

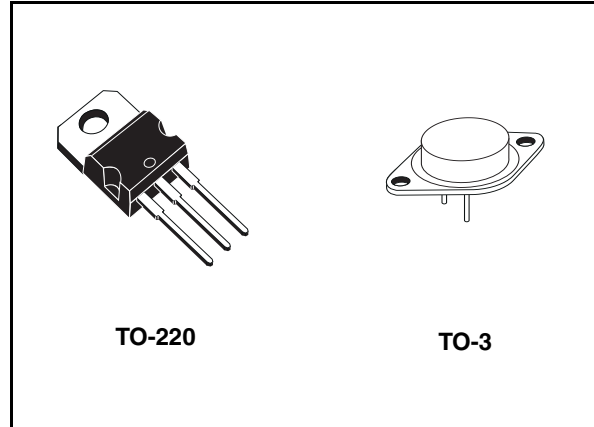
## 2 A positive voltage regulators

### Features

- Output current to 2 A
- Output voltages of 5; 7.5; 9; 10; 12; 15; 18; 24 V
- Thermal overload protection
- Short circuit protection
- Output transition SOA protection

### Description

The L78Sxx series of three-terminal positive regulators is available in TO-220 and TO-3 packages and with several fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 2 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.



**Table 1. Device summary**

Part numbers			
L78S05	L78S09	L78S12	L78S18
L78S05C	L78S09C	L78S12C	L78S18C
L78S75	L78S10	L78S15	L78S24
L78S75C	L78S10C	L78S15C	L78S24C

### 3 Maximum ratings

**Table 2. Absolute maximum ratings**

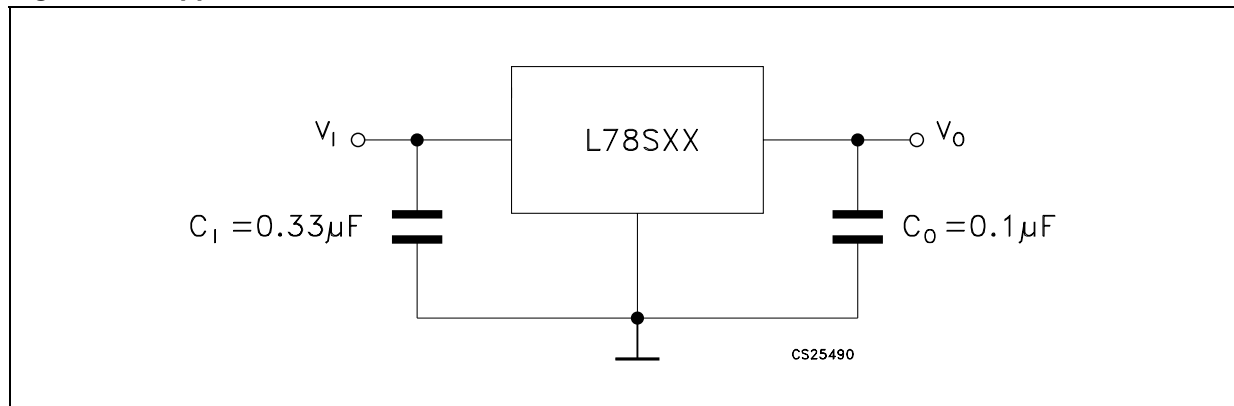
Symbol	Parameter		Value	Unit
$V_I$	DC input voltage	for $V_O = 5$ to 18V	35	V
		for $V_O = 24$ V	40	
$I_O$	Output current		Internally limited	
$P_D$	Power dissipation		Internally limited	
$T_{STG}$	Storage temperature range		-65 to 150	°C
$T_{OP}$	Operating junction temperature range	for L78Sxx	-55 to 150	°C
		for L78SxxC	0 to 150	

*Note:* Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

**Table 3. Thermal data**

Symbol	Parameter	TO-220	TO-3	Unit
$R_{thJC}$	Thermal resistance junction-case	5	4	°C/W
$R_{thJA}$	Thermal resistance junction-ambient	50	35	°C/W

