



# SANYO Semiconductors DATA SHEET

## L780S00 Series — Monolithic Linear IC 5 to 24V 1A 5-Pin Voltage Regulators with Strobe Pin

### Features

- Output voltage  
L780S05 : 5V      L780S08 : 8V      L780S09 : 9V  
L780S10 : 10V    L780S12 : 12V    L780S15 : 15V  
L780S18 : 18V
- The strobe pin can be used to turn ON / OFF output voltage (active-low).
- 1A output current.
- On-chip thermal protector.
- On-chip overcurrent limiter.
- On-chip ASO protector.
- The use of package TO-220-5H (5 pins) facilitates mounting and thermal design.

### Specifications

[Common to L780S00 series]

Maximum Ratings at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max	Pin 1	35	V
Strobe input voltage	V <sub>ST</sub> max	Pin 4	18	V
Strobe input current	I <sub>ST</sub> max	Pin 4	5	mA
Allowable power dissipation	Pd max		1.75	W
		T <sub>c</sub> =25°C	20	W
Thermal resistance	θ <sub>j-c</sub>		5	°C / W
Operating temperature	T <sub>opr</sub>		-20 to +80	°C
Storage temperature	T <sub>stg</sub>		-55 to +150	°C

Strobe Operating Characteristics at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit
Strobe operation start voltage	V <sub>st(on)</sub>		2.4	V
Strobe operation stop voltage	V <sub>st(off)</sub>		0.5	V

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## L780S00 Series

[L780S05]

### Recommended Operating Conditions at $T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage range	$V_{IN}$		7.5 to 20.0	V
Output current range	$I_O$		5 to 1000	mA

### Operating Characteristics at $T_j=25^\circ\text{C}$ , $V_{IN}=10\text{V}$ , $I_O=500\text{mA}$ , $V_{st}=0\text{V}$ , $*T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	$V_{O1}$		4.8	5.0	5.2	V
	$V_{O2}$	$7\text{V} \leq V_{IN} \leq 20\text{V}$ , $5\text{mA} \leq I_O \leq 1\text{A}$	4.75		5.25	V
Line regulation 1	$\Delta V_{OLN1}$	$7\text{V} \leq V_{IN} \leq 25\text{V}$		3	100	mV
Line regulation 2	$\Delta V_{OLN2}$	$8\text{V} \leq V_{IN} \leq 12\text{V}$		1	50	mV
Load regulation 1	$\Delta V_{OLD1}$	$5\text{mA} \leq I_O \leq 1.5\text{A}$			100	mV
Load regulation 2	$\Delta V_{OLD2}$	$250\text{mA} \leq I_O \leq 750\text{mA}$			50	mV
Current dissipation	$I_{CC}$				8.0	mA
Current dissipation variation (Line)	$\Delta I_{CCLN}$	$7\text{V} \leq V_{IN} \leq 25\text{V}$			1.3	mA
Current dissipation variation (Load)	$\Delta I_{CCLD}$	$5\text{mA} \leq I_O \leq 1\text{A}$			0.5	mA
Output noise voltage	$V_{NO}$	$10\text{Hz} \leq f \leq 100\text{kHz}^*$		40		$\mu\text{V}$
Ripple rejection	$R_r$	$f=120\text{Hz}$ , $8\text{V} \leq V_{IN} \leq 18\text{V}$	62	78		dB
Dropout voltage	$V_{drop}$	$I_O=1\text{A}$		2.0		V
Output short current	$I_{OS}$	$V_{IN}=35\text{V}$		0.75		A
Peak output current	$I_{OP}$			2.2		A
Output voltage at strobe mode	$V_{O(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			0.8	V
Current dissipation at strobe mode	$I_{CC(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			3.0	mA
Strobe input current	$I_{st}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			1.0	mA

[L780S08]

### Recommended Operating Conditions at $T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage range	$V_{IN}$		10.5 to 23.0	V
Output current range	$I_O$		5 to 1000	mA

