

Description

The ZXTR2005K monolithically integrates a transistor, Zener diode and resistor to function as a high voltage linear regulator. The device regulates with a 5V nominal output at 15mA. It is designed for use in high-voltage applications where standard linear regulators cannot be used. This function is fully integrated into a TO252 package, minimizing PCB area and reducing number of components when compared with a multi-chip discrete solution.

Applications

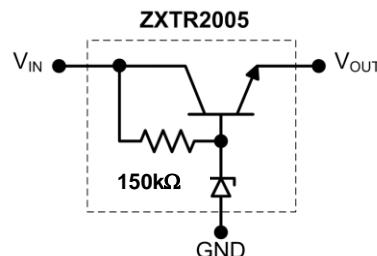
Supply voltage regulation in:

- Startup switch in DC-DC converters
- Networking
- Telecommunications
- Power over Ethernet (PoE)

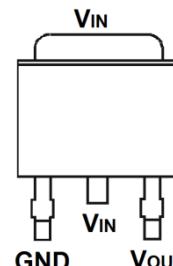
TO252 (DPAK)



Top View



Top View
Pin-Out



Top View
Pin-Out

Pin Name	Pin Function
V _{IN}	Input Supply
GND	Power Ground
V _{OUT}	Voltage Output

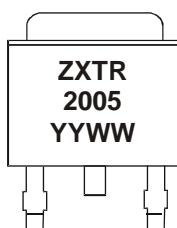
Ordering Information (Note 4)

Product	Package	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTR2005K-13	TO252 (DPAK)	ZXTR 2005	13	16	2,500

Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



ZXTR 2005 = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last Digit of Year (ex: 17 = 2017)
 WW = Week Code 01 - 52

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

Characteristic	Symbol	Value	Unit
Input Voltage	V_{IN}	-0.3 to 100	V
Continuous Input & Output Current	I_{IN}, I_{OUT}	450	mA
Peak Pulsed Input & Output Current	I_{IM}, I_{OM}	2	A
Maximum Voltage applied to V_{OUT}	$V_{OUT(max)}$	Smaller of $V_{IN}+5\text{V}$ or 11V	V

Maximum Current at $V_{IN} = 48\text{V}$ (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Continuous Output Current	I_{OUT}	50	mA
Pulsed Output Current	I_{OM}	830	mA
		170	

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation	P_D	2.3	W
		1.1	
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	44	°C/W
		90	
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	8.4	°C/W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	14.6	
Recommended Operating Junction Temperature Range	T_J	-40 to +125	°C
Maximum Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +150	°C

