

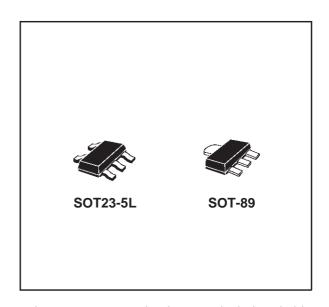
## LD2980 SERIES

# VERY LOW DROP VOLTAGE REGULATORS WITH INHIBIT

- ULTRA LOW DROPOUT VOLTAGE (0.12V TYP. AT 50mA LOAD)
- VERY LOW QUIESCENT CURRENT (MAX 1μA IN OFF MODE; TYP. 375μA AT 50mA LOAD)
- OUTPUT CURRENT UP TO 50 mA
- LOGIC-CONTROLLED ELECTRONIC SHUTDOWN
- OUTPUT VOLTAGES OF 2.85; 3.0; 3.2; 3.3; 3.8; 4.85; 5.0V
- INTERNAL CURRENT AND THERMAL LIMIT
- AVAILABLE IN ± 0.5% TOLLERANCE (AT 25°C, A VERSION)
- SUPPLY VOLTAGE REJECTION: 63dB (TYP)
- ONLY 1µF FOR STABILITY
- TEMPERATURE RANGE: -40 TO 125 °C
- SMALLEST PACKAGES SOT23-5L AND SOT-89
- FAST DYNAMIC RESPONSE TO LINE AND LOAD CHANGES

#### **DESCRIPTION**

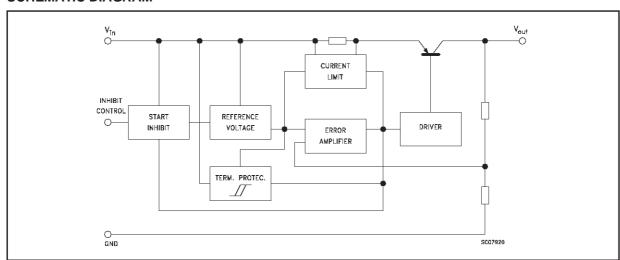
The LD2980 series are very Low Drop regulators available in SOT23-5L and SOT-89 packages. The ultra low drop-voltage and the very low



quiescent current make them particularly suitable for low noise, low power applications and in battery powered systems.

Shutdown Logic Control function is available on pin n. 3 (TTL compatible). This means that when the device is used as local regulator, it is possible to put a part of the board in standby, decreasing the total power consumption.

#### **SCHEMATIC DIAGRAM**



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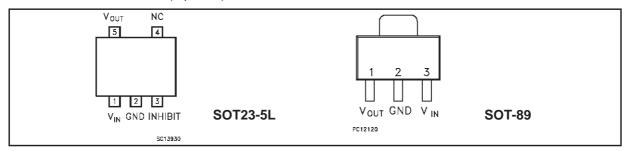
#### **ABSOLUTE MAXIMUM RATING**

Symbol	Parameter	Value	Unit
V <sub>IN</sub>	DC Input Voltage	16	V
V <sub>INH</sub>	INHBIT Input Voltage	16	V
Io	Output Current	Internally limited	mΑ
P <sub>tot</sub>	Power Dissipation	Internally limited	mW
T <sub>stg</sub>	Storage Temperature Range	- 55 to 150	°C
T <sub>op</sub>	Operating Junction Temperature Range	- 40 to 125	°C

#### **THERMAL DATA**

Symb	Parameter Parameter	SOT-89	SOT23-5L	Unit
R <sub>thj-ca</sub>	se Thermal Resistance Junction-case	15	81	°C/W

#### **CONNECTION DIAGRAM** (top view)

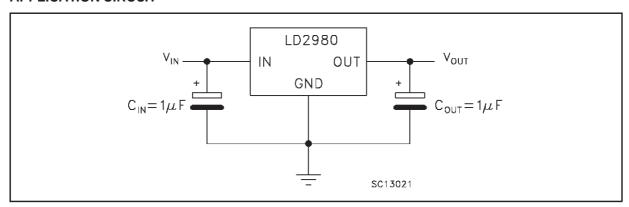


<sup>(\*)</sup> Inhibit pin is not internally pulled-up then it must not be left floating. Disable the device when connected to GND or to a positive voltage less than 0.18V

