Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max T_A = +25°C
60V	7.5Ω @ V_{GS} = 5V	210mA

Features and Benefits

- N-Channel MOSFET
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Small Surface Mount Package
- **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-Q101, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at https://www.diodes.com/products/automotive/automotive-products/.**
- **This part is qualified to JEDEC standards (as references in AEC-Q101) for High Reliability.**
- **https://www.diodes.com/quality/product-definitions/**

Description and Applications

This MOSFET is 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.

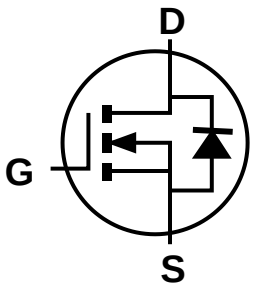
- Motor Control
- Power Management Functions

Mechanical Data

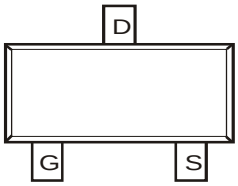
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Terminal Connections: See Diagram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

SOT23

Top View



Equivalent Circuit



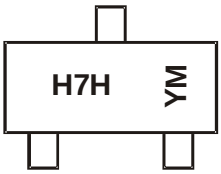
Top View

Ordering Information (Note 3)

Part Number	Case	Packaging
2N7002H-7	SOT23	3,000/Tape & Reel
2N7002H-13	SOT23	10,000/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



H7H = Product Type Marking Code
YM = Date Code Marking
Y or $\overline{Y}$ = Year (ex: B = 2014)
M = Month (ex: 9 = September)

Date Code Key

Year	2014	2015	2016	2017	2018	2019	2020	2021
Code	B	C	D	E	F	G	H	I

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	Units
Drain-Source Voltage			V_{DSS}	60	V
Gate-Source Voltage		Continuous Pulsed	V_{GSS}	±20 ±40	V
Continuous Drain Current (Note 5) V_{GS} = 10V	Steady State	T_A = +25°C T_A = +85°C T_A = +100°C	I_D	170 120 105	mA
Continuous Drain Current (Note 6) V_{GS} = 10V	Steady State	T_A = +25°C T_A = +85°C T_A = +100°C	I_D	210 150 135	mA
Maximum Body Diode Forward Current (Note 6)		Continuous Pulsed	I_S	0.5 2	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I_{DM}	500	mA

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

Characteristic		Symbol	Value	Units
Total Power Dissipation	(Note 5)	P_D	370	mW
	(Note 6)		510	
Thermal Resistance, Junction to Ambient	(Note 5)	$R_{\theta JA}$	341	°C/W
	(Note 6)		249	
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}	60	—	—	V	V_{GS} = 0V, I_D = 10µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1.0	µA	V_{DS} = 60V, V_{GS} = 0V
Gate-Body Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	2.0	—	3.0	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	—	3.0	7.5	Ω	V_{GS} = 5.0V, I_D = 0.05A
Diode Forward Voltage	V_{SD}	—	0.78	1.5	V	V_{GS} = 0V, I_S = 115mA
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	26	—	pF	V_{DS} = 25V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	2.8	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	2.1	—	pF	
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	352	—	pC	V_{DS} = 10V, I_D = 250mA
Gate-Source Charge	Q_{gs}	—	203	—		
Gate-Drain Charge	Q_{gd}	—	123	—		
Turn-On Delay Time	$t_{D(on)}$	—	3.7	—	ns	V_{DD} = 30V, I_D = 0.2A, R_L = 150Ω, V_{GEN} = 10V, R_{GEN} = 25Ω
Turn-On Rise Time	t_r	—	2.9	—		
Turn-Off Delay Time	$t_{D(off)}$	—	8.4	—		
Turn-Off Fall Time	t_f	—	4.7	—		
Body Diode Reverse Recovery Time	t_{rr}	—	9.3	—	ns	I_S = 0.5A, dI/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{rr}	—	3.5	—	nC	I_S = 0.5A, dI/dt = 100A/µs

Notes:
5. Device mounted on FR-4 PCB, with minimum recommended pad layout.
6. Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. Copper, single sided.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

