National Semiconductor

LP8345
Low Dropout, Low IQ, 500mA CMOS Linear Regulator

General Description

The LP8345 low-dropout CMOS linear regulator are available in 5V, 3.3V, 2.5V, 1.8V or adjustable output versions. Packaged in our 6ld LLP package and 3ld DPAK they can deliver up to 500mA output current.

Typical dropout voltage @ 500mA is 210mV for the 5.0V version, 270mV for the 3.3V version and 335mV for the 2.5V version.

The devices include a zener trimmed bandgap voltage reference, foldback current limiting and thermal overload limiting.

The LP8345 features a PMOS output transistor which unlike PNP type low dropout regulators requires no base drive current. This allows the device ground current to remain less than 50µA over operating temperature, supply voltage and irrespective of the load current.

Features

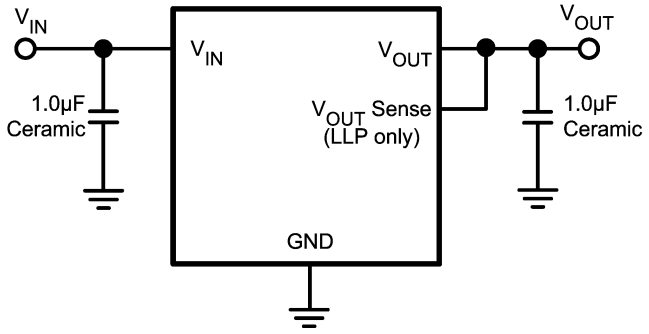
- ±1.5% Typical V_{OUT} tolerance
- 210mV Typical Dropout @ 500mA (V_O = 5V)
- Wide Operating Range 2.7V to 10V
- Internal 500mA PMOS Output Transistor
- 19µA Typical Quiescent Current
- Thermal Overload Limiting
- Foldback Current Limiting
- Zener Trimmed Bandgap Reference
- Space saving LLP package
- Temperature Range
  - — LP8345C 0˚C to 125˚C
  - — LP8345I –40˚C to 125˚C

Applications

- Hard Disk Drives
- Notebook Computers
- Battery Powered Electronics
- Portable Instrumentation

Typical Applications

Fixed V_{OUT}



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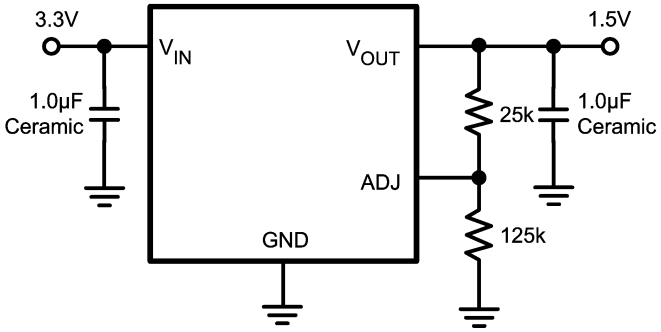
Adjustable V_{OUT}



