

RS-485 IO Expansion Arduino Shield Module

FEATURES

- RS-485 IO Expansion Arduino Shield Module
- Support Seperate Servo Power Supply
- Support RS485
- Support Xbee (Xbee pro)
- Support Bluetooth
- Support APC220
- Support SD card read/write
- Compatible with Arduino Uno, Duemilanove, Mega

APPLICATIONS

- Arduino Board

DESCRIPTION

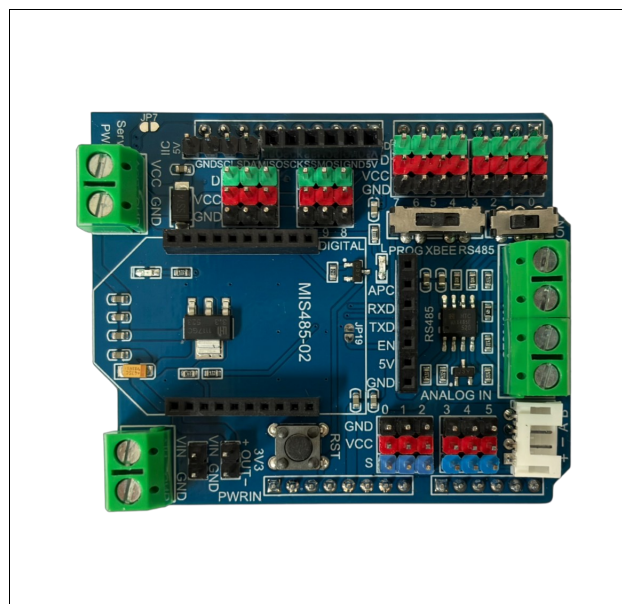
The RS-485 IO Expansion Arduino Shield Module supports Xbee, Bluetooth, RS485, APC220, and SD card functionalities, enhancing Arduino's connectivity and control capabilities.

APPLICATION GUIDE

The RS-485 IO Expansion Arduino Shield Module enhances Arduino's connectivity by supporting multiple communication interfaces, including XBee, Bluetooth, RS485, APC220, and SD card modules.

It enables flexible wireless and wired communication options for data transmission and I/O expansion.

This shield is well suited for industrial control, remote monitoring, and IoT prototyping applications.

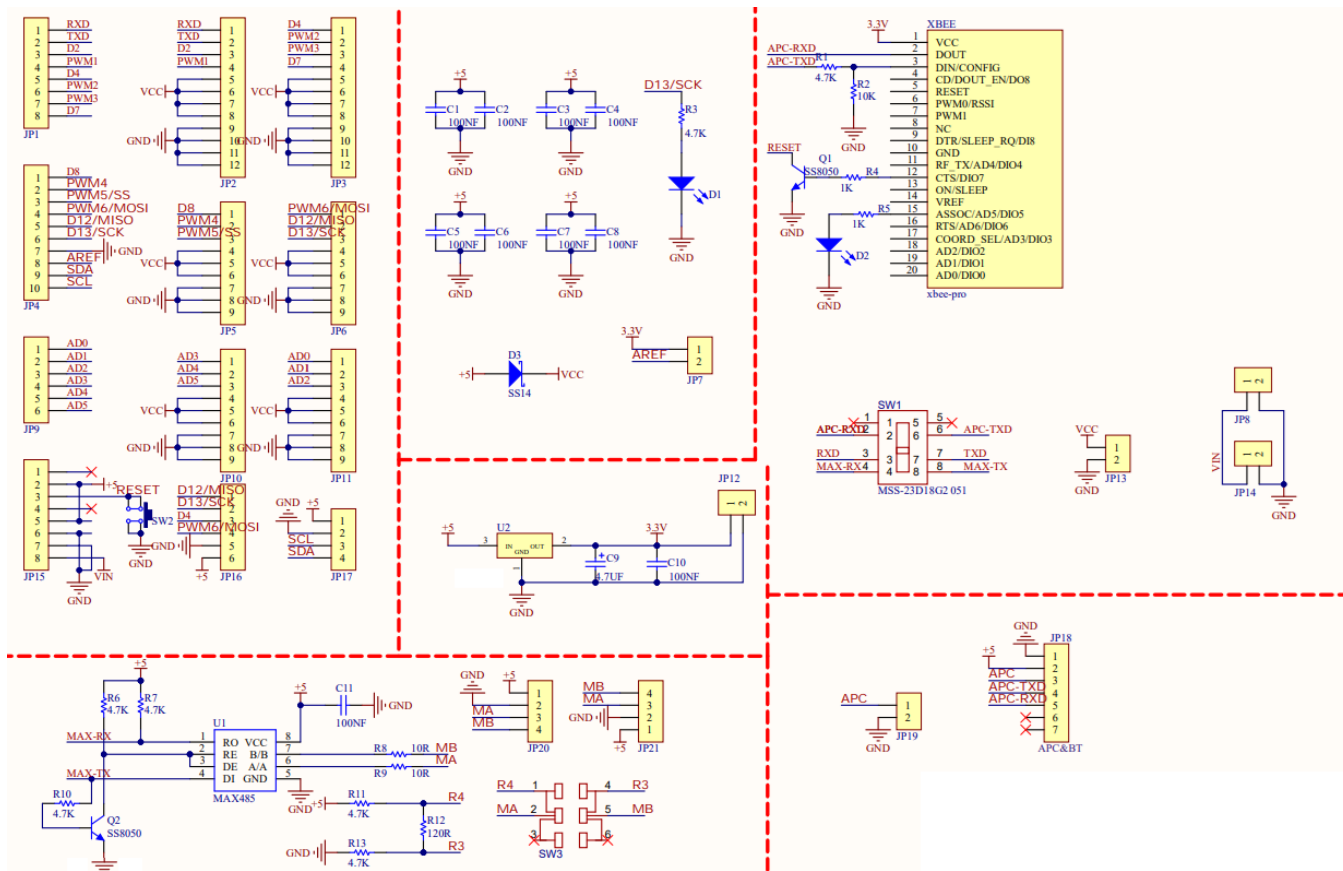


ORDERING INFORMATION

Part Number	MIS0485-02
Device	RS-485 IO Expansion Arduino Shield Module
Package	Assembled Module (65mm X 53mm)

