

**ULV8538****CMOS IC****LOW POWER, PRECISION,
AUTO-ZERO OP AMPS****DESCRIPTION**

The UTC **ULV8538** is very high precision amplifiers featuring extremely low offset voltage, low input bias current, and low power consumption. The supply current is less than 215 μ A maximum per amplifier at 5.0V. Operation is fully specified from 2.7V to 5.0V single supply (± 1.35 V to ± 2.5 V dual supply).

The UTC **ULV8538** operates at very low power making these amplifiers ideal for battery-powered devices and portable equipment.

FEATURES

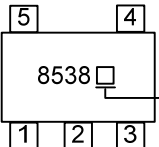
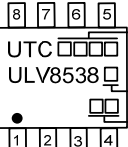
- * Single-supply operation: 2.7V~5.5V
- * Low supply current: 180 μ A
- * Low offset voltage: 13 μ V maximum
- * High gain, CMRR, and PSRR
- * Qualified for automotive applications

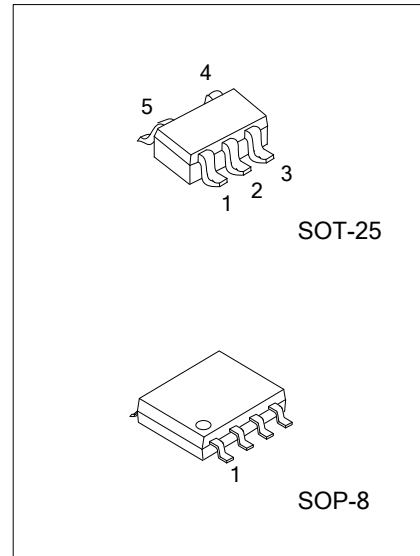
ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV8538L-AF5-R	ULV8538G-AF5-R	SOT-25	Tape Reel
ULV8538L-S08-R	ULV8538G-S08-R	SOP-8	Tape Reel

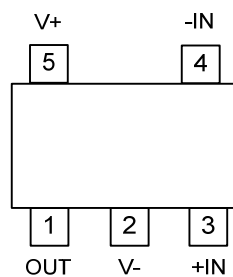
ULV8538G-AF5-R 	(1) Packing Type (2) Package Type (3) Green Package
	(1) R: Tape Reel (2) AF5: SOT-25, S08: SOP-8 (3) G: Halogen Free and Lead Free, L: Lead Free

MARKING

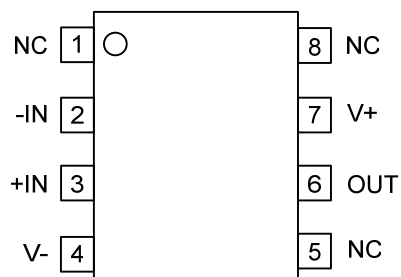
SOT-25	SOP-8
 5 4 8538 □ 1 2 3 L: Lead Free G: Halogen Free	 8 7 6 5 UTC □ □ □ □ ULV8538 □ 1 2 3 4 Date Code L: Lead Free G: Halogen Free Lot Code



PIN CONFIGURATION



SOT-25

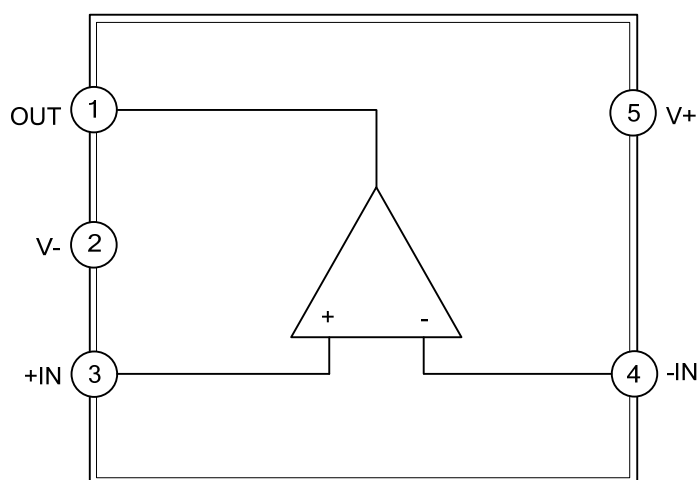


SOP-8

PIN DESCRIPTION

PIN NO.		PIN NAME	DESCRIPTION
SOT-25	SOP-8		
1	6	OUT	Output
2	4	V-	Negative (lowest) power supply
3	3	+IN	Non-inverting input
4	2	-IN	Inverting input
5	7	V+	Positive (highest) power supply
-	1, 5, 8	NC	No connection

BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (T_A=25°C, unless otherwise specified.)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V _{CC}	+6	V
Input Voltage		V _{SS} - 0.3 ~ V _{DD} + 0.3	V
Differential Input Voltage		±6	V
Junction Temperature Range	T _J	-65 ~ +150	°C
Storage Temperature Range	T _{STG}	-65 ~ +150	°C
Operating Temperature Range	T _{OPR}	-40 ~ +125	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS

(V_S=5.0V, V_{CM}=2.5V, V_O=2.5V, T_A=25°C, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
INPUT CHARACTERISTICS						
Offset Voltage	V _{OS}			5	13	μV
Input Bias Current	I _B			15		pA
Input Offset Current	I _{OS}			20		pA
Input Voltage Range			0		5	V
Common-Mode Rejection Ratio	CMRR	V _{CM} =0V~5V	105	120		dB
Large Signal Voltage Gain	A _{VO}	R _L =10kΩ, V _O =0.1V~4.9V	115	141		dB
OUTPUT CHARACTERISTICS						
Output Voltage High	V _{OH}	R _L =100kΩ to Ground	4.99	4.998		V
		R _L =10kΩ to Ground	4.95	4.970		V
Output Voltage Low	V _{OL}	R _L =100kΩ to V+		8	20	mV
		R _L =10kΩ to V+		22	30	mV
Short-Circuit Limit	I _{SC}			±25		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V _S =2.7V~5.0V	105	125		dB
Supply Current/Amplifier	I _{SY}	I _O =0		150	180	μA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R _L =10kΩ		0.4		V/μs
Settling Time 0.01%	t _S	G=±1.2V step, C _L =20pF, R _L =1kΩ		10		μs
Overload Recovery Time				0.05		ms
Gain Bandwidth Product	GBP			430		kHz
Phase Margin	∅ _M	R _L =10kΩ, R _L =100kΩ, C _L =20pF		65		Degree s
NOISE PERFORMANCE						
Voltage Noise	e _{n p-p}	f=0.1Hz~10Hz		2.0		μV p-p
Voltage Noise Density	e _n	f=1kHz		50		nV/√Hz

■ ELECTRICAL CHARACTERISTICS

($V_S=2.7V$, $V_{CM}=1.35V$, $V_O=1.35V$, $T_A=25^\circ C$, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}			5	13	μV
Input Bias Current	I_B			15		pA
Input Offset Current	I_{OS}			20		pA
Input Voltage Range			0		2.7	V
Common-Mode Rejection Ratio	CMRR	$V_{CM}=0V\sim 2.5V$	100	115		dB
Large Signal Voltage Gain	A_{VO}	$R_L=10k\Omega$, $V_O=0.1V\sim 1.7V$	110	140		dB
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	$R_L=100k\Omega$ to Ground	2.68	2.698		V
		$R_L=10k\Omega$ to Ground	2.65	2.67		V
Output Voltage Low	V_{OL}	$R_L=100k\Omega$ to $V+$		7	20	mV
		$R_L=10k\Omega$ to $V+$		22	30	mV
Short-Circuit Limit	I_{SC}			± 8		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	$V_S=2.7V\sim 5.5V$	105	125		dB
Supply Current/Amplifier	I_{SY}	$I_O=0$		150	180	μA
DYNAMIC PERFORMANCE						
Slew Rate	SR	$R_L=10k\Omega$		0.35		V/ μs
Settling Time 0.01%	t_S	$G=\pm 1.1V$ step, $C_L=20pF$, $R_L=1k\Omega$		5		μs
Overload Recovery Time				0.05		ms
Gain Bandwidth Product	GBP			430		kHz
Phase Margin	ϕ_M	$R_L=10k\Omega$, $R_L=100k\Omega$, $C_L=20pF$		65		Degree s
NOISE PERFORMANCE						
Voltage Noise	$e_{n\ p-p}$	$f=0.1Hz\sim 10Hz$		2.0		$\mu V\ p-p$
Voltage Noise Density	e_n	$f=1kHz$		50		nV/ $\sqrt{Hz}$

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