

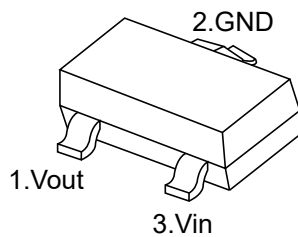
1.Description

The 78Lxx series of fixed voltage monolithic integrated circuit voltage regulators are suitable for applications that required supply up to 150mA.

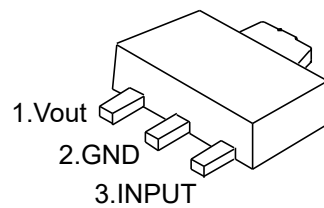
2.Features

- Maximum output current of 150mA
- Output voltage of 3.3V,5V,6V,8V,9V,10V, 12V,15V and 24V
- Thermal overload protection
- Short circuit current limiting
- Output voltage accuracy: 1%

3.Pinning information

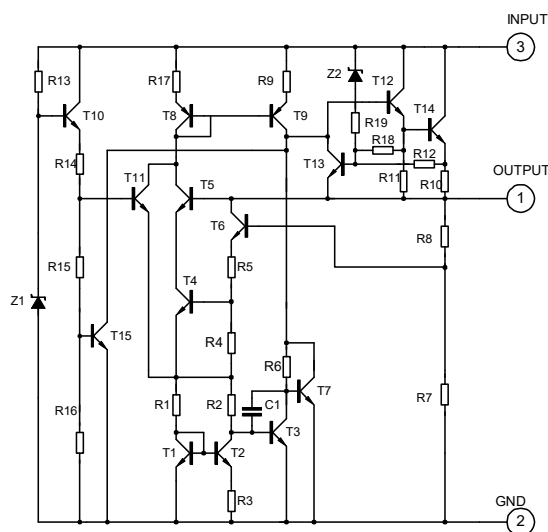


SOT-23



SOT-89

4.Block Diagram





5. Absolute Maximum Ratings

Characteristics	Symbol	Value	Units
Input voltage (for $V_O=3.3\sim 18V$) (for $V_O=24V$)	V_I	35	V
		40	V
High power dissipation	P_D	800	mW
Junction Temperature Range	T_{OPR}	-20 to 120	°C
Storage Temperature Range	T_{STG}	-55 to 150	°C

6.1 Electrical Characteristics (78L33)

($V_I=5.3V$, $I_O=40mA$, $0<T_J<125^\circ C$, $C_1=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_O	$T_J=25^\circ C$	3.267	3.3	3.333	V
Output Voltage (note 2)		$T_J=25^\circ C$	3.267		3.333	V
Load Regulation	ΔV_O	$T_J=25^\circ C$, $I_O=1mA\sim 130mA$		10	60	mV
		$T_J=25^\circ C$, $I_O=1mA\sim 70mA$		7	30	mV
Line regulation	ΔV_O	$5.3V\leq V_I\leq 20V$, $T_J=25^\circ C$		7	150	mV
		$6.3V\leq V_I\leq 20V$, $T_J=25^\circ C$		4	100	mV
Quiescent Current	I_q	$T_J=25^\circ C$		2	5.5	mA
Quiescent Current Change	ΔI_q	$6.3V\leq V_I\leq 20V$			1.5	mA
	ΔI_q	$1mA\leq I_O\leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$, $T_J=25^\circ C$		40		μV
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$		0.45		mV/°C
Ripple Rejection	RR	$6.3V\leq V_I\leq 16.3V$, $f=120Hz$, $T_J=25^\circ C$	40	49		dB
Dropout Voltage	V_d	$T_J=25^\circ C$		1.7		V



6.2 Electrical Characteristics (78L05)

($V_i=10V$, $I_o=40mA$, $0<T_J<125^{\circ}C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_o	$T_J=25^{\circ}C$	4.95	5	5.05	V
Output Voltage (note 2)		$T_J=25^{\circ}C$	4.95	5	5.05	V
Load Regulation	ΔV_o	$T_J=25^{\circ}C$, $I_o=1mA\sim 130mA$		11	60	mV
		$T_J=25^{\circ}C$, $I_o=1mA\sim 40mA$		5	30	mV
Line regulation	ΔV_o	$7V\leq V_i\leq 20V$, $T_J=25^{\circ}C$		8	150	mV
		$8V\leq V_i\leq 20V$, $T_J=25^{\circ}C$		6	100	mV
Quiescent Current	I_q			2	5.5	mA
Quiescent Current Change	ΔI_q	$8V\leq V_i\leq 20V$			1.5	mA
	ΔI_q	$1mA\leq V_i\leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$		40		μV
Temperature coefficient of V_o	$\Delta V_o/\Delta T$	$I_o=5mA$		0.65		$mV/^{\circ}C$
Ripple Rejection	RR	$8V\leq V_i\leq 20V$, $f=120Hz$, $T_J=25^{\circ}C$	40	49		dB
Dropout Voltage	V_d	$T_J=25^{\circ}C$		1.7		V



