30V 100mA Low Dropout Linear Regulator

■ Description

The HM78L33/HM78L05 is a fixed voltage (3.3V/5V) three-terminal integrated regulator that can be used in many applications. Its excellent internal current limit and thermal shutdown characteristics make it especially suitable for overload conditions. When used to replace the traditional Zener diode-resistor bank, its output impedance is effectively improved, but the bias current is greatly reduced。

With enough heat dissipation, HM78L33/HM78L05 can provide 100mA output current. A current limit is included to limit the peak output current to a safe value, and a safe area protection for the output transistor to limit internal power dissipation. A thermal shutdown circuit prevents the IC from overheating if the internal power dissipation is too high for the provided heat sink。

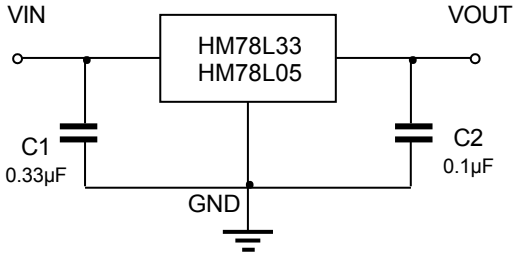
■ Features

- ±4% output voltage tolerance over temperature
- VIN range up to 30V
- Maximum output current 100mA
- Output transistor safe area protection
- Built-in Thermal Protection
- Built-in Overcurrent Protection

■ Application

- New energy (photovoltaic inverter, charging pile, etc.)
- Security (walkie-talkies, alarms, etc.)
- Mobile terminals (notebooks, sound cards, etc.)
- Electric vehicles (wipers, windows, etc.)
- LED lighting
- Smart meters

■ Typical Application Circuit



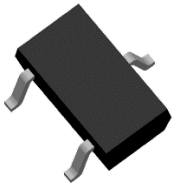
■ Package (RoHS Compliant)

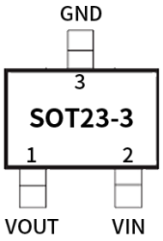
- SOT89-3
- SOT23-3
- TO-92
- SOP8

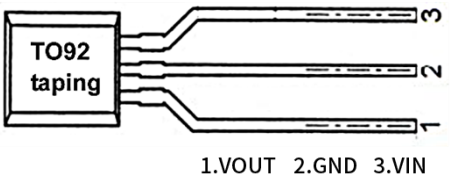
■ Ordering Information

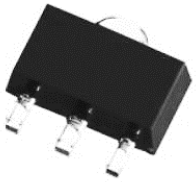
Part Number	Input voltage (V)	Output voltage (V)	Maximum output current (mA)	Quiescent Current (uA)	Output precision	PSRR（dB@120Hz）	Dropout（mV）	Enable
HM78L33 HM78L05	7~30	3.3 5	100	300	±4%	75	800@40mA	—

