élantec
HIGH PERFORMANCE ANALOG INTEGRATED CIRCUITS

EL7556C
Adjustable CPU Power Supply Unit-6A

Features

- Precision internal 1% reference
- 3.3V @ 6 amps continuous
- Internal FETs
- >90% Efficiency
- Synchronous switching
- User adjustable slope compensation
- Internal soft start
- Over temperature indicator
- Low current sleep mode
- Low parts count
- Pulse by pulse current limiting
- High efficiency at light load
- Operates up to 1 MHz
- 1% Output accuracy
- Sync function
- Power good signal
- Power-saver mode
- Intel P54 and P55 compatible
- VCC2DET Interface

Applications

- PC Motherboards
- Local high power CPU supplies
- 5V to 1.0V DC-DC conversion
- Portable electronics/instruments
- P54 and P55 regulators

Ordering Information

Part No.	Temp. Range	Package	Outline #
EL7556CM	−40°C to +85°C	28-Pin SOIC	MDP0027

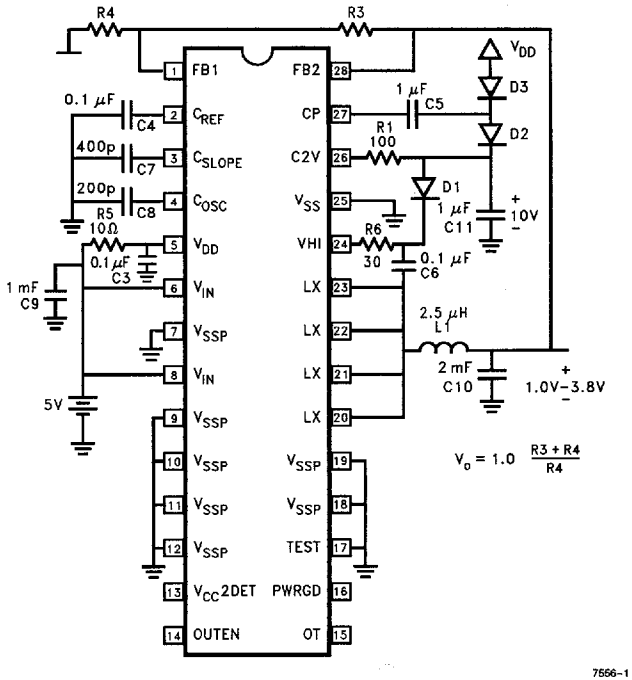
General Description

The EL7556C is the simplest, most cost effective method for powering modern high power CPUs which require a user adjustable output voltage. Although it is particularly designed to function with next generation CPUs, its simple design can provide low cost solutions for any 1.0V to 3.8V application from a 5V bus.

The circuit uses on chip resistorless current sensing for high efficiency, stable current mode control. An on chip temperature sensor resets the OT pin. The OT pin can be tied directly to the OUTEN pin for automatic overtemperature shutdown. The user can adjust the oscillator frequency as well as the slope compensation.

The EL7556C also incorporates the VCC2DET function to directly interface with the Intel P54 and P55 microprocessors. Depending on the state of VCC2DET pin, the output voltage is either set internally or adjustable using two external resistors. A power OK signal "PWRGD" pulls high when the regulator output is within ±10% of the desired voltages.

Connection Diagram



Absolute Maximum Ratings (T_A = 25°C)

Storage Temperature Range	−65°C to +150°C	Operating Junction Temperature	125°C
Supply (V_{IN})	6V	Combined Peak Output Current	9A
Ambient Operating Temperature	0°C to +75°C	Power Dissipation	2W
Output Pins	−0.3V below GND, +0.3V above V_{DD}		

Important Note:
All parameters having Min/Max specifications are guaranteed. The Test Level column indicates the specific device testing actually performed during production and Quality inspection. Elantec performs most electrical tests using modern high-speed automatic test equipment, specifically the LTX77 Series system. Unless otherwise noted, all tests are pulsed tests, therefore $T_J = T_C = T_A$.

Test Level	Test Procedure
I	100% production tested and QA sample tested per QA test plan QCX0002.
II	100% production tested at T_A = 25°C and QA sample tested at T_A = 25°C, T_{MAX} and T_{MIN} per QA test plan QCX0002.
III	QA sample tested per QA test plan QCX0002.
IV	Parameter is guaranteed (but not tested) by Design and Characterization Data.
V	Parameter is typical value at T_A = 25°C for information purposes only.

DC Electrical Characteristics T_A = 25°C, V_{IN} = 5V unless otherwise specified.