6.3 Electrical Characteristics (78L06)

($V_i=12V$, $I_o=40mA$, $0<T_J<125^{\circ}C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_o	$T_J=25^{\circ}C$	5.94	6	6.06	V
Output Voltage (note 2)		$T_J=25^{\circ}C$	5.94	6	6.06	V
Load Regulation	ΔV_o	$T_J=25^{\circ}C$, $I_o=1mA\sim 130mA$		12.8	80	mV
		$T_J=25^{\circ}C$, $I_o=1mA\sim 70mA$		5.8	40	mV
Line regulation	ΔV_o	$8.5V\leq V_i\leq 20V$, $T_J=25^{\circ}C$		64	175	mV
		$9V\leq V_i\leq 20V$, $T_J=25^{\circ}C$		54	125	mV
Quiescent Current	I_q			2	5.5	mA
Quiescent Current Change	ΔI_q	$9V\leq V_i\leq 20V$			1.5	mA
	ΔI_q	$1mA\leq V_i\leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$		49		μV
Temperature coefficient of V_o	$\Delta V_o/\Delta T$	$I_o=5mA$		0.75		mV/ $^{\circ}C$
Ripple Rejection	RR	$10V\leq V_i\leq 20V$, $f=120Hz$, $T_J=25^{\circ}C$	38	46		dB
Dropout Voltage	V_d	$T_J=25^{\circ}C$		1.7		V



6.4 Electrical Characteristics (78L08)

($V_i=14V$, $I_o=40mA$, $0<T_J<125^{\circ}C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_o	$T_J=25^{\circ}C$	7.92	8	8.08	V
Output Voltage (note 2)		$T_J=25^{\circ}C$	7.92	8	8.08	V
Load Regulation	ΔV_o	$T_J=25^{\circ}C$, $I_o=1mA\sim 130mA$		15	80	mV
		$T_J=25^{\circ}C$, $I_o=1mA\sim 70mA$		8	40	mV
Line regulation	ΔV_o	$10.5V\leq V_i\leq 23V$, $T_J=25^{\circ}C$		10	175	mV
		$11V\leq V_i\leq 23V$, $T_J=25^{\circ}C$		8	125	mV
Quiescent Current	I_q			2	5.5	mA
Quiescent Current Change	ΔI_q	$11V\leq V_i\leq 23V$			1.5	mA
	ΔI_q	$1mA\leq V_i\leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$		49		μV
Temperature coefficient of V_o	$\Delta V_o/\Delta T$	$I_o=5mA$		0.75		$mV/^{\circ}C$
Ripple Rejection	RR	$11V\leq V_i\leq 23V$, $f=120Hz$, $T_J=25^{\circ}C$	36	45		dB
Dropout Voltage	V_d	$T_J=25^{\circ}C$		1.7		V



6.5 Electrical Characteristics (78L09)

($V_i=15V$, $I_o=40mA$, $0<T_J<125^{\circ}C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_o	$T_J=25^{\circ}C$	8.91	9	9.09	V
Output Voltage (note 2)		$T_J=25^{\circ}C$	8.91	9	9.09	V
Load Regulation	ΔV_o	$T_J=25^{\circ}C$, $I_o=1mA\sim 130mA$		20	90	mV
		$T_J=25^{\circ}C$, $I_o=1mA\sim 40mA$		10	45	mV
Line regulation	ΔV_o	$11.5V\leq V_i\leq 24V$, $T_J=25^{\circ}C$		90	200	mV
		$13V\leq V_i\leq 24V$, $T_J=25^{\circ}C$		100	150	mV
Quiescent Current	I_q			2	5.5	mA
Quiescent Current Change	ΔI_q	$13V\leq V_i\leq 24V$			1.5	mA
	ΔI_q	$1mA\leq V_i\leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$		49		μV
Temperature coefficient of V_o	$\Delta V_o/\Delta T$	$I_o=5mA$		0.75		$mV/^{\circ}C$
Ripple Rejection	RR	$12V\leq V_i\leq 23V$, $f=120Hz$, $T_J=25^{\circ}C$	36	44		dB
Dropout Voltage	V_d	$T_J=25^{\circ}C$		1.7		V



