Introduction

The MLS78M series is a group of three terminal positive voltage linear regulators with multiple fixed output voltages. In the case of good heat dissipation, it can provide an output current of 1A, and has internal short-circuit protection and thermal shutdown protection, which makes it not affected by overload. In addition to being used as fixed voltage regulators, these devices can also be used with external components to obtain adjustable output voltage and current, and can also be used as power transmission elements in precision regulators.

Features

- Available Output Voltage:
  5.0V, 6.0V, 8.0V, 9.0V and 12V
- Maximum Output Current:
  Exceed 1A
- Line Regulation:

3.0 ~ 10mV (Typ.) at TJ = 25° C

- Load Regulation:

15 ~ 25mV (Typ.) at TJ = 25° C

- Output Tolerances:

±3% at T_J = 25℃

±5% over the Operating T_J

- Build-in Current Limit
- Thermal Shutdown Protection
- Short Circuit Protection

Applications

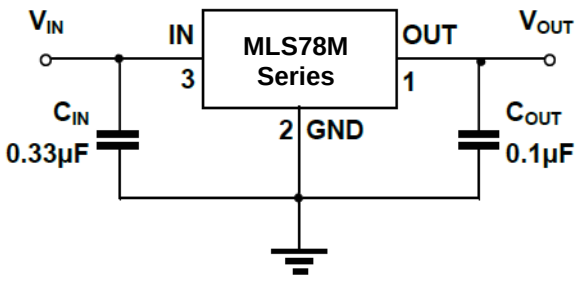
- Appliances and White Goods
- Building Automation
- Computing & Servers
- Electronic Point-of-sale
- Motor Drives
- On-Card Regulation
- Portable Devices
- Telecommunications
- TVs and Set-top Boxes

Available Packages

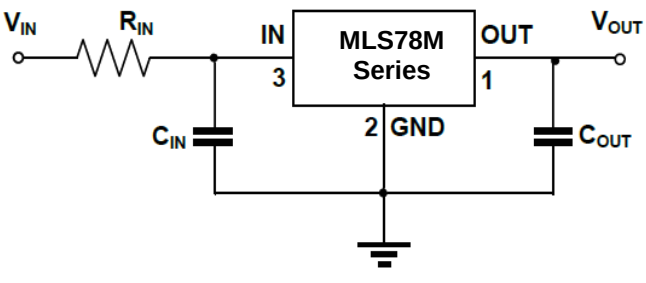
PART NUMBER	PACKAGES
MLS78M Series	TO-220
	TO-220F
	TO-252
	TO-263

Note: For more detailed packaging information, see the part Pin Configuration and Function and the part Mechanical Information.

Pb-Free RoHS Halogen-Free



(1) Conventional Circuit



(2) Resistance are used at IN

Typical Application Circuit

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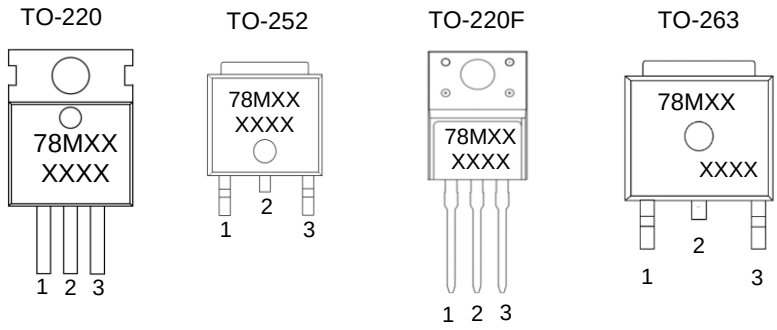
Ordering Information

Model	Device	Package	Minimum Package(pcs)	Inner Box Quantity(pcs)	Outer Carton Quantity(pcs)	Delivery Mode
MLS78MXX	MLS78MXX	TO-252	2,500	5,000	35,000	13"reel
MLS78MXX	MLS78MXX	TO-220	50	1,000	5,000	/
MLS78MXX	MLS78MXX	TO-220F	50	1,000	5,000	/
MLS78MXX	MLS78MXX	TO-263	800	800	4,000	13"reel

Pin Configuration and Marking Information

Pin Configuration and Function



Package Top View

Pin Name	MLS78M Series				I / O	Description
	TO-252	TO-220F	TO-263	TO-220		
IN	1	1	1	1	I	Input to the device.
GND	2	2	2	2	-	Regulator ground.
OUT	3	3	3	3	O	Output of the regulator.

78MXX : Product number, the "XX" in the "78MXX" represents the output voltage, for example, if V_{OUT} = 5.0V, "XX" is "05".
XXXX : Code

Specifications

Absolute Maximum Ratings(1)

Characteristic		Symbol	Value	Unit
Maximum input voltage(2)		V_{IN}	35	V
Maximum power dissipation	TO-220	$P_{D\ Max}$	Internally Limited(3)	W
	TO-220F			
	TO-252			
	TO-263			
Maximum junction temperature		$T_{J\ Max}$	150	°C
Storage temperature		T_{stg}	- 65 ~ 150	°C
Soldering temperature & time		T_{solder}	260°C, 10s	-

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

(2) All voltages are with respect to network ground terminal.

(3) Refer to Thermal Information for details.

Recommended Operating Conditions(4)

Parameter	Symbol	Min.	Nom.	Max.	Unit
Operating junction temperature	Tj	-40	-	125	˚C
Operating ambient temperature	Ta	-	-(5)	-	˚C

(4) Recommends that users should not exceed the rated value in the Recommended Operating Conditions for the application conditions of the equipment, so as to ensure the stability of normal operation and reliability of long-term operation of the equipment. Operation beyond the recommended rated conditions does not mean that the product will fail.The consumers need to evaluate the risks that may be caused by the operation of the product beyond the recommended ratedconditions.

(5) It is necessary to ensure that the operating junction temperature of the equipment does not exceed the rated value of the recommended operating conditions when using the device for design.

ESD Ratings

ESD Ratings		Symbol	Value	Unit
Electrostatic discharge(6)	Human body model	$V_{ESD-HBM}$	2000	V
	Machine model	V_{ESD-MM}	200	

(6) ESD testing is conducted in accordance with the relevant specifications formulated by the Joint Electronic Equipment Engineering Commission (JEDEC). The human body mode (HBM) electrostatic discharge test is based on the JESD22-114D test standard, using a 100pF capacitor and discharging to each pin of the device through a resistance of 1.5kΩ. The electrostatic discharge test in mechanical mode (MM) is based on the JESD22-115-A test standard and uses a 200pF capacitor to discharge directly to each pin of the device.

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Thermal Information

Thermal Metric(7)	Symbol	MLS78M Series				Unit
Junction-to-ambient thermal resistance	$R_{\theta JA}$	TO-220	TO-220F	TO-263	TO-252	℃/W
		67	62.5	60.5	80	
Reference maximum power dissipation for continuous operation	$P_{D\ Ref}$	TO-220	TO-220F	TO-263	TO-252	W
		1.5	1.55	1.6	1.25	

(6) TA = 25° C, the thermal resistance test of TO-220-3L packages did not add additional radiators, see the part Notes for more information about thermal metrics.

Electrical Characteristics

MLS78M05 (V_{OUT} = 5.0V, V_{IN} = 10V, I_{OUT} = 350mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = 25℃, unless otherwise specified)

Characteristic	Symbol	Test Ccnditions(8)	Min	Typ(9)	Max	Uuit
Output voltage(10)	V_{OUT}	V_{IN}=10V，I_O=350mA	4.85	5.0	5.15	V
		V_{IN} = 7.5 to 20V, I_{OUT} = 5 to 350mA	4.75	5.0	5.25	V
Line regulation	ΔV_{LINE}	V_{IN} = 7 to 25V, I_{OUT} = 200mA	-	-	100	mV
		V_{IN} = 8 to 25V, I_{OUT} = 200mA	-	-	50	mV
Load regulation	ΔV_{LOAD}	I_{OUT} = 5 to 500mA	-	-	100	mV
Quiescent current	I_Q	-	-	2.3	5.0	mA
Quiescent current change	ΔI_Q	V_{IN} = 8 to 25V，I_{OUT} = 200mA	-	-	0.8	mA
		I_{OUT} = 5 to 350mA	-	-	0.5	mA
Short circuit current	I_{SC}	V_{IN} = 10V, OUT short to GND	-	300	-	mA
Peak current	I_{Peak}	-	-	1.5	-	A
Dropout voltage(11)	V_{DO}	I_{OUT} = 500mA	-	1.75	2.0	V
		I_{OUT} = 1A	-	2.1	2.5	V
Output noise voltage	V_N	f = 10 to 100kHz	-	40	-	μV
Ripple rejection	RR	V_{IN} = 8 to 18V, I_{OUT} = 300mA,，f = 120Hz	62	78	-	dB

MLS78M06 (V_{OUT} = 6.0V, V_{IN} = 11V, I_{OUT} = 350mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = 25℃, unless otherwise specified)

