

GS324

Low Power Quad Operational Amplifiers

Product Description

The GS324 consists of four independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages.

Operation from split power supplies is also possible and the low power supply current drains in independent of the magnitude of the power supply voltage.

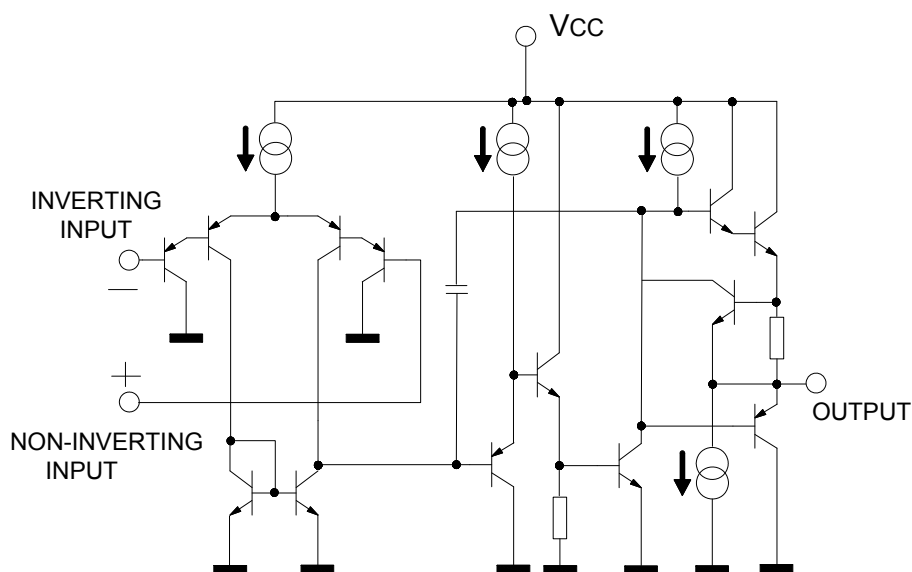
Application areas include transducer amplifiers, DC gain blocks and all the conventional op amp circuits, which now can be more easily implemented in single power supply systems.

For example, the GS324 can be directly operated off of the standard +5V power supply voltage which is used in digital systems and will easily provide the required interface electronics without requiring the additional $\pm 15V$ power supplies.