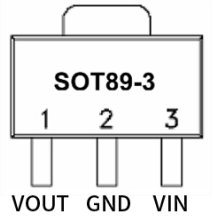
■ Pin configuration

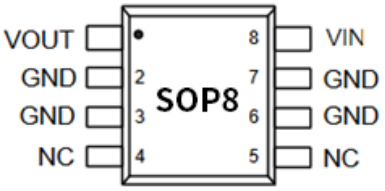






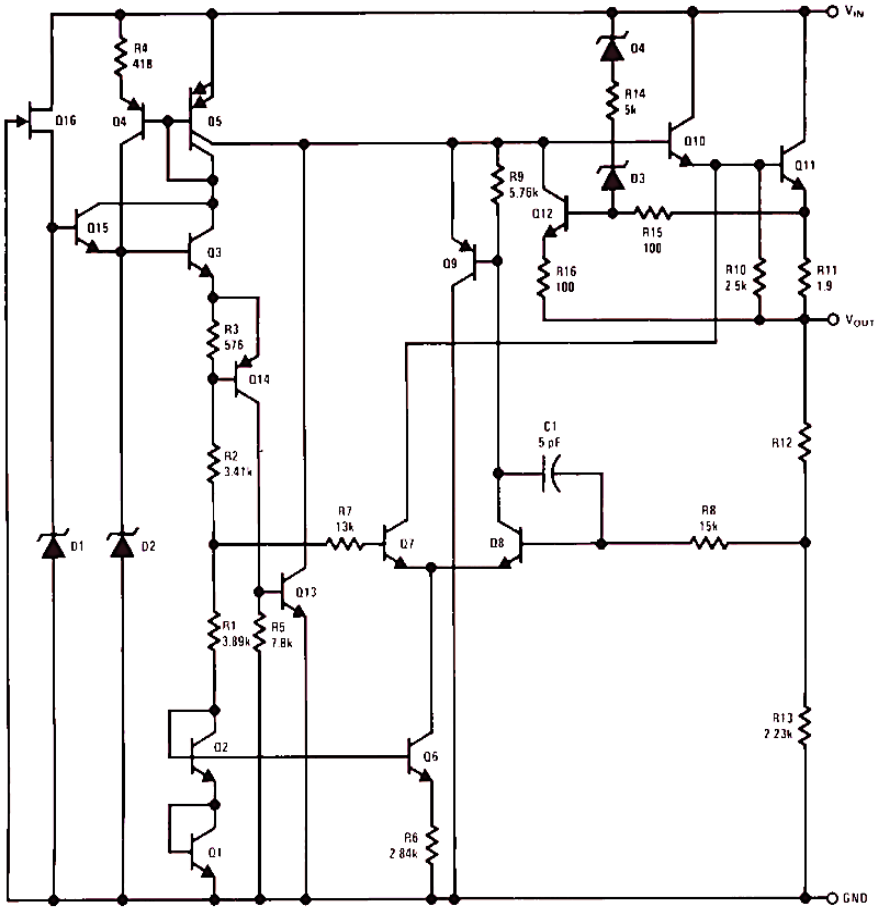






Pin Name	SOT23-3 Pin	TO-92 Pin	SOT89-3 Pin	SOP8 Pin	Pin Function
VOUT	1	1	1	1	Output Voltage Pin
GND	3	2	2	2，3，6，7	Ground
VIN	2	3	3	8	Input Voltage pin.
NC	—	—	—	4，5	Not connected

■ Functional block diagram



■ Absolute Maximum Ratings

Project	Symbol	Value	Units
Input voltage	V_{IN}	-0.3 ~ +35	V
Lead Temperature (Soldering, 10 sec.)	—	300	℃
Storage Temperature	Tstg	-65 ~ +150	℃
Junction Temperature	Tj	125	℃

■ Recommended Operating Conditions

Project	Symbol	Value	Units
Input voltage	V_{IN}	+7~ +30	V
Junction Temperature	Tj	-40 ~ +125	℃

■ Electrical Characteristics

V_{IN}=10V, I_{OUT}=40mA, C_{IN}=0.33uF, C_{OUT}=0.1uF, T_J=25℃, unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{OUT}	Output Voltage（HM78L33）	T_J = 25℃	3.168	3.3	3.432	V
		V_{IN} = 7 ~20V, I_{OUT} = 1mA~40mA T_J = 0℃~125℃	3.135		3.465	
		I_{OUT} = 1mA~70mA T_J = 0℃~125℃	3.135		3.465	
V_{OUT}	Output Voltage（HM78L05）	T_J = 25℃	4.8	5	5.2	V
		V_{IN} = 7 ~20V, I_{OUT} = 1mA~40mA T_J = 0℃~125℃	4.75		5.25	
		I_{OUT} = 1mA~70mA T_J = 0℃~125℃	4.75		5.25	
$\triangle V_{LINE}$	Line Regulation	V_{IN} = 7~20V		12	30	mV
		V_{IN} = 8~20V		10	25	
$\triangle V_{LOAD}$	Load Regulation	I_{OUT} = 1mA ~100mA		20	50	mV
		I_{OUT} = 1mA ~40mA		10	25	
I_Q	Quiescent Current	T_J = 25℃		0.3		mA
		T_J = 125℃			1	
$\triangle I_Q$	Quiescent Current Change	V_{IN} = 8 ~20V T_J = 0℃~125℃			0.2	mA
		I_{OUT} = 1mA~40mA T_J = 0℃~125℃			0.1	
PSRR	Ripple Rejection	f = 120Hz, V_{IN} = 8V~20V T_J = 25°C		75		dB
V_N	Output Noise Voltage	f = 10Hz~100KHz		32		uV
V_{DROP}	Dropout Voltage			0.8		V
$\triangle V_{OUT}/\triangle T$	V_{OUT} Temp. Coefficient	I_{OUT} = 5mA		0.4		mV/℃
I_{PK}	Peak Output Current			170		mA