#### **ORDERING NUMBERS**

AB V	ERSION	C VE	Output Voltage	
SOT23-5L	SOT-89	SOT23-5L	SOT-89	
LD2980ABM28TR	LD2980ABU28TR	LD2980CM28TR	LD2980CU28TR	2.85 V
LD2980ABM30TR	LD2980ABU30TR	LD2980CM30TR	LD2980CU30TR	3.0 V
LD2980ABM32TR	LD2980ABU32TR	LD2980CM32TR	LD2980CU32TR	3.2 V
LD2980ABM33TR	LD2980ABU33TR	LD2980CM33TR	LD2980CU33TR	3.3 V
LD2980ABM38TR	LD2980ABU38TR	LD2980CM38TR	LD2980CU38TR	3.8 V
LD2980ABM48TR	LD2980ABU48TR	LD2980CM48TR	LD2980CU48TR	4.85 V
LD2980ABM50TR	LD2980ABU50TR	LD2980CM50TR	LD2980CU50TR	5.0 V

#### **APPLICATION CIRCUIT**



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#### **ELECTRICAL CHARACTERISTICS FOR LD2980AB** (refer to the test circuits, T<sub>J</sub> = 25 °C,

 $V_{IN} = V_{O(NOM)} + 1$ ,  $C_O = 1 \mu F$ ,  $I_O = 1 mA$ ,  $V_{inh} = 2V$ , unless otherwise specified)