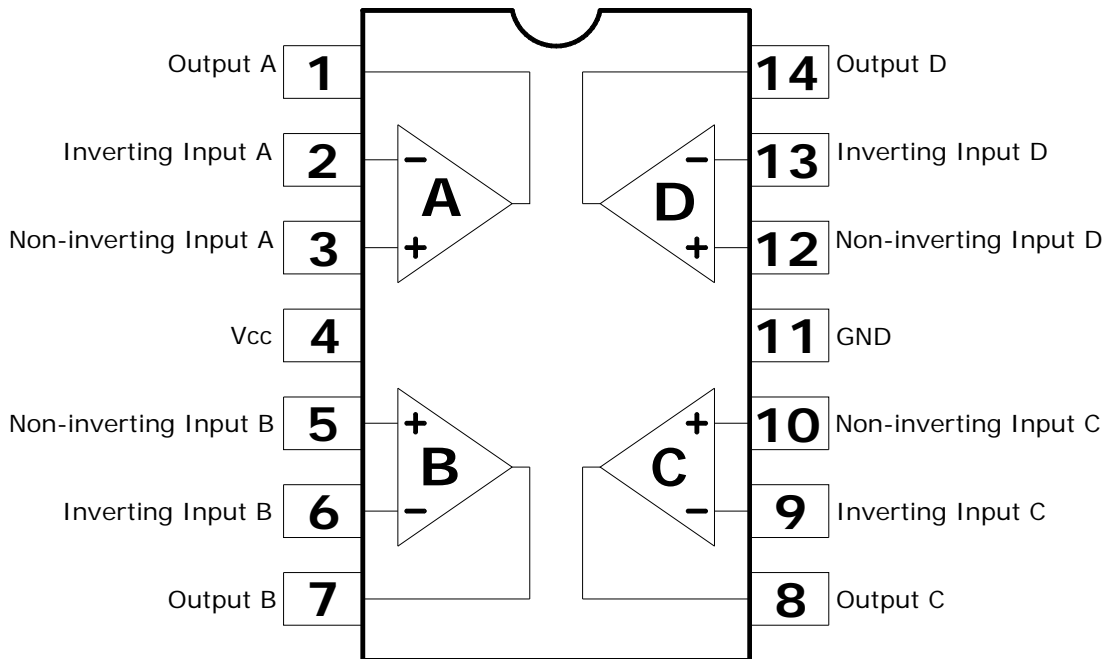
Features

- Wide range of supply voltages 3V to 36V
- Low supply current drain independent of supply voltage 1.5mA TYP.
- Low input biasing current
- Low input offset voltage and offset current
- Input common-mode voltage range includes ground
- Differential input voltage range equal to the power supply voltage
- DC voltage gain: 100V/mV TYP.
- Internally frequency compensation
- RoHS Compliant, 100%Pb & Halogen Free
- ESD Protection(2KV) between V+/V- and GND

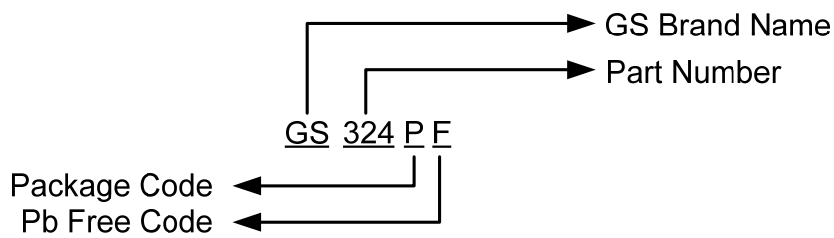
Block Diagram



Pin Assignments

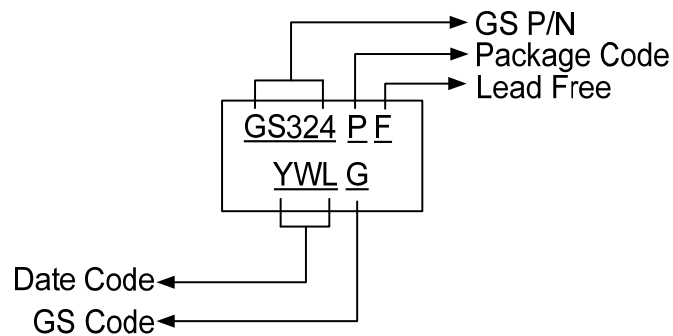


Ordering Information



Device	Package
GS324PF	DIP-14
GS324SF	SOP-14

Marking Information



Absolute Maximum Ratings

Symbol	Parameter	Value	Unit	
V_{CC}	Single Supply	40	V	
V_{CC}, V_{EE}	Split Supply	± 20	V	
V_{IDR}	Input Differential Voltage Range	± 40	V	
I_{OS}	Output Short-circuit to GND	Continuous		
T_J	Junction Temperature	150	$^{\circ}C$	
T_{STG}	Storage Temperature Range	-65 to +150	$^{\circ}C$	
T_A	Operating Ambient Temperature Range	-40 to 85	$^{\circ}C$	
θ_{JA}	Junction to Ambient Thermal Resistance	DIP-14	115	$^{\circ}C/W$
		SOP-14	150	
θ_{JC}	Junction to Case Thermal Resistance	DIP-14	41	$^{\circ}C/W$
		SOP-14	23	
ESD	ESD Rating (HBM)	2K	V	

Electrical Characteristics

at specified free-air temperature, $V_{CC}=5V$ (Unless Otherwise Noted)

Symbol	Parameter	Test Conditions*	Min	Typ	Max	Unit	
V_{IO}	Input offset voltage	$V_{CC}=5V$ to Max. $V_{IC}=V_{ICR\ min}$, $V_O=1.4V$	25 $^{\circ}C$		3	7	mV
			Full range			9	
αV_{IO}	Average temperature coefficient of input offset voltage		Full range	7		$\mu V/^{\circ}C$	
I_{IO}	Input offset current	$V_O=1.4V$	25 $^{\circ}C$		2	50	nA
			Full range			150	
αI_{IO}	Average temperature coefficient of input offset current		Full range	10		$pA/^{\circ}C$	
I_{IB}	Input bias current	$V_O=1.4V$	25 $^{\circ}C$		20	250	nA
			Full range			500	
V_{ICR}	Common-mode input voltage range	$V_{CC}=5V$ to MAX	25 $^{\circ}C$	0 to $V_{CC}-1.5$			V
			Full range	0 to $V_{CC}-2$			
V_{OH}	High-level output voltage	$R_L \geq 2k\Omega$	25 $^{\circ}C$	$V_{CC}-1.5$			V
		$V_{CC}=MAX$, $R_L=2k\Omega$	Full range	26			
		$V_{CC}=MAX$, $R_L \geq 10k\Omega$	Full range	27	28		
V_{OL}	Low-level output voltage	$R_L \geq 10k\Omega$	Full range		5	20	mV

