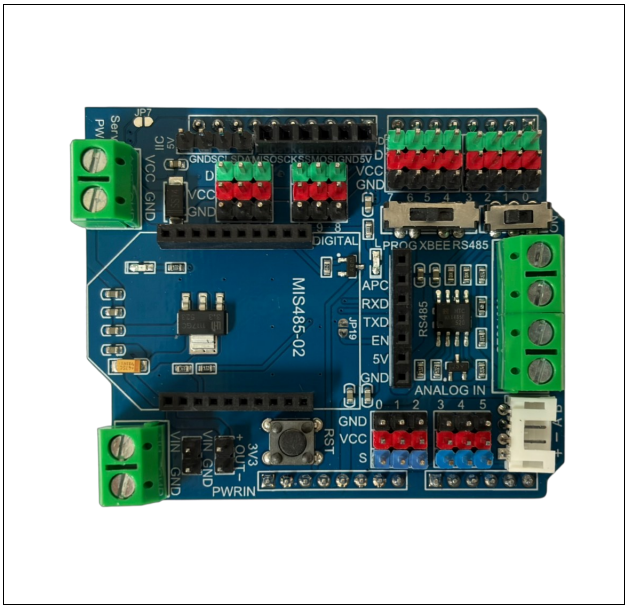
RS-485 IO Expansion Shield Module for Arduino

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.

ORDERING INFORMATION

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

APPLICATION GUIDE

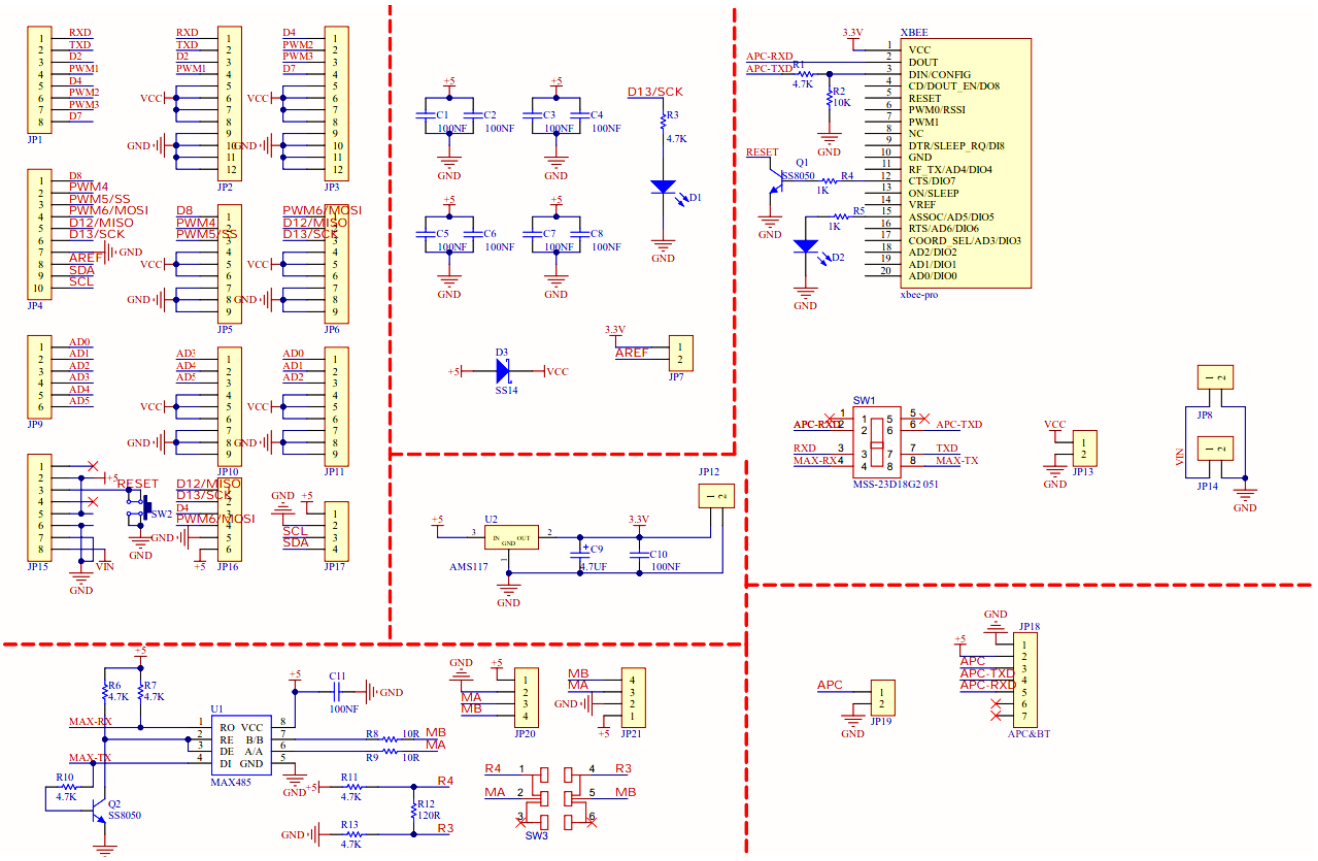
The RS-485 IO Expansion Arduino Shield Module enhances Arduino's connectivity by supporting multiple communication interfaces, including XBee, Bluetooth, RS485, APC220, and SD card modules.

