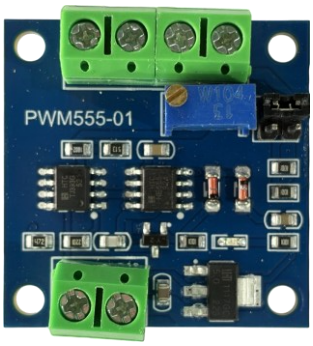
Voltage to PWM Converter Module

FEATURES

- Voltage to PWM Converter Module
- Supply Voltage: 7V to 12V
- Conversion Range: 0-5V/0-10V voltage conversion to 0%-100% PWM
- Accuracy: 1% to 3%.
- Output PWM Amplitude: 5V
- Output PWM Frequency: About 50kHz.



APPLICATIONS

- DC Motor Speed Control
- LED Brightness Control (PWM Dimming)
- Analog Signal to PWM Interface for Microcontrollers

ORDERING INFORMATION

Part Number	PWM555-01
Device	Voltage to PWM Converter Module
Package	Assembled Module (35mm X 35mm)

DESCRIPTION

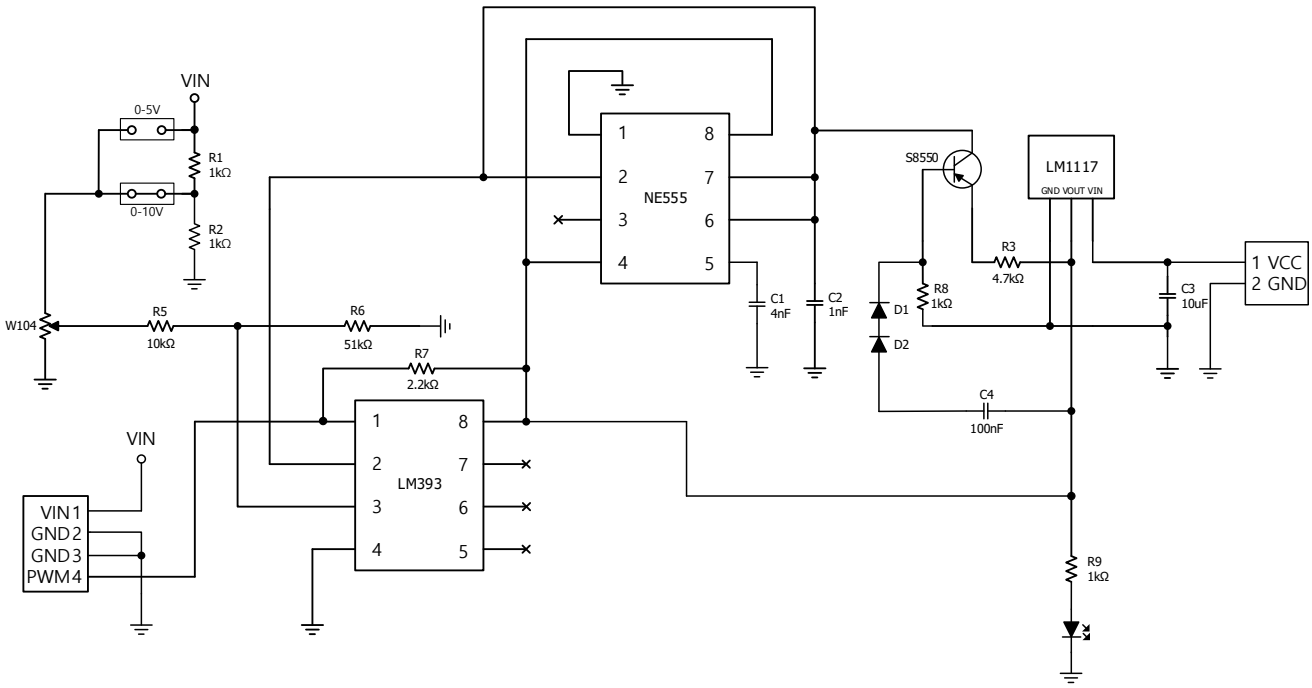
The Voltage to PWM Converter Module converts an analog voltage signal into a proportional PWM signal.

APPLICATION GUIDE

The Voltage to PWM Converter Module converts an analog voltage signal (0–5V or 0–10V) into a proportional PWM signal (0–100% duty cycle).
It uses an embedded microcontroller for accurate signal conversion and allows fine adjustment through an onboard potentiometer. The input voltage range can be selected via a jumper cap, making the module suitable for various analog control applications such as motor speed control, LED dimming, and signal interfacing.