### Operating Characteristics at $T_j=25^\circ\text{C}$ , $V_{IN}=15\text{V}$ , $I_O=500\text{mA}$ , $V_{st}=0\text{V}$ , $*T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	$V_{O1}$		7.7	8.0	8.3	V
	$V_{O2}$	$10.5\text{V} \leq V_{IN} \leq 23\text{V}$ , $5\text{mA} \leq I_O \leq 1\text{A}$	7.6		8.4	V
Line regulation 1	$\Delta V_{OLN1}$	$10.5\text{V} \leq V_{IN} \leq 25\text{V}$		6.0	160	mV
Line regulation 2	$\Delta V_{OLN2}$	$11\text{V} \leq V_{IN} \leq 17\text{V}$		2.0	80	mV
Load regulation 1	$\Delta V_{OLD1}$	$5\text{mA} \leq I_O \leq 1.5\text{A}$			160	mV
Load regulation 2	$\Delta V_{OLD2}$	$250\text{mA} \leq I_O \leq 750\text{mA}$			80	mV
Current dissipation	$I_{CC}$				8.0	mA
Current dissipation variation (Line)	$\Delta I_{CCLN}$	$10.5\text{V} \leq V_{IN} \leq 25\text{V}$			1.0	mA
Current dissipation variation (Load)	$\Delta I_{CCLD}$	$5\text{mA} \leq I_O \leq 1\text{A}$			0.5	mA
Output noise voltage	$V_{NO}$	$10\text{Hz} \leq f \leq 100\text{kHz}^*$		52		$\mu\text{V}$
Ripple rejection	$R_r$	$f=120\text{Hz}$ , $11.5\text{V} \leq V_{IN} \leq 21.5\text{V}$	56	72		dB
Dropout voltage	$V_{drop}$	$I_O=1\text{A}$		2.0		V
Output short current	$I_{OS}$	$V_{IN}=35\text{V}$		0.75		A
Peak output current	$I_{OP}$			2.2		A
Output voltage at strobe mode	$V_{O(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			0.8	V
Current dissipation at strobe mode	$I_{CC(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			3.0	mA
Strobe input current	$I_{st}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			1.0	mA

## L780S00 Series

[L780S09]

### Recommended Operating Conditions at $T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage range	$V_{IN}$		11.5 to 25.0	V
Output current range	$I_O$		5 to 1000	mA

### Operating Characteristics at $T_j=25^\circ\text{C}$ , $V_{IN}=16\text{V}$ , $I_O=500\text{mA}$ , $V_{st}=0\text{V}$ , $*T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	$V_{O1}$		8.64	9.0	9.36	V
	$V_{O2}$	$11.5\text{V} \leq V_{IN} \leq 24\text{V}$ , $5\text{mA} \leq I_O \leq 1\text{A}$	8.55		9.45	V
Line regulation 1	$\Delta V_{OLN1}$	$11.5\text{V} \leq V_{IN} \leq 25\text{V}$		7	180	mV
Line regulation 2	$\Delta V_{OLN2}$	$12\text{V} \leq V_{IN} \leq 20\text{V}$		2	90	mV
Load regulation 1	$\Delta V_{OLD1}$	$5\text{mA} \leq I_O \leq 1.5\text{A}$			180	mV
Load regulation 2	$\Delta V_{OLD2}$	$250\text{mA} \leq I_O \leq 750\text{mA}$			90	mV
Current dissipation	$I_{CC}$				8.0	mA
Current dissipation variation (Line)	$\Delta I_{CCLN}$	$11.5\text{V} \leq V_{IN} \leq 26\text{V}$			1.0	mA
Current dissipation variation (Load)	$\Delta I_{CCLD}$	$5\text{mA} \leq I_O \leq 1\text{A}$			0.5	mA
Output noise voltage	$V_{NO}$	$10\text{Hz} \leq f \leq 100\text{kHz}^*$		57		$\mu\text{V}$
Ripple rejection	$R_r$	$f=120\text{Hz}$ , $12\text{V} \leq V_{IN} \leq 22\text{V}$	56	72		dB
Dropout voltage	$V_{drop}$	$I_O=1\text{A}$		2.0		V
Output short current	$I_{OS}$	$V_{IN}=35\text{V}$		0.75		A
Peak output current	$I_{OP}$			2.2		A
Output voltage at strobe mode	$V_{O(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			0.8	V
Current dissipation at strobe mode	$I_{CC(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			3.0	mA
Strobe input current	$I_{st}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			1.0	mA

