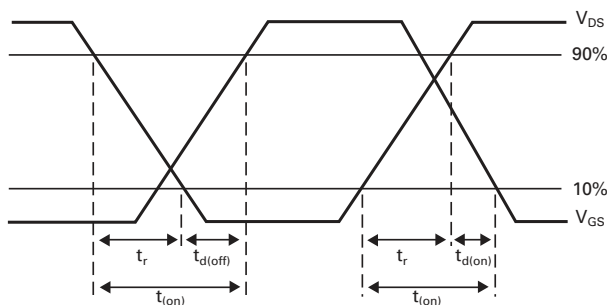
Test Circuits



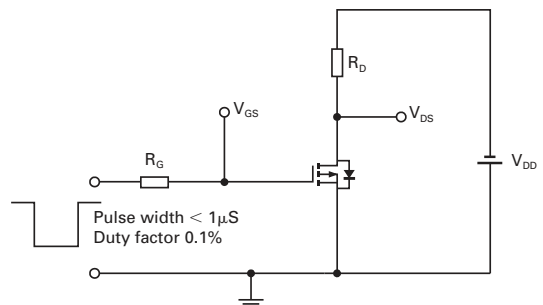
Basic gate charge waveform



Gate charge test circuit



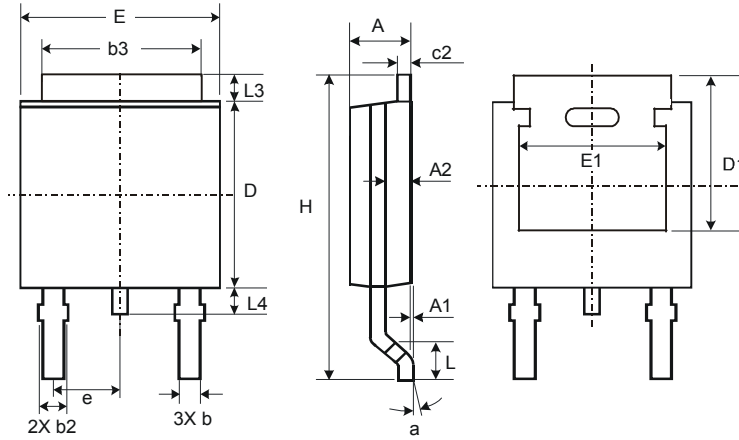
Switching time waveforms



Switching time test circuit

Package Outline Dimensions

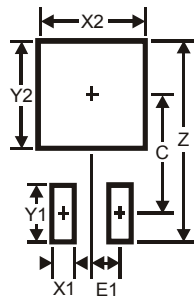
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



TO252			
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
c2	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 AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
Z	11.6
X1	1.5
X2	7.0
Y1	2.5
Y2	7.0
C	6.9
E1	2.3

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