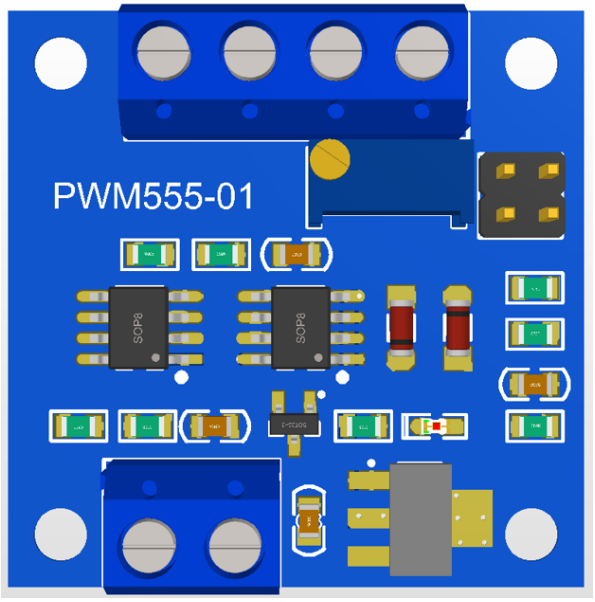
Voltage to PWM Converter Module

SCHEMATICS



LAYOUT

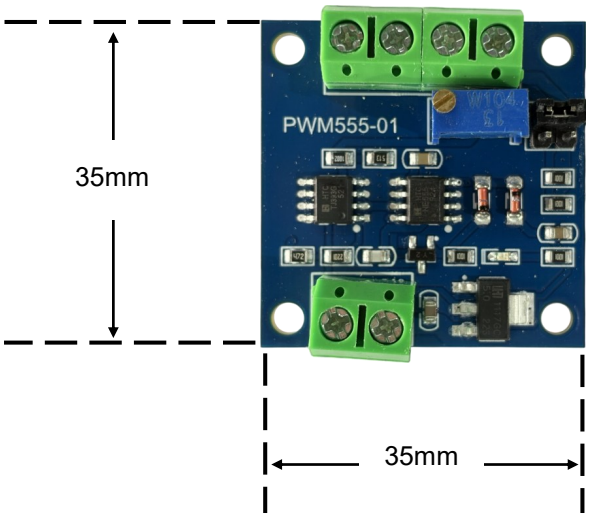
Top



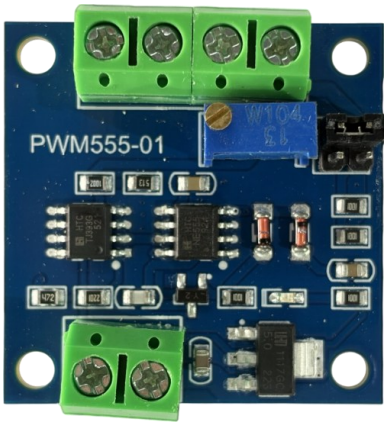
Bottom

Voltage to PWM Converter Module

SIZE INFORMATION

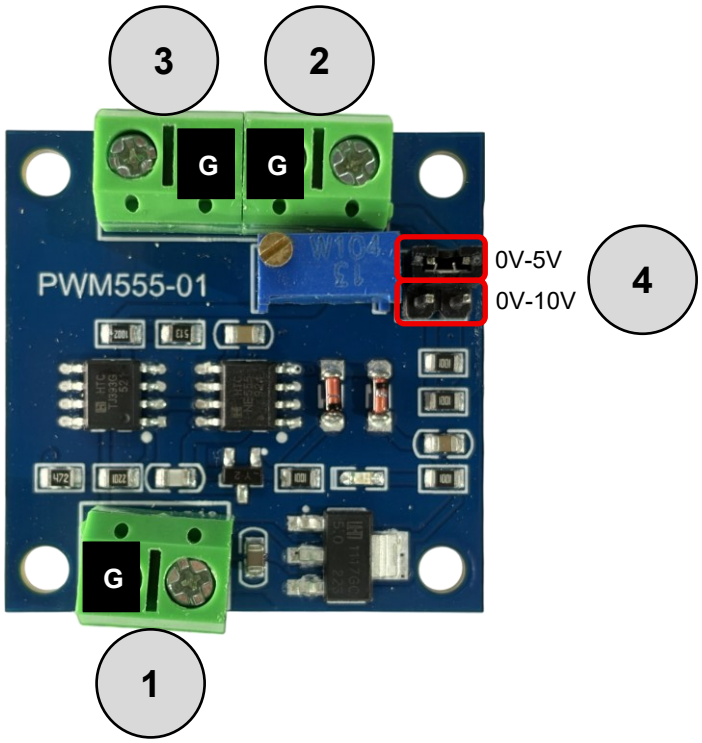


PRODUCT IMAGE



Voltage to PWM Converter Module

I/O PORT CONFIGURATION AND DESCRIPTION



Designator	Port Name	Port Description
1	VCC	Supply Voltage Range: 7V to 12V
2	Input Stage	Input Voltage Range: 0V-5V / 0V-10V
3	Output Stage	Output PWM Range: 0%-100%
4	Input Voltage Range Select	0V-5V or 0V-10V

REVISION NOTICE

The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.

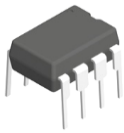
CMOS GENERAL PURPOSE TIMER NE555

FEATURES

- Exact equivalent in most cases for SE/NE555
- Low Supply Current
- High speed operation – 500KHz guaranteed
- Wide operation supply voltage range - 2V to 18V
- Timing from microseconds through hours
- Operates in both astable and monostable modes
- Adjustable duty cycle
- High output source/sink driver can drive TTL/CMOS

SOP-8

DIP-8



APPLICATION

- Precision timing
- Pulse generation
- Sequential timing
- Time delay generation
- Pulse width modulation
- Pulse position modulation
- Missing Pulse detector

ORDERING INFORMATION

Device	Package
NE555D	SOP-8
NE555N	DIP-8

DESCRIPTION

The NE555 is CMOS RC timers providing significantly improved performance over the standard SE/NE555 and 355 timers, while at the same time being direct replacements for those devices in most applications.
Improved parameters include low supply current, wide operating supply voltage range, low THRESHOLD, TRIGGER and RESET currents, no crowbarring of the supply current during output transitions, higher frequency performance and no requirement to decouple CONTROL VOLTAGE for stable operation.
Specifically, the NE555 is stable controller capable of producing accurate time delays of frequencies.

ABSOLUTE MAXIMUM RATINGS (Note 1)

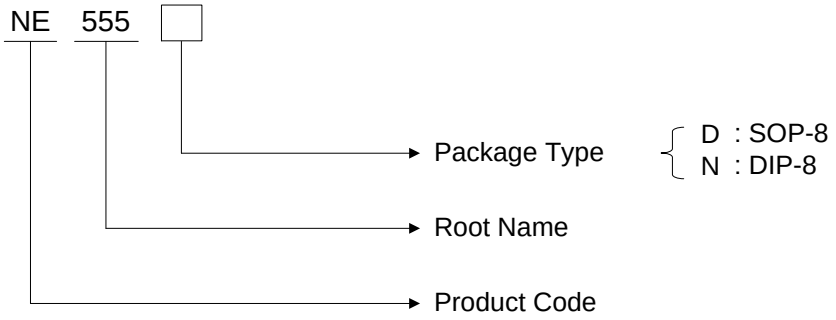
CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V_{CC}	0	18	V
Output Current	I_O	-	100	mA
Input Voltage	V_{TH}, V_{TRIG}, V_{RST}	-0.3	V_{CC}+0.3	V
Storage Temperature Range	T_{STG}	-65	150	°C
Junction Temperature Range	T_J	-20	85	°C

RECOMMENDED OPERATING RATINGS (Note 2)

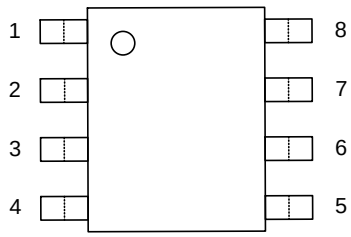
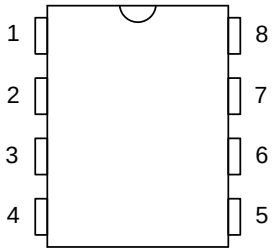
CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V_{CC}	2	18	V
Operating Junction Temperature Range	$T_{J\ OPR}$	-20	70	°C