Characteristic	Symbol	Test Ccnditions(8)	Min	Typ(9)	Max	Uuit
Output voltage(10)	V_{OUT}	-	5.82	6.0	6.18	V
		V_{IN} = 8 to 21V, I_{OUT} = 5 to 350mA	5.70	6.0	6.30	V
Line regulation	ΔV_{LINE}	V_{IN} = 8 to 25V, I_{OUT} = 200mA	-	5	100	mV
		V_{IN} = 9 to 25V, I_{OUT} = 200mA	-	1.5	50	mV
Load regulation	ΔV_{LOAD}	I_{OUT} = 5 to 500mA	-	18	100	mV
		I_{OUT} = 5 to 200mA	-	10.0	50	mV
Quiescent current	I_Q	-	-	4.3	6	mA
Quiescent current change	ΔI_Q	V_{IN} = 9 to 25V，I_{OUT} = 200mA	-	-	0.8	mA
		I_{OUT} = 5 to 350mA	-	-	0.5	mA
Short circuit current	I_{SC}	V_{IN} = 11V, OUT short to GND	-	270	-	mA
Peak current	I_{Peak}	-	-	0.5	-	A
Dropout voltage(11)	V_{DO}	I_{OUT} = 350mA	-	2	-	V
Output noise voltage	V_N	f = 10 to 100kHz	-	45	-	μV
Ripple rejection	RR	V_{IN} = 9 to 19V, I_{OUT} = 300mA,，f = 120Hz	59	80	-	dB

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MLS78M08 (V_{OUT} = 8.0V, V_{IN} = 14V, I_{OUT} = 350mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = 25℃, unless otherwise specified)

Characteristic	Symbol	Test Ccnditions[8]	Min	Typ[9]	Max	Uuit
Output voltage[10]	V_{OUT}	-	7.76	8.0	8.24	V
		V_{IN} = 10.5 to 23V, I_{OUT} = 5 to 350mA	7.60	8.0	8.40	V
Line regulation	ΔV_{LINE}	V_{IN} = 10.5 to 25V, I_{OUT} = 200mA	-	6	100	mV
		V_{IN} = 11 to 25V, I_{OUT} = 200mA	-	2	50	mV
Load regulation	ΔV_{LOAD}	I_{OUT} = 5 to 500mA	-	20	160	mV
		I_{OUT} = 5 to 200mA	-	10	80	mV
Quiescent current	I_Q	-	-	4.3	6	mA
Quiescent current change	ΔI_Q	V_{IN} = 10.5 to 25V， I_{OUT} = 200mA	-	-	0.8	mA
		I_{OUT} = 5 to 350mA	-	-	0.5	mA
Short circuit current	I_{SC}	V_{IN} = 14V, OUT short to GND	-	250	-	mA
Peak current	I_{Peak}	-	-	0.5	-	A
Dropout voltage[11]	V_{DO}	I_{OUT} = 350mA	-	2	-	V
Output noise voltage	V_N	f = 10 to 100kHz	-	52	-	μV
Ripple rejection	RR	V_{IN} = 11.5 to 21V, I_{OUT} = 300mA,， f = 120Hz	56	80	-	dB

MLS78M09 (V_{OUT} = 9.0V, V_{IN} = 16V, I_{OUT} = 350mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = 25℃, unless otherwise specified)

Characteristic	Symbol	Test Ccnditions[8]	Min	Typ[9]	Max	Uuit
Output voltage[10]	V_{OUT}	-	8.73	9.0	9.27	V
		V_{IN} = 11.5 to 24V, I_{OUT} = 5 to 350mA	8.55	9.0	9.45	V
Line regulation	ΔV_{LINE}	V_{IN} = 11.5 to 26V, I_{OUT} = 200mA	-	6	100	mV
		V_{IN} = 12 to 26V, I_{OUT} = 200mA	-	2	50	mV
Load regulation	ΔV_{LOAD}	I_{OUT} = 5 to 500mA	-	20	180	mV
		I_{OUT} = 5 to 200mA	-	10	90	mV
Quiescent current	I_Q	-	-	4.6	6	mA
Quiescent current change	ΔI_Q	V_{IN} = 11.5 to 26V， I_{OUT} = 200mA	-	-	0.8	mA
		I_{OUT} = 5 to 350mA	-	-	0.5	mA
Short circuit current	I_{SC}	V_{IN} = 16V, OUT short to GND	-	250	-	mA
Peak current	I_{Peak}	-	-	0.5	-	A
Dropout voltage[11]	V_{DO}	I_{OUT} = 350mA	-	2	-	V
Output noise voltage	V_N	f = 10 to 100kHz	-	60	-	μV
Ripple rejection	RR	V_{IN} = 13 to 23V, I_{OUT} = 300mA,， f = 120Hz	56	80	-	dB

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MLS78M12 (V_{OUT} = 12.0V, V_{IN} = 19V, I_{OUT} = 350mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = 25℃, unless otherwise specified)

Characteristic	Symbol	Test Ccnditions[8]	Min	Typ[9]	Max	Uuit
Output voltage[10]	V_{OUT}	V_{IN}=17V，I_O=350mA	11.64	12.0	12.36	V
		V_{IN} = 14.5 to 27V, I_{OUT} = 5 to 350mA	11.40	12.0	12.60	V
Line regulation	ΔV_{LINE}	V_{IN} = 14.5 to 32V, I_{OUT} = 200mA	-	-	100	mV
		V_{IN} = 16 to 32V, I_{OUT} = 200mA	-	-	50	mV
Load regulation	ΔV_{LOAD}	I_{OUT} = 5 to 500mA	-	-	200	mV
Quiescent current	I_Q	-	-	2.3	5.0	mA
Quiescent current change	ΔI_Q	V_{IN} = 14.5 to 32V，I_{OUT} = 200mA	-	-	0.8	mA
		I_{OUT} = 5 to 350mA	-	-	0.5	mA
Short circuit current	I_{SC}	V_{IN} = 19V, OUT short to GND	-	240	-	mA
Peak current	I_{Peak}	-	-	1.5	-	A
Dropout voltage[11]	V_{DO}	I_{OUT} = 500mA	-	1.75	2.0	V
		I_{OUT} = 1A	-	2.1	2.5	V
Output noise voltage	V_N	f = 10 to 100kHz	-	75	-	μV
Ripple rejection	RR	V_{IN} = 15 to 25V, I_{OUT} = 300mA,，f = 120Hz	55	78	-	dB

Note:

(8) Pulse test technology is used to make T_J as close to TA as possible. Thermal effects must be considered separately.

(9) Typical numbers are at 25℃ (T_J) and represent the most likely norm.

(10) This specification only applies to the DC power consumption allowed by the absolute maximum rating.

(11) The difference of output voltage and input voltage when input voltage is decreased gradually till output voltage equals to 95% of V_{OUT}.

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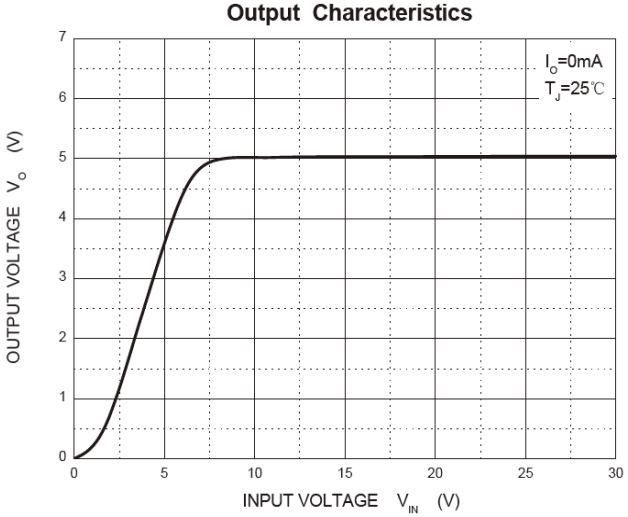
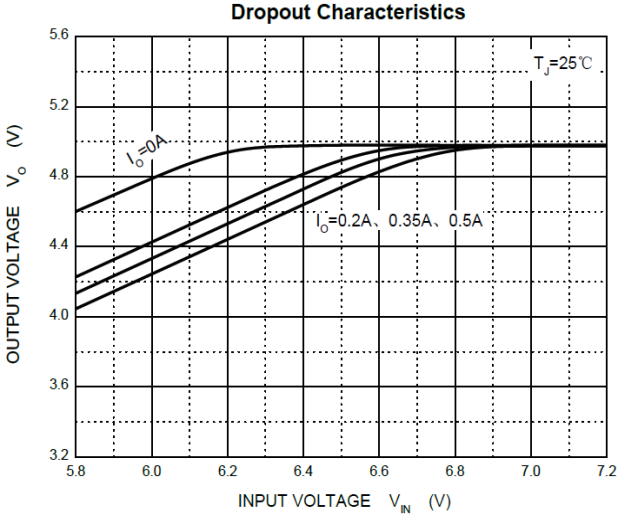
Typical Characteristics

MLS78M05 (V_{OUT} = 5.0V, T_J = 25℃, unless otherwise specified)