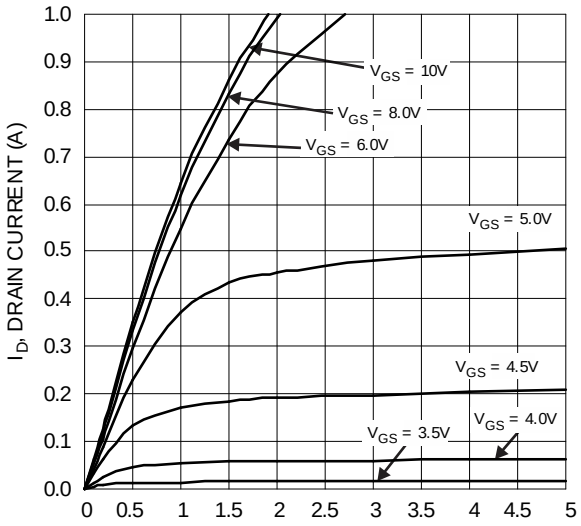


Figure 1 Typical Output Characteristics

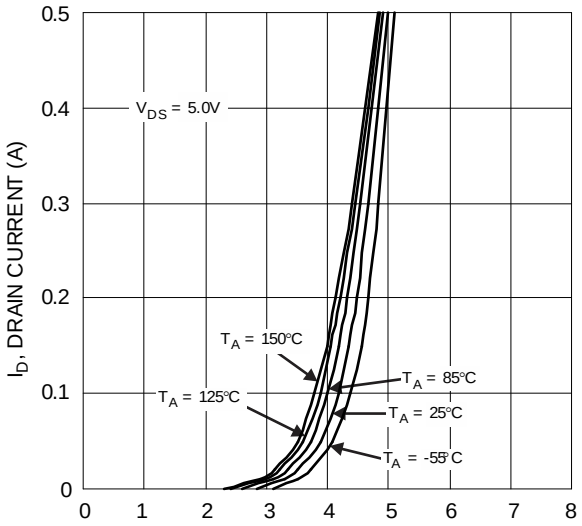


Figure 2 Typical Transfer Characteristics

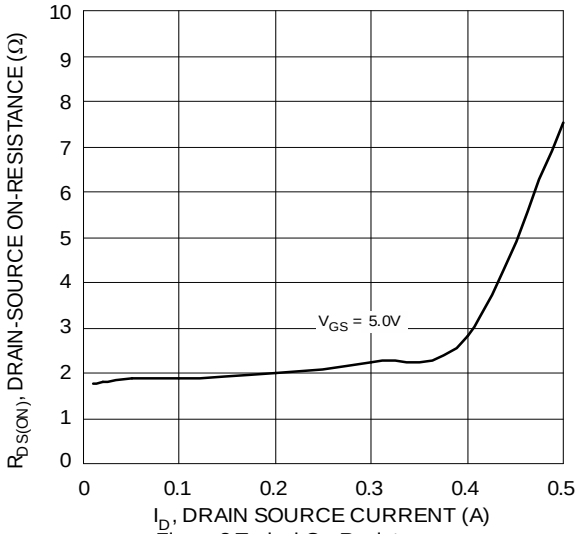


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

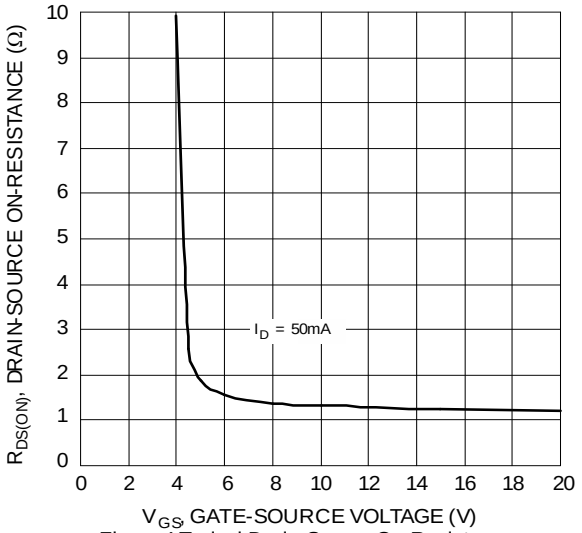


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

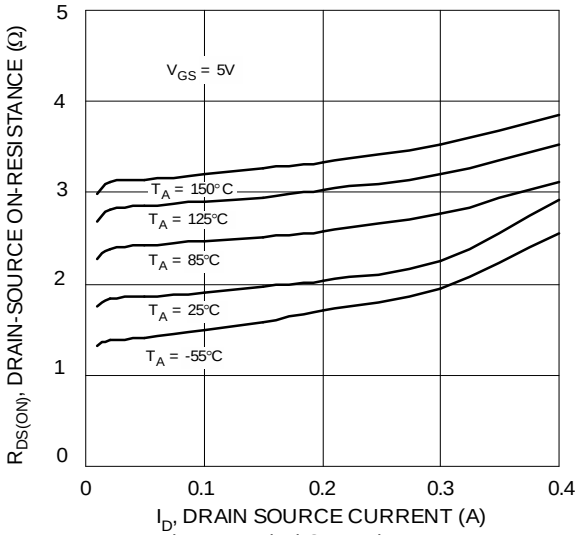