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Ordering Information

Package	Part Number	Package Marking	Transport Media	NSC Drawing
6-Pin LLP	LP8345CLD-ADJ	L045B	1k Units Tape and Reel	LDE06A
	LP8345CLDX-ADJ		4.5k Units Tape and Reel	
	LP8345CLD-1.8	L046B	1k Units Tape and Reel	
	LP8345CLDX-1.8		4.5k Units Tape and Reel	
	LP8345CLD-2.5	L047B	1k Units Tape and Reel	
	LP8345CLDX-2.5		4.5k Units Tape and Reel	
	LP8345CLD-3.3	L048B	1k Units Tape and Reel	
	LP8345CLDX-3.3		4.5k Units Tape and Reel	
	LP8345CLD-5.0	L049B	1k Units Tape and Reel	
	LP8345CLDX-5.0		4.5k Units Tape and Reel	
	LP8345ILD-ADJ	L073B	1k Units Tape and Reel	
	LP8345ILDX-ADJ		4.5k Units Tape and Reel	
	LP8345ILD-1.8	L074B	1k Units Tape and Reel	
	LP8345ILDX-1.8		4.5k Units Tape and Reel	
	LP8345ILD-2.5	L075B	1k Units Tape and Reel	
	LP8345ILDX-2.5		4.5k Units Tape and Reel	
	LP8345ILD-3.3	L076B	1k Units Tape and Reel	
	LP8345ILDX-3.3		4.5k Units Tape and Reel	
	LP8345ILD-5.0	L077B	1k Units Tape and Reel	
	LP8345ILDX-5.0		4.5k Units Tape and Reel	
3-Pin DPAK	LP8345CDT-1.8	LP8345CDT-1.8	75 Units/Rail	TD03B
	LP8345CDTX-1.8		2.5k Units Tape and Reel	
	LP8345CDT-2.5	LP8345CDT-2.5	75 Units/Rail	
	LP8345CDTX-2.5		2.5k Units Tape and Reel	
	LP8345CDT-3.3	LP8345CDT-3.3	75 Units/Rail	
	LP8345CDTX-3.3		2.5k Units Tape and Reel	
	LP8345CDT-5.0	LP8345CDT-5.0	75 Units/Rail	
	LP8345CDTX-5.0		2.5k Units Tape and Reel	
	LP8345IDT-1.8	LP8345IDT-1.8	75 Units/Rail	
	LP8345IDTX-1.8		2.5k Units Tape and Reel	
	LP8345IDT-2.5	LP8345IDT-2.5	75 Units/Rail	
	LP8345IDTX-2.5		2.5k Units Tape and Reel	
	LP8345IDTX-3.3	LP8345IDTX-3.3	75 Units/Rail	
	LP8345IDT-3.3		2.5k Units Tape and Reel	
	LP8345IDTX-5.0	LP8345IDTX-5.0	75 Units/Rail	
	LP8345IDT-5.0		2.5k Units Tape and Reel	

Absolute Maximum Ratings (Notes 1, 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

V_{IN}, V_{OUT}, V_{OUT} Sense, ADJ	−0.3V to 12V
Storage Temperature Range	−65˚C to 160˚C
Junction Temperature (T_J)	150˚C
Power Dissipation	(Note 3)
ESD Rating	
Human Body Model (Note 6)	2kV
Machine Model	200V

Operating Ratings (Notes 1, 2)

Supply Voltage	2.7 to 10V
Temperature Range	
LP8345C	0˚C to 125˚C
LP8345I	−40˚C to 125˚C

LP8345C Electrical Characteristics

Unless otherwise specified all limits guaranteed for $V_{IN} = V_O + 1V$, $C_{IN} = C_{OUT} = 10\mu F$, $T_J = 25˚C$. **Boldface** limits apply over the full operating temperature range of $T_J = 0˚C$ to 125˚C