Parameter	Description	Condition	Min	Typ	Max	Test Level	Units
V_{2X}	Voltage Doubler Output	V_{DD} = 5V, ILOAD = 20 mA	7.9	8.4	8.9	I	V
V_{REF}	Reference Absolute Value	ILOAD = 0	1.150		1.250	I	V
V_{REFTC}	Reference Voltage Tempco			50			ppm
$V_{REFLOAD}$	Reference Voltage Load Regulation	0 < ILOAD < 1 mA	−0.5%		0.5	I	%
F_{OSC}	Oscillator Initial Accuracy	C_{OSC} = 1000 pF	90	100	110	I	kHz
F_{OSCTC}	Oscillator Tempco	0 < T_A < 125 C_{OSC} = 1000 pF	−0.1		0.1	V	%/deg
F_{RAMP}	Oscillator Ramp Amplitude	C_{OSC} = 1000 pF	1.1		1.3	V	V
M_{SS}	Soft Start Slope	F_{OSC} = 500 kHz	0.1		0.5	V	V/msec
VCC2DET	VCC2DET Pull Up Current			13		V	µA
I_{CSLOPE}	CSLOPE Charging Current		10		14	I	µA
I_{DD}	Supply Current	OUTEN = 4V		9	14	I	mA
I_{DDOFF}	Stdby Current	OUTEN = 0		9	15	I	mA
R_{DSON}	Composite FET Resistance			15	25	I	mΩ
V_{OUT}	Output Initial Accuracy	VCC2DET = High	3.465	3.5	3.535	I	V
I_{LMAX}	Maximum Current	V_{OUT} = 0	6.5	7.5		V	amps
V_{OUTTC}	Output Tempco		−1	0	1	V	%
$V_{OUTLINE}$	Output Line Regulation	V_{out} = 2.5 4 < V_{IN} < 5.5	−1		1	I	%
$V_{OUTLOAD}$	Output Load Regulation	1A < I_{LOAD} < 6A	−1		1	V	%
V_{OUTTOT}	Output Total Variation		−2		2	V	%

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DC Electrical Characteristics — Contd.

Parameter	Description	Condition	Min	Typ	Max	Test Level	Units
T_{OFF}	Over Temperature Threshold			150		V	C
T_{HYS}	Over Temperature Hysteresis			20		V	C
V_{GOOD}	Power Good Threshold with Respect to Desired Output Voltage		±6	±10	±14	I	%
V_{DDON}	Minimum V_{DD} form Startup				4	I	V
V_{DDOFF}	Maximum V_{DD} for Shutdown		3.75			I	V

EL7556C Pin Description

Pin No.	Pin Name	Description
1	FB1	Voltage feedback pin for the buck regulator. Active when VCC2DET is low. Normally connected to a resistor divider externally.
2	C_{REF}	Reference bypass pin. Use at least 0.1 μF bypass to ground.
3	C_{SLOPE}	Slope compensation capacitor. A 10 μA current flows out of this pin. The voltage at this pin is reset to the reference voltage each clock period during the dead time.
4	C_{OSC}	Oscillator timing capacitor. The oscillator frequency is approximately: F_{OSC} (HZ) = 0.0001/C_{OSC}(F) The duty cycle is approximately 4%.
5	V_{DD}	This pin supplies power to the internal control circuitry. It will draw some tens of milliamps when operating.
6	V_{IN}	Positive power supply input to the buck regulator. This is one of two pins connected to the drain of a very large NMOS FET called the "Main" FET.
7	VSSP	Ground return to the buck regulator. This pin is connected to the source of a very large NMOS FET called the "synchronous" FET.
8	V_{IN}	Same as pin 6.
9	VSSP	Same as pin 7.
10	VSSP	Same as pin 7.
11	VSSP	Same as pin 7.
12	VSSP	Same as pin 7.
13	VCC2DET	VCC2DET interface. When High FB2 is selected. When low, FB1 is selected.
14	OUTEN	Enables the switching regulator. High is "on". The reference, oscillator, and voltage doubler operate whenever the power supply qualified regardless of the state of this pin.
15	OT	Over temperature indicator. This pin is normally high. It pulls low when the die temperature exceeds 150°C. There is 10–20 degrees of hysteresis in the comparator.
16	PWRGD	This pin pulls high whenever the FB pin is within 7% of its programmed value.
17	TEST	Test pin. Must be connected to ground.
18	VSSP	Same as pin 7.
19	VSSP	Same as pin 7.
20	LX	This is the halfway point between the two large intemal FETs. It drives the inductor of the buck regulator circuit. These are high current outputs.
21	LX	Same as pin 20.

EL7556C Pin Description — Contd.

Pin No.	Pin Name	Description
22	LX	Same as pin 20.
23	LX	Same as pin 20
24	VHI	Positive supply for the high side driver. This pin is bootstrapped from LX pin with a 0.1 μF capacitor.
25	V_{SS}	Ground return for the control circuitry.
26	C2V	Voltage doubler output. This pin requires at least a 1 μF capacitor to GND. The voltage on this pin will be 9V–10V depending on the load.
27	CP	Input for the charge pump bootstrap capacitor.
28	FB2	Voltage feedback pin. Active when VCC2DET is high. Normally connected to a resistor divider internally.

Applications Information

The EL7556 incorporates a VCC2DET function to directly interface with the Intel P54 and P55 microprocessors. When this pin is shorted to ground as in the P55 processor, the feedback path of EL7556 is internally switched to FB1. The regulator output is determined by the external resistor divider ratio, $V_{OUT} = 1.0\ (1 + R3/R4)$. When this pin is open as in the P54 processor, the feedback path of the EL7556 is switched to FB2. The regulator output is set internally to 3.5V nominal.