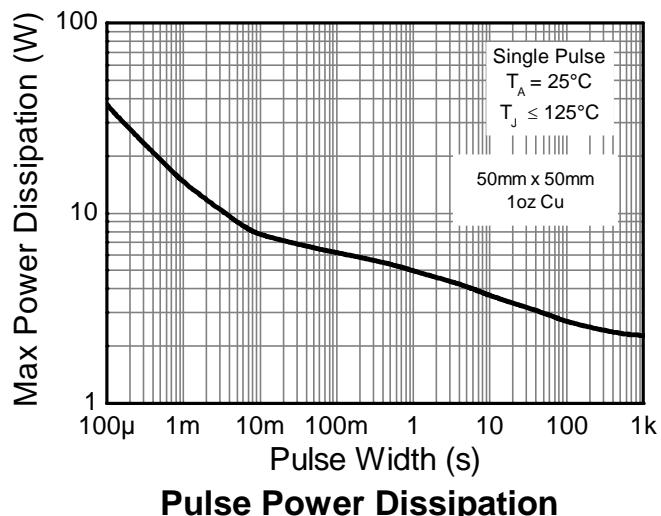
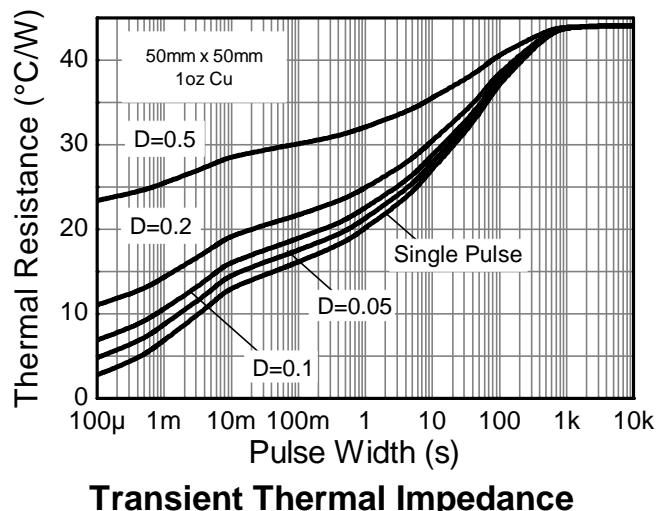
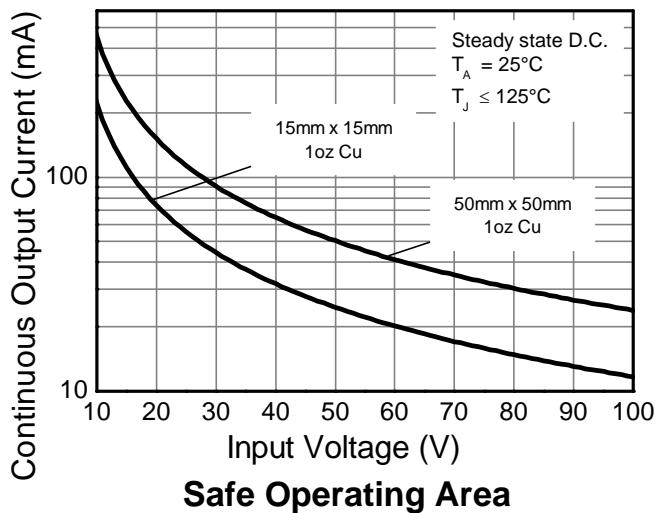
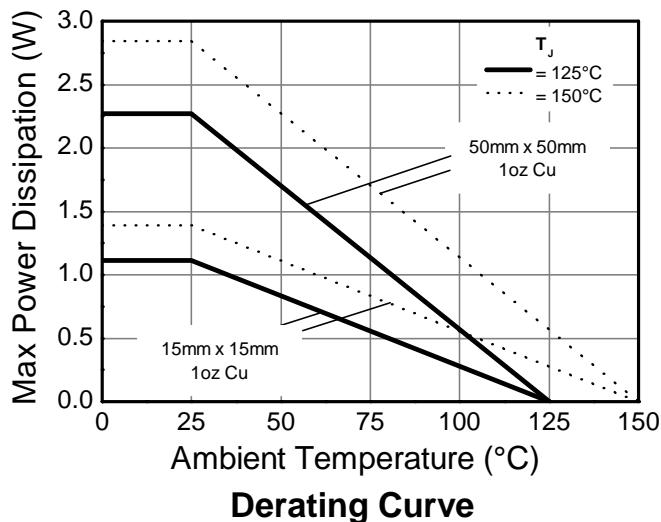
ESD Ratings (Note 11)

Characteristics	Symbols	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

Notes:

5. For a device mounted with the exposed V_{IN} pad on 50mm x 50mm 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady-state.
6. Same as note 5, except mounted on 15mm x 15mm 1oz copper.
7. Same as note 5, whilst operating at $V_{IN} = 48\text{V}$. Refer to Safe Operating Area for other Input Voltages.
8. Same as note 5, except measured with a single pulse width = $100\mu\text{s}$ and $V_{IN} = 48\text{V}$.
9. Same as note 5, except measured with a single pulse width = 10ms and $V_{IN} = 48\text{V}$.
10. $R_{\theta JL}$ = Thermal resistance from junction to solder-point (on the exposed V_{IN} pad).
 $R_{\theta JC}$ = Thermal resistance from junction to the top of case.
11. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics and Derating Information