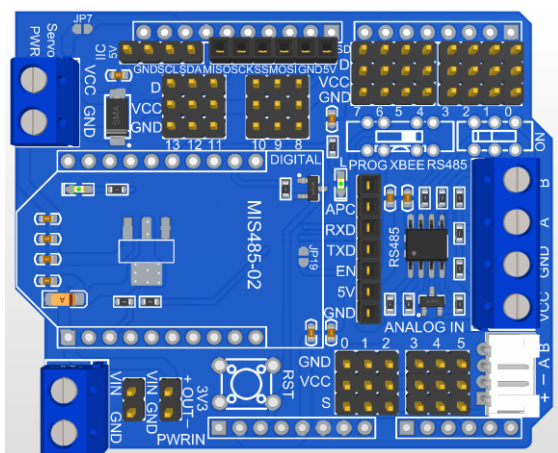
RS-485 IO Expansion Arduino Shield Module

SCHEMATICS

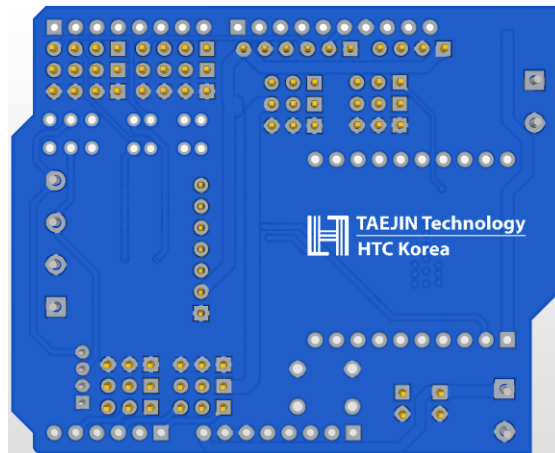


LAYOUT

Top

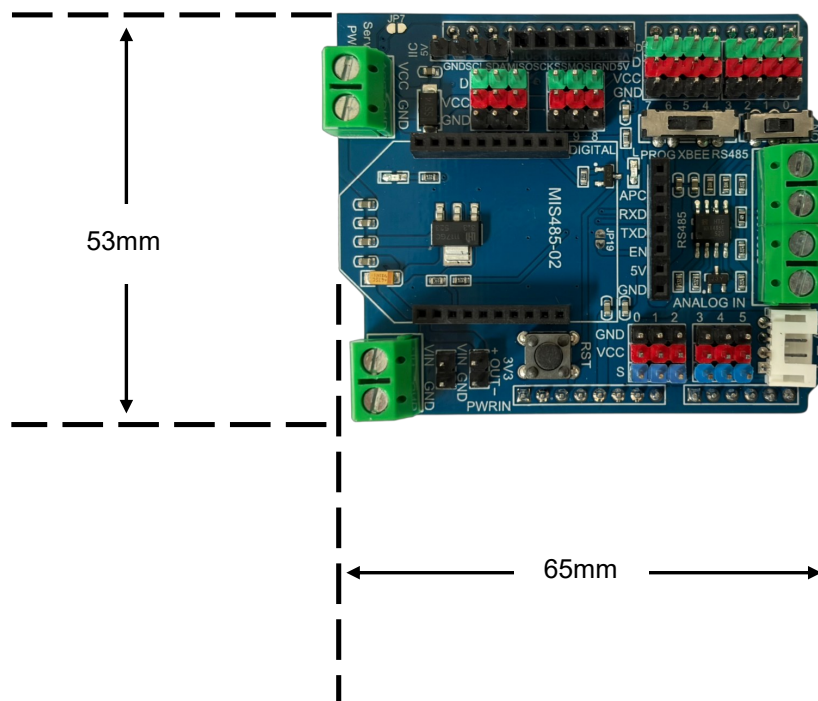


Bottom

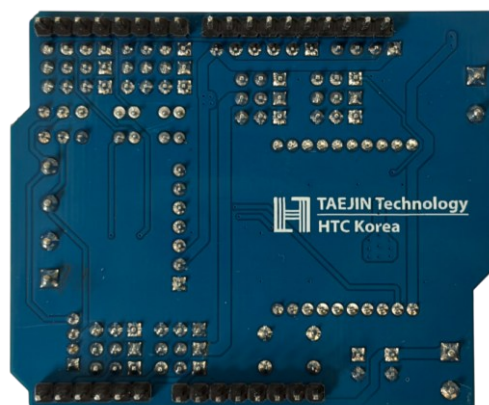
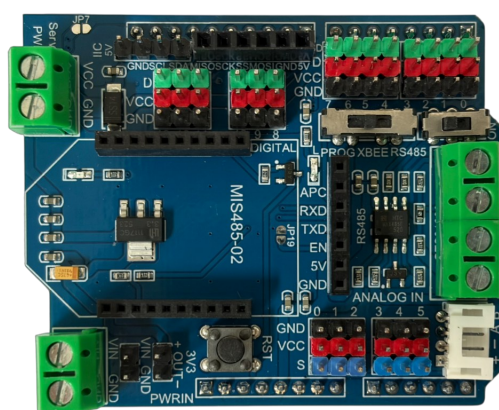