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.

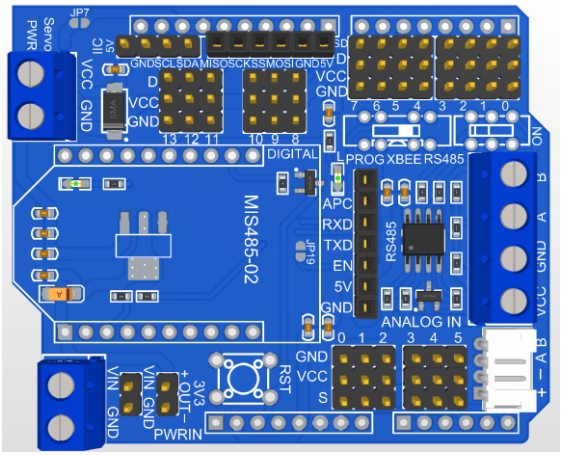
RS-485 IO Expansion Shield Module for Arduino

SCHEMATICS

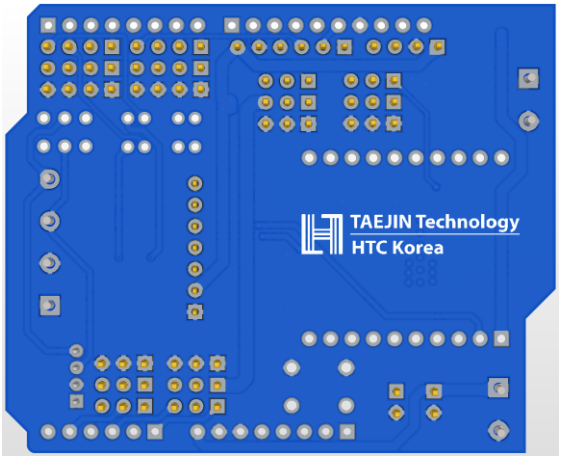


LAYOUT

Top



Bottom

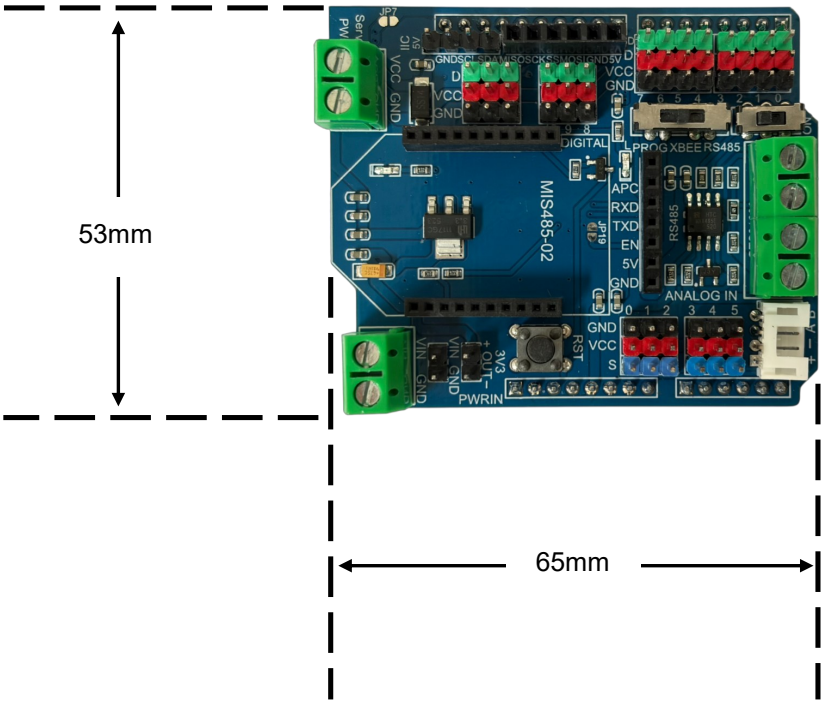


PARTS LIST

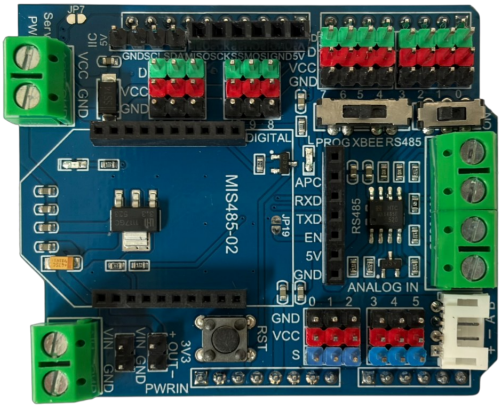
Name	Description	P/N	Qty.	Distributor
PCB	Printed Circuit Board	FR4 Lead-Free PCB	1	TAEJIN
IC	MAX485ED	MAX485ED, SOP-8	1	TAEJIN
IC	LM1117GS-3.3	LM1117GS-3.3, SOT-223-3L	1	TAEJIN
Connector	Wire to Board Connector	KF301 / 4P, 5.08mm	1	Generic
Connector	Wire to Board Connector	KF301 / 2P, 5.08mm	2	Generic
Pin Header	1*2 / 2.54mm pitch	Male Pin Header	2	Generic
Pin Header	1*3 / 2.54mm pitch	Male Pin Header	12	Generic
Pin Header	1*4 / 2.54mm pitch	Male Pin Header	7	Generic
Pin Header	1*6 / 2.54mm pitch	Male Pin Header	1	Generic
Pin Header	1*8 / 2.54mm pitch	Male Pin Header	2	Generic
Pin Header	1*10 / 2.54mm pitch	Male Pin Header	1	Generic
Pin Header	1*10 / 2.54mm pitch	Female Pin Header	2	Generic
Pin Header	1*7 / 2.54mm pitch	Female Pin Header	1	Generic
Pin Header	1*6 / 2.54mm pitch	Female Pin Header	1	Generic
Connector	Angle Type Connector	4P, 2.0mm	1	Generic