Symbol	Parameter	Test Conditions*		Min	Typ	Max	Unit
A _{VD}	Large-signal differential voltage amplification	V _{CC} =15V V _O =1V to 11V R _L ≥2kΩ	25°C	25	100		V/mV
			Full range	15			
CMRR	Common-mode rejection ratio	V _{CC} =5V to MAX V _{IC} =V _{ICR} min	25°C	65	80		dB
K _{SVR}	Supply voltage rejection ratio (ΔV _{CC} /ΔV _{IO})	V _{CC} =5V to MAX	25°C	65	100		dB
V _{O1} /V _{O2}	Crosstalk attenuation	f=1kHz to 20kHz	25°C		120		dB
I _O	Output current	V _{CC} =15V, V _{ID} =1V, V _O =0V	25°C	-20	-30		mA
			Full range	-10			
		V _{CC} =15V V _{ID} =-1V, V _O =15V	25°C	10	20		mA
			Full range	5			
V _{ID} =-1V, V _O =200mV	25°C	12	30		μA		

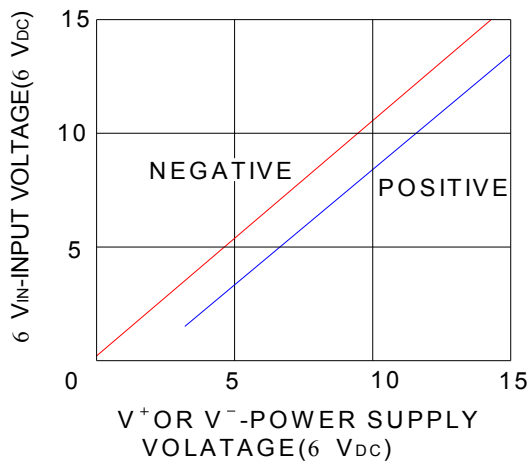
Electrical Characteristics (Continue)

Symbol	Parameter	Test Conditions*		Min	Typ	Max	Unit
I _{OS}	Short-circuit output current	V _{CC} at 5V, GND at -5V, V _O =0V	25°C		±40	±60	mA
I _{CC}	Supply current (two amplifiers)	V _O =2.5V, No load	Full range		1.5	2.4	mA
		V _{CC} =MAX, V _O =0.5V _{CC} , No load	Full range		1.1	3	

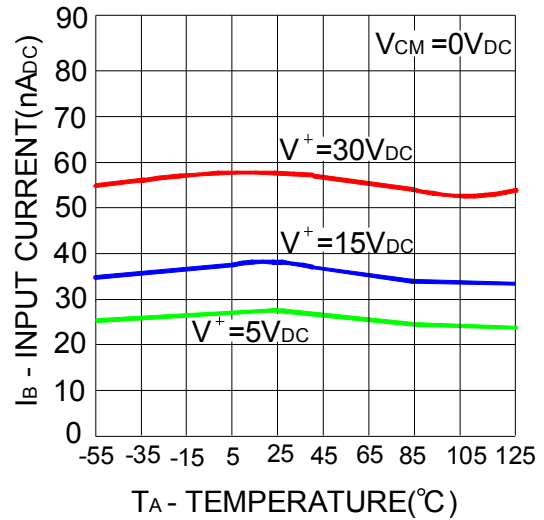
*All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified. "MAX" V_{CC} for testing Purposes is 30V. Full range is -40 °C to 85 °C.