**Figure 4. Application circuits**



## 5 Electrical characteristics

**Table 4. Electrical characteristics of L78S05** (refer to the test circuits,  $T_J = 25\text{ }^\circ\text{C}$ ,  $V_I = 10\text{ V}$ ,  $I_O = 500\text{ mA}$ , unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage		4.8	5	5.2	V
$V_O$	Output voltage	$I_O = 1\text{ A}$ , $V_I = 7\text{ V}$	4.75	5	5.25	V
$\Delta V_O$	Line regulation	$V_I = 7\text{ to }25\text{ V}$			100	mV
		$V_I = 8\text{ to }25\text{ V}$			50	
$\Delta V_O$	Load regulation	$I_O = 20\text{ mA to }2\text{ A}$			100	mV
$I_Q$	Quiescent current				8	mA
$\Delta I_Q$	Quiescent current change	$I_O = 20\text{ mA to }1\text{ A}$			0.5	mA
		$V_I = 7\text{ to }25\text{ V}$ , $I_O = 20\text{ mA}$			1.3	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$ , $T_J = -55\text{ }^\circ\text{C to }150\text{ }^\circ\text{C}$		-1.1		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz to }100\text{ kHz}$		40		$\mu\text{V}$
SVR	Supply voltage rejection	$f = 120\text{ Hz}$	60			dB
$V_I$	Operating input voltage	$I_O \leq 1\text{ A}$	8			V
$R_O$	Output resistance	$f = 1\text{ kHz}$		17		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 27\text{ V}$		500		mA
$I_{scp}$	Short circuit peak current			3		A

**Table 17. Electrical characteristics of L78S15C** (refer to the test circuits,  $T_J = 25^\circ\text{C}$ ,  $V_I = 23\text{ V}$ ,  $I_O = 500\text{ mA}$ , unless otherwise specified)

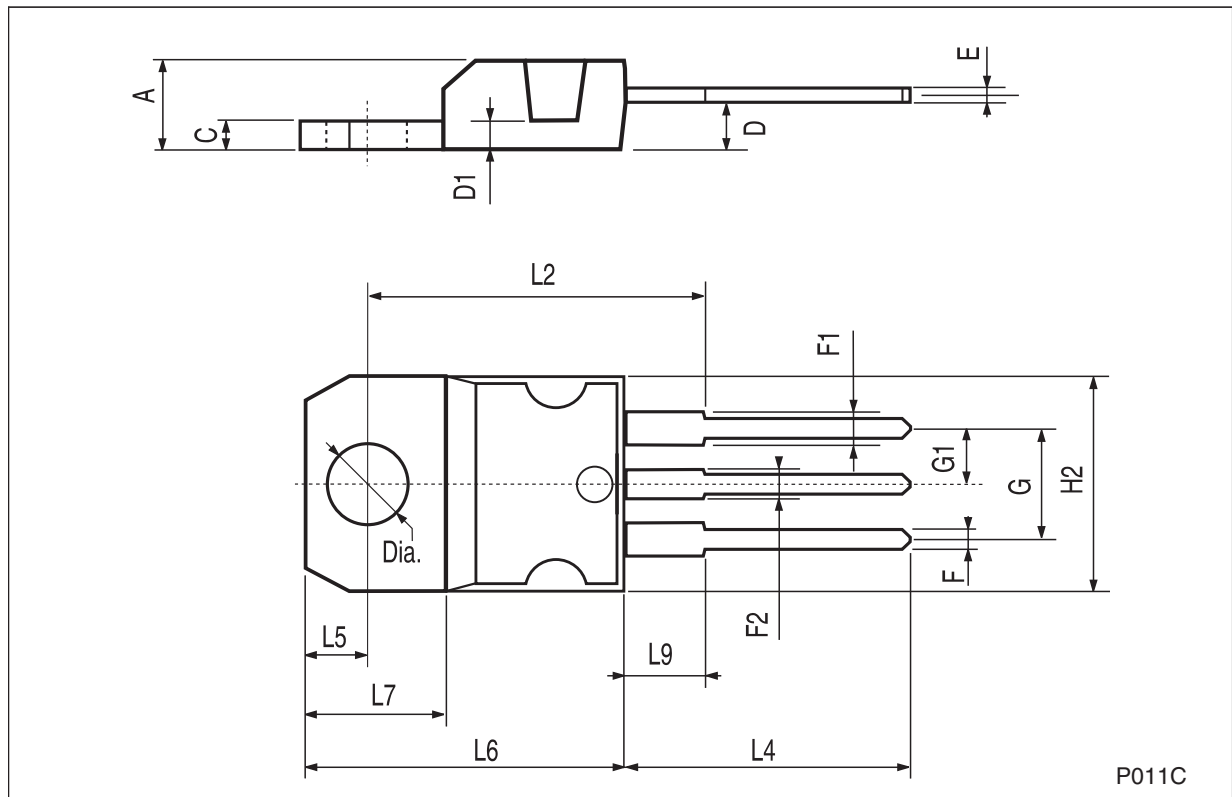
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage		14.4	15	15.6	V
$V_O$	Output voltage	$I_O = 1\text{ A}$ , $V_I = 17.5\text{ V}$	14.25	15	15.75	V
$\Delta V_O$	Line regulation	$V_I = 17.5$ to $30\text{ V}$			300	mV
		$V_I = 20$ to $26\text{ V}$			150	
$\Delta V_O$	Load regulation	$I_O = 20\text{ mA}$ to $1.5\text{ A}$			300	mV
		$I_O = 2\text{ A}$		150		
$I_Q$	Quiescent current				8	mA
$\Delta I_Q$	Quiescent current change	$I_O = 20\text{ mA}$ to $1\text{ A}$			0.5	mA
		$V_I = 17.5$ to $30\text{ V}$ , $I_O = 20\text{ mA}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$ , $T_J = 0^\circ\text{C}$ to $70^\circ\text{C}$		-1		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz}$ to $100\text{ kHz}$		90		$\mu\text{V}$
SVR	Supply voltage rejection	$f = 120\text{ Hz}$	46			dB
$V_I$	Operating input voltage	$I_O \leq 1\text{ A}$	18			V
$R_O$	Output resistance	$f = 1\text{ kHz}$		19		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 27\text{ V}$		500		mA
$I_{scp}$	Short circuit peak current			3		A