Switch	Reset Switch	Tact Switch 6*6*5mm	1	Generic
Switch	Slide Switch	Three Stage Slide Switch	1	Generic
Switch	Slide Switch	Two Stage Slide Switch	1	Generic
Capacitor	4.7uF Capacitor	4.7uF/16V Tantal Capacitor	1	Generic
Capacitor	100nF / 16V Capacitor	100nF / 25V Capacitor, 1608(0603)	10	Generic
Resistor	4.7KΩ Resistor	4.7KΩ 1% Resistor, 1608(0603)	7	Generic
Resistor	1KΩ Resistor	1KΩ 1% Resistor, 1608(0603)	2	Generic
Resistor	10KΩ Resistor	10KΩ 1% Resistor, 1608(0603)	1	Generic
Resistor	10Ω Resistor	10Ω 1% Resistor, 1608(0603)	2	Generic
Resistor	120Ω Resistor	120Ω 5% Resistor, 1608(0603)	1	Generic
Transistor	NPN Transistor	S8050, SOT-23-3 25V/0.5A NPN	2	Generic
Diode	Schottky Rectifier Diode	SS14	1	Generic
LED	LED for Indicator	LED, Green	2	Generic

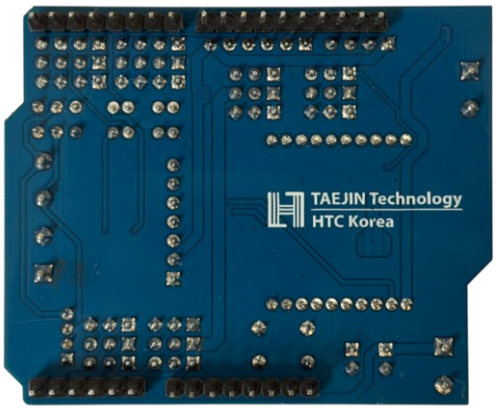
RS-485 IO Expansion Shield Module for Arduino

SIZE INFORMATION



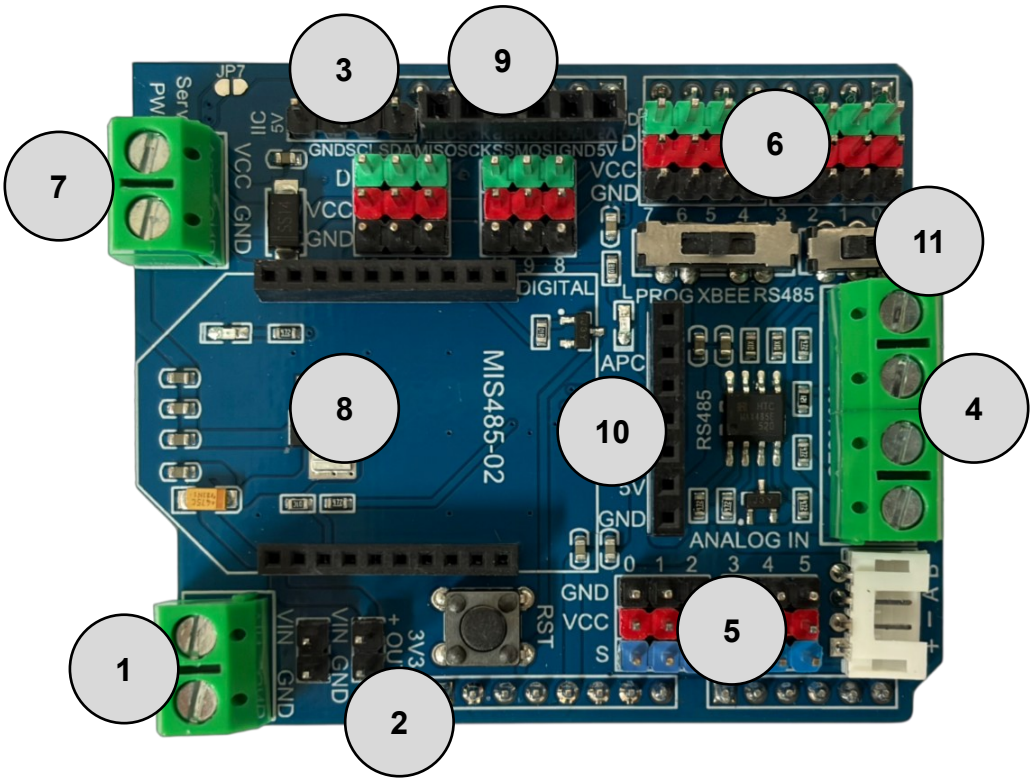
PRODUCT IMAGE





RS-485 IO Expansion Shield Module for Arduino

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

REVISION NOTICE

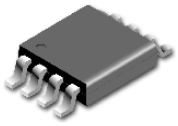
The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.