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

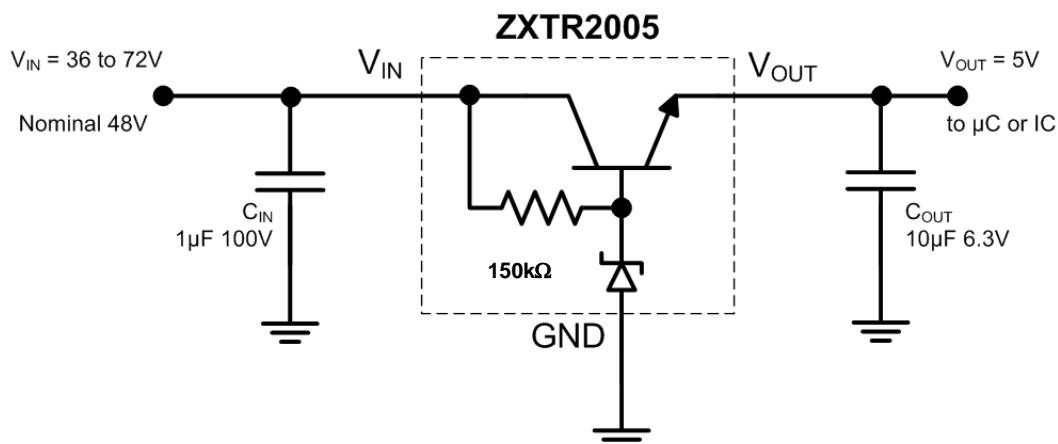
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage (Note 12)	V_{OUT}	4.5	5.0	5.5	V	$V_{\text{IN}} = 48\text{V}$, $I_{\text{OUT}} = 15\text{mA}$
Line Regulation (Notes 12 & 13)	ΔV_{OUT}	—	195	300	mV	$V_{\text{IN}} = 10$ to 72V , $I_{\text{OUT}} = 15\text{mA}$
Temperature Coefficient	$\Delta V_{\text{OUT}}/\Delta T$	—	7.0	—	$\text{mV}/^\circ\text{C}$	$T_J = -40^\circ\text{C}$ to $+125^\circ\text{C}$ $V_{\text{IN}} = 48\text{V}$, $I_{\text{OUT}} = 15\text{mA}$
Load Regulation (Notes 12 & 14)	ΔV_{OUT}	—	-185 -205	-350 -400	mV	$I_{\text{OUT}} = 0.1$ to 30mA , $V_{\text{IN}} = 48\text{V}$ $I_{\text{OUT}} = 0.1$ to 100mA , $V_{\text{IN}} = 48\text{V}$
Minimum Value of Input Voltage Required to Maintain Line Regulation	$V_{\text{IN(MIN)}}$	10	—	—	V	—
Quiescent Current	I_Q	—	260 550	500 900	μA	$V_{\text{IN}} = 48\text{V}$, $I_{\text{OUT}} = 10\mu\text{A}$ $V_{\text{IN}} = 100\text{V}$, $I_{\text{OUT}} = 10\mu\text{A}$
Power Supply Rejection Ratio	$\Delta V_{\text{in}}/\Delta V_{\text{out}}$	—	45	—	dB	$C_{\text{OUT}} = 100\text{nF}$, $I_{\text{OUT}} = 15\text{mA}$, $V_{\text{OUT}} = 5\text{V}$, $V_{\text{IN}} = 10$ to 100V , $f = 100\text{Hz}$

Notes: 12. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$

13. Line regulation $\Delta V_{\text{OUT}} = V_{\text{OUT}} (@ V_{\text{IN}} = 72\text{V}) - V_{\text{OUT}} (@ V_{\text{IN}} = 10\text{V})$

14. Load regulation $\Delta V_{\text{OUT}} = V_{\text{OUT}} (@ I_{\text{OUT}} = 30\text{mA}) - V_{\text{OUT}} (@ I_{\text{OUT}} = 0.1\text{mA})$

$\Delta V_{\text{OUT}} = V_{\text{OUT}} (@ I_{\text{OUT}} = 100\text{mA}) - V_{\text{OUT}} (@ I_{\text{OUT}} = 0.1\text{mA})$

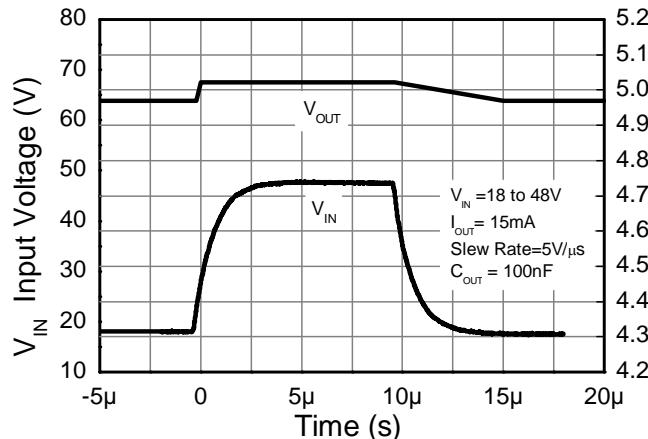
Typical Application Circuit


Example of a 5V regulated supply from a nominal 48V for powering a Controller IC.