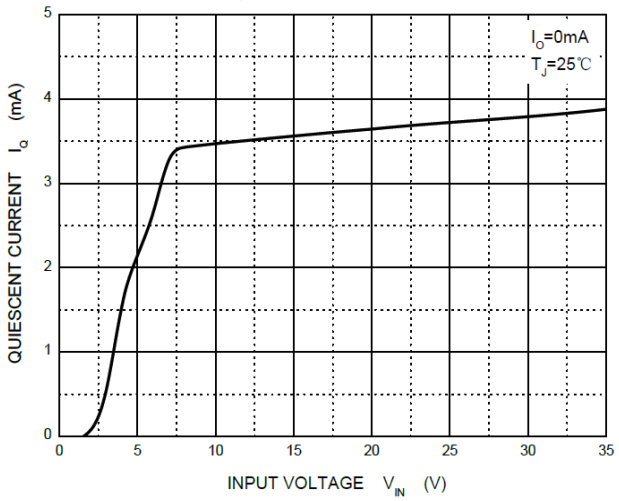
Output Characteristics



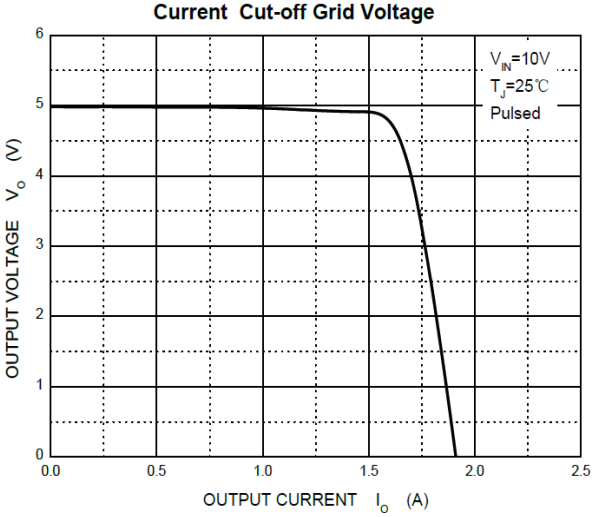
Dropout Characteristics



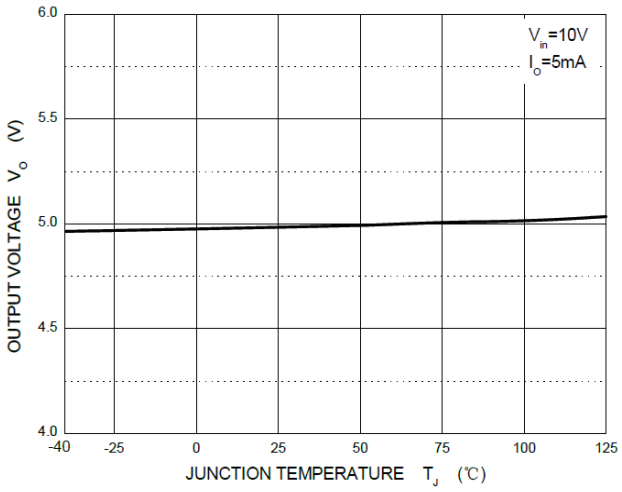
Quiescent Current



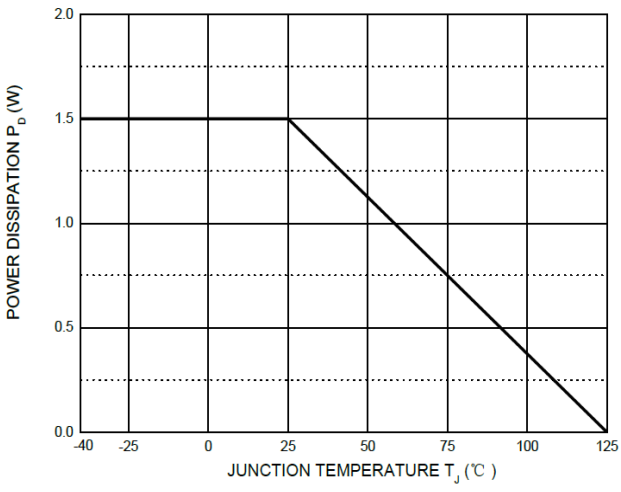
Current Cut-off Grid Voltage



Output Voltage vs Junction Temperature



Power Derating Curve



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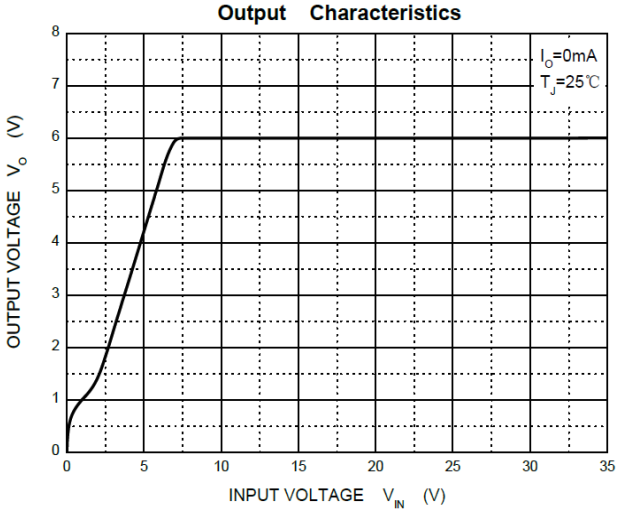
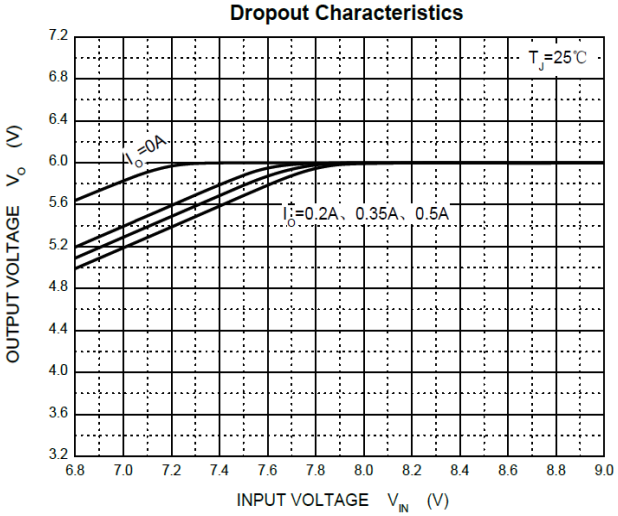
MLS78M06 (V_{OUT} = 6.0V, T_J = 25℃, unless otherwise specified)