Symbol	i i	mA, V <sub>inh</sub> = 2V, unless otherwise spe Test Conditions	Min.	Тур.	Max.	Unit
Vo	Output Voltage	V <sub>IN</sub> = 3.85 V	2.835	2.85	2.865	V
		$1 < I_0 < 50 \text{ mA}$	2.828		2.872	V
		1 < I <sub>o</sub> < 50 mA, -40 < T <sub>J</sub> < 125 °C	2.778	_	2.922	V
Vo	Output Voltage	$V_{IN} = 4 V$	2.985 2.977	3	3.015 3.023	V
		$1 < I_0 < 50 \text{ mA}$ $1 < I_0 < 50 \text{ mA}$ , $-40 < T_J < 125 °C$	2.977		3.023	V
Vo	Output Voltage	V <sub>IN</sub> = 4.2 V	3.184	3.2	3.216	V
	Output voltage	$1 < I_0 < 50 \text{ mA}$	3.175	0.2	3.225	v
		$1 < I_0 < 50 \text{ mA}, -40 < T_J < 125 °C$	3.12		3.28	V
Vo	Output Voltage	V <sub>IN</sub> = 4.3 V	3.283	3.3	3.317	V
		$1 < I_0 < 50 \text{ mA},$	3.275		3.325	V
		$1 < I_o < 50 \text{ mA}, -40 < T_J < 125 ^{\circ}\text{C}$	3.217		3.383	V
Vo	Output Voltage	$V_{\rm IN} = 4.8  \text{V}$	3.781 3.771	3.8	3.819	V
		$1 < I_0 < 50 \text{ mA},$ $1 < I_0 < 50 \text{ mA}, -40 < T_J < 125 °C$	3.705		3.829 3.895	V
Vo	Output Voltage	V <sub>IN</sub> = 5.85 V	4.825	4.85	4.875	V
		$1 < I_0 < 50 \text{ mA},$	4.813		4.887	v
		$1 < I_0 < 50 \text{ mA}, -40 < T_J < 125 ^{\circ}\text{C}$	4.729		4.971	V
Vo	Output Voltage	V <sub>IN</sub> = 6 V	4.975	5	5.025	V
		$1 < I_0 < 50 \text{ mA},$ $1 < I_0 < 50 \text{ mA}, -40 < T_J < 125 °C$	4.962 4.875		5.038	V
1	Output Current Limit		150		5.125	
lout		$R_L = 0$	150	0.002	0.014	mA
ΔV <sub>o</sub>	Line Regulation	$V_{O(NOM)}$ +1 < $V_{IN}$ < 16V, $I_0$ = 1 mA -40 < $T_J$ < 125 °C		0.003	0.014 0.032	%/V <sub>in</sub>
I <sub>d</sub>	Quiescent Current	ON MODE		0.5	0.5	
		$I_0 = 0 \text{ mA}$ $I_0 = 0 \text{ mA}$ $-40 < T_J < 125 °C$		65	95 125	μA μA
		I <sub>o</sub> = 1 mA		80	110	μΑ
		$I_0 = 1 \text{ mA}$ $-40 < T_J < 125 ^{\circ}\text{C}$			170	μA
		$I_0 = 10 \text{ mA}$		140	220	μΑ
		$I_0 = 10 \text{ mA}$ $-40 < T_J < 125 °C$		275	460	μΑ
		$I_0 = 50 \text{ mA}$ $I_0 = 50 \text{ mA}$ $-40 < T_J < 125 °C$		375	600 1200	μA μA
		OFF MODE			1_00	μ. ·
		V <sub>INH</sub> < 0.18 V		0		μΑ
		$V_{INH} < 0.18 \text{ V} -40 < T_{J} < 125 ^{\circ}\text{C}$			1	μA
SVR	Supply Voltage Rejection	$f = 1 \text{ KHz},  C_{out} = 10 \mu\text{F}$		63		dB
V <sub>d</sub>	Dropout Voltage	$I_0 = 0 \text{ mA}$		1	3	mV
		$I_0 = 0 \text{ mA}$ $-40 < T_J < 125 ^{\circ}\text{C}$		7	5	mV
		$I_0 = 1 \text{ mA}$ $I_0 = 1 \text{ mA}$ $-40 < T_J < 125 °C$		7	10 15	mV mV
		$I_0 = 10 \text{ mA}$		40	60	mV
		$I_0 = 10 \text{ mA}$ $-40 < T_J < 125 ^{\circ}\text{C}$			90	m۷
		$I_0 = 50 \text{ mA}$		120	150	mV
\/	Control Input Logic Low	I <sub>0</sub> = 50 mA -40 < T <sub>J</sub> < 125 °C			225	mV V
V <sub>il</sub>	Control Input Logic Low	LOW = Output OFF -40 < T <sub>J</sub> < 125 °C	2		0.18	V
V <sub>ih</sub>	Control Input Logic High Control Input Current	HIGH = Output ON -40 < T <sub>J</sub> < 125 °C	2	0	1	
l <sub>i</sub>	Control Input Current	V <sub>INH</sub> = 0 V V <sub>INH</sub> = 5 V, -40 < T <sub>J</sub> < 125 °C		0 5	-1 15	μA μA
eN	Output Noise Voltage (RMS)	BW = 300 Hz to 50 KHz, $C_{out} = 10 \mu F$		160		μV