■ Typical Characteristics

V_{IN}=10V, I_{OUT}=40mA, C_{IN}=0.33uF, C_{OUT}=0.1uF, T_J=25℃, unless otherwise specified

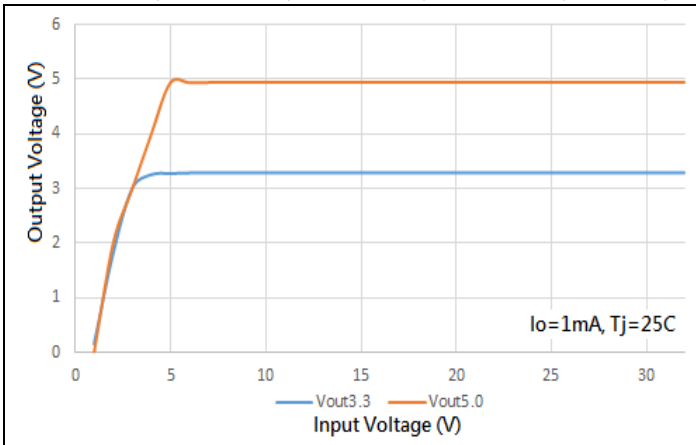


Fig 1. Output Voltage vs Input Voltage

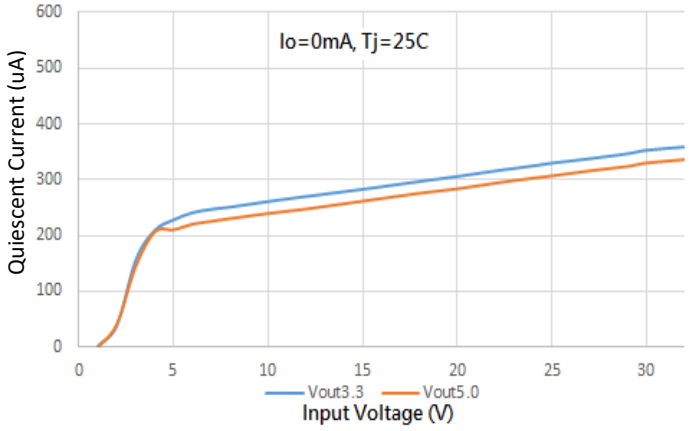


Fig 2. Quiescent Current vs Input Voltage