ORDERING INFORMATION

Order No.	Package	Description	Supplied As	Status
NE555D	SOP-8	General Purpose Timer	Reel	Active
NE555N	DIP-8	General Purpose Timer	Tube	Active



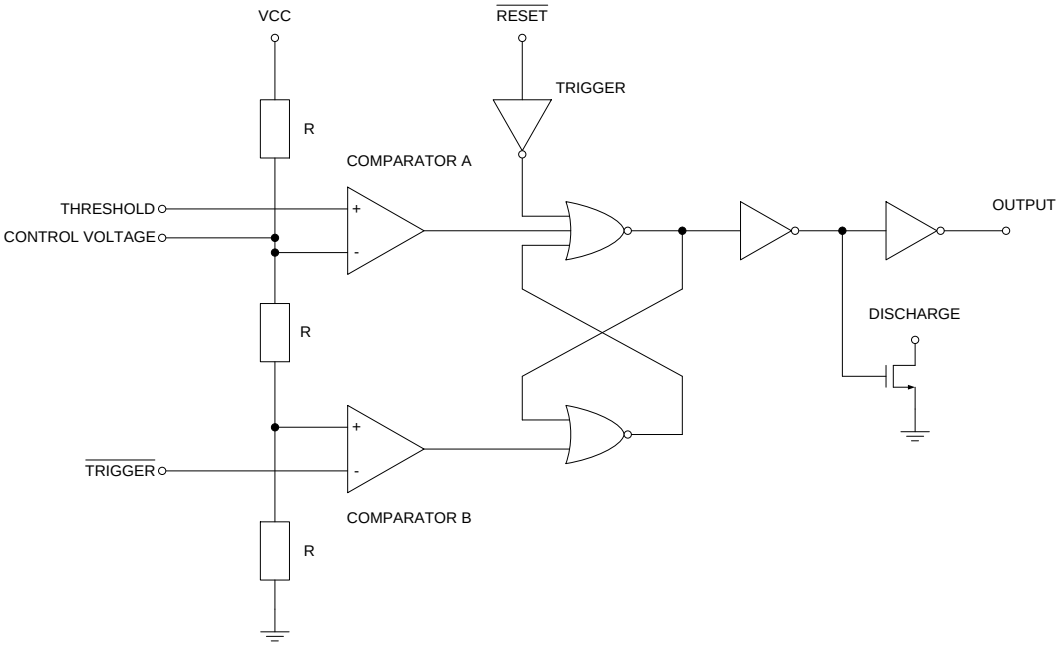
PIN CONFIGURATION

SOP-8	DIP-8
(Top View) 	(Top View) 

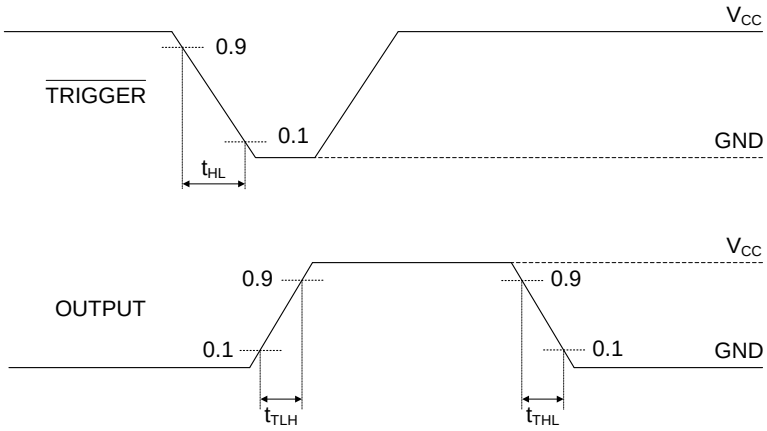
PIN DESCRIPTION

Pin No.	Name	Function
1	GND	Supply ground
2	$\overline{\text{TRIGGER}}$	Start timer input; (Active LOW)
3	OUTPUT	Timer logic level output
4	$\overline{\text{RESET}}$	Timer inhibit input; (Active LOW)
5	CONTROL VOLTAGE	Timing capacitor upper voltage sense input
6	THRESHOLD	Timing capacitor lower voltage sense input
7	DISCHARGE	Timing capacitor discharge output
8	VCC	Supply voltage

FUNCTIONAL DIAGRAM



SWITCHING WAVEFORMS



TRUTH TABLE

THRESHOLD	$\overline{\text{TRIGGER}}$	$\overline{\text{RESET}}$	OUTPUT	DISCHARGE
X	X	L	L	ON
> 2/3V_{CC}	> 1/3V_{CC}	H	L	ON
< 2/3V_{CC}	> 1/3V_{CC}	H	STABLE	STABLE
X	< 1/3V_{CC}	H	H	OFF

ELECTRICAL CHARACTERISTICS (Note 3)

Limits in standard typeface are for T_J = 25°C, and limits in **boldface type** apply over the **full operating temperature range.** V_{CC}=5V, unless otherwise specified.

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
DC ELECTRICAL CHARACTERISTICS						
Threshold Voltage	V_{TH}	V_{CC} = 5V	3.2		3.5	V
		V_{CC} = 15V	9.6		10.5	
Trigger Voltage	V_{TRIG}	V_{CC} = 5V	1.55		1.8	V
		V_{CC} = 15V	4.6		5.4	
Reset Voltage	V_{RST}	V_{CC} = 2V, 15V, 18V	0.4		1.0	V
Control Voltage	V_{CV}	V_{CC} = 5V	3.2		3.5	V
		V_{CC} = 15V	9.6		10.5	
Output Voltage (Low)	V_{OL}	V_{CC} = 5V, I_{OL} = 3.2mA			0.4	V
		V_{CC} = 15V, I_{OL} = 20mA			1.0	
		V_{CC} = 15V, I_{OL} = 50mA			2.0	
Output Voltage (High)	V_{OH}	V_{CC} = 5V, I_{OH} = −0.8mA	4.0			V
		V_{CC} = 15V, I_{OH} = −0.8mA	14.3			
		V_{CC} = 15V, I_{OH} = −10mA	12.5			
Supply Current	I_{CC}	V_{CC} = 2V			200	µA
		V_{CC} = 18V			300	
AC ELECTRICAL CHARACTERISTICS						
Rise/ Fall Time of Output	t_{THL}, t_{TLH}	V_{CC} = 5V, R_L = 10MΩ, C_L = 10pF		35		ns
					150	
Guaranteed Max Osc Freq.	f_{MAX}	V_{CC} = 5V, astable mode	500			kHz
Initial Accuracy		R_L = 1 to 100KΩ, C_L = 0.1µF	5			%
Drift with Temperature	αf	V_{CC} = 5V, R_L = 1 to 100KΩ, C_L = 0.1µF			**0.02**	%/°C
		V_{CC} = 10V, R_L = 1 to 100KΩ, C_L = 0.1µF			**0.03**	
		V_{CC} = 15V, R_L = 1 to 100KΩ, C_L = 0.1µF			**0.06**	
Drift with Supply Voltage	△f	V_{CC} = 5V, R_L = 1 to 100KΩ, C_L = 0.1µF			3	%/V
					6	

Note 1. Exceeding the absolute maximum ratings may damage the device.