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

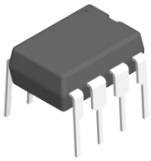
DESCRIPTION

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 ±8kV for both Human Body Model and ±15kV for IEC61000-4-2 Air Discharge Method on this device.

SOP-8



DIP-8



FEATURES

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

APPLICATIONS

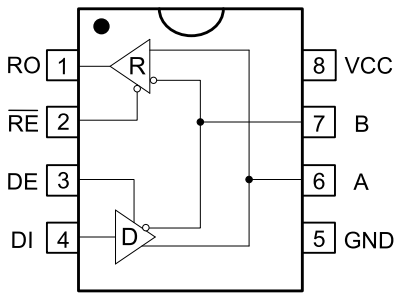
- Low Power RS-485 Systems
- DTE-DCE Interface
- Packet Switching
- Local Area Networks
- Data Concentration
- Data Multiplexers
- Integrated Services Digital Network (ISDN)

TRUTH TABLE

Transmission				
Inputs			Outputs	
$\overline{RE}$	DE	DI	A	B
X	1	1	1	0
X	1	0	0	1
0	0	X	Z	Z
1	0	X	Z	Z

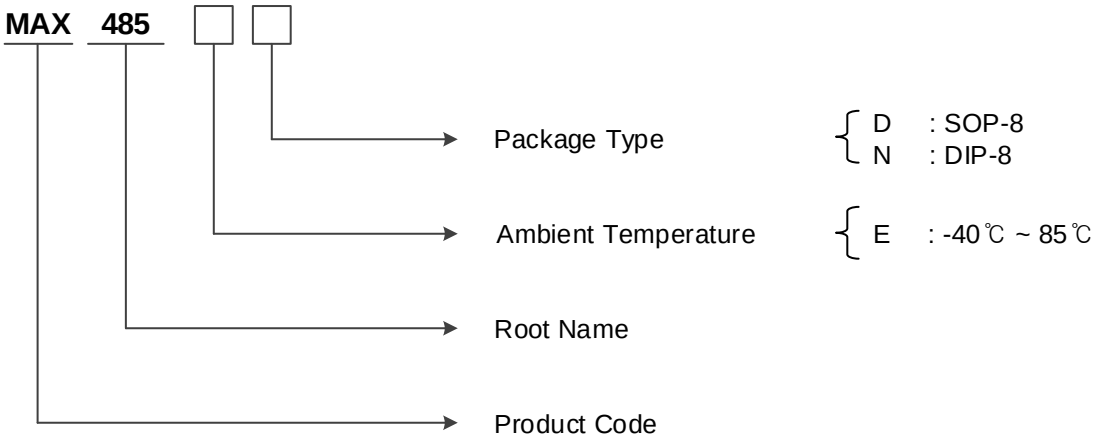
Receiver			
Inputs			Outputs
$\overline{RE}$	DE	A-B	RO
0	0	≥ +0.2V	1
0	0	≤ -0.2V	0
0	0	Open	1
1	0	X	Z

PIN CONFIGRUATION AND LOGIC DIAGRAM



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



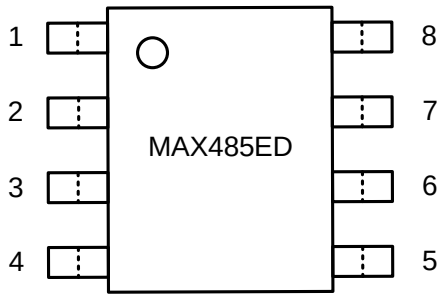
ABSOLUTE MAXIMUM RATINGS

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

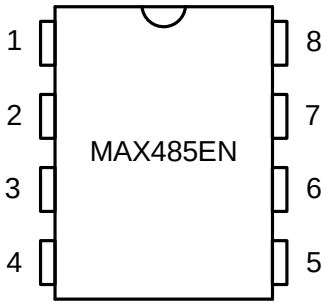
RECOMMENDED OPERATING CONDITIONS

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

PIN CONFIGURATION



SOP-8



DIP-8

PIN DESCRIPTION

Pin No.	SOP-8 / DIP-8 PKG	
	Name	**Function**
1	RO	Receiver Output
2	$\overline{RE}$	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

ELECTRICAL CHARACTERISTICS

Unless otherwise specified: V_{CC} = 5V ± 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_{CC} = 0V or 5.25V	V_{IN} = 12V			1.0	mA
			V_{IN} = -7V			-0.8	
Receiver Short-Circuit Current	I_{OSR}	0V ≤ V_O ≤ V_{CC}		7		95	mA

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
| tPLH - tPHL | 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

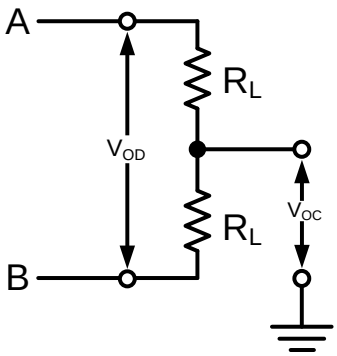


Figure1.