[L780S10]

### Recommended Operating Conditions at $T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage range	$V_{IN}$		13.0 to 25.0	V
Output current range	$I_O$		5 to 1000	mA

### Operating Characteristics at $T_j=25^\circ\text{C}$ , $V_{IN}=17\text{V}$ , $I_O=500\text{mA}$ , $V_{st}=0\text{V}$ , $*T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	$V_{O1}$		9.6	10.0	10.4	V
	$V_{O2}$	$12.5\text{V} \leq V_{IN} \leq 25\text{V}$ , $5\text{mA} \leq I_O \leq 1\text{A}$	9.5		10.5	V
Line regulation 1	$\Delta V_{OLN1}$	$12.5\text{V} \leq V_{IN} \leq 28\text{V}$		8	200	mV
Line regulation 2	$\Delta V_{OLN2}$	$14\text{V} \leq V_{IN} \leq 20\text{V}$		2.5	100	mV
Load regulation 1	$\Delta V_{OLD1}$	$5\text{mA} \leq I_O \leq 1.5\text{A}$			200	mV
Load regulation 2	$\Delta V_{OLD2}$	$250\text{mA} \leq I_O \leq 750\text{mA}$			100	mV
Current dissipation	$I_{CC}$				8.0	mA
Current dissipation variation (Line)	$\Delta I_{CCLN}$	$12.5\text{V} \leq V_{IN} \leq 25\text{V}$			1.0	mA
Current dissipation variation (Load)	$\Delta I_{CCLD}$	$5\text{mA} \leq I_O \leq 1\text{A}$			0.5	mA
Output noise voltage	$V_{NO}$	$10\text{Hz} \leq f \leq 100\text{kHz}^*$		63		$\mu\text{V}$
Ripple rejection	$R_r$	$f=120\text{Hz}$ , $13\text{V} \leq V_{IN} \leq 23\text{V}$	55	72		dB
Dropout voltage	$V_{drop}$	$I_O=1\text{A}$		2.0		V
Output short current	$I_{OS}$	$V_{IN}=35\text{V}$		0.75		A
Peak output current	$I_{OP}$			2.2		A
Output voltage at strobe mode	$V_{O(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			0.8	V
Current dissipation at strobe mode	$I_{CC(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			3.0	mA
Strobe input current	$I_{st}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			1.0	mA

## L780S00 Series

[L780S12]

### Recommended Operating Conditions at $T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage range	$V_{IN}$		15.0 to 27.0	V
Output current range	$I_O$		5 to 1000	mA