Note 2. The device is not guaranteed to function outside its operating ratings.

Note 3. Stresses listed as the absolute maximum ratings may cause permanent damage to the device. These are for stress ratings. Functional operating of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibly to affect device reliability.

Note 4. Parameters are not 100% tested. Majority of all units meet this specification.

APPLICATION INFORMATION

T.B.D.

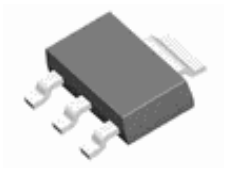
REVISION NOTICE

The description in this datasheet is subject to change without notice to describe its electrical characteristics properly.

1A L.D.O VOLTAGE REGULATOR LM1117GS

FEATURES

- Output Current up to 1A
- Dropout Voltage is 1.2V at Output current
- Three Terminal Adjustable(ADJ) or Fixed 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, and 5.0V
- Line Regulation typically at 0.1% typ.
- Load Regulation typically at 0.2% typ.
- Internal Current and Thermal Protection
- Surface Mount Package SOT-223-3L
- Moisture Sensitivity Level 3



SOT-223-3L

APPLICATIONS

- Active SCSI Terminators
- Portable/ Plan Top/ Notebook Computers
- High Efficiency Linear Regulators
- SMPS Post Regulators
- Mother B/D Clock Supplies
- Disk Drives
- Battery Chargers

ORDERING INFORMATION

Device	Package
LM1117GS-ADJ	SOT-223-3L
LM1117GS-x.x	

x.x: Output Voltage = 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, and 5.0V

DESCRIPTION

The LM1117GS is a low power positive-voltage regulator designed to meet 1A output current. This device is an excellent choice for use in battery-powered applications, as active terminators for the SCSI bus, and portable computers. The LM1117GS features very low quiescent current and very low dropout voltage of 1.2V at a full load and lower as output current decreases. LM1117GS is available as an adjustable or fixed 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, and 5.0V output voltages. The LM1117GS is offered in a 3-pin surface mount package SOT-223-3L. The output capacitor of 10μF or larger is needed for output stability of LM1117GS as required by most of the other regulator circuits.

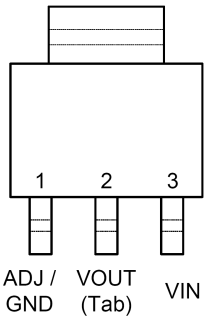
ABSOLUTE MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Input Supply Voltage	V_{IN}	-	20	V
Lead Temperature (Soldering, 10 seconds)	T_{SOL}	-	260	°C
Storage Temperature Range	T_{STG}	−65	150	°C
Operating Junction Temperature Range	T_{JOPR}	−40	125	°C

ORDERING INFORMATION

V_{OUT}	Package	Order No.	Supplied As	Status
ADJ	SOT-223-3L	LM1117GS-ADJ	Tape & Reel	Active
1.2V	SOT-223-3L	LM1117GS-1.2	Tape & Reel	Active
1.5V	SOT-223-3L	LM1117GS-1.5	Tape & Reel	Active
1.8V	SOT-223-3L	LM1117GS-1.8	Tape & Reel	Active
2.5V	SOT-223-3L	LM1117GS-2.5	Tape & Reel	Active
3.3V	SOT-223-3L	LM1117GS-3.3	Tape & Reel	Active
5.0V	SOT-223-3L	LM1117GS-5.0	Tape & Reel	Active

PIN CONFIGURATION



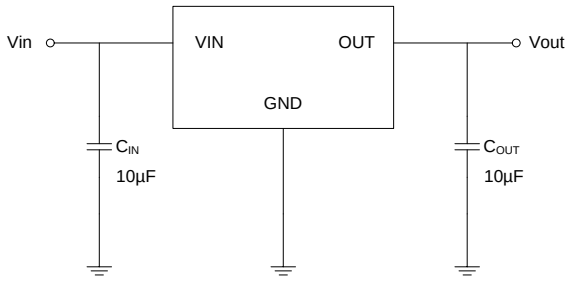
SOT-223-3L

PIN DESCRIPTION

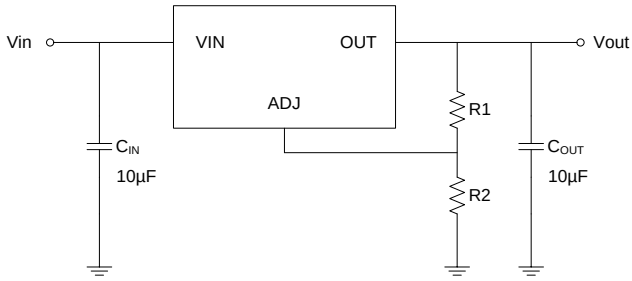
Pin No.	Pin Name	Pin Function
1	ADJ / GND	Adjustable or Ground (Fixed Version)
2	VOUT	Output Voltage
3	VIN	Input Voltage