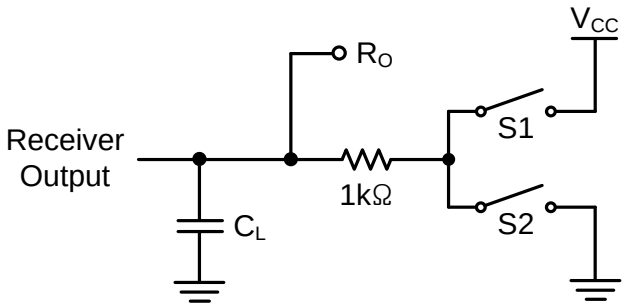


Figure 2.

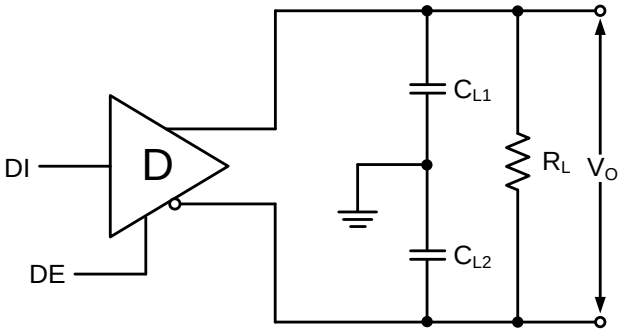


Figure 3.

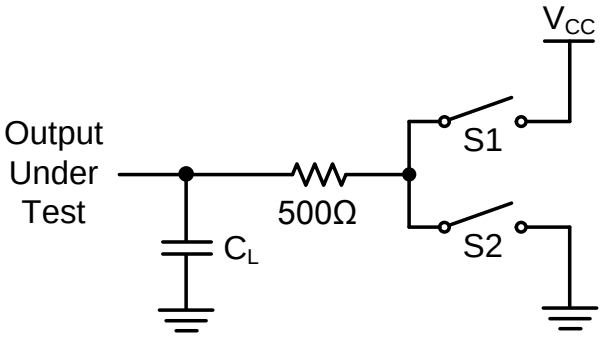


Figure 4.

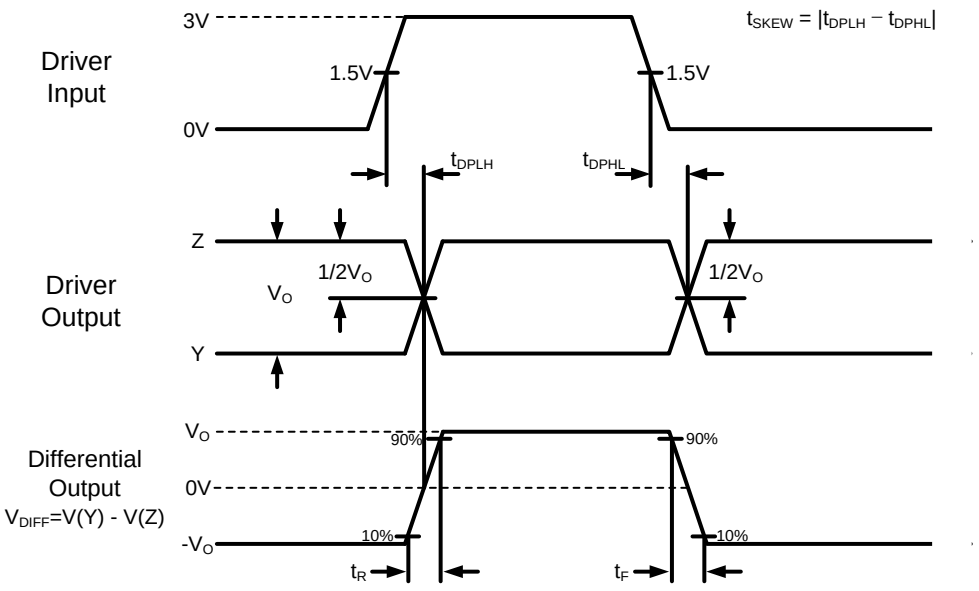


Figure 5.