Typical Performance Characteristics

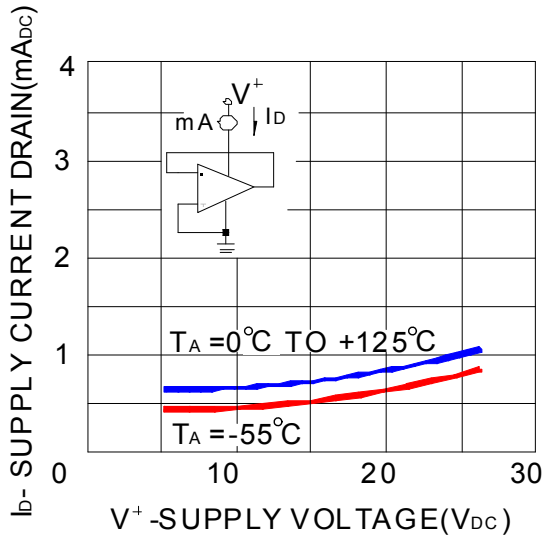
Input Voltage Range



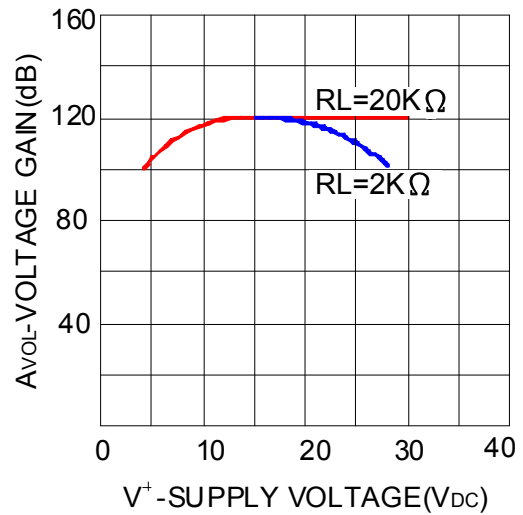
Input Current



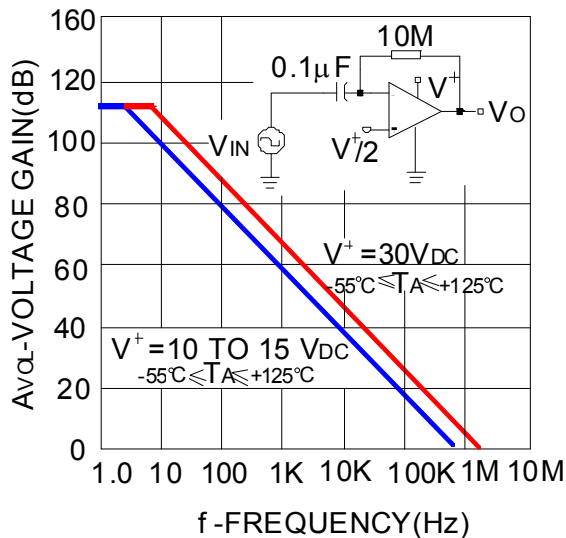
Supply Current



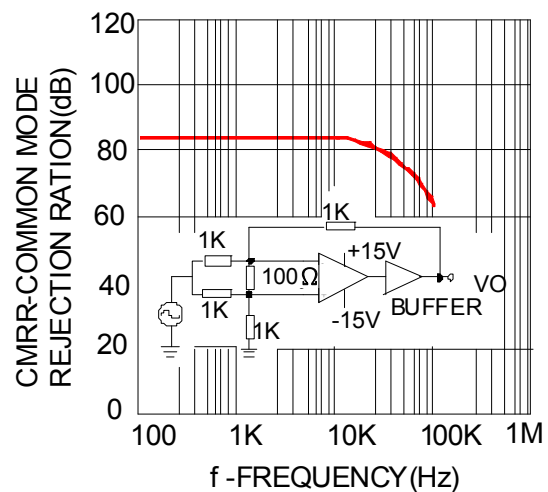
Voltage Gain



Open Loop Frequency Response