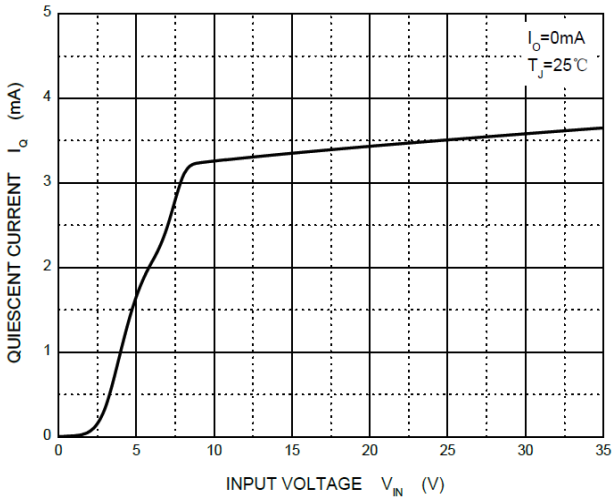
Output Characteristics



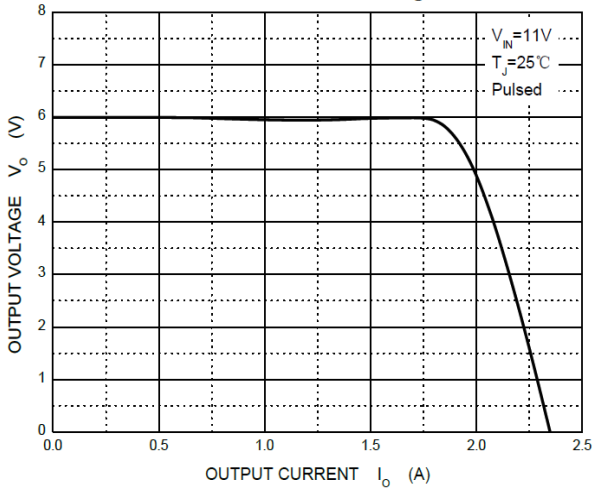
Dropout Characteristics



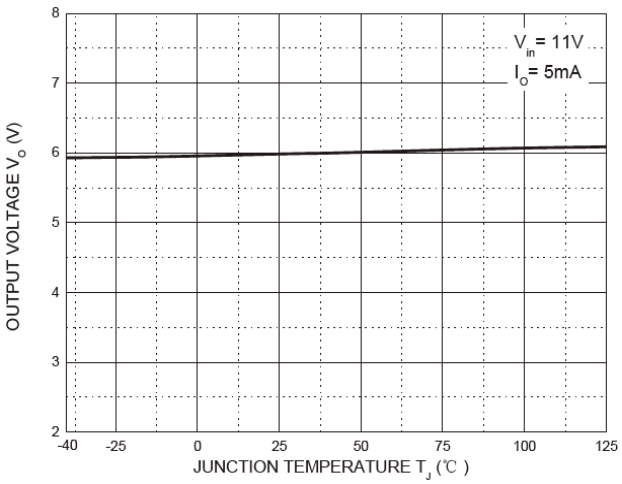
Quiescent Current



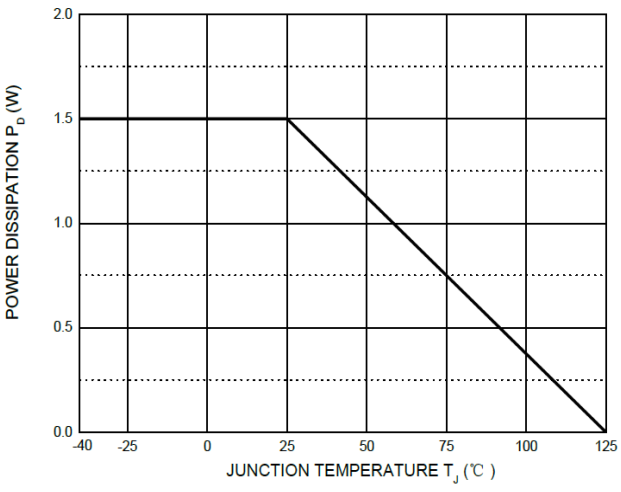
Current Cut-off Grid Voltage



Output Voltage vs Junction Temperature



Power Derating Curve



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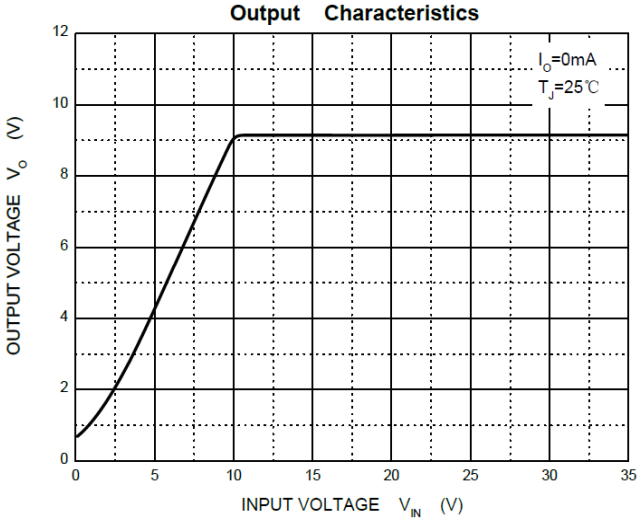
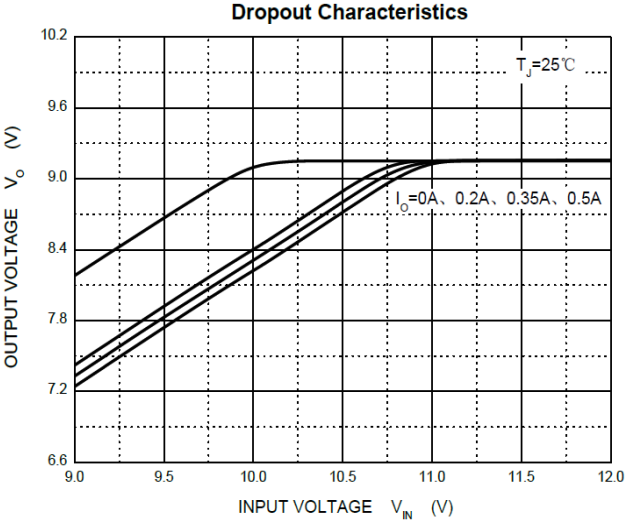
MLS78M08 (V_{OUT} = 8.0V, T_J = 25℃, unless otherwise specified)

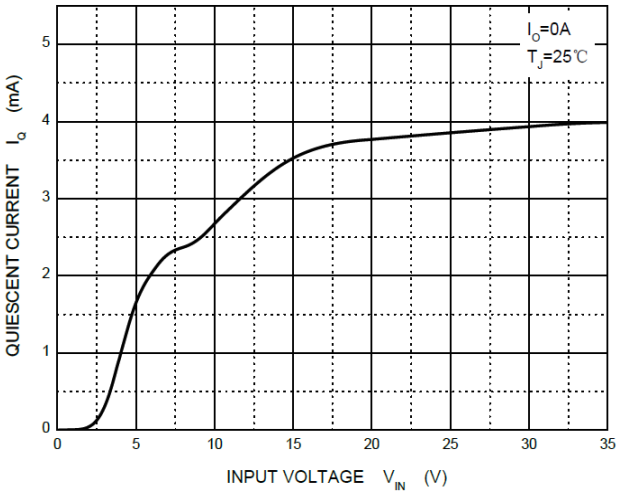
Output Characteristics



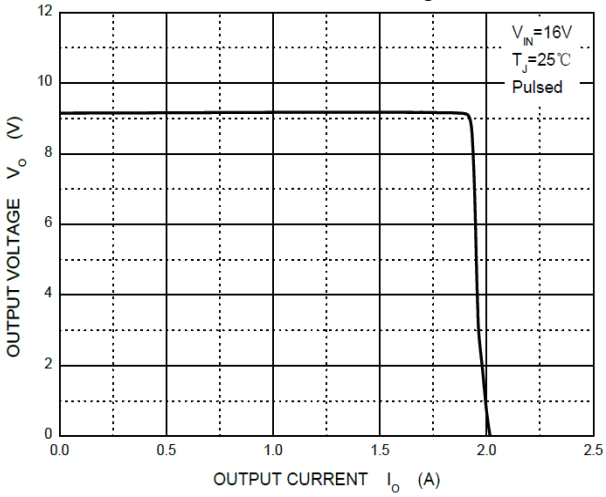
Dropout Characteristics



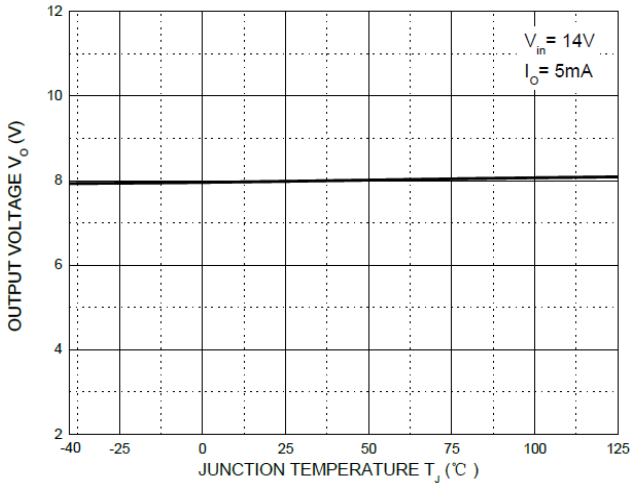
Quiescent Current



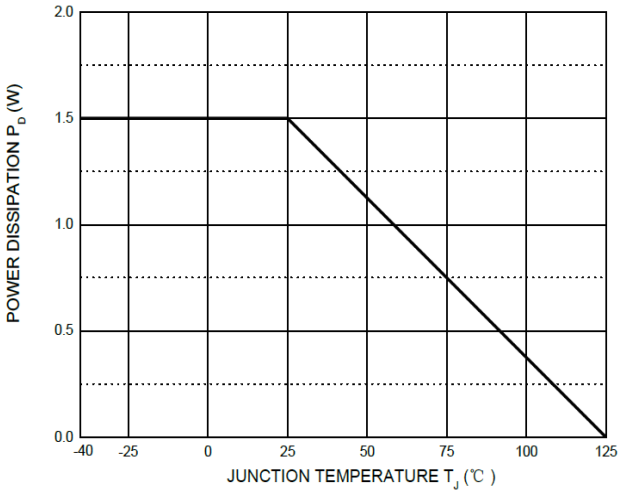
Current Cut-off Grid Voltage



Output Voltage vs Junction Temperature



Power Derating Curve



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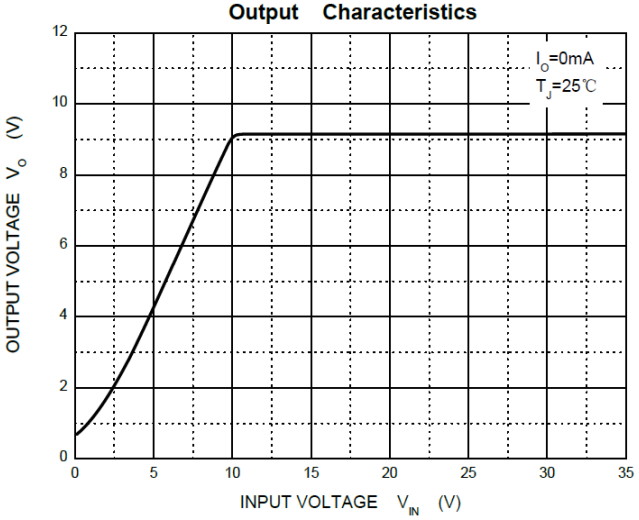
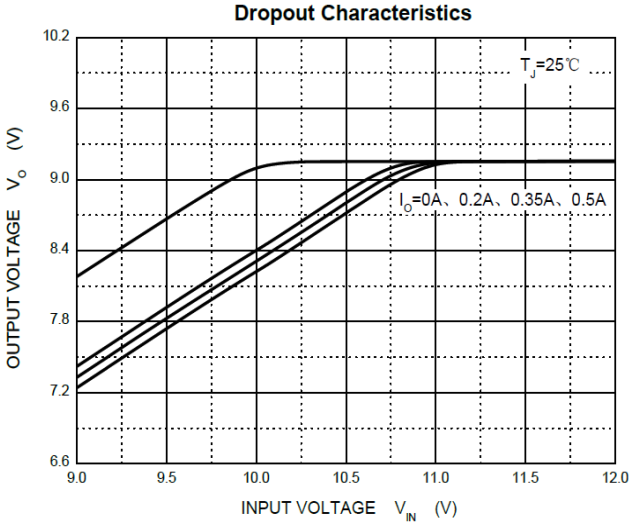
MLS78M09 (V_{OUT} = 9.0V, T_J = 25℃, unless otherwise specified)