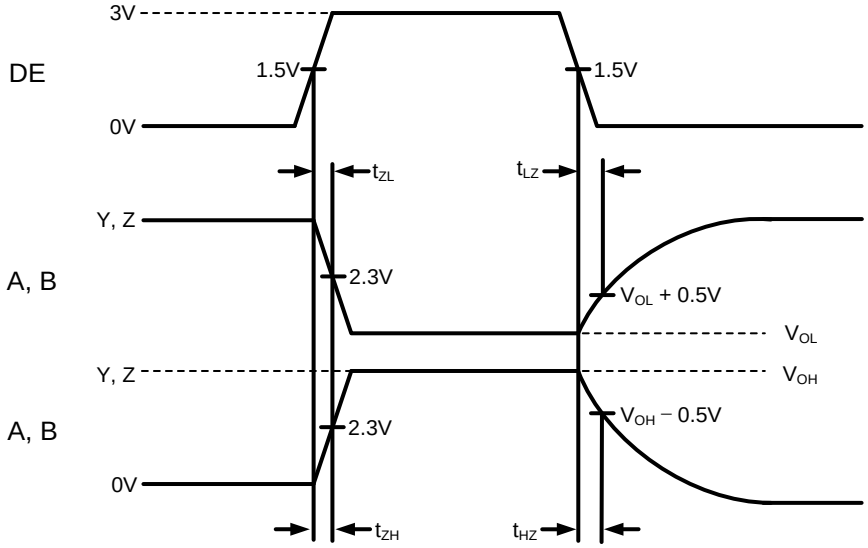


Figure 6.

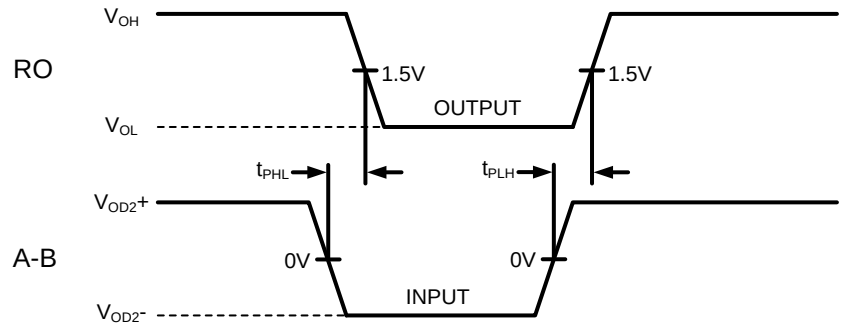


Figure 7.

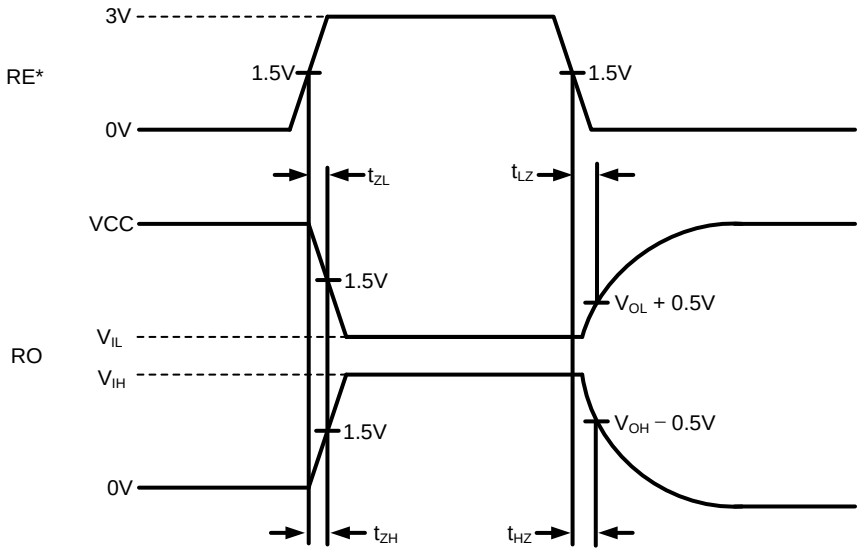


Figure 8.

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 54Ω 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 ±200mV. Input impedance of the receivers is typically 15kΩ (12kΩ 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.

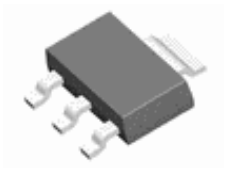
REVISION NOTICE

The description in this datasheet can be revised without any 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.

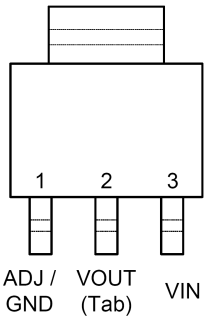
ABSOLUTE MAXIMUM RATINGS

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



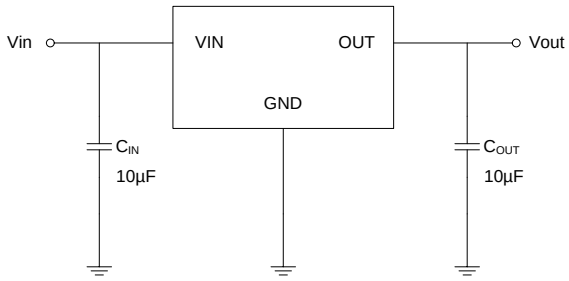
SOT-223-3L

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>



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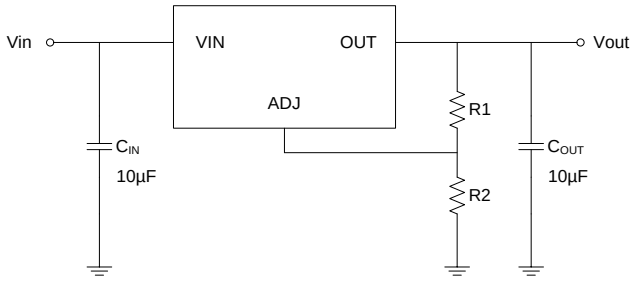