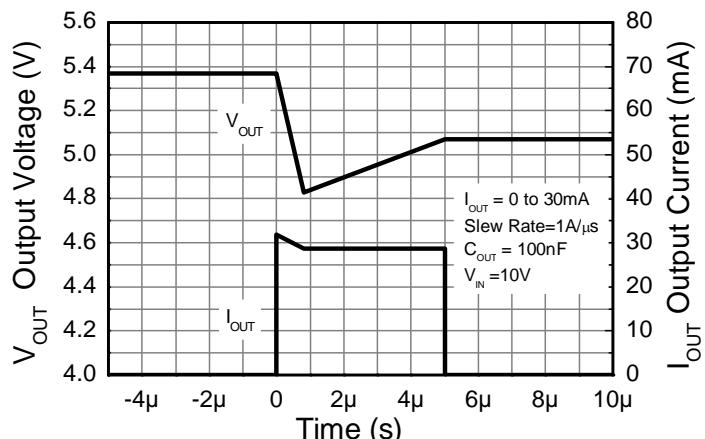
Pin Functions

Pin Name	Pin Function	Notes
VIN	Input Supply	Input voltage can vary from -0.3V to 100V with respect to GND; for V_{OUT} regulated then $10\text{V} \leq V_{\text{IN}} \leq 100\text{V}$. It is recommended to connect a $1\mu\text{F}$ capacitor to GND.
GND	Power Ground	This pin should be tied to the system ground.
VOUT	Voltage Output	Outputs a regulated 5V when $10\text{V} \leq V_{\text{IN}} \leq 100\text{V}$. When $V_{\text{IN}} < 10\text{V}$, then V_{OUT} maximum = $V_{\text{IN}} - 1.5\text{V}$. The pin can be pulled high to a maximum of $+11\text{V}$ with respect to GND, or $+5\text{V}$ with respect to V_{IN} , whichever is lower. It is recommended to connect a $10\mu\text{F}$ capacitor to GND and a minimum of $10\mu\text{A}$ to be drawn from V_{OUT} to maintain regulation.

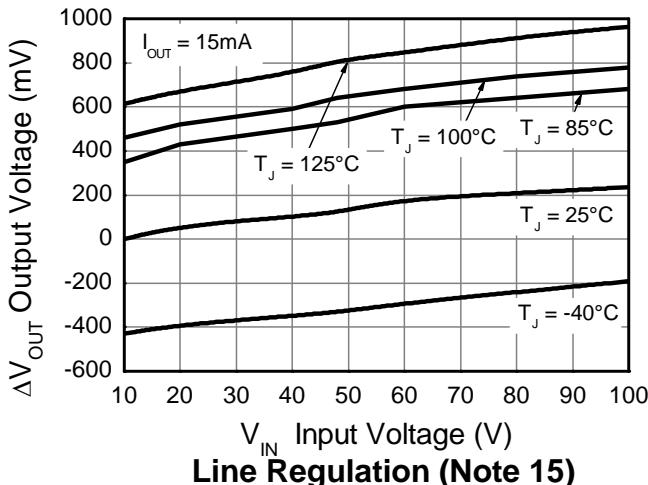
Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