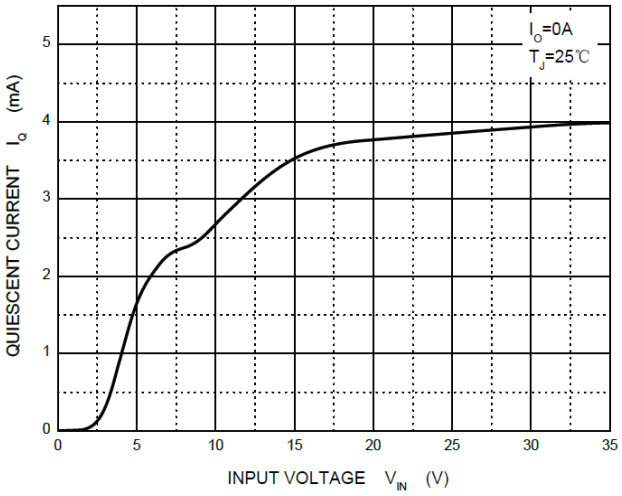
Output Characteristics



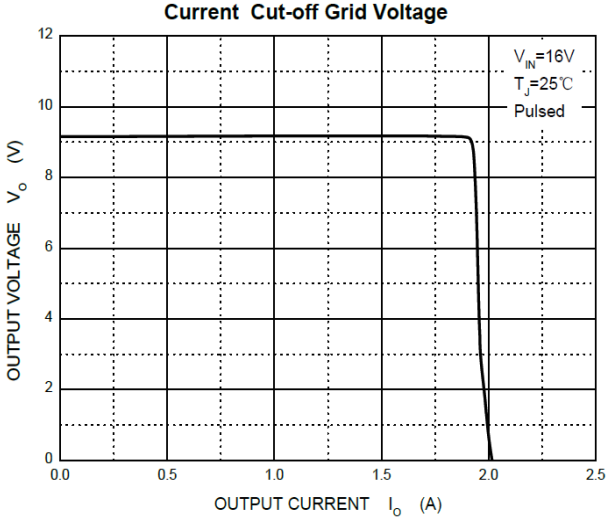
Dropout Characteristics



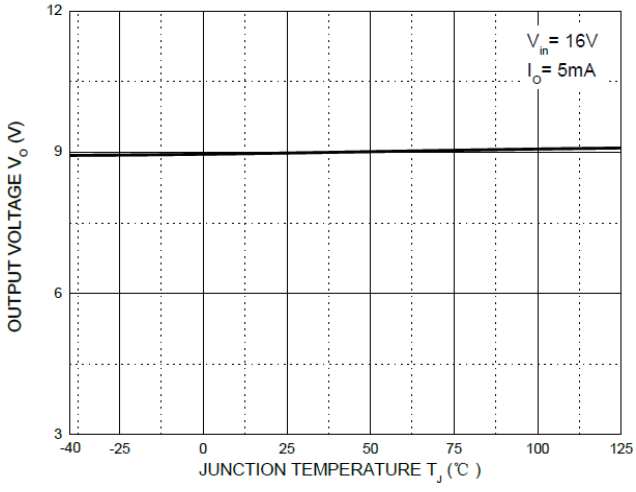
Quiescent Current



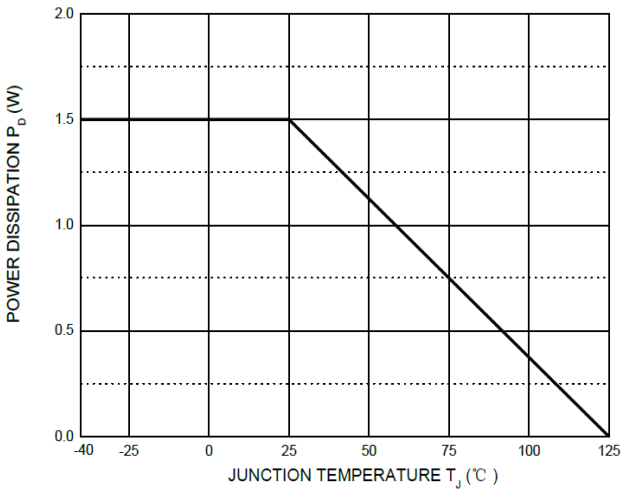
Current Cut-off Grid Voltage



Output Voltage vs Junction Temperature



Power Derating Curve



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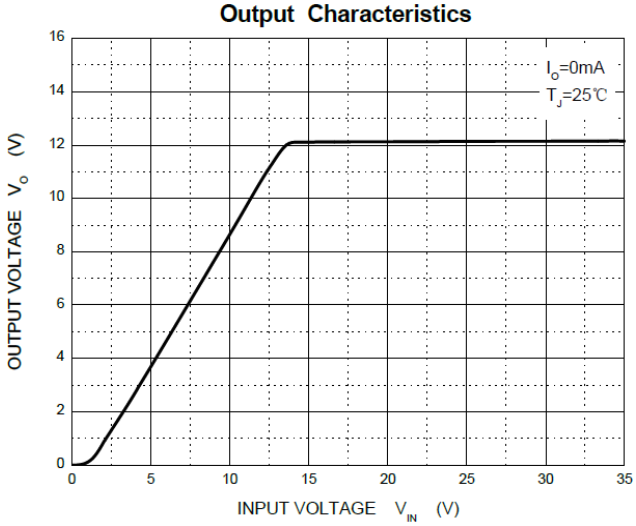
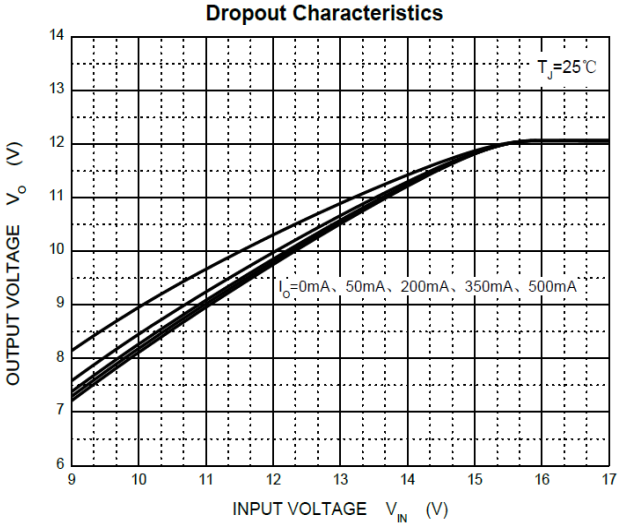
MLS78M12 (V_{OUT} = 12V, T_J = 25℃, unless otherwise specified)