TYPICAL APPLICATION CIRCUITS

< Fixed Version>



<Adjustable Version>



ELECTRICAL CHARACTERISTICS

For ADJ Output Voltage (T_J=25°C, C_{OUT} = 10µF unless otherwise specified)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{REF}	Reference Voltage	V_{IN} = 5V, I_O = 10mA	1.238	1.250	1.262	V
V_{REF}	Reference Voltage	I_O = 10mA to 1A, V_{IN} - V_{REF} = 1.5V to 13.75V (T_J = -40°C ~ 125°C)	1.219		1.281	V
ΔV_{LINE}	Line Regulation	I_O = 10mA , V_{IN} - V_{REF} = 1.5V to 12V		0.1	0.2	%
ΔV_{LOAD}	Load Regulation	I_O = 10mA to 1A, V_{IN} - V_{REF} = 2V		0.2	0.4	%
V_{IN}	Operating Input Voltage				12	V
I_{ADJ}	Adjustment pin Current	V_{IN} - V_{REF} = 1.5V to 12V, I_O = 100mA		50	120	µA
ΔI_{ADJ}	Adjustment Pin Current Change	V_{IN} - V_{REF} = 1.5V to 12V, I_O = 100mA to 1A		0.5	5	µA
$I_{O(MIN)}$	Minimum Load Current	V_{IN} = 5V, V_{REF} = 0V		5	10	mA
I_O	Current Limit	V_{IN} - V_{REF} = 5V	1000			mA
eN	Output Noise (%V_O)	B = 10Hz to 10kHz, T_J = 25°C		0.003		%
SVR	Supply Voltage Rejection	I_O = 1A, f = 120Hz, V_{IN} - V_{REF} = 3V, V_{RIPPLE} = 1V_{PP}	60	75		dB

For 1.2V Output Voltage (T_J=25°C, C_{OUT} = 10µF unless otherwise specified)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_O	Output Voltage	V_{IN} = 2.7V, I_O = 10mA	1.176	1.200	1.224	V
V_O	Output Voltage	V_{IN} = 2.7V to 12V, I_O = 0mA to 1A (T_J = -40°C ~ 125°C)	1.152		1.248	V
ΔV_{LINE}	Line Regulation	I_O = 10mA , V_{IN} = 2.7V to 12V		0.1	0.2	%
ΔV_{LOAD}	Load Regulation	I_O = 10mA to 1A, V_{IN} = 3.2V		0.2	0.4	%
V_{IN}	Operating Input Voltage				12	V
I_D	Quiescent Current	V_{IN} - V_O = 5V		5	10	mA
I_O	Current Limit	V_{IN} - V_O = 5V	1000			mA
eN	Output Noise (%V_O)	B = 10Hz to 10kHz, T_J = 25°C		0.003		%
SVR	Supply Voltage Rejection	I_O = 1A, f = 120Hz, V_{IN} - V_O = 1.5V, V_{RIPPLE} = 1V_{PP}	60	75		dB

For 1.5V Output Voltage (T_J=25°C, C_{OUT} = 10µF unless otherwise specified)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_O	Output Voltage	V_{IN} = 3.0V, I_O = 10mA	1.485	1.5	1.515	V
V_O	Output Voltage	V_{IN} = 3.0V to 12V, I_O = 0mA to 1A (T_J = -40°C ~ 125°C)	1.470		1.530	V
ΔV_{LINE}	Line Regulation	I_O = 10mA , V_{IN} = 3.0V to 12V		0.1	0.2	%
ΔV_{LOAD}	Load Regulation	I_O = 10mA to 1A, V_{IN} = 3.5V		0.2	0.4	%
V_{IN}	Operating Input Voltage				12	V
I_D	Quiescent Current	V_{IN} - V_O = 5V		5	10	mA
I_O	Current Limit	V_{IN} - V_O = 5V	1000			mA
eN	Output Noise(%V_O)	B = 10Hz to 10kHz, T_J = 25°C		100		µV
SVR	Supply Voltage Rejection	I_O = 1A, f = 120Hz, V_{IN} - V_O = 3V, V_{RIPPLE} = 1V_{PP}	60	75		dB

For 1.8V Output Voltage (T_J=25°C, C_{OUT} = 10µF unless otherwise specified)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_O	Output Voltage	V_{IN} = 3.3V, I_O = 10mA	1.782	1.8	1.818	V
V_O	Output Voltage	V_{IN} = 3.3V to 12V, I_O = 0mA to 1A (T_J = -40°C ~ 125°C)	1.764		1.836	V
ΔV_{LINE}	Line Regulation	I_O = 10mA , V_{IN} = 3.3V to 12V		0.1	0.2	%
ΔV_{LOAD}	Load Regulation	I_O = 10mA to 1A, V_{IN} = 3.8V		0.2	0.4	%
V_{IN}	Operating Input Voltage				12	V
I_D	Quiescent Current	V_{IN} - V_O = 5V		5	10	mA
I_O	Current Limit	V_{IN} - V_O = 5V	1000			mA
eN	Output Noise(%V_O)	B = 10Hz to 10kHz, T_J = 25°C		100		µV
SVR	Supply Voltage Rejection	I_O = 1A, f = 120Hz, V_{IN} - V_O = 3V, V_{RIPPLE} = 1V_{PP}	60	75		dB

For 2.5V Output Voltage (T_J=25°C, C_{OUT} = 10µF unless otherwise specified)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_O	Output Voltage	V_{IN} = 4.0V, I_O = 10mA	2.475	2.5	2.525	V
V_O	Output Voltage	V_{IN} = 4.0V to 12V, I_O = 0mA to 1A (T_J = -40°C ~ 125°C)	2.450		2.550	V
ΔV_{LINE}	Line Regulation	I_O = 10mA , V_{IN} = 4.0V to 12V		0.1	0.2	%
ΔV_{LOAD}	Load Regulation	I_O = 10mA to 1A, V_{IN} = 4.5V		0.2	0.4	%
V_{IN}	Operating Input Voltage				12	V
I_D	Quiescent Current	V_{IN} - V_O = 5V		5	10	mA
I_O	Current Limit	V_{IN} - V_O = 5V	1000			mA
eN	Output Noise(%V_O)	B = 10Hz to 10kHz, T_J = 25°C		100		µV
SVR	Supply Voltage Rejection	I_O = 1A, f = 120Hz, V_{IN} - V_O = 3V, V_{RIPPLE} = $1V_{PP}$	60	75		dB

For 3.3V Output Voltage (T_J=25°C, C_{OUT} = 10µF unless otherwise specified)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_O	Output Voltage	V_{IN} = 4.8V, I_O = 10mA	3.267	3.3	3.333	V
V_O	Output Voltage	V_{IN} = 4.8V to 12V, I_O = 0mA to 1A (T_J = -40°C ~ 125°C)	3.234		3.366	V
ΔV_{LINE}	Line Regulation	I_O = 10mA , V_{IN} = 4.8V to 12V		0.1	0.2	%
ΔV_{LOAD}	Load Regulation	I_O = 10mA to 1A, V_{IN} = 5.3V		0.2	0.4	%
V_{IN}	Operating Input Voltage				12	V
I_D	Quiescent Current	V_{IN} - V_O = 5V		5	10	mA
I_O	Current Limit	V_{IN} - V_O = 5V	1000			mA
eN	Output Noise(%V_O)	B = 10Hz to 10kHz, T_J = 25°C		100		µV
SVR	Supply Voltage Rejection	I_O = 1A, f = 120Hz, V_{IN} - V_O = 3V, V_{RIPPLE} = $1V_{PP}$	60	75		dB