RS-485 IO Expansion Arduino Shield Module

SIZE INFORMATION

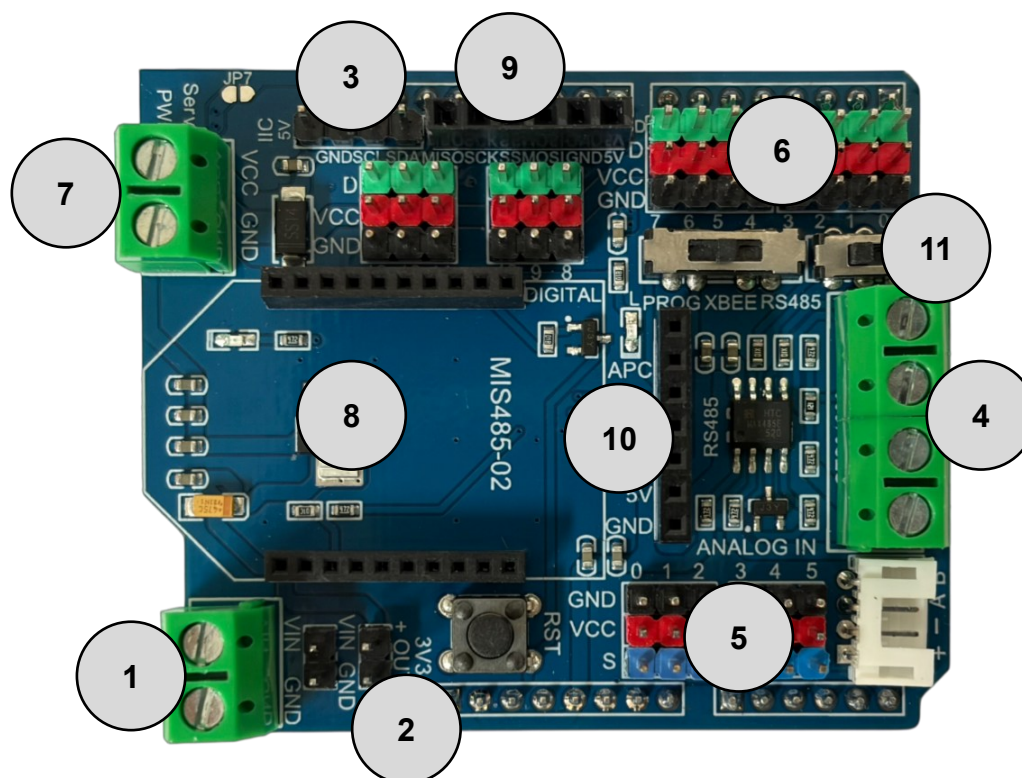


PRODUCT IMAGE



RS-485 IO Expansion Arduino Shield Module

I/O PORT CONFIGURATION AND DESCRIPTION



Designator	Port Name & Port Description
1	Power In Connector
2	3.3V Output Pin
3	I2C Pin
4	RS485 Connector
5	Analog Pins
6	Digital Pins
7	Servo Power Connector
8	Xbee Bluetooth Bee Socket
9	SD Module Socket
10	APC220/ Bluetooth Socket
11	RS485/TTL Selection Pin

RS-485 IO Expansion Arduino Shield Module

REVISION NOTICE

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

Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers MAX485

DESCRIPTION

The MAX485 is a half-duplex transceiver that meets the specifications of RS-485 and RS-422. Its BiCMOS design allows low power operation without sacrificing performance. The MAX485 meets the requirements of the RS-485 and RS-422 protocols up to 5Mbps underload. The ESD tolerance is more than $\pm 8\text{kV}$ for both Human Body Model and $\pm 15\text{kV}$ for IEC61000-4-2 Air Discharge Method on this device.

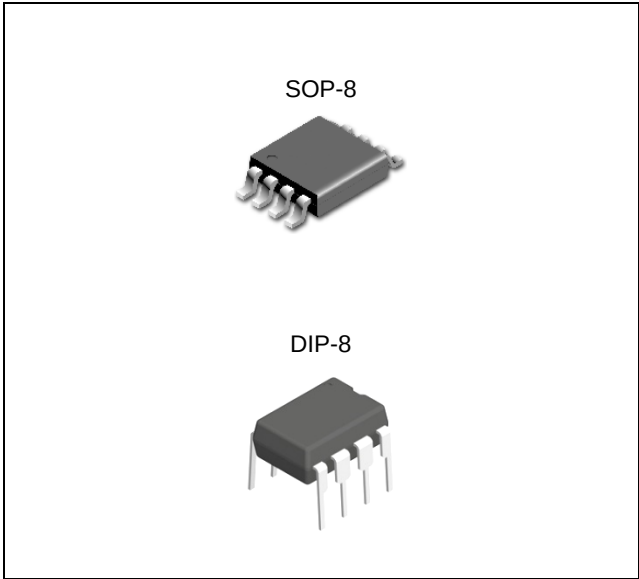
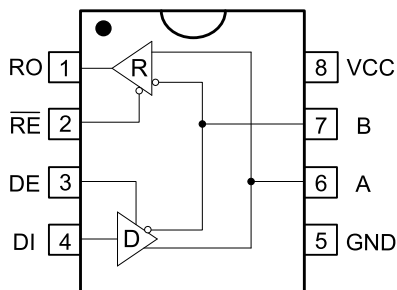
FEATURES

- Single +5V Supply
- Low Power BiCMOS
- Driver/Receiver Enable for Multi-Drop Configurations
- Half-Duplex Versions Available
- Data rate: 5 Mbps
- ESD Specifications
 - $\pm 15\text{kV}$ IEC61000-4-2 Air Discharge
 - $\pm 8\text{kV}$ Human Body Model

APPLICATIONS

- Low Power RS-485 Systems
- DTE-DCE Interface
- Packet Switching
- Local Area Networks
- Data Concentration
- Data Multiplexers
- Integrated Services Digital Network (ISDN)

PIN CONFIGURATION AND LOGIC DIAGRAM



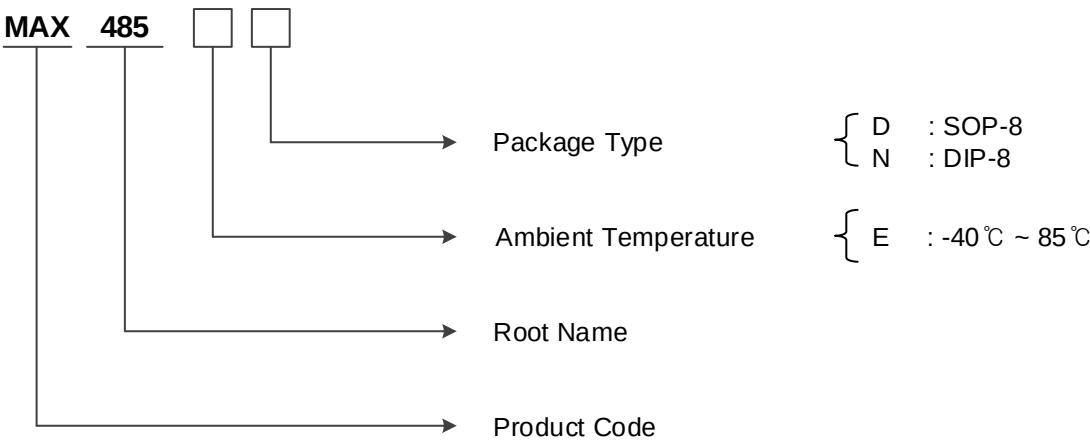
TRUTH TABLE

Transmission				
Inputs			Outputs	
$\overline{\text{RE}}$	DE	DI	A	B
X	1	1	1	0
X	1	0	0	1
0	0	X	Z	Z
1	0	X	Z	Z
Receiver				
Inputs			Outputs	
$\overline{\text{RE}}$	DE	A-B	RO	
0	0	$\geq +0.2\text{V}$	1	
0	0	$\leq -0.2\text{V}$	0	
0	0	Open	1	
1	0	X	Z	

Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers **MAX485**

ORDERING INFORMATION

Package	Oder No.	Description	Marking	Compliance	Status
SOP-8	MAX485ED	RS-485/RS-422 Transceivers	MAX485E	RoHS, Green	Active
DIP-8	MAX485EN	RS-485/RS-422 Transceivers	MAX485E	RoHS, Green	Active



Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers MAX485

ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}		7	V
Control Input Voltage	V_{DE}, V_{RE}	-0.3	$V_{CC} + 0.5$	V
Driver Input Voltage	V_{DI}	-0.3	$V_{CC} + 0.5$	V
Driver Output Voltage	A, B	-15	15	V
Receiver Input Voltage	A, B	-15	15	V
Receiver Output Voltage	V_{RO}	-0.3	$V_{CC} + 0.5$	V
Junction Temperature	T_J	-40	125	°C
Storage Temperature Range	T_{STG}	-65	150	°C

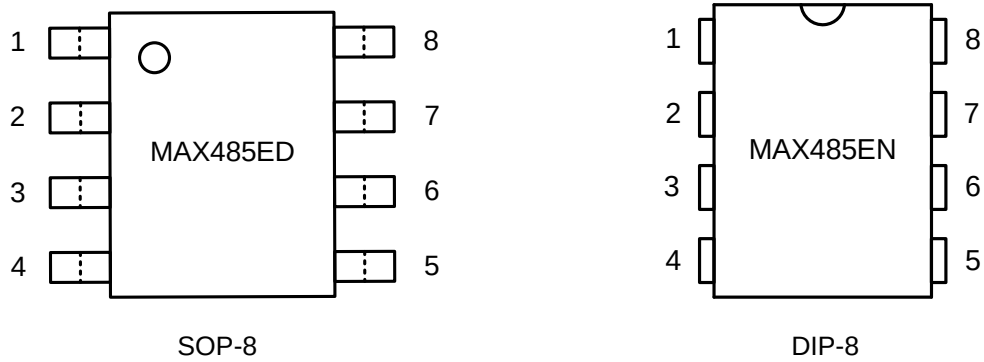
RECOMMENDED OPERATING CONDITIONS

Characteristic	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}	4.75	5.25	V
Operating Ambient Temperature Ranges	T_A	-40	85	°C

Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers

MAX485

PIN CONFIGURATION



PIN DESCRIPTION

Pin No.	SOP-8 / DIP-8 PKG	
	Name	Function
1	RO	Receiver Output
2	$\overline{\text{RE}}$	Receiver Output Enable Active Low
3	DE	Driver Output Enable Active High
4	DI	Driver Input
5	GND	Ground
6	A	Non-inverting Driver Output and Receiver Input
7	B	Inverting Driver Output and Receiver Input
8	V _{CC}	Power Supply: 4.75V to 5.25V

Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers MAX485

ELECTRICAL CHARACTERISTICS

Unless otherwise specified: $V_{CC} = 5V \pm 5\%$, $T_A = T_{MIN}$ to T_{MAX}

PARAMETER	Symbol	CONDITIONS		MIN	TYP	MAX	UNITS
DRIVER DC Characteristics							
Differential Driver Output (no load)	V _{OD1}	R _L = ∞, Figure 1		GND		V _{CC}	V
Differential Driver Output (with load)	V _{OD2}	R _L = 50Ω (RS-422), Figure 1		2		V _{CC}	V
		R _L = 27Ω (RS-485), Figure 1		1.5		V _{CC}	
Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	ΔV _{OD}	R _L = 27Ω or 50Ω, Figure 1				0.2	V
Driver Common-Mode Output Voltage	V _{OC}	R _L = 27Ω or 50Ω, Figure 1				3	V
Change in Magnitude of Driver Common-Mode Output Voltage for Complementary Output States	ΔV _{OC}	R = 27Ω or 50Ω, Figure 1				0.2	V
Input High Voltage	V _{IH}	DE, DI, RE*		2.0			V
Input Low Voltage	V _{IL}	DE, DI, RE*				0.8	V
Input Current	I _{IN1}	DE, DI, RE*				±10	uA
Driver Short Circuit Current							
Driver Short-Circuit Current, V _O = High	I _{OSD1}	-7V ≤ V _O ≤ 12V				±250	mA
Driver Short-Circuit Current, V _O = Low	I _{OSD2}	-7V ≤ V _O ≤ 12V				±250	mA
DRIVER AC Characteristics							
Max. Transmission Rate	f _{MAX}			5			Mbps
Driver Input to Output	t _{DPLH}	Figure 3 & 5 R _L = 54Ω, C _{L1} = C _{L2} = 100pF			30	60	ns
	t _{DPHL}				30	60	ns
Driver Output Skew to Output	t _{SKEW}				5	10	ns
Driver Rise or Fall Time	t _r , t _f				15	40	ns
Driver Enable to Output High	t _{ZH}	Figure 4 & 6 C _L =100pF	S ₂ closed		40	70	ns
Driver Enable to Output Low	t _{ZL}		S ₁ closed		40	70	ns
Driver Disable Time from Low	t _{HZ}		S ₂ closed		40	70	ns
Driver Disable Time from High	t _{LZ}		S ₁ closed		40	70	ns
RECEIVER DC Characteristics							
Receiver Differential Threshold Voltage	V _{TH}	-7V ≤ V _{CM} ≤ 12V		-0.2		0.2	V
Receiver Input Hysteresis	ΔV _{TH}	V _{CM} = 0V			20		mV
Receiver Output High Voltage	V _{OH}	I _O = -4mA, V _{ID} = +200mV		3.5			V
Receiver Output Low Voltage	V _{OL}	I _O = +4mA, V _{ID} = -200mV				0.4	V
Three-State (High Impedance) Output Current at Receiver	I _{OZR}	0.4V ≤ V _O ≤ 2.4V, RE* = 5V				±1	uA
Receiver Input Resistance	R _{IN}	-7V ≤ V _{CM} ≤ 12V		12	15		kΩ
Input Current (A, B)	I _{IN2}	DE = 0V	V _{IN} = 12V			1.0	mA
		V _{CC} = 0V or 5.25V	V _{IN} = -7V			-0.8	
Receiver Short-Circuit Current	I _{OSR}	0V ≤ V _O ≤ V _{CC}		7		95	mA

Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers MAX485

RECEIVER AC Characteristics							
Receiver Input to Output	t _{PLH}	Figure 2 & 7 S ₁ , S ₂ open C _L = 15pF		20	45	100	ns
	t _{PHL}			20	45	100	ns
t _{PLH} - t _{PHL} Differential Receiver Skew	t _{SKD}				13		ns
Receiver Enable to Output Low	t _{zL}	Figure 2 & 8 C _L = 15pF	S ₁ closed		45	70	ns
Receiver Enable to Output High	t _{zH}		S ₂ closed		45	70	ns
Receiver Disable Time from Low	t _{LZ}		S ₁ closed		45	70	ns
Receiver Disable Time from High	t _{hZ}		S ₂ closed		45	70	Ns
Supply Current							
No-Load Supply Current	I _{CC}	RE = 0V or V _{CC}	DE=V _{CC}		900		uA
			DE=0V		600		

TEST CIRCUITS

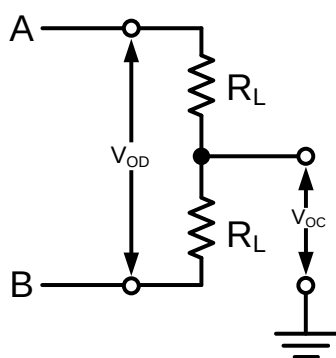


Figure1.

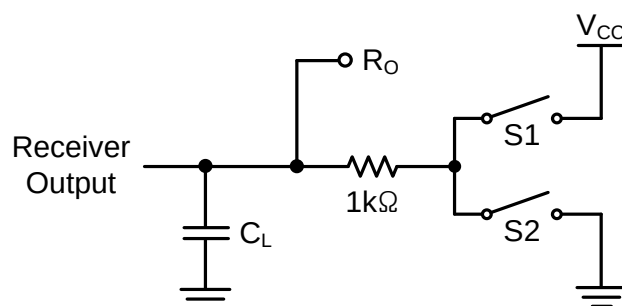


Figure 2.

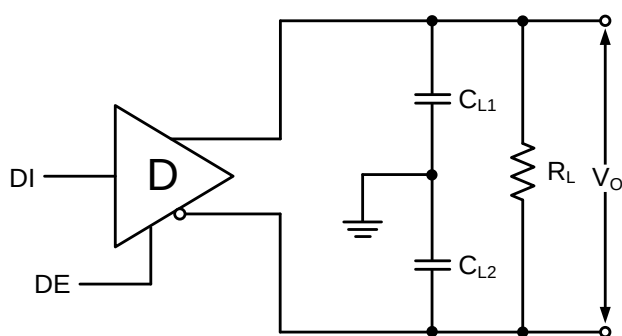


Figure 3.

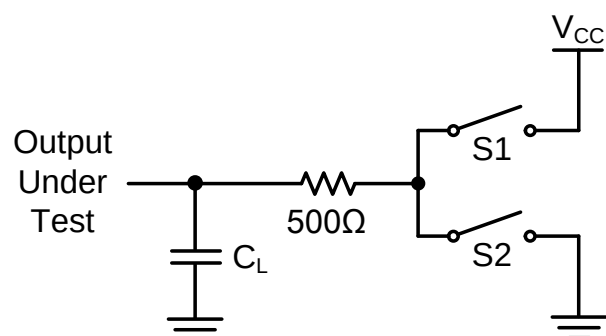


Figure 4.

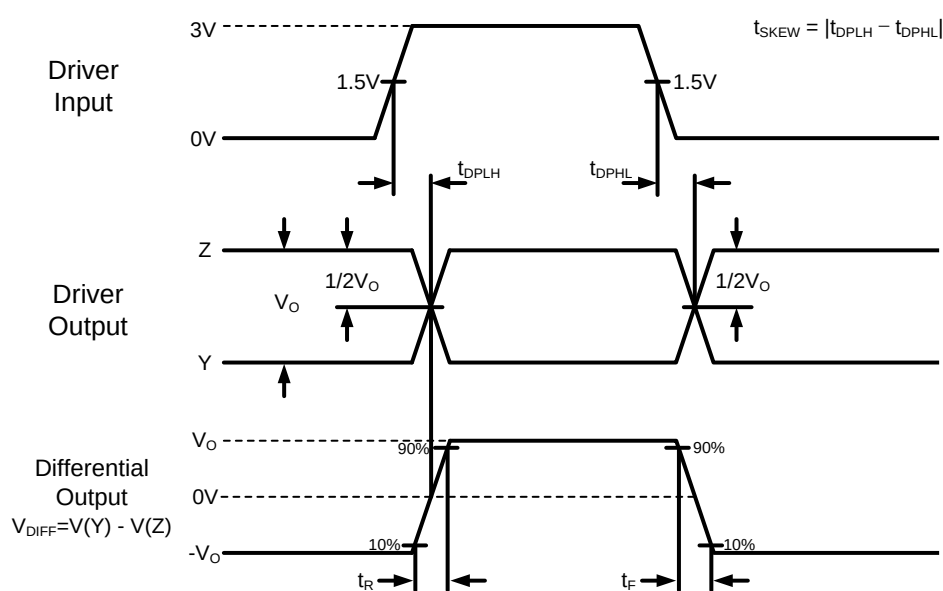


Figure 5.