### Operating Characteristics at $T_j=25^\circ\text{C}$ , $V_{IN}=19\text{V}$ , $I_O=500\text{mA}$ , $V_{st}=0\text{V}$ , $*T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	$V_{O1}$		11.5	12.0	12.5	V
	$V_{O2}$	$14.5\text{V} \leq V_{IN} \leq 27\text{V}$ , $5\text{mA} \leq I_O \leq 1\text{A}$	11.4		12.6	V
Line regulation 1	$\Delta V_{OLN1}$	$14.5\text{V} \leq V_{IN} \leq 30\text{V}$		10	240	mV
Line regulation 2	$\Delta V_{OLN2}$	$16\text{V} \leq V_{IN} \leq 22\text{V}$		3	120	mV
Load regulation 1	$\Delta V_{OLD1}$	$5\text{mA} \leq I_O \leq 1.5\text{A}$			240	mV
Load regulation 2	$\Delta V_{OLD2}$	$250\text{mA} \leq I_O \leq 750\text{mA}$			120	mV
Current dissipation	$I_{CC}$				8.0	mA
Current dissipation variation (Line)	$\Delta I_{CCLN}$	$14.5\text{V} \leq V_{IN} \leq 30\text{V}$			1.0	mA
Current dissipation variation (Load)	$\Delta I_{CCLD}$	$5\text{mA} \leq I_O \leq 1\text{A}$			0.5	mA
Output noise voltage	$V_{NO}$	$10\text{Hz} \leq f \leq 100\text{kHz}^*$		75		$\mu\text{V}$
Ripple rejection	$R_r$	$f=120\text{Hz}$ , $15\text{V} \leq V_{IN} \leq 25\text{V}$	55	71		dB
Dropout voltage	$V_{drop}$	$I_O=1\text{A}$		2.0		V
Output short current	$I_{OS}$	$V_{IN}=35\text{V}$		0.75		A
Peak output current	$I_{OP}$			2.2		A
Output voltage at strobe mode	$V_{O(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			0.8	V
Current dissipation at strobe mode	$I_{CC(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			3.0	mA
Strobe input current	$I_{st}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			1.0	mA

[L780S15]

### Recommended Operating Conditions at $T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage range	$V_{IN}$		18.0 to 30.0	V
Output current range	$I_O$		5 to 1000	mA

### Operating Characteristics at $T_j=25^\circ\text{C}$ , $V_{IN}=23\text{V}$ , $I_O=500\text{mA}$ , $V_{st}=0\text{V}$ , $*T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	$V_{O1}$		14.4	15.0	15.6	V
	$V_{O2}$	$17.5\text{V} \leq V_{IN} \leq 30\text{V}$ , $5\text{mA} \leq I_O \leq 1\text{A}$	14.25		15.75	V
Line regulation 1	$\Delta V_{OLN1}$	$17.5\text{V} \leq V_{IN} \leq 30\text{V}$		11	300	mV
Line regulation 2	$\Delta V_{OLN2}$	$20\text{V} \leq V_{IN} \leq 26\text{V}$		3	150	mV
Load regulation 1	$\Delta V_{OLD1}$	$5\text{mA} \leq I_O \leq 1.5\text{A}$			300	mV
Load regulation 2	$\Delta V_{OLD2}$	$250\text{mA} \leq I_O \leq 750\text{mA}$			150	mV
Current dissipation	$I_{CC}$				8.0	mA
Current dissipation variation (Line)	$\Delta I_{CCLN}$	$17.5\text{V} \leq V_{IN} \leq 30\text{V}$			1.0	mA
Current dissipation variation (Load)	$\Delta I_{CCLD}$	$5\text{mA} \leq I_O \leq 1\text{A}$			0.5	mA
Output noise voltage	$V_{NO}$	$10\text{Hz} \leq f \leq 100\text{kHz}^*$		90		$\mu\text{V}$
Ripple rejection	$R_r$	$f=120\text{Hz}$ , $18.5\text{V} \leq V_{IN} \leq 28.5\text{V}$	54	70		dB
Dropout voltage	$V_{drop}$	$I_O=1\text{A}$		2.0		V
Output short current	$I_{OS}$	$V_{IN}=35\text{V}$		0.75		A
Peak output current	$I_{OP}$			2.2		A
Output voltage at strobe mode	$V_{O(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			0.8	V
Current dissipation at strobe mode	$I_{CC(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			3.0	mA
Strobe input current	$I_{st}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			1.0	mA

## L780S0 Series

[L780S18]

### Recommended Operating Conditions at $T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage range	$V_{IN}$		21.0 to 33.0	V
Output current range	$I_O$		5 to 1000	mA