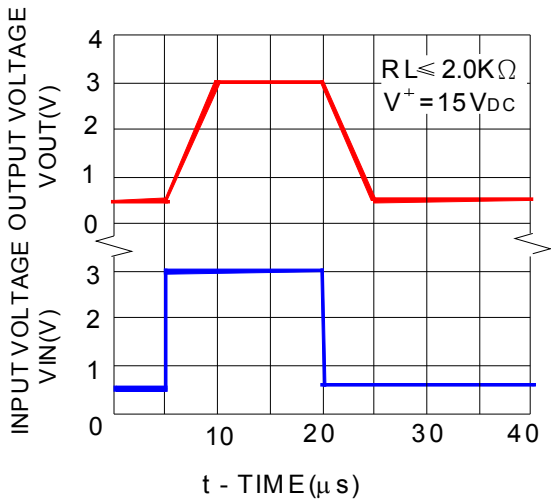


Common Mode Rejection Ratio

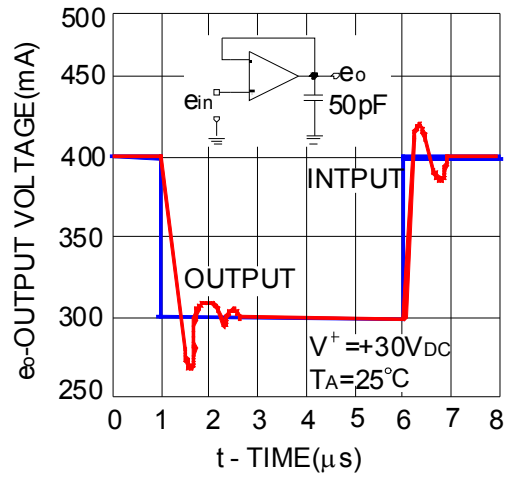


Typical Performance Characteristics (Continue)

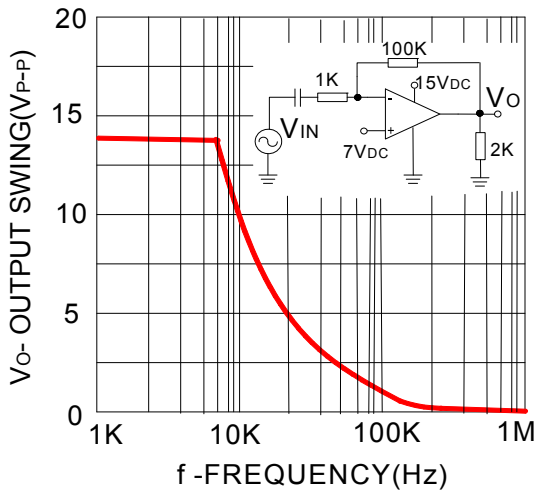
Voltage Follower Pulse Response



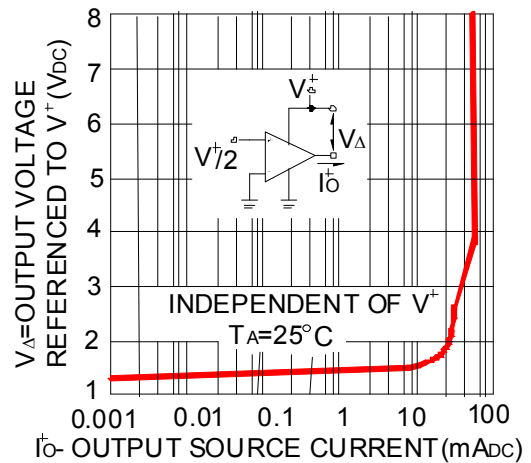
Voltage Follower Pulse Response (Small Signal)