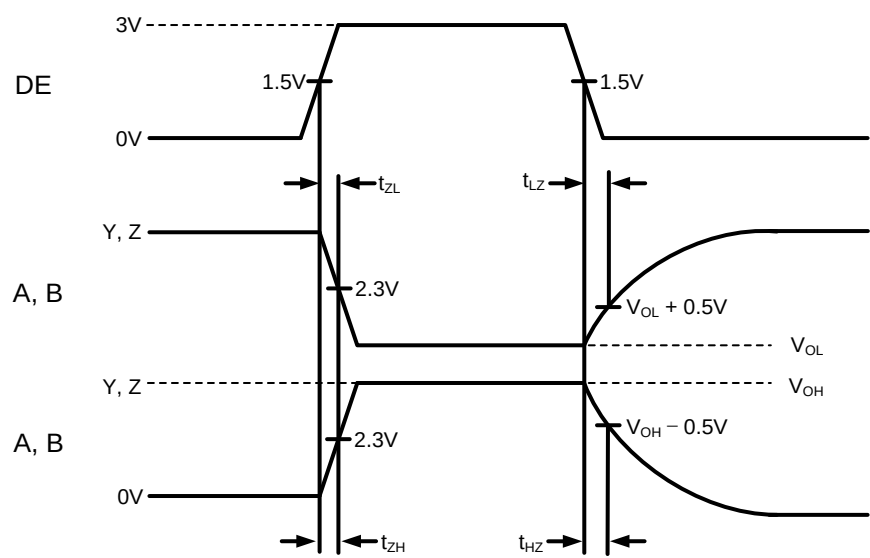


Figure 6.

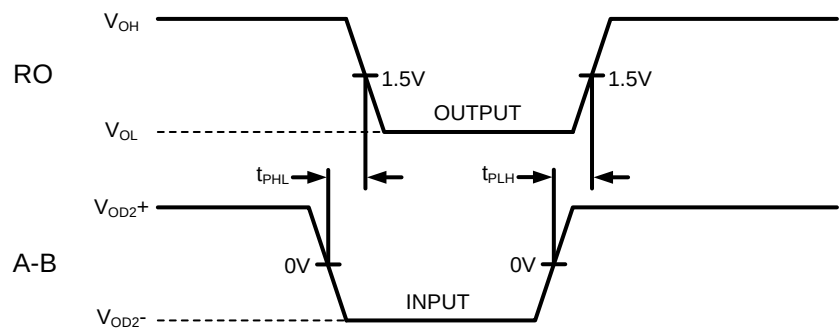


Figure 7.

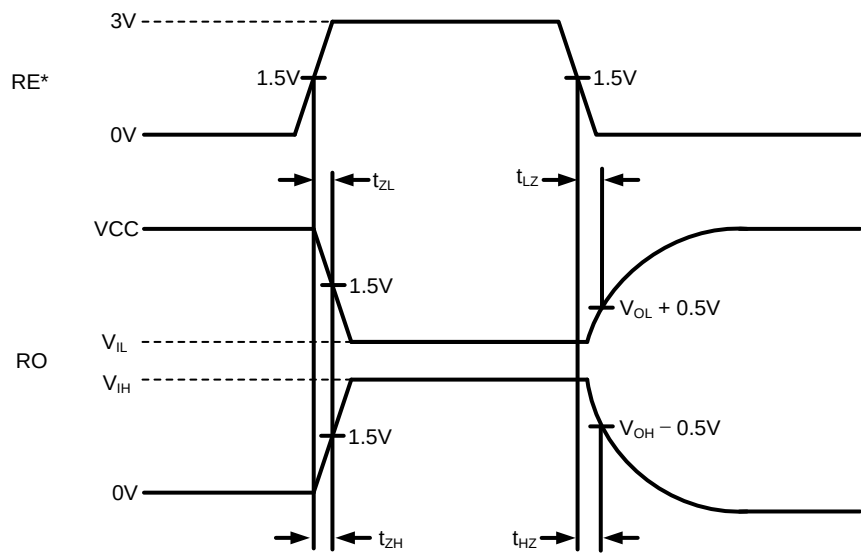


Figure 8.

APPLICATION INFORMATION

FUNCTIONAL DESCRIPTION

The MAX485 is half-duplex differential transceiver that meets the requirements of RS-485 and RS-422. The RS-485 standard is ideal for multi-drop applications and for long-distance interfaces. RS-485 allows up to 32 drivers and 32 receivers to be connected to a data bus, making it an ideal choice for multi-drop applications. Since the cabling can be as long as 4,000 feet, RS-485 transceivers are equipped with a wide (-7V to +12V) common mode range to accommodate ground potential differences. Because RS-485 is a differential interface, data is virtually immune to noise in the transmission line.

DRIVERS

The driver outputs of the MAX485 are differential outputs meeting the RS-485 and RS-422 standards. The typical voltage output swing with no load will be 0 Volts to +5 Volts. With worst case loading of 54 Ω across the differential outputs, the drivers can maintain greater than 1.5V voltage levels. The drivers of the MAX485 have an enable control line which is active HIGH. A logic HIGH on DE (pin 3) will enable the differential driver outputs. A logic LOW on the DE(pin 3) will tri-state the driver output. The transmitters of the MAX485 will operate up to at least 5Mbps.

RECEIVERS

The MAX485 receiver has differential inputs with an input sensitivity as low as $\pm 200\text{mV}$. Input impedance of the receivers is typically 15k Ω (12k Ω minimum). A wide common mode range of -7V to +12V allows for large ground potential differences between systems. The receivers of the MAX485 have a tri-state enable control pin. A logic LOW on RE* (pin 2) will enable the receiver, a logic HIGH on RE*(pin 2) will disable the receiver. The receiver for the MAX485 will operate up to at least 5Mbps. The receiver is equipped with the fail-safe feature. Fail-safe guarantees that the receiver output will be in a HIGH state when the input is left unconnected.

Low-Power, Slew-Rate-Limited RS-485/RS-422 Transceivers MAX485

REVISION NOTICE

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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

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 10 μ F or larger is needed for output stability of LM1117GS as required by most of the other regulator circuits.