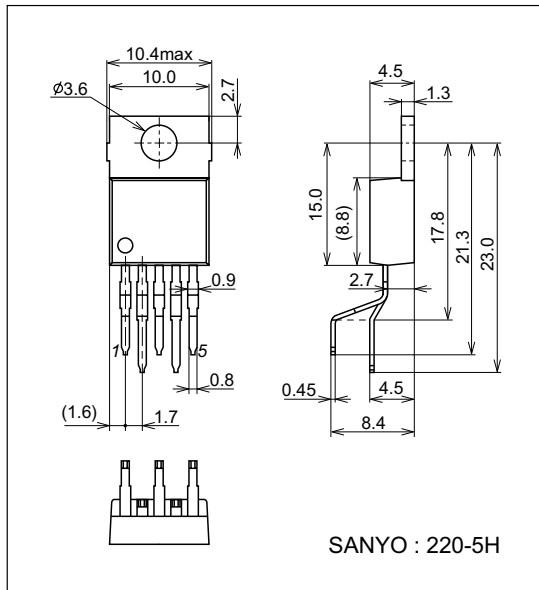
### Operating Characteristics at $T_j=25^\circ\text{C}$ , $V_{IN}=27\text{V}$ , $I_O=500\text{mA}$ , $V_{st}=0\text{V}$ , $*T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	$V_{O1}$		17.3	18.0	18.7	V
	$V_{O2}$	$21\text{V} \leq V_{IN} \leq 33\text{V}$ , $5\text{mA} \leq I_O \leq 1\text{A}$	17.1		18.9	V
Line regulation 1	$\Delta V_{OLN1}$	$21\text{V} \leq V_{IN} \leq 33\text{V}$		15	360	mV
Line regulation 2	$\Delta V_{OLN2}$	$24\text{V} \leq V_{IN} \leq 30\text{V}$		5	180	mV
Load regulation 1	$\Delta V_{OLD1}$	$5\text{mA} \leq I_O \leq 1.5\text{A}$			360	mV
Load regulation 2	$\Delta V_{OLD2}$	$250\text{mA} \leq I_O \leq 750\text{mA}$			180	mV
Current dissipation	$I_{CC}$				8.0	mA
Current dissipation variation (Line)	$\Delta I_{CCLN}$	$21\text{V} \leq V_{IN} \leq 33\text{V}$			1.0	mA
Current dissipation variation (Load)	$\Delta I_{CCLD}$	$5\text{mA} \leq I_O \leq 1\text{A}$			0.5	mA
Output noise voltage	$V_{NO}$	$10\text{Hz} \leq f \leq 100\text{kHz}^*$		110		$\mu\text{V}$
Ripple rejection	$R_r$	$f=120\text{Hz}$ , $22\text{V} \leq V_{IN} \leq 32\text{V}$	53	69		dB
Dropout voltage	$V_{drop}$	$I_O=1\text{A}$		2.0		V
Output short current	$I_{OS}$	$V_{IN}=35\text{V}$		0.75		A
Peak output current	$I_{OP}$			2.2		A
Output voltage at strobe mode	$V_{O(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			0.8	V
Current dissipation at strobe mode	$I_{CC(ston)}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			3.0	mA
Strobe input current	$I_{st}$	$V_{IN}=35\text{V}$ , $V_{st}=5\text{V}$ , $I_O=0\text{A}$ , *			1.0	mA