### **ELECTRICAL CHARACTERISTICS FOR LD2980C** (refer to the test circuits, $T_J = 25$ °C,

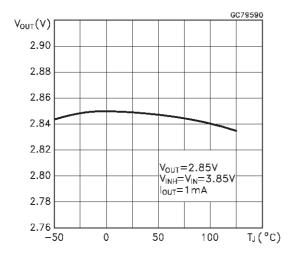
 $V_{IN} = V_{O(NOM)}$  +1,  $C_O = 1 \mu F$ ,  $I_O = 1 mA$ ,  $V_{inh} = 2V$ , unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Vo	Output Voltage	V <sub>IN</sub> = 3.85 V	2.821	2.85	2.879	V
		1 < I <sub>o</sub> < 50 mA	2.807		2.893	V
		$1 < I_0 < 50 \text{ mA}, -40 < T_J < 125 ^{\circ}\text{C}$	2.750		2.950	V
Vo	Output Voltage	$V_{IN} = 4 V$	2.970	3	3.030	V
		$ 1 < I_0 < 50 \text{ mA}$ $ 1 < I_0 < 50 \text{ mA}, -40 < T_J < 125 °C$	2.955		3.045	V V
	Outrout Valta an		2.895	0.0	3.105	
Vo	Output Voltage	$V_{IN} = 4.2 V$ 1 < $I_0$ < 50 mA	3.168 3.152	3.2	3.232 3.248	V V
		$1 < l_0 < 50 \text{ mA}$ $1 < l_0 < 50 \text{ mA}$ , $-40 < T_J < 125 °C$	3.088		3.312	V
Vo	Output Voltage	V <sub>IN</sub> = 4.3 V	3.267	3.3	3.333	V
""	Calput Vollage	$1 < I_0 < 50 \text{ mA},$	3.250	0.0	3.350	V
		$1 < I_0 < 50 \text{ mA}, -40 < T_J < 125 °C$	3.184		3.416	V
Vo	Output Voltage	V <sub>IN</sub> = 4.8 V	3.762	3.8	3.838	V
		$1 < I_0 < 50 \text{ mA},$	3.743		3.857	V
		$1 < I_0 < 50 \text{ mA}, -40 < T_J < 125 ^{\circ}\text{C}$	3.667		3.933	V
Vo	Output Voltage	V <sub>IN</sub> = 5.85 V	4.800	4.85	4.900	V
		$1 < l_0 < 50 \text{ mA},$	4.777		4.923	V
		$1 < I_0 < 50 \text{ mA}, -40 < T_J < 125 ^{\circ}\text{C}$	4.680		5.020	V
Vo	Output Voltage	$V_{IN} = 6 V$	4.950	5	5.050	V
		$ 1 < I_0 < 50 \text{ mA},$ $ 1 < I_0 < 50 \text{ mA}, -40 < T_J < 125 °C$	4.925 4.825		5.075 5.175	V V
1	Output Current Limit	R <sub>L</sub> = 0	150		3.173	mA
lout			150	0.003	0.014	
ΔV <sub>o</sub>	Line Regulation	$V_{O(NOM)}$ +1 < $V_{IN}$ < 16V, $I_0$ = 1 mA -40 < $T_J$ < 125 °C		0.003	0.014 0.032	%/V <sub>in</sub>
I <sub>d</sub>	Quiescent Current	ON MODE				
		$I_0 = 0 \text{ mA}$		65	95	μA
		$I_0 = 0 \text{ mA}$ $-40 < T_J < 125 ^{\circ}\text{C}$ $I_0 = 1 \text{ mA}$		80	125 110	μA μA
		I <sub>0</sub> = 1 mA -40 < T <sub>J</sub> < 125 °C		00	170	μΑ
		I <sub>o</sub> = 10 mA		140	220	μΑ
		$I_0 = 10 \text{ mA}$ $-40 < T_J < 125 ^{\circ}\text{C}$			460	μΑ
		$I_0 = 50 \text{ mA}$		375	600	μΑ
		$I_0 = 50 \text{ mA}$ $-40 < T_J < 125 ^{\circ}\text{C}$			1200	μΑ
		OFF MODE		_		_
		$V_{INH} < 0.18 V$ $V_{INH} < 0.18 V$ $-40 < T_{J} < 125 °C$		0	1	μΑ
CV/D	Supply Voltage Beingtien			62	'	μA
SVR	Supply Voltage Rejection	$f = 1 \text{ KHz},  C_{out} = 10 \mu\text{F}$		63		dB
V <sub>d</sub>	Dropout Voltage	$I_0 = 0 \text{ mA}$ $I_0 = 0 \text{ mA}$ $-40 < T_J < 125 °C$		1	3 5	mV mV
		I <sub>0</sub> = 0 mA -40 < 1J < 125 C		7	10	mV
		I <sub>o</sub> = 1 mA -40 < T <sub>J</sub> < 125 °C		,	15	mV
		$I_0 = 10 \text{ mA}$		40	60	mV
		$I_0 = 10 \text{ mA}$ $-40 < T_J < 125 °C$			90	mV
		$I_0 = 50 \text{ mA}$ $I_0 = 50 \text{ mA}$ $-40 < T_J < 125 °C$		120	150	mV mV
V <sub>il</sub>	Control Input Logic Low	$I_0 = 50 \text{ mA}$ $-40 < T_J < 125 °C$ $LOW = Output OFF -40 < T_J < 125 °C$			225	mV V
	Control Input Logic Low  Control Input Logic High	HIGH = Output ON $-40 < T_J < 125$ °C	2		0.18	V
V <sub>ih</sub>	' " "			0	4	
l <sub>i</sub>	Control Input Current	$V_{INH} = 0 V$ $V_{INH} = 5 V$ , $-40 < T_{J} < 125 °C$		0 5	-1 15	μA μA
eN	Output Noise Voltage (RMS)	BW = 300 Hz to 50 KHz, $C_{out} = 10 \mu\text{F}$		160		μV
CIN	Carpar voise voilage (INVIO)	5 v = 000 112 to 00 lv 12, O <sub>00t</sub> = 10 μι		100		μν