Symbol	Parameter	Conditions	Min (Note 5)	Typ (Note 4)	Max (Note 5)	Units
V_{IN}	Input Voltage	LP8345-ADJ,1.8, 2.5 LP8345-3.3, 5.0	**2.7**		**10** **10**	V
V_{OUT}	Output Voltage	LP8345-ADJ, ADJ = OUT I_{OUT} = 10mA, V_{IN} = 2.7V, T_J = 25˚C 100µA ≤I_{OUT}≤ 500mA, 2.7V ≤V_{IN}≤V_{OUT} +4V	 1.231 **1.213**	 1.250	 1.269 **1.288**	V
		LP8345-1.8 I_{OUT} = 10mA, V_{IN} = 2.8V, T_J = 25˚C 100µA ≤I_{OUT} ≤500mA, 2.8V ≤V_{IN}≤6V	 1.773 **1.746**	 1.800	 1.827 **1.854**	V
		LP8345-2.5 I_{OUT} = 10mA, V_{IN} = 3.5V, T_J = 25˚C 100µA ≤I_{OUT} ≤500mA, 3.5V ≤V_{IN} ≤6.5V	 2.463 **2.425**	 2.500	 2.538 **2.575**	V
		LP8345-3.3 I_{OUT} = 10mA, V_{IN} = 4.3V T_J = 25˚C 100µA ≤I_{OUT} ≤500mA, 4.3V ≤V_{IN} ≤7.5V	 3.250 **3.201**	 3.300	 3.350 **3.399**	V
		LP8345-5.0 I_{OUT} = 10mA, V_{IN} = 6V, T_J = 25˚C 100µA ≤I_{OUT} ≤500mA, 6V ≤V_{IN} ≤9V	 4.925 **4.850**	 5.000	 5.075 **5.150**	V
ΔV_O	Load Regulation	LP8345-ADJ, ADJ=OUT I_{OUT} = 1mA to 500mA, V_{IN} = 2.7V		6	**20**	mV
		LP8345-1.8 I_{OUT} = 1mA to 500mA, V_{IN} = 2.8V		7	**20**	
		LP8345-2.5 I_{OUT} = 1mA to 500mA, V_{IN} = 3.5V		9	**30**	
		LP8345-3.3 I_{OUT} = 1mA to 500mA, V_{IN} = 4.3V		12	**35**	
		LP8345-5.0 I_{OUT} = 1mA to 500mA, V_{IN} = 6V		14	**40**	
ΔV_O	Line Regulation	V_{OUT} + 0.5V ≤V_{IN} ≤10V, I_{OUT} = 25mA (Note 7)		4	**15**	mV
$V_{IN} - V_O$	Dropout Voltage (Note 7) (Note 8)	LP8345-2.5 I_{OUT} = 500mA		335	**650**	mV
		LP8345-3.3 LP8345-ADJ, V_{OUT} = 3.3V, I_{OUT} = 500mA		270	**500**	
		LP8345-5.0 I_{OUT} = 500mA		210	**400**	
I_Q	Quiescent Current	V_{IN} ≤10V		19	**50**	µA
	Minimum Load Current	$V_{IN} - V_{OUT}$ ≤4V			**100**	µA
I_{LIMIT}	Foldback Current Limit	$V_{IN} - V_{OUT}$ >5V		450		mA
		$V_{IN} - V_{OUT}$ <4V		1200		

LP8345C Electrical Characteristics (Continued)

Unless otherwise specified all limits guaranteed for $V_{IN} = V_O + 1V$, $C_{IN} = C_{OUT} = 10\mu F$, $T_J = 25^\circ C$. **Boldface** limits apply over the full operating temperature range of $T_J = 0^\circ C$ to $125^\circ C$