### Package Dimensions

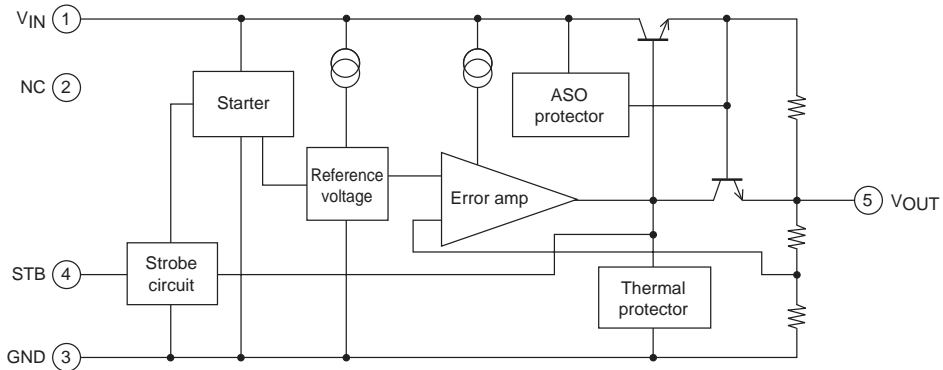
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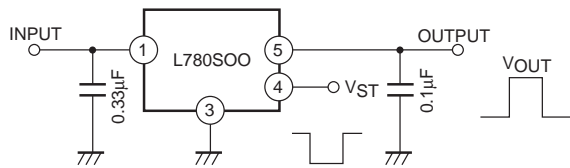
# L780S00 Series

## Equivalent Circuit Block Diagram

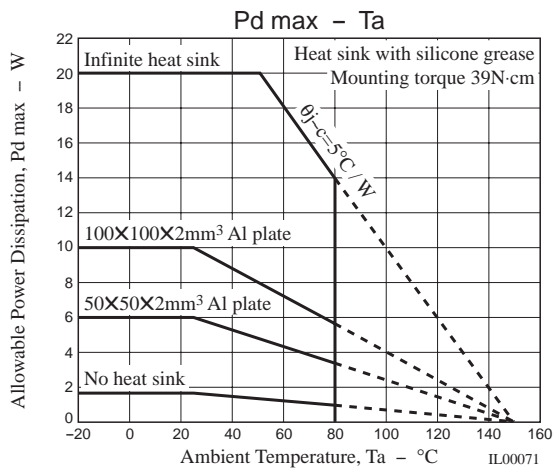


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## DC Characteristics Test Circuit (Common to L780S00 series)