ELECTRICAL CHARACTERISTICS

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

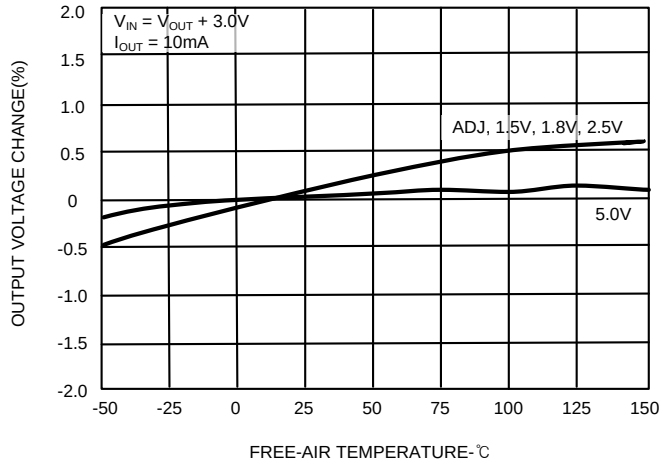
For 5.0V Output Voltage (T_J=25°C, C_{OUT} = 10µF unless otherwise specified)

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

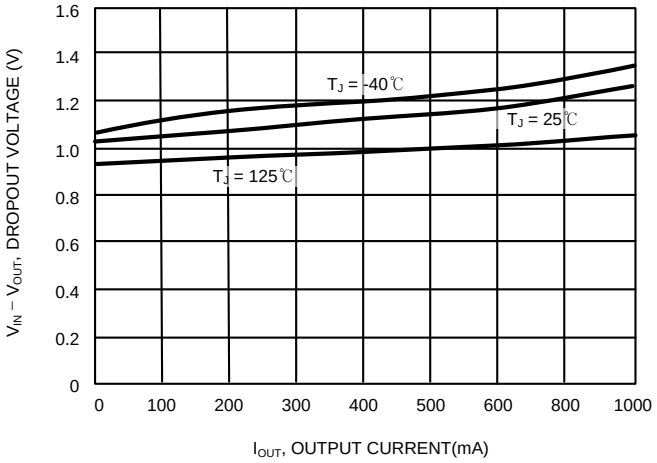
For All Output Voltage (T_J=25°C, C_{OUT} = 10µF unless otherwise specified)