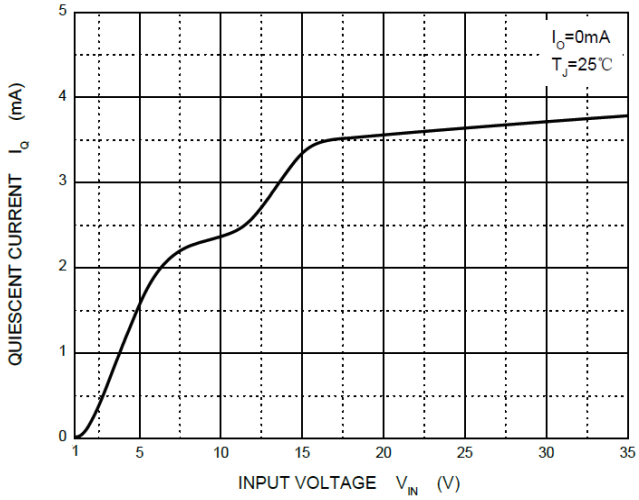
Output Characteristics



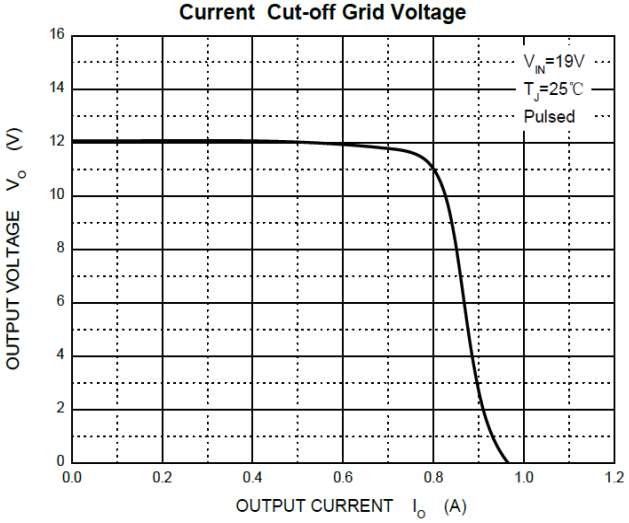
Dropout Characteristics



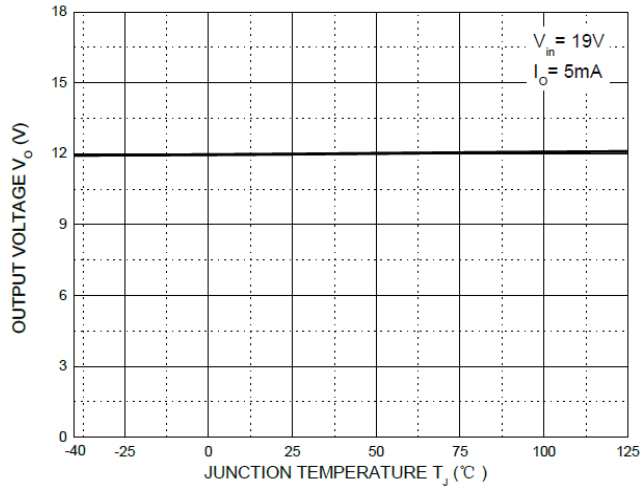
Quiescent Current vs Input Voltage



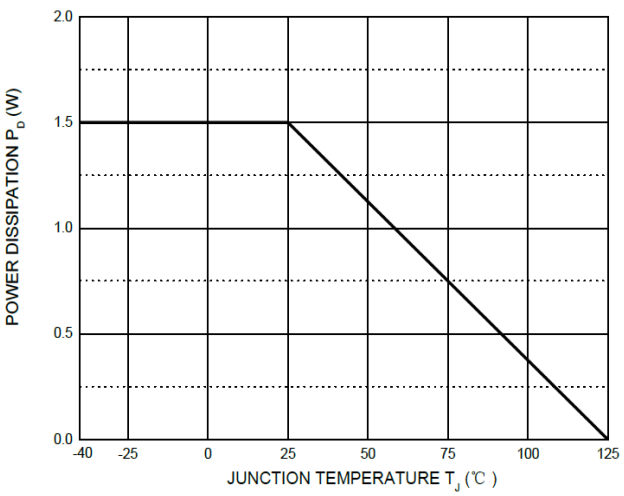
Current Cut-off Grid Voltage



Output Voltage vs Junction Temperature



Power Derating Curve



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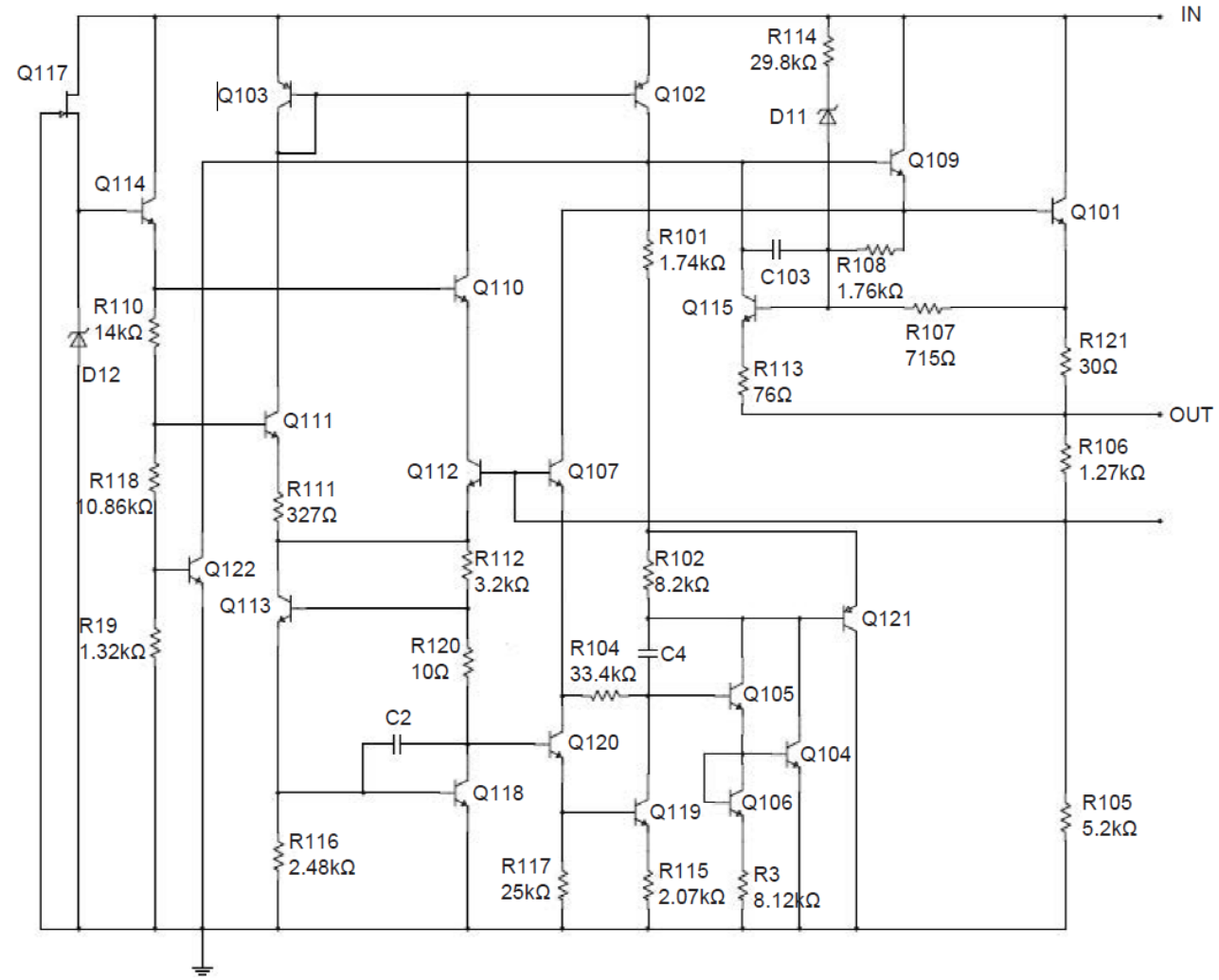
Detailed Description

Description

This series of fixed-voltage integrated-circuit voltage regulators is designed for a wide range of applications. Theapplications include on-card regulation for elimination of noise and distribution problems associated with singlepoint regulation. Each of these regulators can deliver up to 500mA of output current. The internal current-limiting and thermal-shutdown features of these regulators essentially make them immune to overload. In addition to use as fixed-voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents (not both) and also as the power-pass element in precision regulators.

Representative Schematic Diagram



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Feature Description

Input Voltage

When the input voltage is lower than the rated range of the data sheet, the device will lose the regulation function of stabilizing the output voltage, that is, it is unable to maintain the output voltage within the rated range. When the input voltage is higher than the rated range of the data sheet, the device may cause irreversible damage or failure due to exceeding the maximum rated range of electrical stress.

Built-in Current Limit & Short Circuit Protection

The MLS78M series has built-in current limit and short circuit protection mechanism. When the output current of the device is too high, the output of the device will be shut down. When the output of the device is short circuited to ground, the output of the device will also be shut down and the output current will be maintained within a certain range.

Thermal Shutdown Protection

The MLS78M series has thermal shutdown protection mechanism. When the junction temperature exceeds the rated temperature range for normal operation in the data sheet, the device will enter the thermal shutdown state. At this time, the output voltage of the device will be reduced to prevent catastrophic damage to the chip due to accidental heat. When the junction temperature decreases and no longer remains too high, the device will release the thermal shutdown and output normally. To ensure reliable operation, please limit the junction temperature to the specified range of Recommended Operating Conditions in the data sheet. Applications that exceed the recommended temperature range may cause the equipment to exceed its operating specifications.

Although the internal protection circuitry of the device is designed to protect against thermal overall conditions, this circuitry is not intended to replace proper heat sinking. Continuously running the device into thermal shutdown or above the maximum recommended junction temperature reduces long-term reliability.

Output Current

Due to the internal integration of thermal shutdown protection, in the case of large output current, the device may enter the thermal shutdown state because the junction temperature is higher than the rated value in the data sheet. Therefore, the appropriate package should be selected for circuit design according to the heat dissipation power consumption of the package and the effective connection thermal resistance with the environment, so as to make the device emit more heat energy, so as to ensure the maximum load current capacity of the device. If the circuit design is appropriate and the device has good heat dissipation conditions, the MLS78M series can output a current of up to 1.2A.

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Application and Implementation

Risk Alert and Precautions

The MLS78M series is designed for thermal shutdown protection, built-in current limit and output short circuit protection. However, like any IC regulator, precautions are necessary to reduce the possibility of accidental damage to the regulator. The following describes the possible causes of unit damage or failure.

Electrostatic Discharge (ESD)

Electrostatic discharge (ESD) is a common near-field hazard source. It comes from many sources, such as human body, mechanical equipment and electronic components themselves. ESD can cause phenomena such as high voltage and instantaneous high current in a very short time, resulting in damage or failure of the device due to electric shock.

Instantaneous Electrical Surge

In some applications, a short duration but high energy spike may occur in the circuit, including peak voltage and surge current. They may cause unstable operation of the regulator, accelerated aging and potential hazards, and even damage or malfunction of the regulator. These peaks are usually more likely to occur in hot-plug, switch inductance, heavy-load, and other types of circuits.

Precautions for ESD and Electrical Surge

In the practical application of the circuit, adopting the following suggestions can reduce the possibility of device failure due to the above reasons to a certain extent.

1. Place a TVS between the IN and GND of the voltage regulator to absorb the peak voltage that may be generated due to ESD or other reasons. As shown in Figure 1;

2. Place a resistor with appropriate resistance in series before the IN of the voltage regulator, which can help the voltage regulator share part of the energy in case of surge. The resistance value of the resistance should not be too large. The specific resistance value depends on the application of the circuit. Generally, the resistance value of this resistance does not exceed 20Ω. As shown in Figure 2.