6.6 Electrical Characteristics (78L12)

($V_i=19V$, $I_o=40mA$, $0<T_J<125^{\circ}C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_o	$T_J=25^{\circ}C$	11.88	12	12.12	V
Output Voltage (note 2)		$T_J=25^{\circ}C$	11.88	12	12.12	V
Load Regulation	ΔV_o	$T_J=25^{\circ}C$, $I_o=1mA\sim 130mA$		25	150	mV
		$T_J=25^{\circ}C$, $I_o=1mA\sim 40mA$		12	75	mV
Line regulation	ΔV_o	$14.5V\leq V_i\leq 27V$, $T_J=25^{\circ}C$		25	300	mV
		$16V\leq V_i\leq 27V$, $T_J=25^{\circ}C$		20	250	mV
Quiescent Current	I_q			2	5.5	mA
Quiescent Current Change	ΔI_q	$16V\leq V_i\leq 27V$			1.5	mA
	ΔI_q	$1mA\leq V_i\leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$		80		μV
Temperature coefficient of V_o	$\Delta V_o/\Delta T$	$I_o=5mA$		1		$mV/^{\circ}C$
Ripple Rejection	RR	$15V\leq V_i\leq 25V$, $f=120Hz$, $T_J=25^{\circ}C$	36	42		dB
Dropout Voltage	V_d	$T_J=25^{\circ}C$		1.7		V



6.7 Electrical Characteristics (78L15)

($V_i=23V$, $I_o=40mA$, $0<T_J<125^{\circ}C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_o	$T_J=25^{\circ}C$	14.85	15	15.15	V
Output Voltage (note 2)		$T_J=25^{\circ}C$	14.85	15	15.15	V
Load Regulation	ΔV_o	$T_J=25^{\circ}C$, $I_o=1mA\sim 130mA$		20	150	mV
		$T_J=25^{\circ}C$, $I_o=1mA\sim 70mA$		25	150	mV
Line regulation	ΔV_o	$17.5V\leq V_i\leq 30V$, $T_J=25^{\circ}C$		25	150	mV
		$20V\leq V_i\leq 30V$, $T_J=25^{\circ}C$		15	75	mV
Quiescent Current	I_q			2.2	6	mA
Quiescent Current Change	ΔI_q	$20V\leq V_i\leq 30V$			1.5	mA
	ΔI_q	$1mA\leq V_i\leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$		90		μV
Temperature coefficient of V_o	$\Delta V_o/\Delta T$	$I_o=5mA$		1.3		$mV/^{\circ}C$
Ripple Rejection	RR	$18.5V\leq V_i\leq 28.5V$, $f=120Hz$, $T_J=25^{\circ}C$	33	39		dB
Dropout Voltage	V_d	$T_J=25^{\circ}C$		1.7		V



6.8 Electrical Characteristics (78L18)

($V_I=27V$, $I_O=40mA$, $0<T_J<125^{\circ}C$, $C_1=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_O	$T_J=25^{\circ}C$	17.82	18	18.18	V
Output Voltage (note 2)		$T_J=25^{\circ}C$	17.82	18	18.18	V
Load Regulation	ΔV_O	$T_J=25^{\circ}C$, $I_O=1mA\sim 130mA$		30	170	mV
		$T_J=25^{\circ}C$, $I_O=1mA\sim 40mA$		15	85	mV
Line regulation	ΔV_O	$21V\leq V_I\leq 33V$, $T_J=25^{\circ}C$		145	300	mV
		$22V\leq V_I\leq 33V$, $T_J=25^{\circ}C$		135	250	mV
Quiescent Current	I_q			2.2	6	mA
Quiescent Current Change	ΔI_q	$21V\leq V_I\leq 33V$			1.5	mA
	ΔI_q	$1mA\leq V_I\leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$		150		μV
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$		1.8		mV/ $^{\circ}C$
Ripple Rejection	RR	$23V\leq V_I\leq 33V$, $f=120Hz$, $T_J=25^{\circ}C$	32	38		dB
Dropout Voltage	V_d	$T_J=25^{\circ}C$		1.7		V