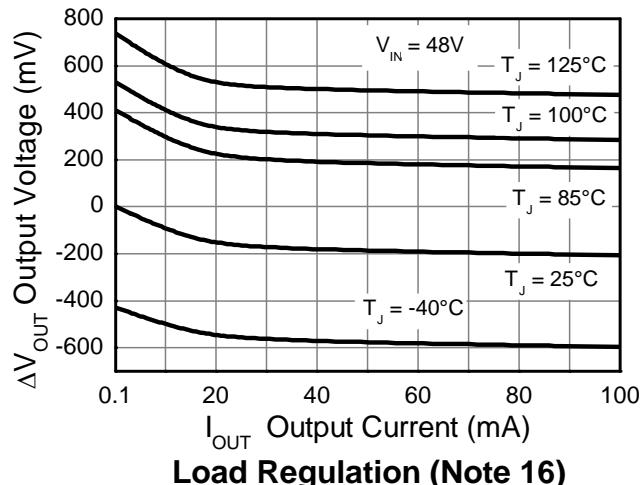
Line transient response



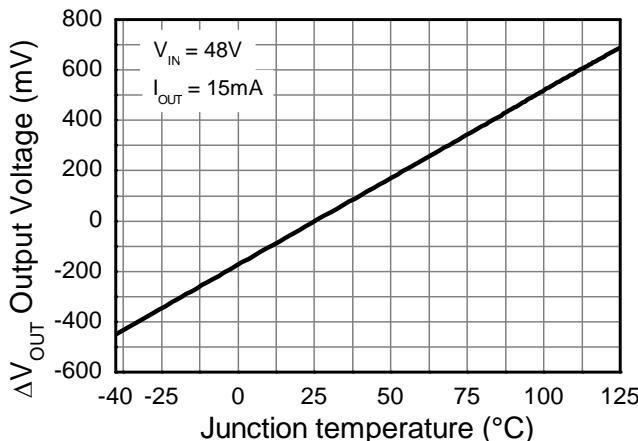
Load transient response



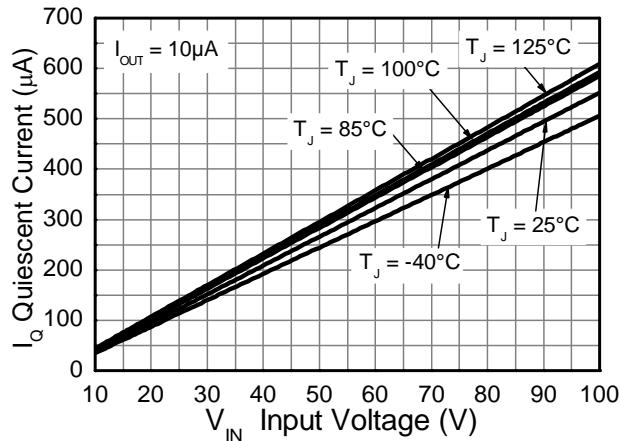
Line Regulation (Note 15)



Load Regulation (Note 16)



Temperature Coefficient (Note 17)



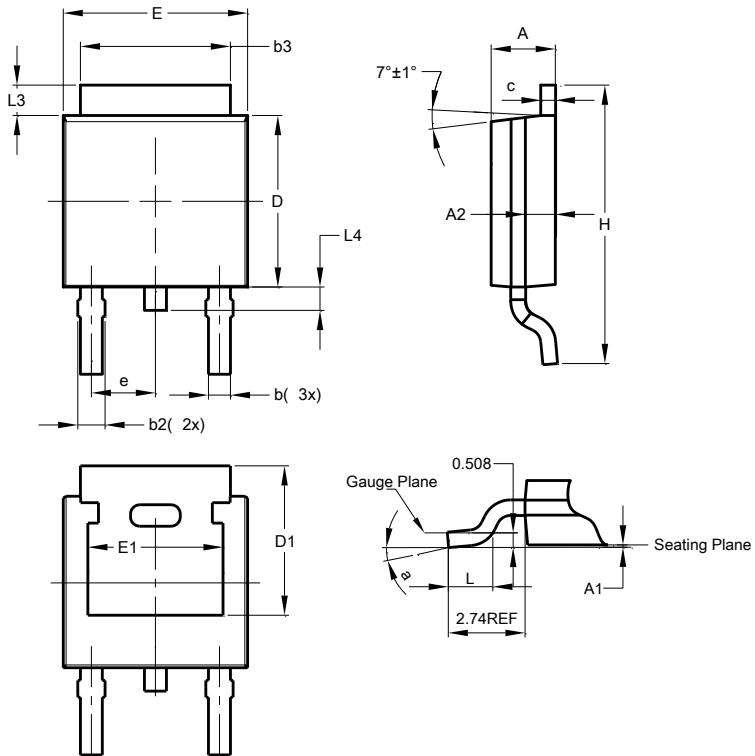
Quiescent Current

Notes:

15. Line regulation $\Delta V_{\text{OUT}} = V_{\text{OUT}} - V_{\text{OUT}} (@ V_{\text{IN}} = 10\text{V}, I_{\text{OUT}} = 15\text{mA}, T_J = +25^\circ\text{C})$
16. Load regulation $\Delta V_{\text{OUT}} = V_{\text{OUT}} - V_{\text{OUT}} (@ V_{\text{IN}} = 48\text{V}, I_{\text{OUT}} = 0.1\text{mA}, T_J = +25^\circ\text{C})$
17. Temperature Coefficient $\Delta V_{\text{OUT}} = V_{\text{OUT}} - V_{\text{OUT}} (@ V_{\text{IN}} = 48\text{V}, I_{\text{OUT}} = 15\text{mA}, T_J = +25^\circ\text{C})$

Package Outline Dimensions

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

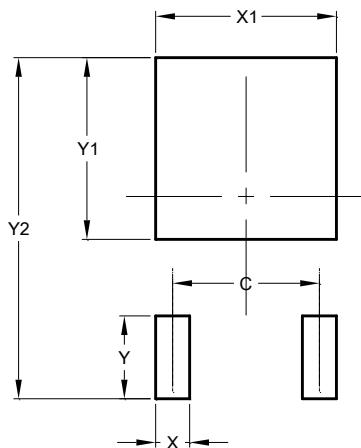


TO252 (DPAK)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°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

All Dimensions in mm

Suggested Pad Layout

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



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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