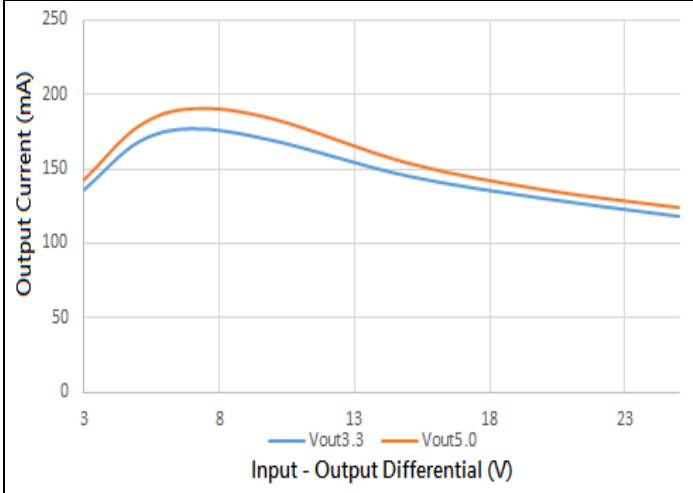


Fig 3. Peak Output Current vs Input-Output Differential

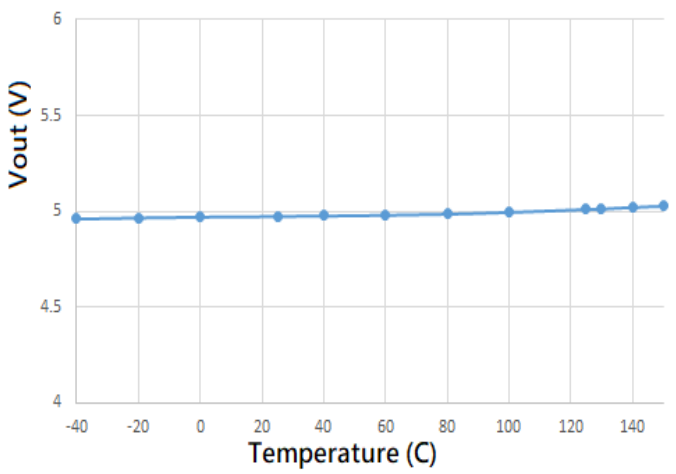


Fig 4. V_{OUT} vs Temp

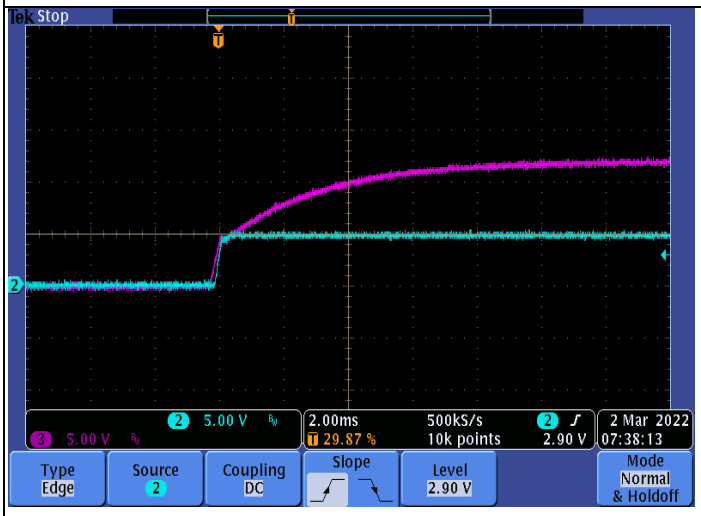


Fig 5. V_{IN} Start up

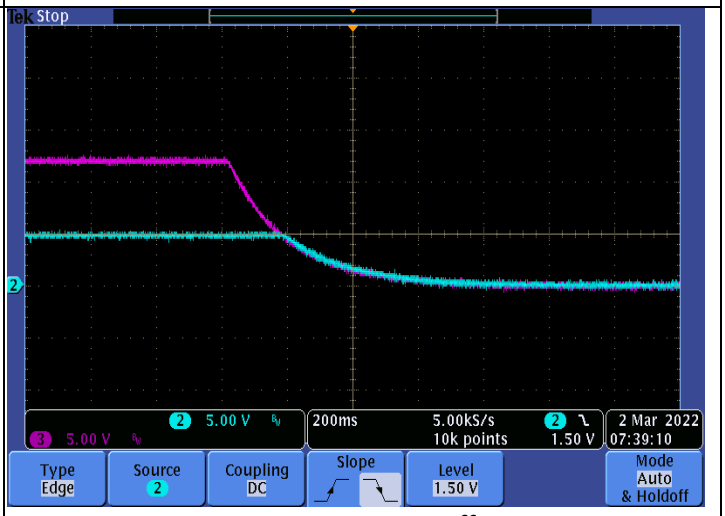


Fig 6. V_{IN} Power off