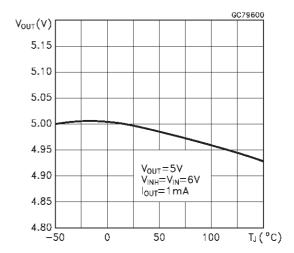
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#### TYPICAL PERFORMANCE CHARACTERISTICS (unless otherwise specified T<sub>J</sub>=25°C, C<sub>IN</sub>=C<sub>OUT</sub>=1μF)

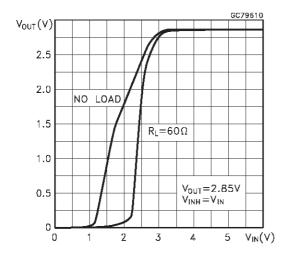
#### Output Voltage vs Temperature



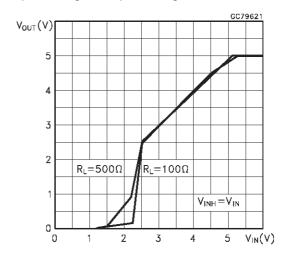
#### Output Voltage vs Temperature



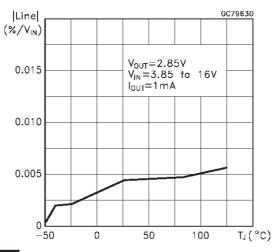
#### Output Voltage vs Input Voltage



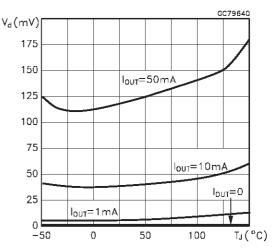
Output Voltage vs Input Voltage



#### Line Regulation vs Temperature



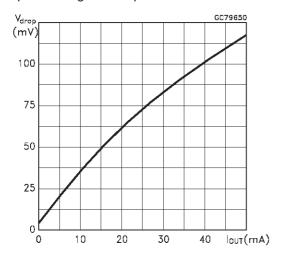
#### Dropout Voltage vs Temperature



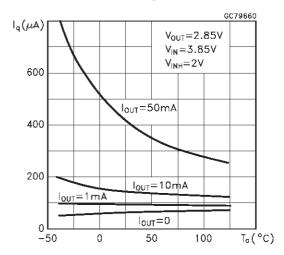
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#### TYPICAL PERFORMANCE CHARACTERISTICS (continued)

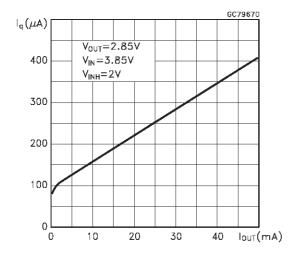
#### **Dropout Voltage vs Output Current**



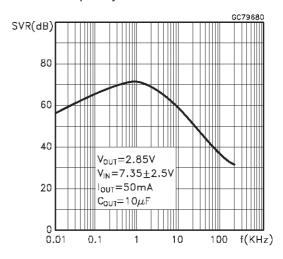
#### Quiescent Current vs Temperature



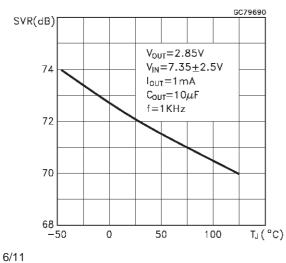
#### Quiescent Current vs Output Current