6.9 Electrical Characteristics (78L24)

($V_i=33V$, $I_o=40mA$, $0<T_J<125^{\circ}C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified) (Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Voltage	V_o	$T_J=25^{\circ}C$	23.76	24	24.24	V
Output Voltage (note 2)		$T_J=25^{\circ}C$	23.76	24	24.24	V
Load Regulation	ΔV_o	$T_J=25^{\circ}C$, $I_o=1mA\sim 130mA$		40	200	mV
		$T_J=25^{\circ}C$, $I_o=1mA\sim 40mA$		20	100	mV
Line regulation	ΔV_o	$27V\leq V_i\leq 38V$, $T_J=25^{\circ}C$		160	300	mV
		$28V\leq V_i\leq 38V$, $T_J=25^{\circ}C$		150	250	mV
Quiescent Current	I_q			2.2	6	mA
Quiescent Current Change	ΔI_q	$21V\leq V_i\leq 38V$			1.5	mA
	ΔI_q	$1mA\leq V_i\leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$		200		μV
Temperature coefficient of V_o	$\Delta V_o/\Delta T$	$I_o=5mA$		2		$mV/^{\circ}C$
Ripple Rejection	RR	$27V\leq V_i\leq 38V$, $f=120Hz$, $T_J=25^{\circ}C$	30	37		dB
Dropout Voltage	V_d	$T_J=25^{\circ}C$		1.7		V

Notes

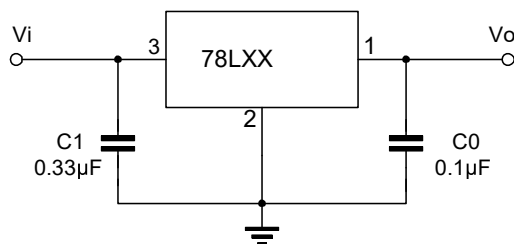
1: The Maximum steady state usable output current and input voltage are very dependent on the heating sinking and/or lead temperature length of the package. The data above represent pulse test conditions with junction temperatures as indicated at the initiation of test.

Note 2: Power dissipation $<0.75W$.

Note 3: Output voltage of 78Lxx.



7. Typical Application



Note 1: To specify an output voltage, substitute voltage value for "XX".

Note 2: Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators

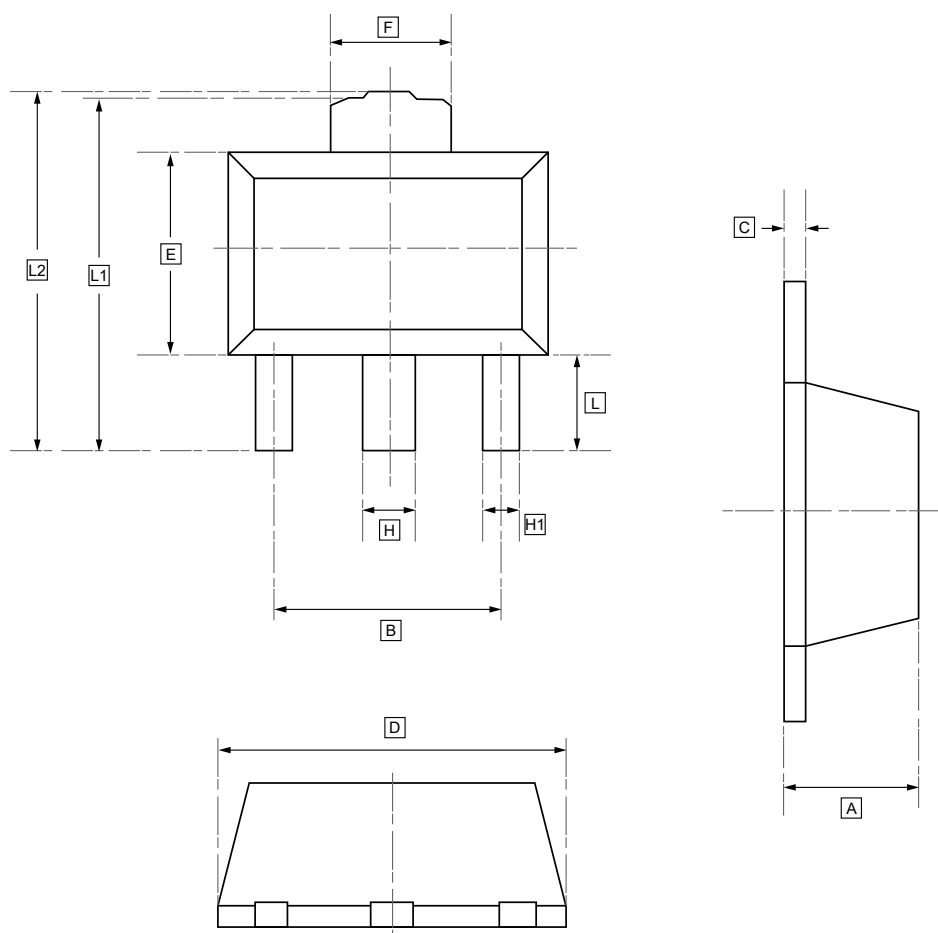


8. Typical characteristic

Figure 1: 78L05/12 Output Voltage vs Ambient Temperature	Figure 2: 78L05/12 Quiescent Current vs Output Current
Figure 3: 78L05 Quiescent Current vs Input	Figure 4: 78 L05/12/24 Thermal Shutdown
Figure 5: 78 L05/12/24 Output Characteristics	Figure 6: 78 L05 Dropout Characteristics