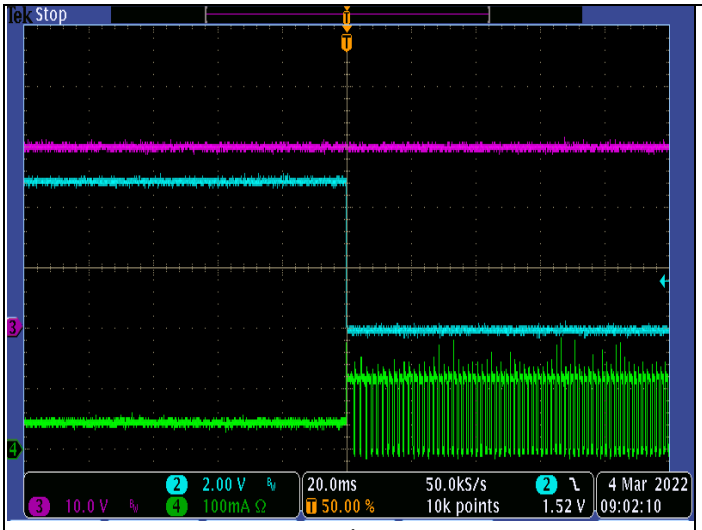


Fig 7. V_{OUT} Short to GND

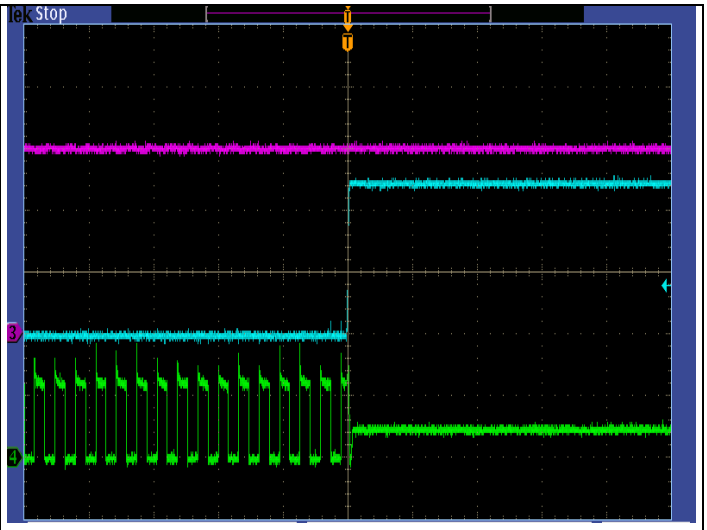


Fig 8. V_{OUT} Short and Release

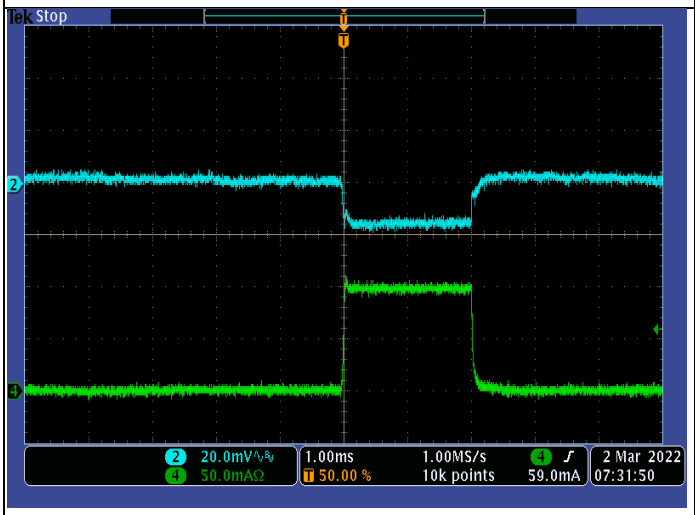


Fig 9. Load Transient

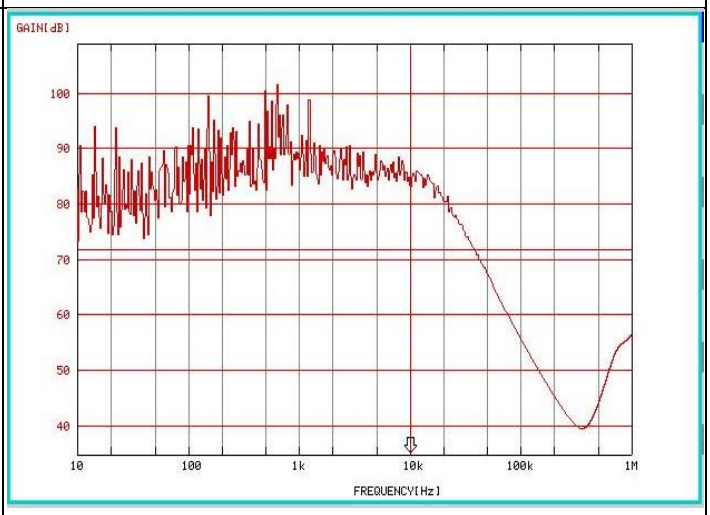


Fig 10. PSRR vs Frequency (V_{IN} = 9V, V_{OUT} = 5V)