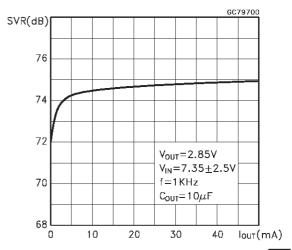
S.V.R. vs Frequency



#### S.V.R. vs Temperature

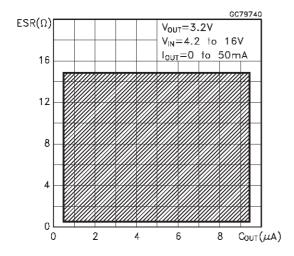


S.V.R. vs Output Current

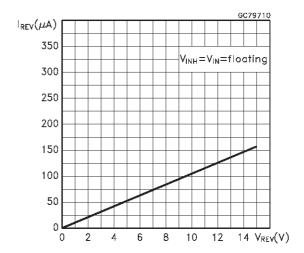


#### TYPICAL PERFORMANCE CHARACTERISTICS (continued)

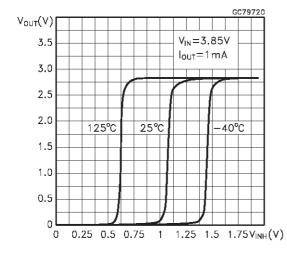
#### Stability



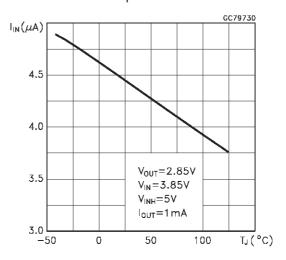
#### Reverse Current vs Reverse Voltage



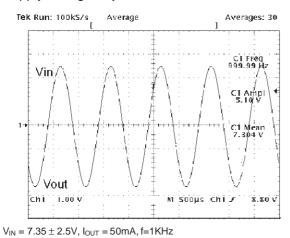
#### Output Voltage vs Inhibit Voltage



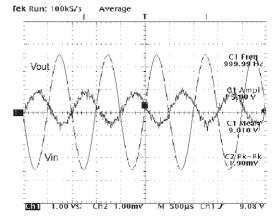
Inhibit Current vs Temperature



#### Supply Voltage Rejection at Vout = 2.85V



Supply Voltage Rejection at Vout = 5V

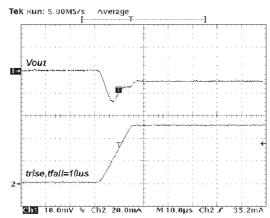


 $V_{IN}=9\pm2.5V,\,I_{OUT}=50mA,f{=}1KHz$ 

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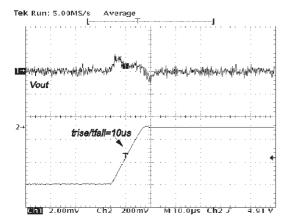
#### TYPICAL PERFORMANCE CHARACTERISTICS (continued)

#### Line Transient Response



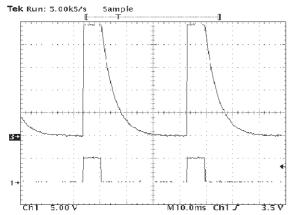
 $V_{CC}$  = 5V,  $I_{OUT}$  = 1 to 50mA,  $C_{OUT}$  = 10 $\mu\text{F},$   $C_{IN}$  = 150nF (ESR=1 $\Omega$  at 1KHz)

#### Line Transient Response



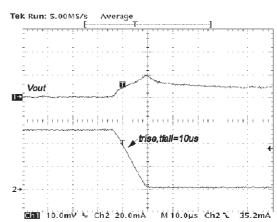
 $V_{CC}=4.75$  to 5.25V,  $I_{OUT}=0.05A,$   $C_{OUT}=10\mu F,$   $C_{IN}=150nF$  (ESR=1 $\Omega$  at 1KHz)

#### Supply Boltage Rejection



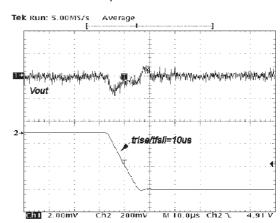
 $V_{OUT}=5V,\,V_{IN}=6V,\,V_{INH}=0$  to 5V,  $C_{IN}=\,C_{OUT}=1\,\mu F$  (Tant.)