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

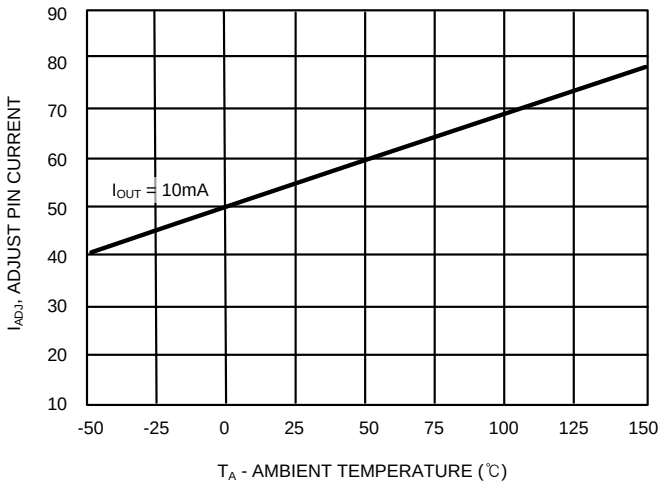
TYPICAL OPERATING CHARACTERISTICS



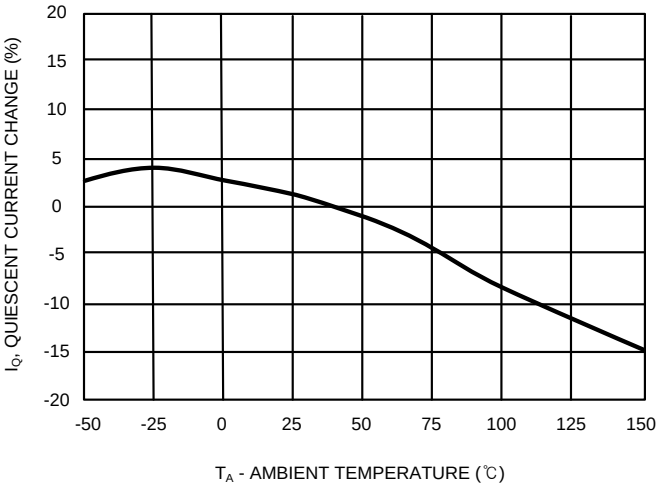
OUTPUT VOLTAGE CHANGE VS TEMPERATURE



DROPOUT VOLTAGE VS OUTPUT CURRENT



ADJ PIN CURRENT VS TEMPERATURE



QUIESCENT CURRENT CHANGE VS TEMPERATURE

APPLICATION CIRCUITS

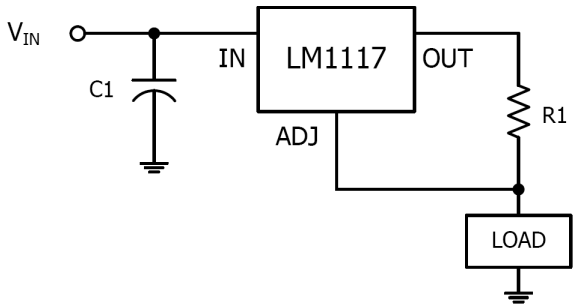


Fig.1 300mA Current Output

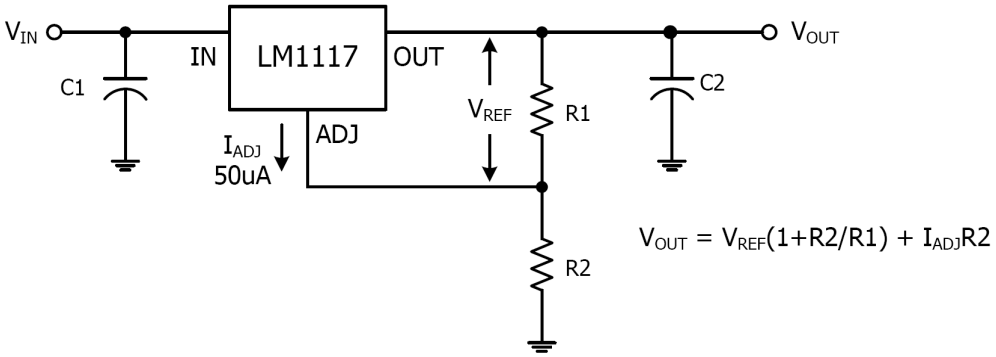


Fig.2 Typical Adjustable Regulator

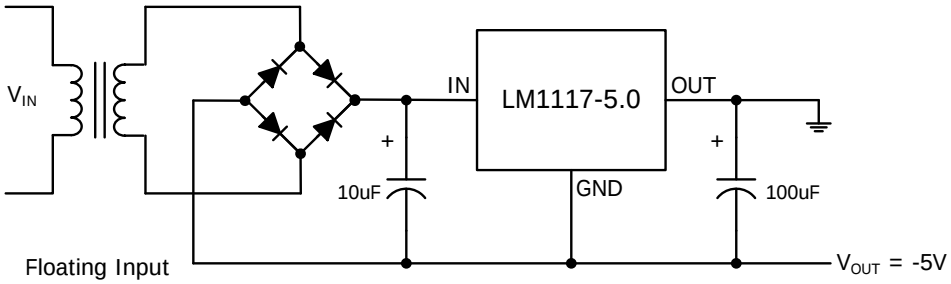


Fig.3 Negative Supply

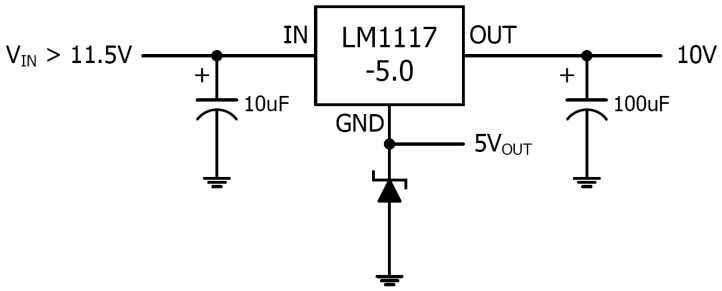


Fig.4 Voltage Regulator with Reference

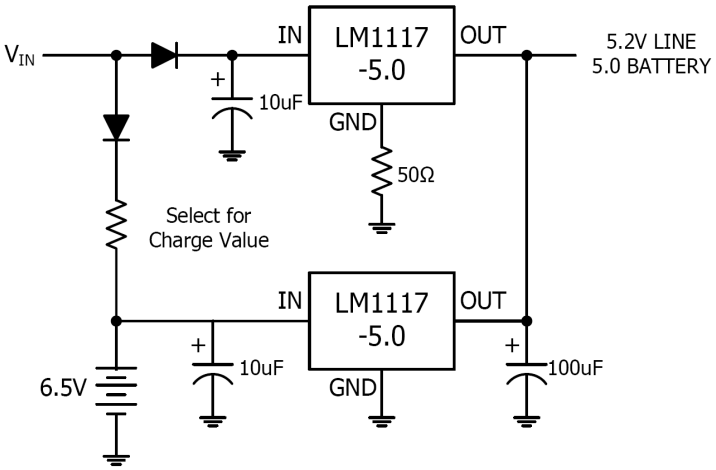


Fig.5 Battery Backed-up Regulated Supply

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.