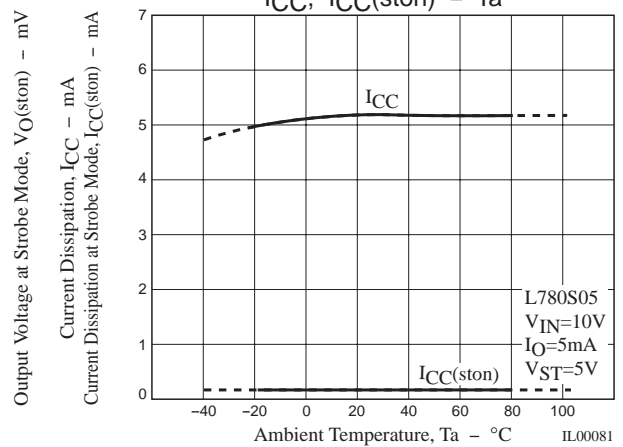
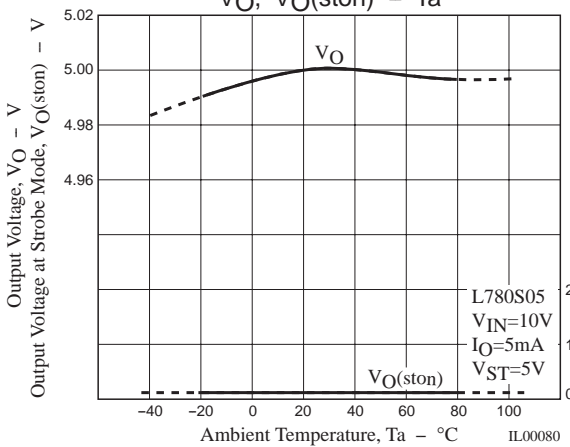
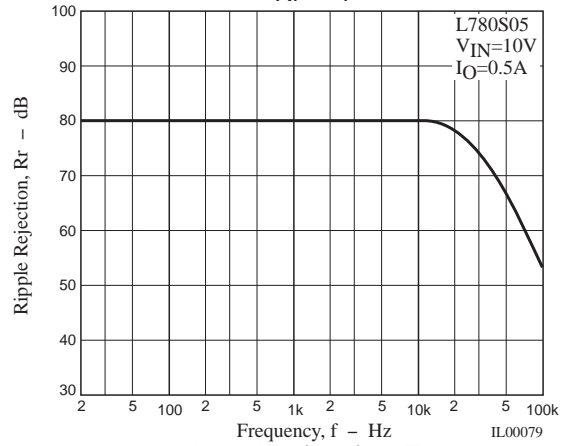
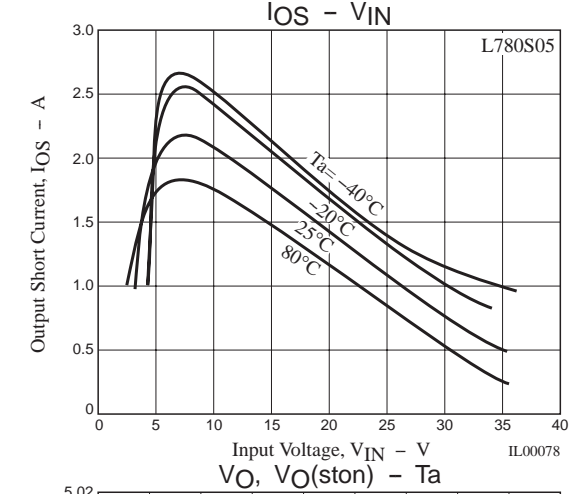
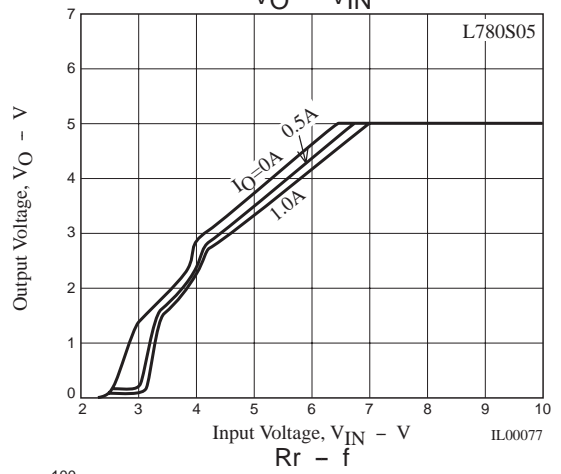
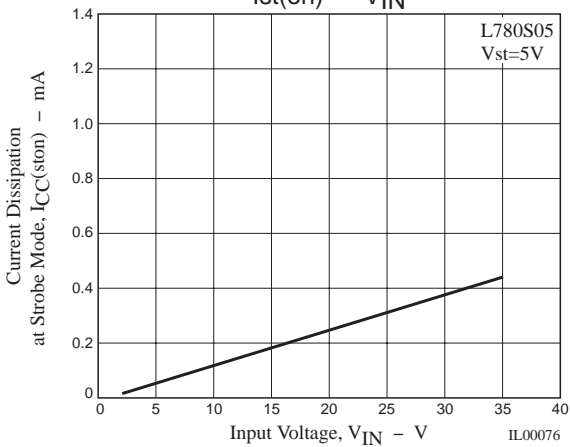
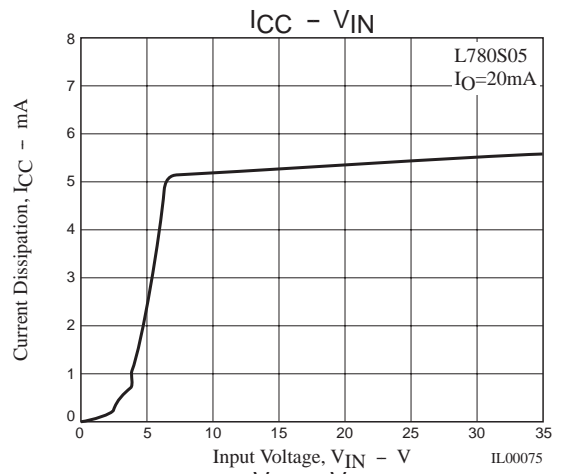
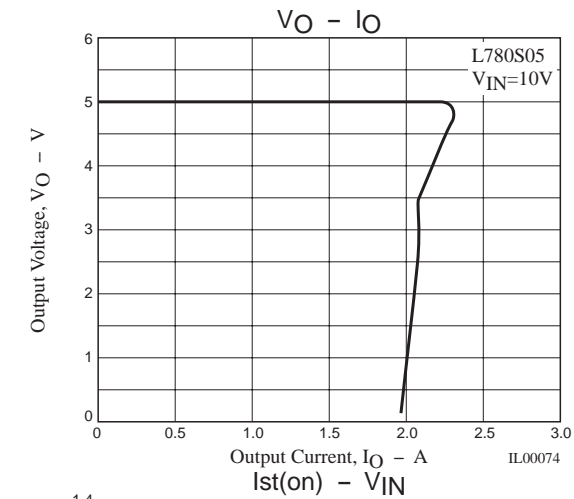