**Table 18. Electrical characteristics of L78S18C** (refer to the test circuits,  $T_J = 25^\circ\text{C}$ ,  $V_I = 26\text{ V}$ ,  $I_O = 500\text{ mA}$ , unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage		17.1	18	18.9	V
$V_O$	Output voltage	$I_O = 1\text{ A}$ , $V_I = 20.5\text{ V}$	17	18	19	V
$\Delta V_O$	Line regulation	$V_I = 20.5$ to $30\text{ V}$			360	mV
		$V_I = 22$ to $28\text{ V}$			180	
$\Delta V_O$	Load regulation	$I_O = 20\text{ mA}$ to $1.5\text{ A}$			360	mV
		$I_O = 2\text{ A}$		200		
$I_Q$	Quiescent current				8	mA
$\Delta I_Q$	Quiescent current change	$I_O = 20\text{ mA}$ to $1\text{ A}$			0.5	mA
		$V_I = 20.5$ to $30\text{ V}$ , $I_O = 20\text{ mA}$			1	
$\Delta V_O/\Delta T$	Output voltage drift	$I_O = 5\text{ mA}$ , $T_J = 0^\circ\text{C}$ to $70^\circ\text{C}$		-1		mV/ $^\circ\text{C}$
eN	Output noise voltage	$B = 10\text{ Hz}$ to $100\text{ kHz}$		110		$\mu\text{V}$
SVR	Supply voltage rejection	$f = 120\text{ Hz}$	43			dB
$V_I$	Operating input voltage	$I_O \leq 1\text{ A}$	21			V
$R_O$	Output resistance	$f = 1\text{ kHz}$		22		m $\Omega$
$I_{sc}$	Short circuit current	$V_I = 27\text{ V}$		500		mA
$I_{scp}$	Short circuit peak current			3		A

**TO-220 mechanical data**

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



## 8 Order codes

Table 20. Order codes

Part numbers	Packages		Output voltage
	TO-220	T0-3	
L78S05		L78S05T <sup>(1)</sup>	5 V
L78S05C	L78S05CV	L78S05CT <sup>(1)</sup>	5 V
L78S75		L78S75T <sup>(1)</sup>	7.5 V
L78S75C	L78S75CV	L78S75CT <sup>(1)</sup>	7.5 V
L78S09		L78S09T <sup>(1)</sup>	9 V
L78S09C	L78S09CV		9 V
L78S10		L78S10T <sup>(1)</sup>	10 V
L78S10C	L78S10CV	L78S10CT <sup>(1)</sup>	10 V
L78S12		L78S12T <sup>(1)</sup>	12 V
L78S12C	L78S12CV	L78S12CT	12 V
L78S15		L78S15T <sup>(1)</sup>	15 V
L78S15C	L78S15CV		15 V
L78S18		L78S18T <sup>(1)</sup>	18 V
L78S18C	L78S18CV		18 V
L78S24		L78S24T <sup>(1)</sup>	24 V
L78S24C	L78S24CV	L78S24CT <sup>(1)</sup>	24 V

1. Available on request.