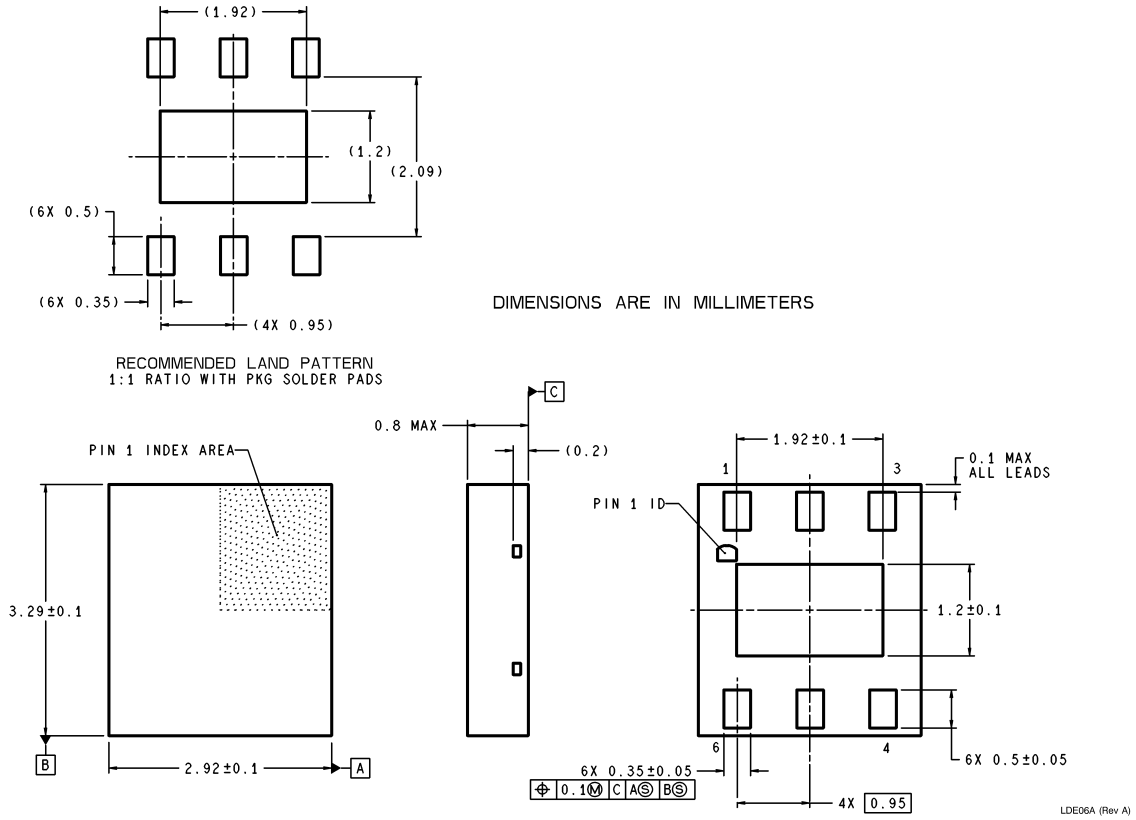
Symbol	Parameter	Conditions	Min (Note 5)	Typ (Note 4)	Max (Note 5)	Units
	Ripple Rejection Ratio	V_{IN} (dc) = V_{OUT} + 2V V_{IN} (ac) = $1V_{P-P}$ @ 120Hz	**48**	55		dB
T_{SD}	Thermal Shutdown Temp. Thermal Shutdown Hyst.			160 10		°C
	ADJ Input Leakage Current	V_{ADJ} = 1.5V or 0V		±0.01	±100	nA
	V_{OUT} Leakage Current	LP8345-ADJ ADJ = OUT, V_{OUT} = 2V, V_{IN} = 10V			10	µA
		LP8345-1.8, V_{OUT} = 2.5V, V_{IN} = 10V			10	
		LP8345-2.5, V_{OUT} = 3.5V, V_{IN} = 10V			10	
		LP8345-3.3, V_{OUT} = 4V, V_{IN} = 10V			10	
		LP8345-5.0, V_{OUT} = 6V, V_{IN} = 10V			10	
e_n	Output Noise	10Hz to 10kHz, R_L = 1kΩ, C_{OUT} = 10µF		250		µVrms

LP8345I Electrical Characteristics

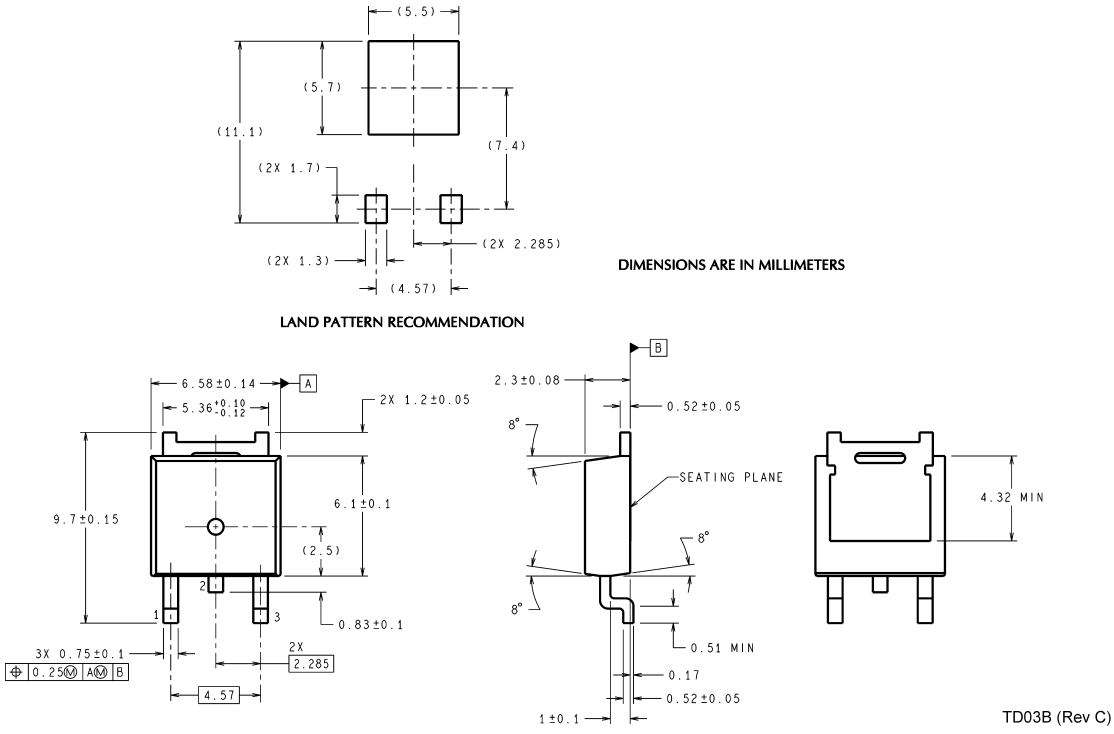
Unless otherwise specified all limits guaranteed for $V_{IN} = V_O + 1V$, $C_{IN} = C_{OUT} = 10\mu F$, $T_J = 25^\circ C$. **Boldface** limits apply over the full operating temperature range of $T_J = -40^\circ C$ to $125^\circ C$