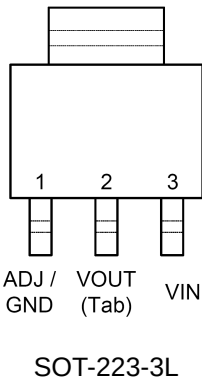
ABSOLUTE MAXIMUM RATINGS

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

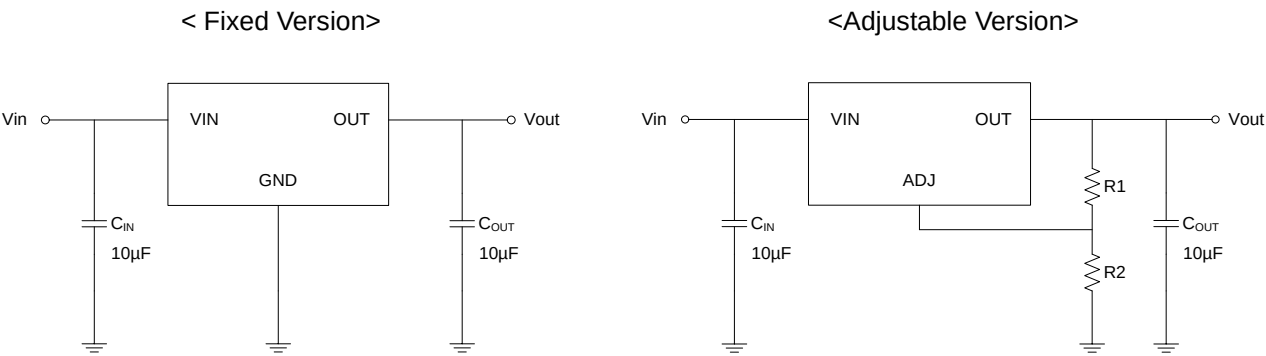
PIN CONFIGURATION



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



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

1A L.D.O VOLTAGE REGULATOR

LM1117GS

For 1.5V Output Voltage

($T_J=25^{\circ}\text{C}$, $C_{OUT} = 10\mu\text{F}$ unless otherwise specified)

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

For 1.8V Output Voltage

($T_J=25^{\circ}\text{C}$, $C_{OUT} = 10\mu\text{F}$ unless otherwise specified)

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

1A L.D.O VOLTAGE REGULATOR

LM1117GS

For 2.5V Output Voltage

($T_J=25^{\circ}\text{C}$, $C_{OUT} = 10\mu\text{F}$ unless otherwise specified)

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

For 3.3V Output Voltage

($T_J=25^{\circ}\text{C}$, $C_{OUT} = 10\mu\text{F}$ unless otherwise specified)

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

For 5.0V Output Voltage

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

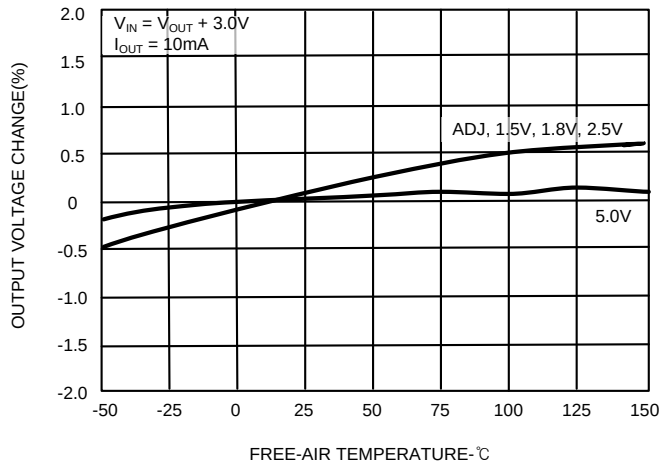
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V _O	Output Voltage	V _{IN} = 6.5V, I _O = 10mA	4.950	5.0	5.050	V
V _O	Output Voltage	V _{IN} = 6.5V to 15V, I _O = 0mA to 1A (T _J = -40°C ~ 125°C)	4.900		5.100	V
ΔV _{LINE}	Line Regulation	I _O = 10mA, V _{IN} = 6.5V to 15V		0.1	0.2	%
ΔV _{LOAD}	Load 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

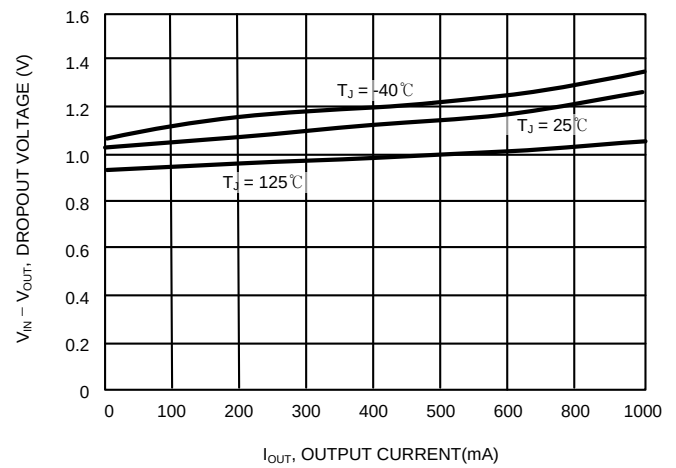
(T_J=25°C, C_{OUT} = 10μF unless otherwise specified)