For the MLS78M series, it is recommended that the input voltage should not exceed 17V and the peak voltage should not exceed 35V. **When the input voltage is greater than 17V, or the peak voltage that may be greater than 35V may appear in the practical circuit, it is recommended to adopt the circuit layout shown in Figure 2 in the circuit design.**

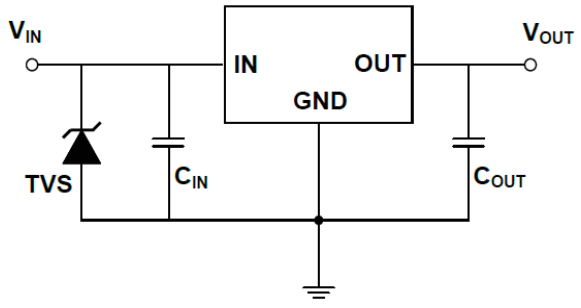

Figure 1. TVS is used at IN

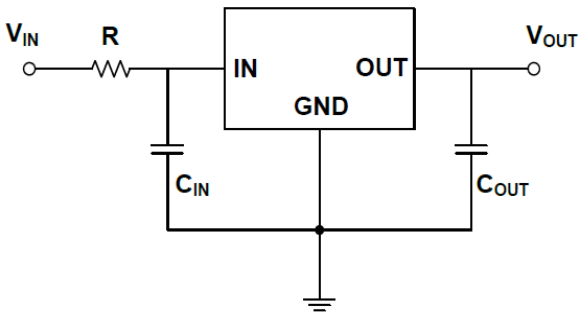

Figure 2. Resistance is used at IN

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Risk Alert and Precautions (continued)

Large Output Capacitance

The MLS78M series can obtain better transient response with the help of output capacitance. However, if the output capacitor is relatively large, the surge current generated by the charging of the output capacitor will also be large at the moment of power on of the regulator, and the large surge current passing through the regulator may damage the internal circuit. When the output capacitance is large, adopting the circuit design shown in Figure 2 will reduce the possibility of damage to the device due to large surge current to a certain extent. It is recommended that the selection of output capacitor should not exceed 20μF. If the selection of output capacitor exceeds 20μF, it is recommended to adopt the circuit design in Figure 2 to reduce the possibility of accidental failure of the device due to large surge current during power on.

Bypass Capacitance Selection

A capacitance between IN and GND (C_{IN}) is required if the regulator is located far from the power supply filter. It is recommended to use a 0.33μF capacitor for C_{IN}, and the capacitor (C_{IN}) should be placed as close to the device IN pin and GND pin as possible.

It is recommended to use a 0.1μF capacitor between OUT and GND (C_{OUT}), and the capacitor should be placed as close as possible between OUT and GND. The output capacitance can limit the high-frequency noise and help the device obtain the best stability and transient response.

The tolerance and temperature coefficient of the input and output capacitor (C_{IN} and C_{OUT}) must be considered to ensure that the capacitor can work normally within the rated working ambient temperature and rated working conditions of the equipment.

It is recommended that the output capacitor (C_{OUT}) should not exceed 20μF. When the output capacitor (C_{OUT}) exceeds 20μF, it is recommended to use the circuit layout shown in Figure 2. See Large Output Capacitance for more details.

System Example

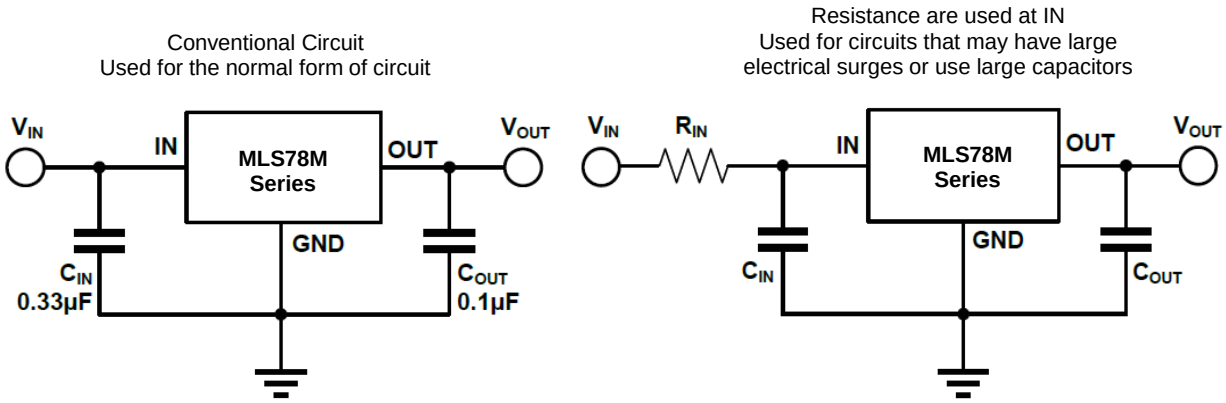
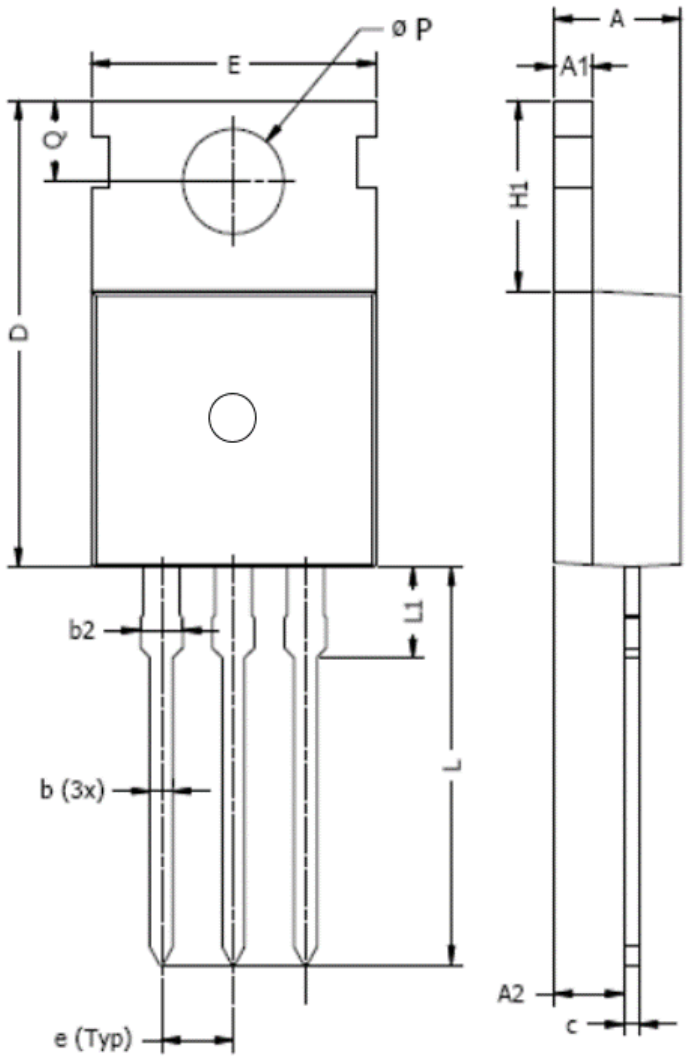


Figure 3. Fixed Output Regulator

TO-220 Package information



Symbol	Dimensions in Millimeters(mm)		Dimensions In Inches	
	Min	Max	Min	Max
A	3.600	4.800	0.142	0.189
A1	1.200	1.400	0.047	0.055
A2	2.030	2.900	0.080	0.114
b	0.400	1.000	0.016	0.039
b2	1.200	1.780	0.047	0.070
c	0.360	0.600	0.014	0.024
D	14.220	16.500	0.561	0.651
e	2.340	2.740	0.092	0.108
E	9.700	10.600	0.383	0.418
H1	5.840	6.850	0.230	0.270
L	12.700	14.700	0.501	0.580
L1	2.700	3.300	0.106	0.130
ØP	3.500	4.000	0.138	0.158
Q	2.540	3.400	0.100	0.134

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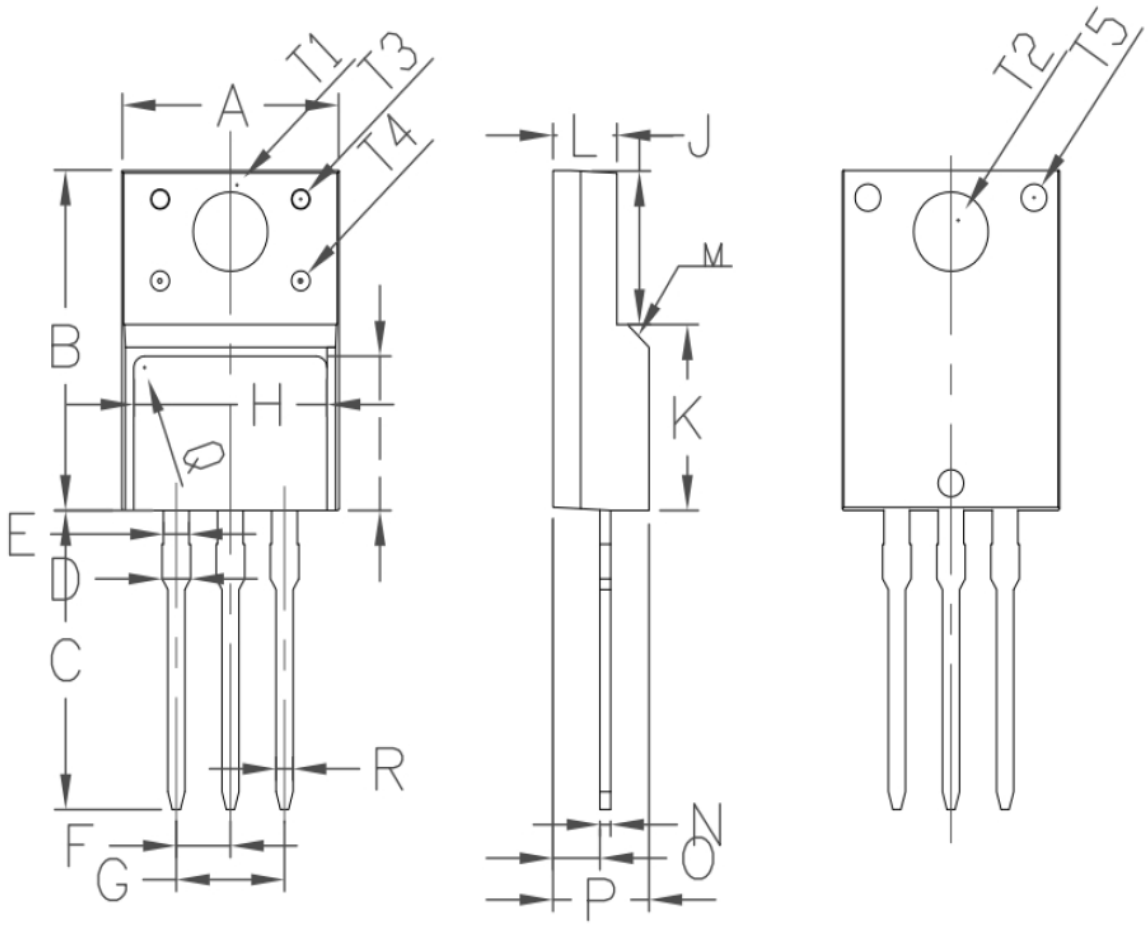
TO-220F Package information