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

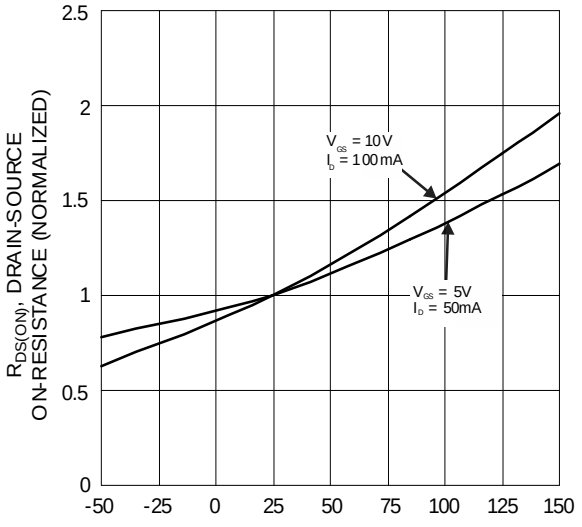


Figure 6 On-Resistance Variation with Temperature

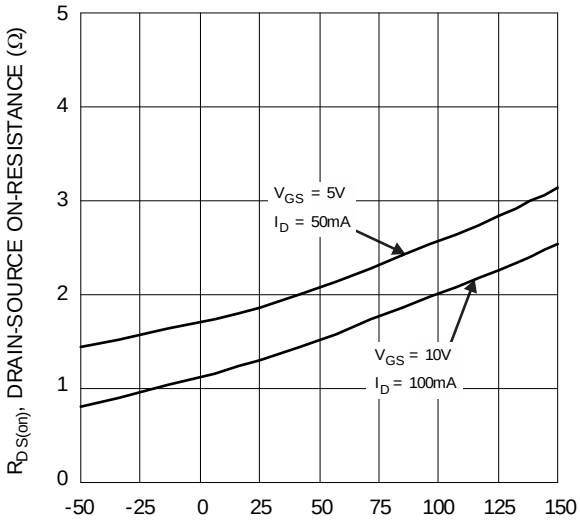


Figure 7 On-Resistance Variation with Temperature

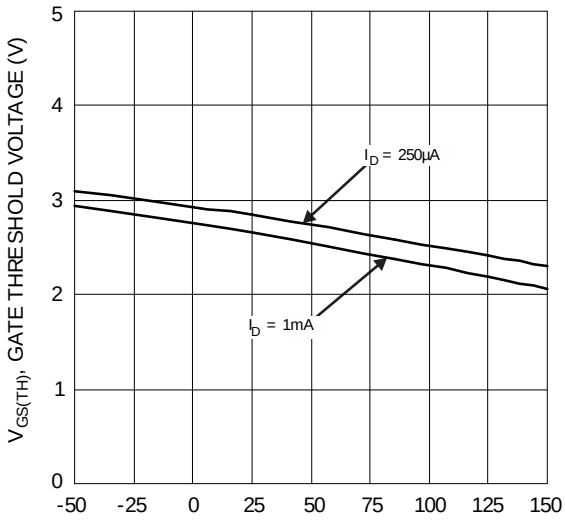


Figure 8 Gate Threshold Variation vs. Ambient Temperature

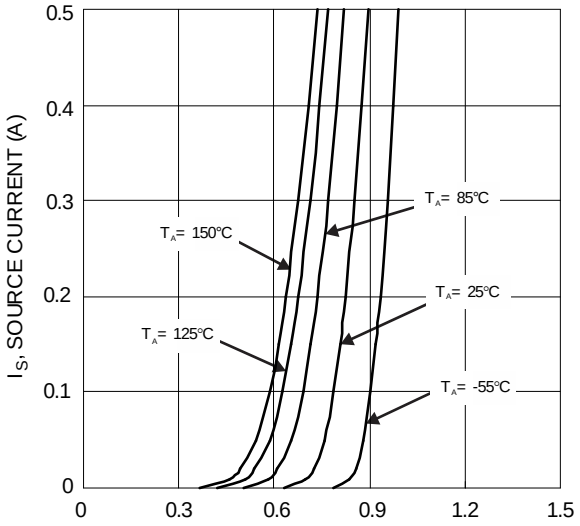