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

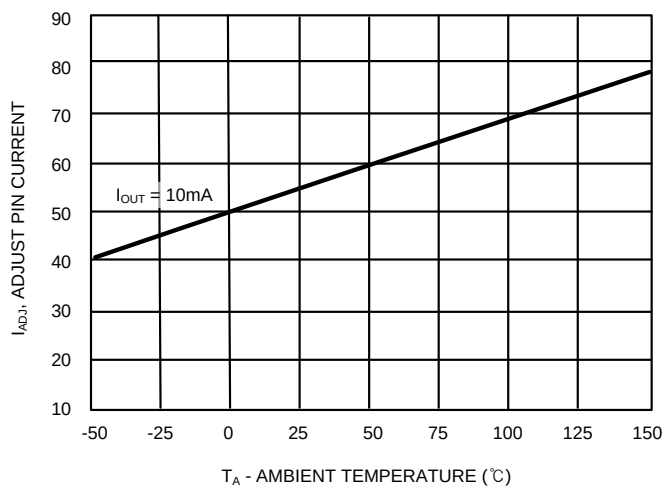
TYPICAL OPERATING CHARACTERISTICS



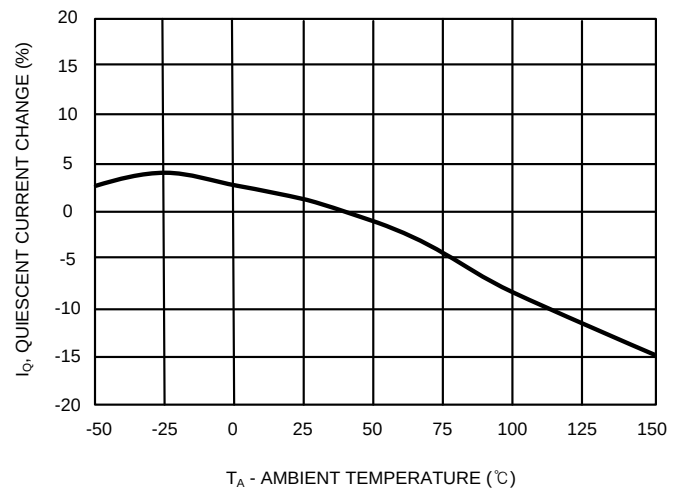
OUTPUT VOLTAGE CHANGE VS TEMPERATURE



DROPOUT VOLTAGE VS OUTPUT CURRENT



ADJ PIN CURRENT VS TEMPERATURE



QUIESCENT CURRENT CHANGE VS TEMPERATURE

APPLICATION CIRCUITS

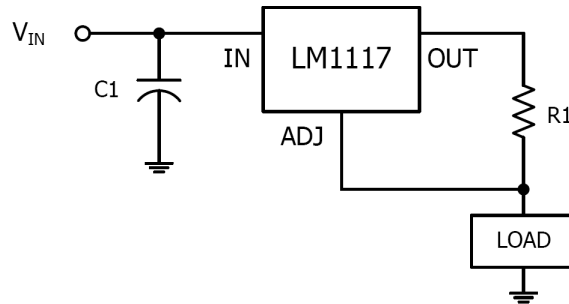


Fig.1 300mA Current Output

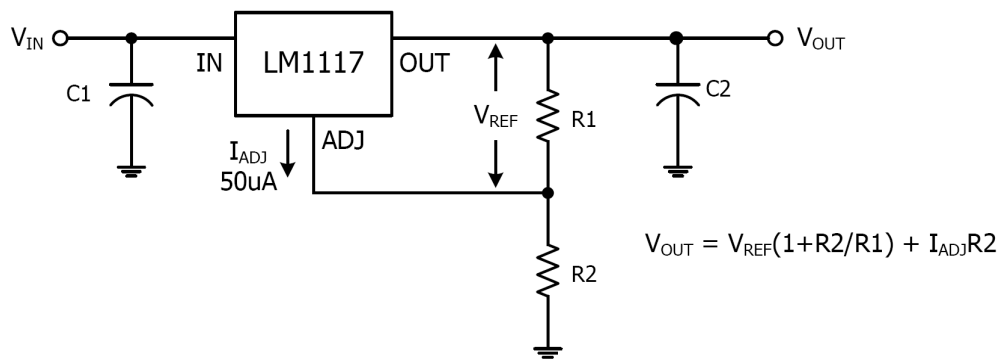


Fig.2 Typical Adjustable Regulator

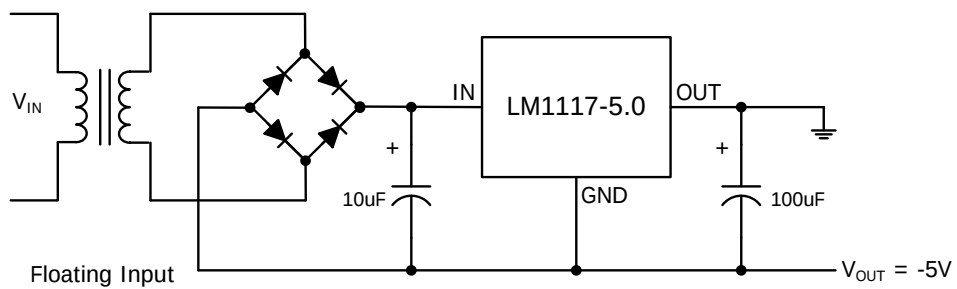


Fig.3 Negative Supply

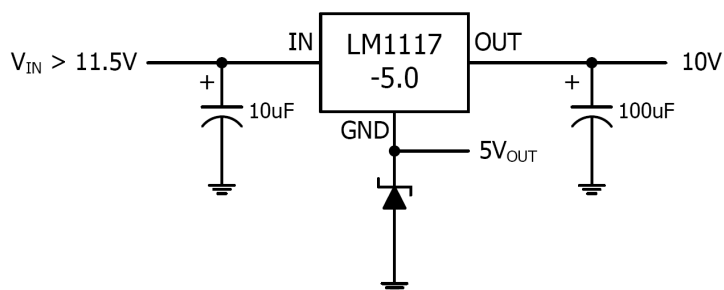


Fig.4 Voltage Regulator with Reference

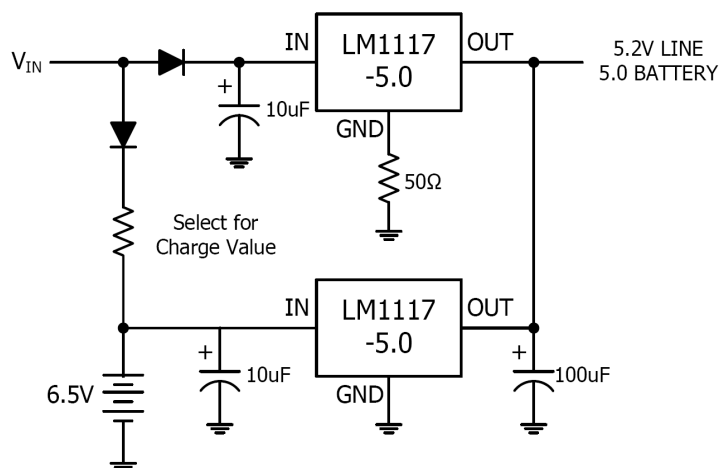


Fig.5 Battery Backed-up Regulated Supply

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:

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

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	$\theta_{JA-SOT-223}$	140	°C/W
Thermal Resistance Junction-To-Case / SOT-223-3L	$\theta_{JC-SOT-223}$	18	°C/W

No heat sink / No air flow / No adjacent heat source / $T_A=25^\circ\text{C}$

REVISION NOTICE

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