Symbol	Dimensions in Millimeters(mm)		Dimensions In Inches	
	Min	Max	Min	Max
A	9.960	10.360	0.392	0.407
B	15.670	16.070	0.616	0.632
C	13.140	13.540	0.517	0.533
D	1.200	1.400	0.047	0.055
E	1.200TYP		0.047TYP	
F	2.540TYP		0.100TYP	
G	5.080TYP		0.200TYP	
H	7.600	8.000	0.299	0.314
I	7.100	7.500	0.279	0.295
J	6.480	6.880	0.255	0.270
K	8.990	9.390	0.353	0.369
L	2.340	2.740	0.092	0.107
M	45°TYP		45°TYP	
N	0.490	0.520	0.019	0.020
O	2.150	2.550	0.084	0.100
P	4.500	4.900	0.177	0.192
Q	0.500TYP		0.019TYP	
S	4.5°TYP		4.5°TYP	
T1	3.450TYP		0.135TYP	
T2	3.180TYP		0.125TYP	
T3	1.500TYP		0.059TYP	
T4	1.200TYP		0.047TYP	
T5	1.500TYP		0.059TYP	
R	0.770	0.830	0.030	0.032

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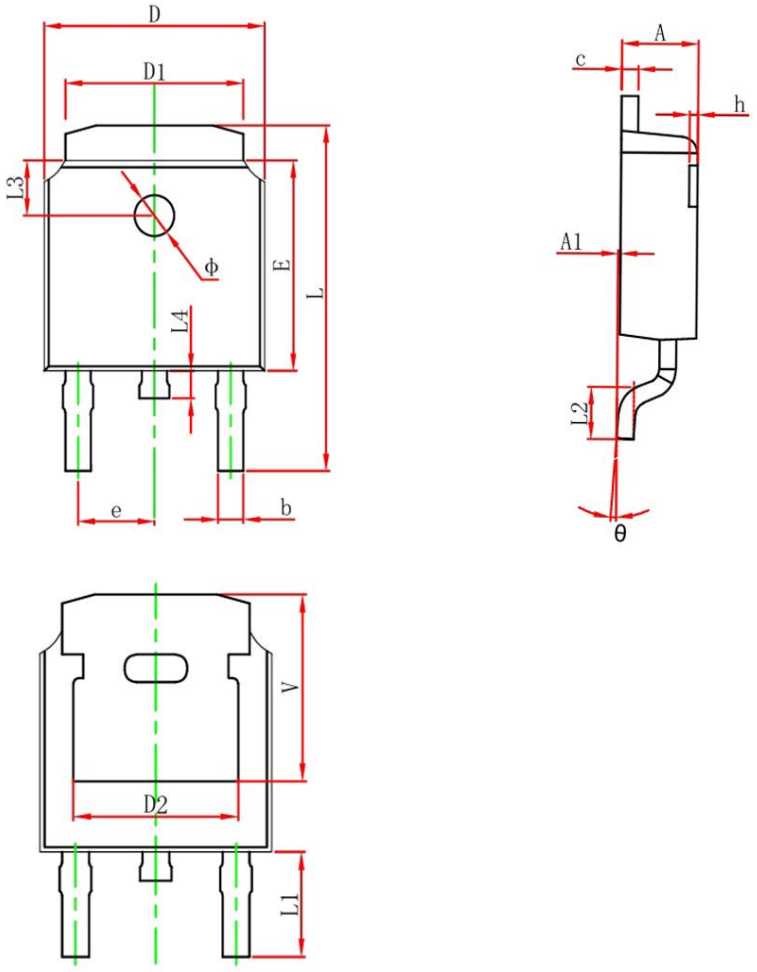
TO-252 Package information



Symbol	Dimensions in Millimeters(mm)		Dimensions In Inches	
	Min	Max	Min	Max
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.635	0.770	0.025	0.030
c	0.450	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.712	10.312	0.386	0.406
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.250 REF.		0.207 REF.	

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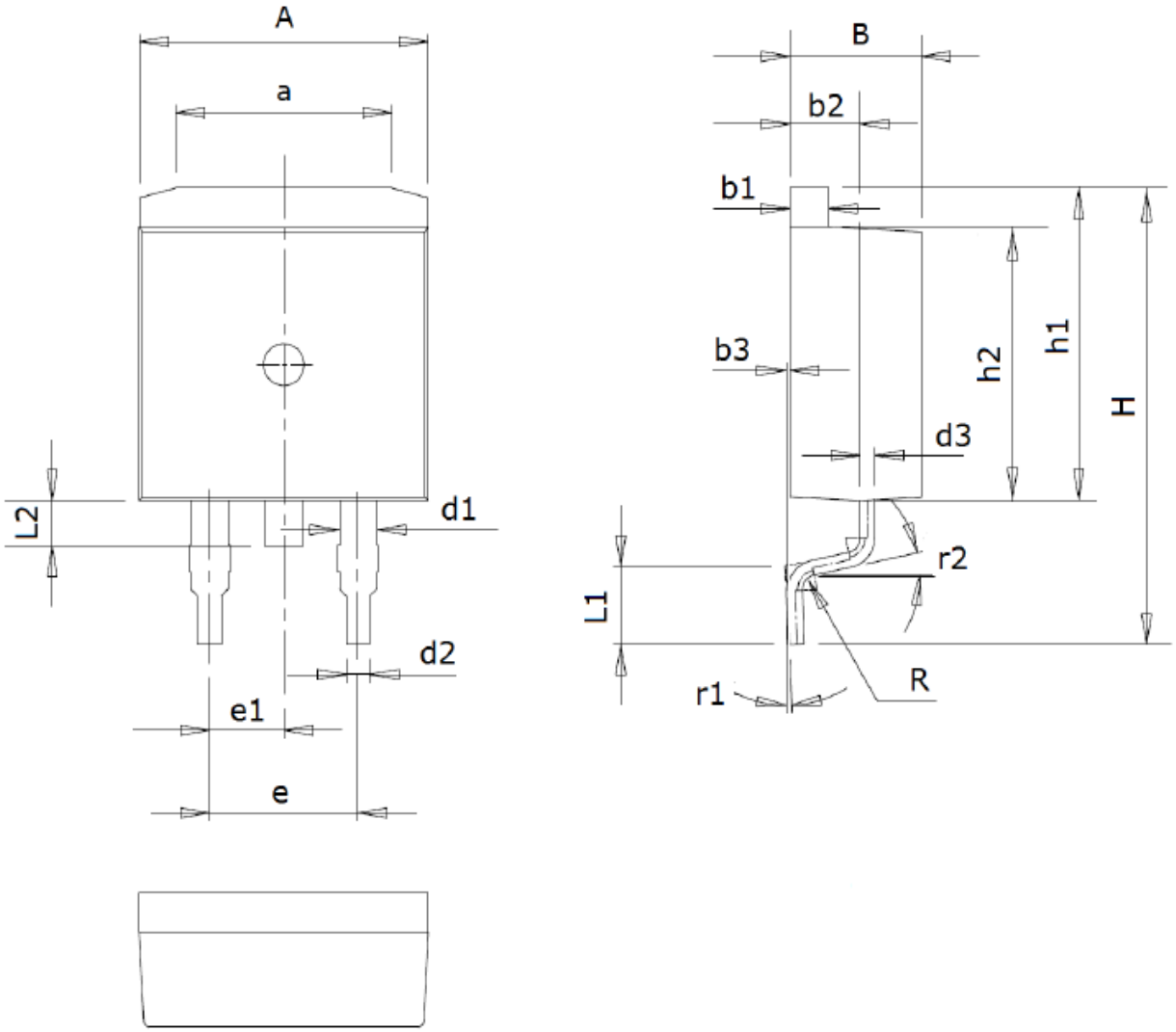
TO-263 Package information



Symbol	Dimensions in Millimeters(mm)		Symbol	Dimensions in Millimeters(mm)	
	Min	Max		Min	Max
A	9.700	10.300	e1	2.54TYP	
a	7.000	7.800	H	14.800	15.600
B	4.300	4.700	h1	10.200	10.700
b1	1.250	1.350	h2	8.900	9.400
b2	2.200	2.600	L1	2.400	2.900
b3	0.000	0.200	L2	1.300	1.800
d1	1.200	1.400	R	0.5TYP	
d2	0.700	0.900	r1	0°	8°
d3	0.400	0.600	r2	12°TYP	
e	5.08TYP				

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