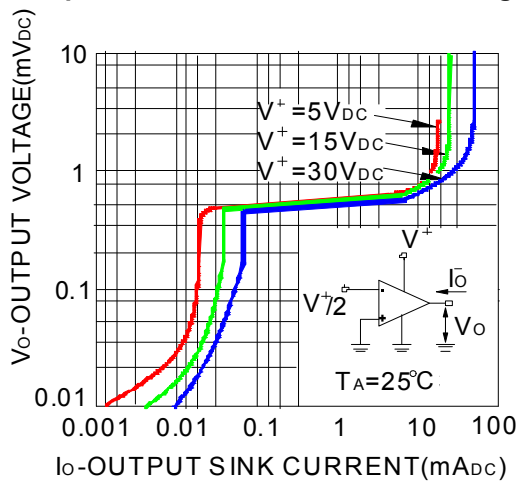
Large Signal Frequency Response



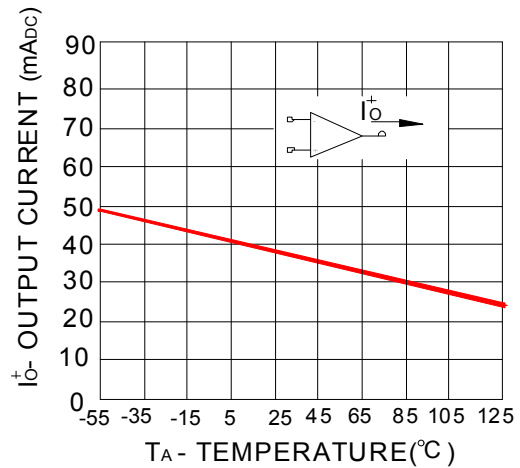
Output Characteristics current Sourcing



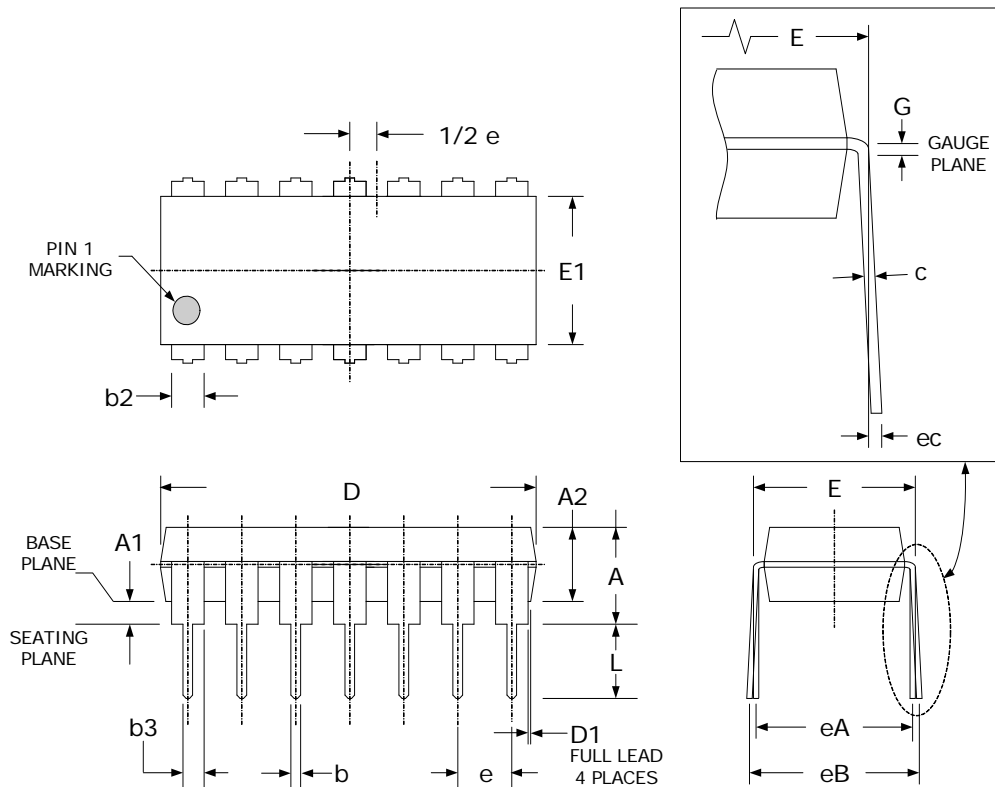
Output Characteristics Current Sinking



Current Limiting



DIP-14 PLASTIC PACKAGE







Dimensions

SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	-	5.33	-	.210
A1	0.38	-	.015	-
A2	2.92	4.95	.115	.195
b	0.36	0.56	.014	.022
b2	1.14	1.78	.045	.070
b3	0.76	1.14	.030	.045
c	0.20	0.36	.008	.014
D	18.67	19.69	.735	.775
D1	0.13	-	.005	-
E	7.62	8.26	.300	.325
E1	6.10	7.11	.240	.280
e	2.54 (TYP)		.100 (TYP)	
eA	7.62 (TYP)		.300 (TYP)	
eB	-	10.92	-	.430
eC	0.00	1.52	.000	.060
L	2.92	3.81	.115	.150
G	0.38 (TYP)		.015 (TYP)	

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