9.1 SOT-89 Package Outline Dimensions

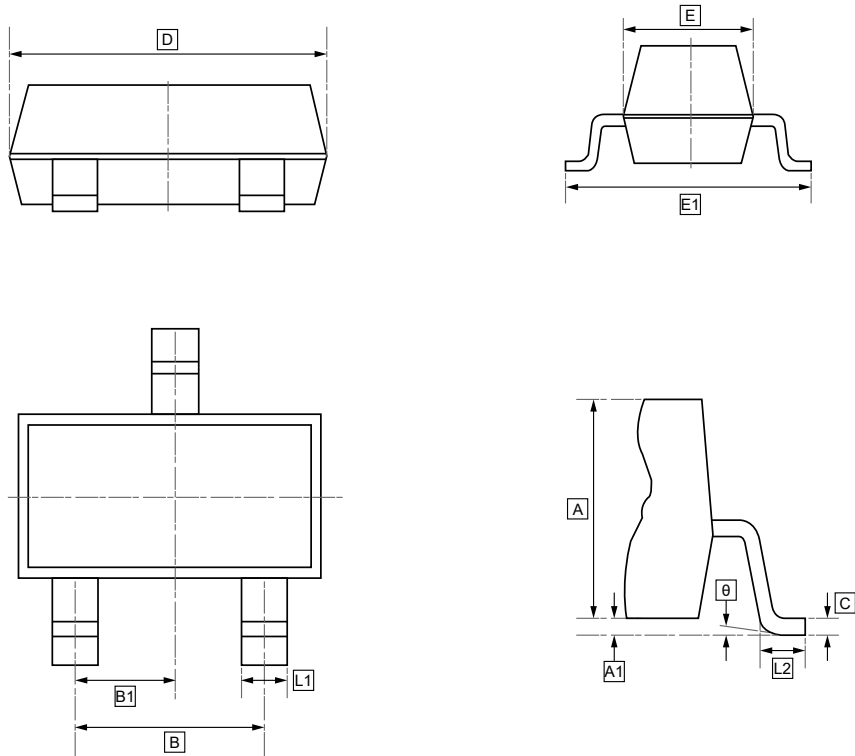


DIMENSIONS (mm are the original dimensions)

Symbol	A	B	C	D	E	F	H	H1	L	L1	L2
Min	1.450	2.950	0.330	4.450	2.450	1.650	0.450	0.370	0.900	4.100	4.100
Max	1.550	3.050	0.430	4.550	2.550	1.750	0.580	0.480	1.000	4.300	4.350



9.2 SOT-23 Package Outline Dimensions

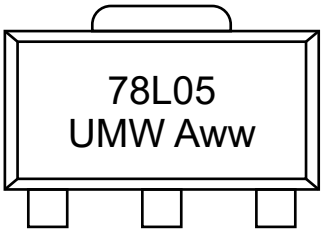


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	L1	L2	C	D	E	E1	B	B1	θ
Min	0.900	0.020	0.300	0.300	0.100	2.800	1.200	2.300	1.800	0.950	0°
Max	1.100	0.100	0.500	0.500	0.120	3.000	1.400	2.500	2.000	TYP	8°



10.Ordering Information



Order Code	Marking	Package	Base QTY	Delivery Mode
UMW78L33-150	78L33	SOT-89	1000	Tape and reel
UMW 78L05-150	78L05	SOT-89	1000	Tape and reel
UMW 78L06-150	78L06	SOT-89	1000	Tape and reel
UMW 78L08-150	78L08	SOT-89	1000	Tape and reel
UMW 78L09-150	78L09	SOT-89	1000	Tape and reel
UMW78L12-150	78L12	SOT-89	1000	Tape and reel
UMW78L15-150	78L15	SOT-89	1000	Tape and reel
UMW78L18-150	78L18	SOT-89	1000	Tape and reel
UMW78L24-150	78L24	SOT-89	1000	Tape and reel
UMW 78L05S-150	L05	SOT-23	3000	Tape and reel



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