#### Line Transient Response



 $V_{CC}$  = 5V,  $I_{OUT}$  = 50 to 1mA,  $C_{OUT}$  = 10µF,  $C_{IN}$  = 150nF (ESR=1 $\Omega$  at 1KHz)

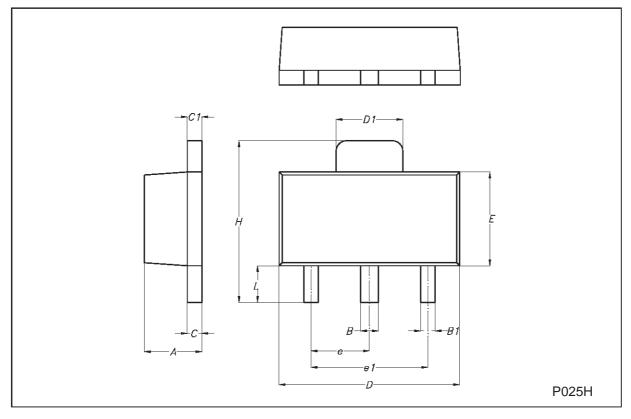
#### Line Transient Response



 $V_{CC}=5.25\,to$  6.25V,  $I_{OUT}=0.05A, C_{OUT}=10\mu F,~C_{IN}=150nF$  (ESR=1 $\Omega$  at 1KHz)

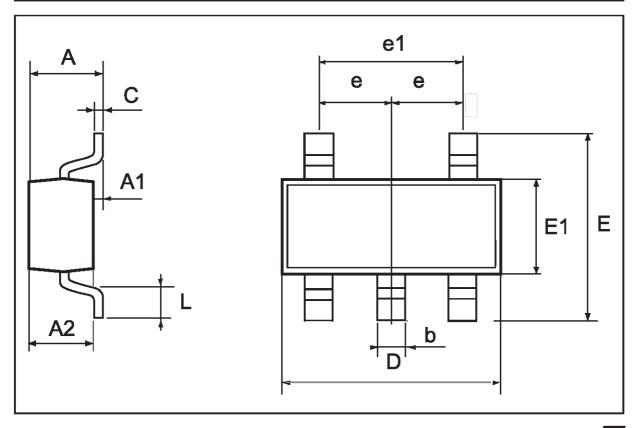
## **SOT-89 MECHANICAL DATA**

DIM.	mm			mils			
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
А	1.4		1.6	55.1		63.0	
В	0.44		0.56	17.3		22.0	
B1	0.36		0.48	14.2		18.9	
С	0.35		0.44	13.8		17.3	
C1	0.35		0.44	13.8		17.3	
D	4.4		4.6	173.2		181.1	
D1	1.62		1.83	63.8		72.0	
Е	2.29		2.6	90.2		102.4	
е	1.42		1.57	55.9		61.8	
e1	2.92		3.07	115.0		120.9	
Н	3.94		4.25	155.1		167.3	
L	0.89		1.2	35.0		47.2	



## **SOT23-5L MECHANICAL DATA**

DIM.	mm			mils			
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
А	0.90		1.45	35.4		57.1	
A1	0.00		0.15	0.0		5.9	
A2	0.90		1.30	35.4		51.2	
b	0.35		0.50	13.7		19.7	
С	0.09		0.20	3.5		7.8	
D	2.80		3.00	110.2		118.1	
Е	2.60		3.00	102.3		118.1	
E1	1.50		1.75	59.0		68.8	
L	0.35		0.55	13.7		21.6	
е		0.95			37.4		
e1		1.9			74.8		



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