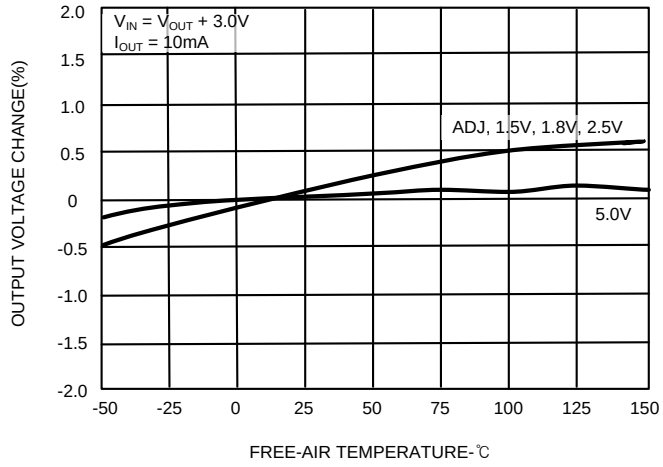
For 5.0V Output Voltage (T_J=25°C, C_{OUT} = 10µF unless otherwise specified)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_O	Output Voltage	V_{IN} = 6.5V, I_O = 10mA	4.950	5.0	5.050	V
V_O	Output Voltage	V_{IN} = 6.5V to 15V, I_O = 0mA to 1A (T_J = -40°C ~ 125°C)	4.900		5.100	V
ΔV_{LINE}	Line Regulation	I_O = 10mA , V_{IN} = 6.5V to 15V		0.1	0.2	%
ΔV_{LOAD}	Load Regulation	I_O = 10mA to 1A, V_{IN} = 7.0V		0.2	0.4	%
V_{IN}	Operating Input Voltage				15	V
I_D	Quiescent Current	V_{IN} - V_O = 5V		5	10	mA
I_O	Current Limit	V_{IN} - V_O = 5V	1000			mA
eN	Output Noise(%V_O)	B = 10Hz to 10kHz, T_J = 25°C		100		µV
SVR	Supply Voltage Rejection	I_O = 1A, f = 120Hz, V_{IN} - V_O = 3V, V_{RIPPLE} = 1V_{PP}	60	75		dB

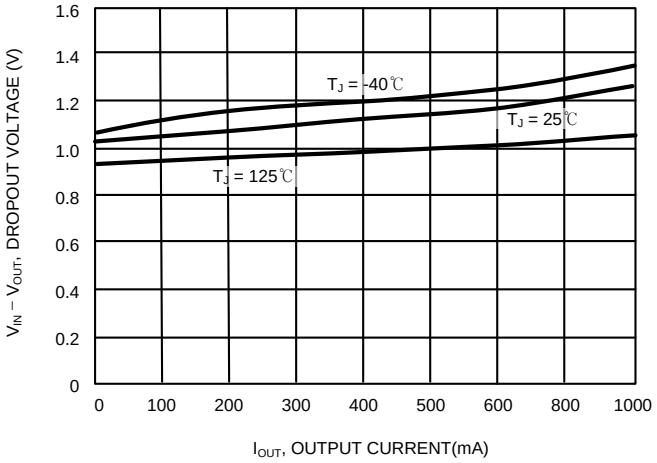
For All Output Voltage (T_J=25°C, C_{OUT} = 10µF unless otherwise specified)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_D	Dropout Voltage	I_O = 100mA		1.0	1.1	V
		I_O = 500mA		1.1	1.2	V
		I_O = 1A		1.2	1.3	V
	Temperature Stability			0.5		%
	Long Term Stability	1000 hrs, T_J = 125°C		0.3		%
	Thermal Regulation	T_A = 25°C 30ms Pulse		0.003		%/W