Symbol	Parameter	Conditions	Min (Note 5)	Typ (Note 4)	Max (Note 5)	Units
V_{IN}	Input Voltage	LP8345-ADJ,1.8, 2.5 LP8345-3.3, 5.0	**2.7**		**10** **10**	V
V_{OUT}	Output Voltage	LP8345-ADJ, ADJ = OUT I_{OUT} = 10mA, V_{IN} = 2.7V, $T_J = 25^\circ C$ 100µA ≤I_{OUT}≤ 500mA, 2.7V ≤V_{IN}≤V_{OUT} +4V	1.231 **1.213**	1.250	1.269 **1.288**	V
		LP8345-1.8 I_{OUT} = 10mA, V_{IN} = 2.8V, $T_J = 25^\circ C$ 100µA ≤I_{OUT} ≤500mA, 2.8V ≤V_{IN}≤6V	1.773 **1.746**	1.800	1.827 **1.854**	V
		LP8345-2.5 I_{OUT} = 10mA, V_{IN} = 3.5V, $T_J = 25^\circ C$ 100µA ≤I_{OUT} ≤500mA, 3.5V ≤V_{IN} ≤6.5V	2.463 **2.425**	2.500	2.538 **2.575**	V
		LP8345-3.3 I_{OUT} = 10mA, V_{IN} = 4.3V $T_J = 25^\circ C$ 100µA ≤I_{OUT} ≤500mA, 4.3V ≤V_{IN} ≤7.5V	3.250 **3.201**	3.300	3.350 **3.399**	V
		LP8345-5.0 I_{OUT} = 10mA, V_{IN} = 6V, $T_J = 25^\circ C$ 100µA ≤I_{OUT} ≤500mA, 6V ≤V_{IN} ≤9V	4.925 **4.850**	5.000	5.075 **5.150**	V
ΔV_O	Load Regulation	LP8345-ADJ, ADJ=OUT I_{OUT} = 1mA to 500mA, V_{IN} = 2.7V		6	**20**	mV
		LP8345-1.8 I_{OUT} = 1mA to 500mA, V_{IN} = 2.8V		7	**20**	
		LP8345-2.5 I_{OUT} = 1mA to 500mA, V_{IN} = 3.5V		9	**30**	
		LP8345-3.3 I_{OUT} = 1mA to 500mA, V_{IN} = 4.3V		12	**35**	
		LP8345-5.0 I_{OUT} = 1mA to 500mA, V_{IN} = 6V		14	**40**	
ΔV_O	Line Regulation	V_{OUT} + 0.5V ≤V_{IN} ≤10V, I_{OUT} = 25mA (Note 7)		4	**15**	mV

Physical Dimensions inches (millimeters) unless otherwise noted



6-Pin LLP
NS Package Number LDE06A



3-Pin DPAK
NS Package Number TD03B