Figure 9 Diode Forward Voltage vs. Current

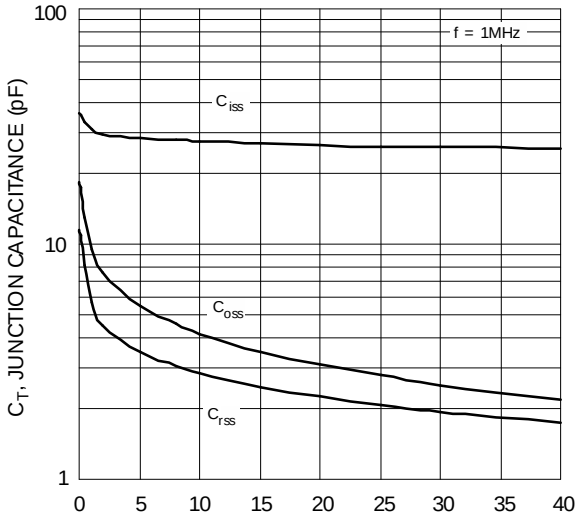


Figure 10 Typical Junction Capacitance

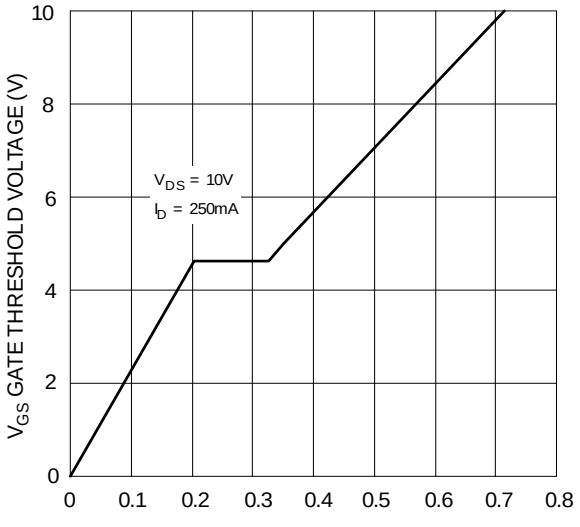


Figure 11 Gate Charge

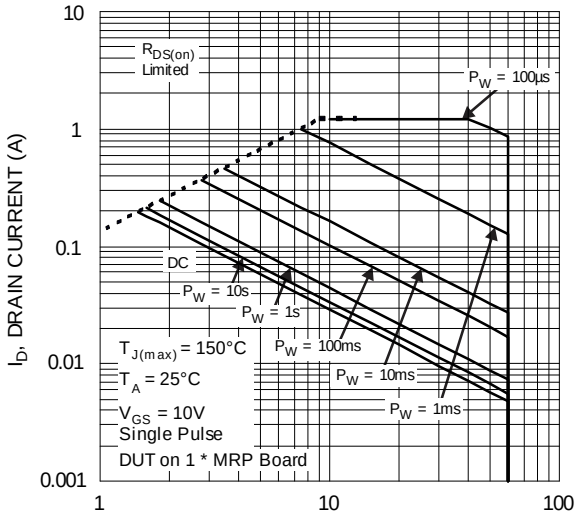


Figure 12 SOA, Safe Operation Area

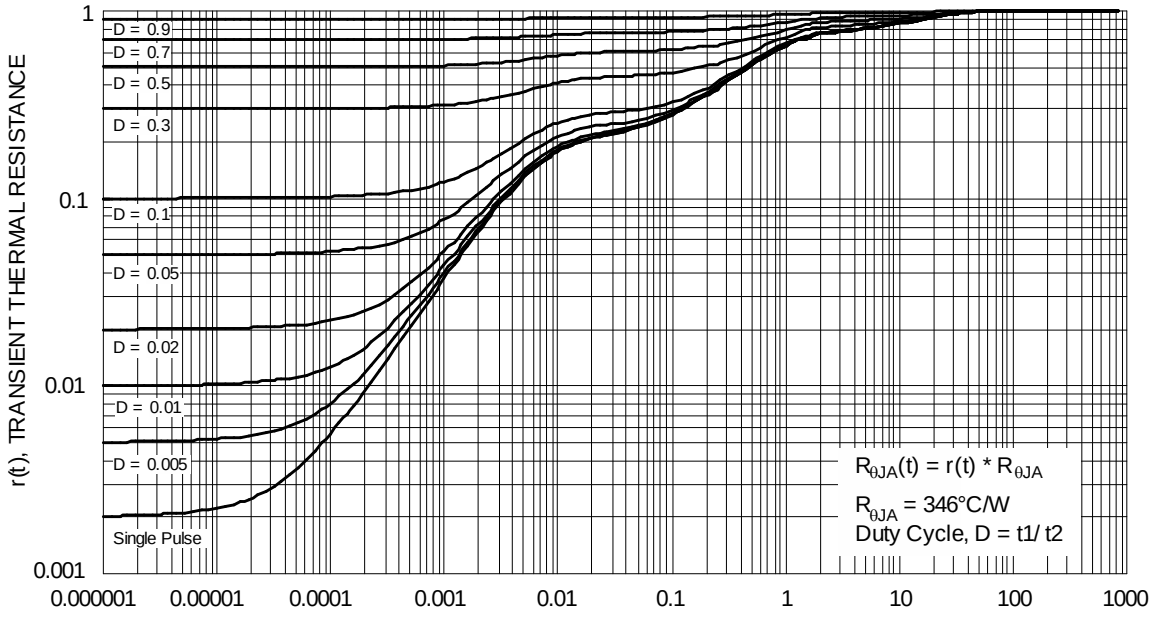
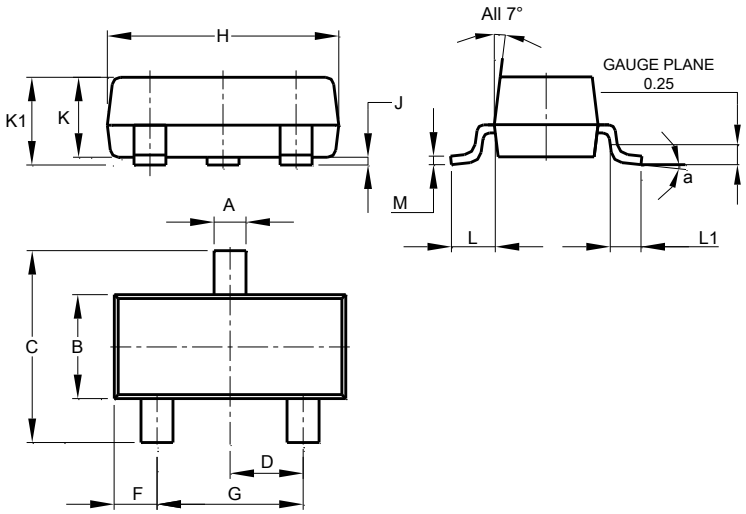


Figure 15 Transient Thermal Resistance

Package Outline Dimensions

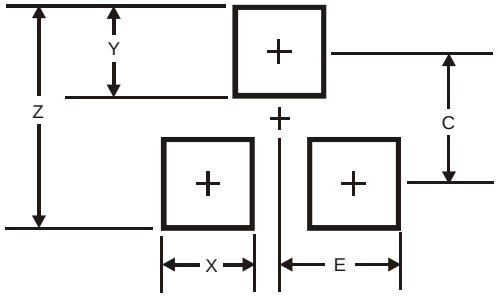
Please see http://www.diodes.com/package-outlines.html for the latest version.



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	8°		
All Dimensions in mm			

Suggested Pad Layout

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



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

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