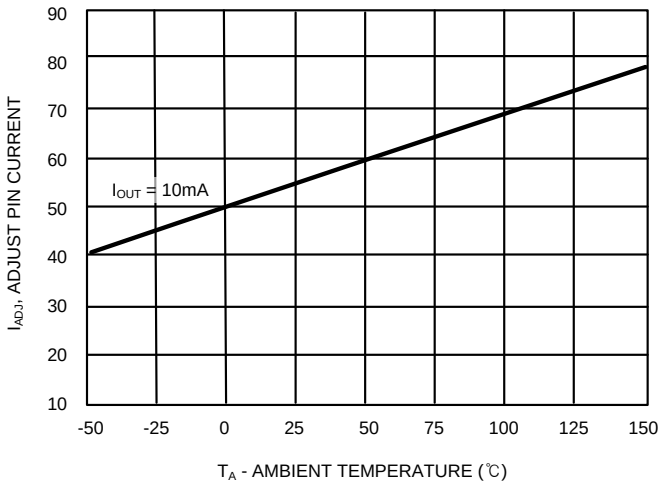
TYPICAL OPERATING CHARACTERISTICS



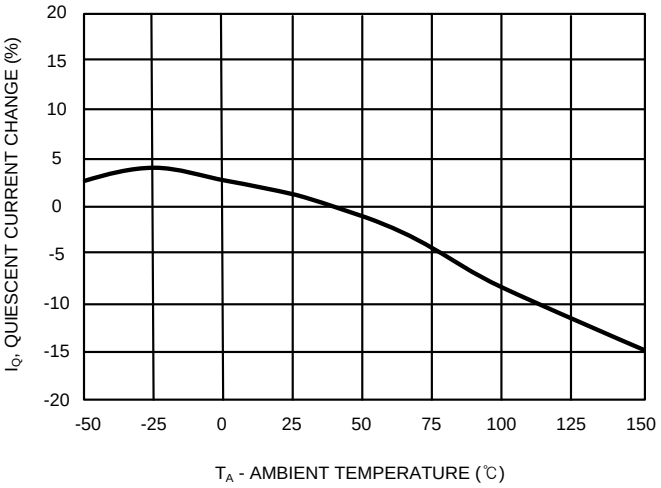
OUTPUT VOLTAGE CHANGE VS TEMPERATURE



DROPOUT VOLTAGE VS OUTPUT CURRENT



ADJ PIN CURRENT VS TEMPERATURE



QUIESCENT CURRENT CHANGE VS TEMPERATURE

APPLICATION CIRCUITS

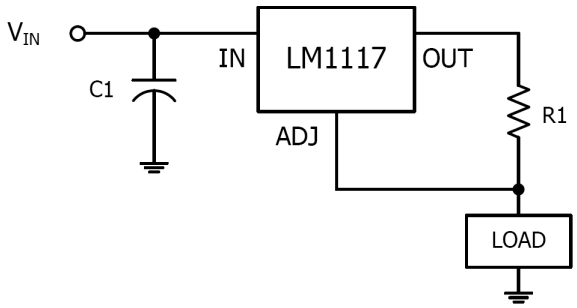


Fig.1 300mA Current Output

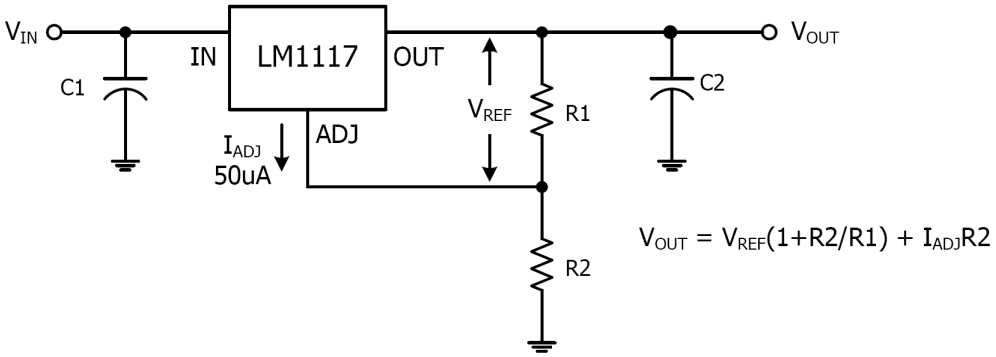


Fig.2 Typical Adjustable Regulator

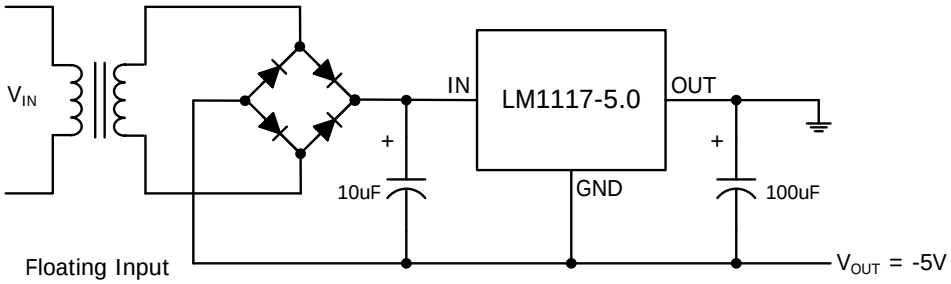


Fig.3 Negative Supply

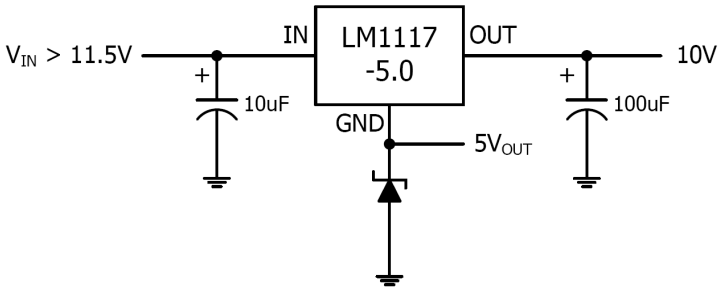


Fig.4 Voltage Regulator with Reference

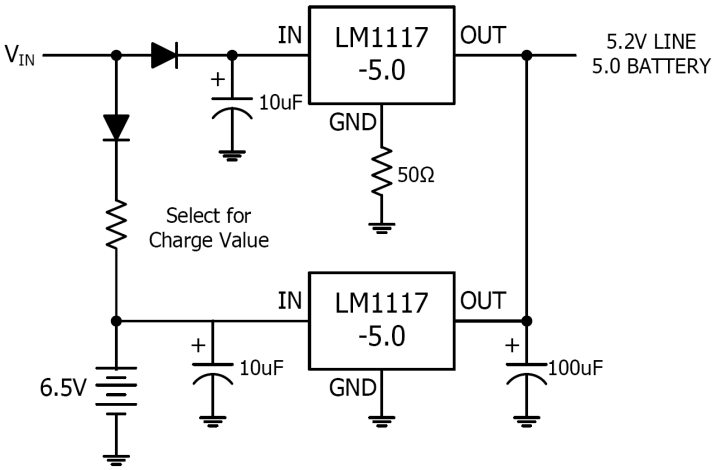


Fig.5 Battery Backed-up Regulated Supply

APPLICATION INFORMATION

The LM1117GS can deliver a continuous current of 1A over the full operating junction temperature range. However, the output current is limited by the restriction of power dissipation which differs from packages. A heat sink may be required depending on the maximum power dissipation and maximum ambient temperature of application. With respect to the applied package, the maximum output current of 1A may be still undeliverable due to the restriction of the power dissipation of LM1117GS. Under all possible conditions, the junction temperature must be within the range specified under operating conditions. The temperatures over the device are given by:

$$T_C = T_A + P_D \times \theta_{CA} \quad / \quad T_J = T_C + P_D \times \theta_{JC} \quad / \quad T_J = T_A + P_D \times \theta_{JA}$$

where T_J is the junction temperature, T_C is the case temperature, T_A is the ambient temperature, P_D is the total power dissipation of the device, θ_{CA} is the thermal resistance of case-to-ambient, θ_{JC} is the thermal resistance of junction-to-case, and θ_{JA} is the thermal resistance of junction to ambient. The total power dissipation of the device is given by:

$$P_D = P_{IN} - P_{OUT} = (V_{IN} \times I_{IN}) - (V_{OUT} \times I_{OUT})$$
$$= (V_{IN} \times (I_{OUT} + I_{GND})) - (V_{OUT} \times I_{OUT}) = (V_{IN} - V_{OUT}) \times I_{OUT} + (V_{IN} \times I_{GND})$$

where I_{GND} is the operating ground current of the device which is specified at the Electrical Characteristics. The maximum allowable temperature rise (T_{Rmax}) depends on the maximum ambient temperature (T_{Amax}) of the application, and the maximum allowable junction temperature (T_{Jmax}):

$$T_{Rmax} = T_{Jmax} - T_{Amax}$$

The maximum allowable value for junction-to-ambient thermal resistance, θ_{JA}, can be calculated using the formula:

$$\theta_{JA} = T_{Rmax} / P_D = (T_{Jmax} - T_{Amax}) / P_D$$

LM1117GS is available in SOT-223-3L packages. The thermal resistance depends on amount of copper area or heat sink, and on air flow. If the maximum allowable value of θ_{JA} calculated above is over 140°C/W for SOT-223-3L package, no heat sink is needed since the package can dissipate enough heat to satisfy these requirements. If the value for allowable θ_{JA} falls near or below these limits, a heat sink or proper area of copper plane is required. In summary, the absolute maximum ratings of thermal resistances are as follow:

Characteristic	Symbol	Rating	Unit
Thermal Resistance Junction-To-Ambient / SOT-223-3L	θ_{JA}-SOT-223	140	°C/W
Thermal Resistance Junction-To-Case / SOT-223-3L	θ_{JC}-SOT-223	18	°C/W

No heat sink / No air flow / No adjacent heat source / T_A=25°C

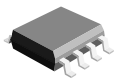
REVISION NOTICE

The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.

Dual Differential Comparators TJ393

FEATURES

- Wide range of supply voltages
- Low supply current drain independent of supply voltage
- Low input biasing current
- Low input offset current
- Low input offset voltage
- Input common-mode voltage range includes GND
- Differential input voltage range equal to the power supply voltage
- Low output saturation voltage
- Output voltage compatible with TTL, MOS and CMOS logic



SOP-8

ORDERING INFORMATION

Device	Package
TJ393GD	SOP-8

DESCRIPTION

The TJ393 consists of two independent voltage comparators. These 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 drain is independent of the magnitude of the power supply voltage. The outputs can be connected to other open-collector outputs to achieve wired-AND relationships.

ABSOLUTE MAXIMUM RATINGS (Note 1)

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V_{CC}	-	36 or ±18	V
Differential Input Voltage	V_{ID}	-	36	V
Input Voltage Range (either input)	V_{IC}	−0.3	36	V
Output Voltage	V_O	-	36	V
Junction Temperature Range	T_J	−40	125	°C
Storage Temperature Range	T_{STG}	−65	150	°C

Note 1. Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS (Note 2)

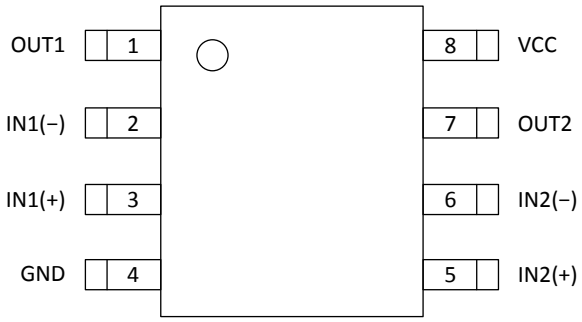
CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V_{CC}	2.0	30	V
Operating Ambient Temperature Range	T_{OPR}	−40	125	°C

Note 2. The device is not guaranteed to function outside its operating ratings.

ORDERING INFORMATION

Package	Order No.	Description	Supplied As	Status
SOP-8	TJ393GD	Dual Differential Comparators	Tape & Reel	Active

PIN CONFIGURATION



SOP-8

PIN DESCRIPTION

Pin No.	Pin Name	Pin Function
1	OUT1	Output of the Comparator 1
2	IN1(−)	Negative Input of the Comparator 1
3	IN1(+)	Positive Input of the Comparator 1
4	GND	Ground
5	IN2(+)	Positive Input of the Comparator 2
6	IN2(−)	Negative Input of the Comparator 2
7	OUT2	Output of the Comparator 2
8	VCC	Power Supply

ELECTRICAL CHARACTERISTICS

At specified free-air temperature and V_{CC} = 5V unless otherwise specified

SYMBOL	PARAMETER	TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
V_{IO}	Input Offset Voltage	V_{CC} = 5V to 30V, $V_{IC} = V_{ICR}$ min, V_O = 1.4V	25°C	-	2	5	mV
			Full range	-	-	9	
I_{IO}	Input Offset Current	V_O = 1.4V	25°C	-	5	50	nA
			Full range	-	-	150	
I_{IB}	Input Bias Current	V_O = 1.4V	25°C	-	−25	−250	nA
			Full range	-	-	−400	
V_{ICR}	Common-mode Input Voltage Range (Note 5)		25°C	0	-	V_{CC} – 1.5	V
			Full range	0	-	V_{CC} – 2.0	
V_{OL}	Low-Level Output Voltage	I_{OL} = 4mA, V_{ID} = −1V	25°C	-	150	400	mV
			Full range	-	-	700	
A_{VD}	Large-Signal Differential Voltage Amplification	V_{CC} = 15V, V_O = 1.4V to 11.4V, R_L ≥ 15kΩ to V_{CC}	25°C	50	200	-	V/mV
I_{OH}	High-Level Output Current	V_{OH} = 5V, V_{ID} = 1V	25°C	-	0.1	50	nA
		V_{OH} = 30V, V_{ID} = 1V	Full range	-	-	1	μA
I_{OL}	Low-Level Output Current	V_{OL} = 1.5V, V_{ID} = −1V	25°C	6	-	-	mA
I_{CC}	Supply Current	R_L = ∞, V_{CC} = 5V	25°C	-	0.8	1	mA
		R_L = ∞, V_{CC} = 30V	Full range	-	-	2.5	

Note 3. All characteristics are measured with zero common-mode input voltage, unless otherwise specified.
Note 4. Temperature full range is −40°C to 125°C.
Note 5. The Voltage at either input or common-mode should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V_{CC} − 1.5V.

SWITCHING CHARACTERISTICS

V_{CC} = 5V, T_A = 25°C

PARAMETER	TEST CONDITIONS		TYP	UNIT
Response Time	R_L connected to 5V through 5.1kΩ, C_L = 15pF (Note 6, 7)	100mV input step with 5mV overdrive	1.3	μs
		TTL-Level Input Step	0.3	

Note 6. C_L includes probe and jig capacitance.
Note 7. The response time specified is the interval between the input step function and the instant when the output crosses 1.4V.

TYPICAL OPERATING CHARACTERISTICS

T.B.D.

REVISION NOTICE

The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.