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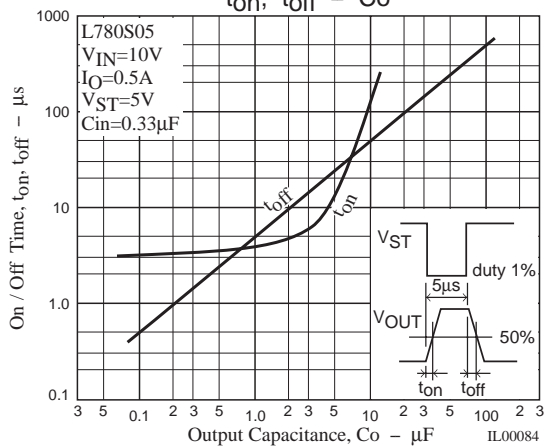
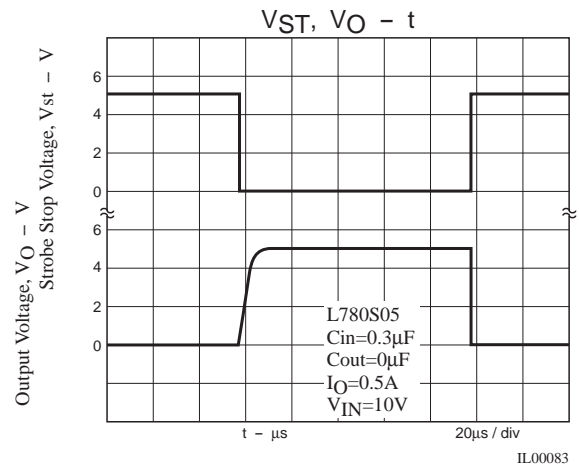
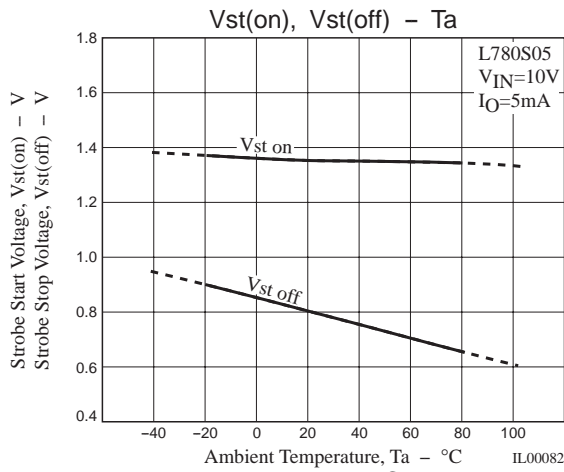


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# L780S00 Series



## L780S00 Series



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