Soldering Packages to PC Boards

DIP Packages

Wave soldering is recommended for DIP packages. Solder plated boards are recommended. Rosin mildly activated (RMA) flux is needed. Wave soldering using a dual wave system at 250°C ±10°C for two seconds per wave is preferable. Thorough cleaning of boards after soldering is required.

Hand soldering, Elantec's DIP packages will survive a peak temperature of 300°C (at leads) for a maximum period of 10 seconds.

Surface Mount Packages

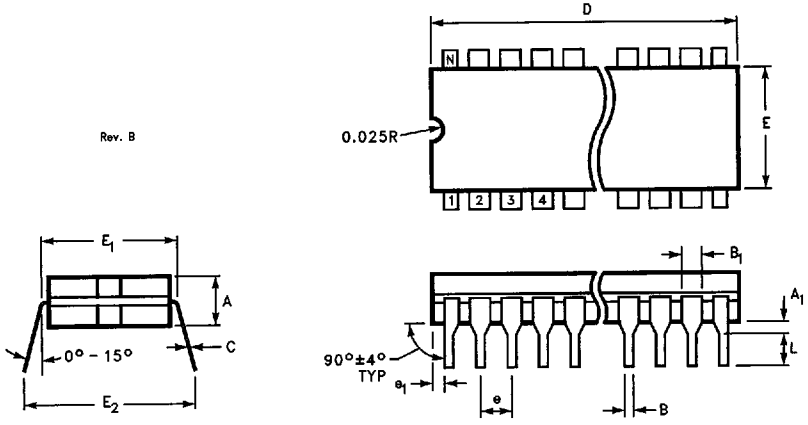
Wave soldering and vapor phase or infrared (IR) reflow can be used for soldering surface mount packages to PC boards. Solder plated boards are recommended for wave soldering and vapor phase or IR reflow methods.

Wave Soldering: Adhesive is used to hold components on the boards during wave soldering. Place components on the board and cure adhesive before wave soldering. Rosin mildly activated (RMA) flux or organic flux is needed. Wave soldering using a dual wave system at 250°C ±10°C for a maximum of two seconds per wave is preferable. Thorough cleaning of boards after soldering is required.

Reflow Soldering: Screen solder paste on board and attach components to board. Solder paste with RMA flux is recommended. Bake boards at 65°C–90°C for 15 minutes. Preheat boards to within 60°C–70°C of the solder temperature. To reflow solder paste with vapor phase method, the solder paste temperature must be maintained at or above 200°C for at least 30 seconds. The components temperature can not exceed 215°C. For the IR reflow method, the solder paste temperature must be maintained at or above 200°C for at least 30 seconds. The components temperature can not exceed 220°C. The temperature/time ramp-up during vapor phase or IR reflow shall be no greater than 2°C/sec.

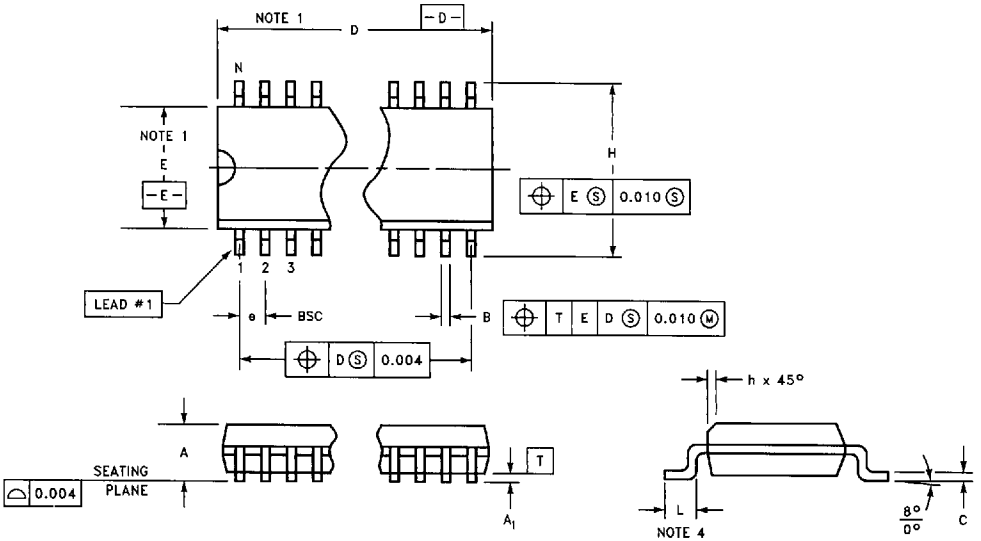
Hand soldering, Elantec's surface mount packages will survive a peak temperature of 260°C (at leads) for a maximum period of 10 seconds.

Package Outlines



MDP0016 Rev. B
CerDIP Package
Lead Finish (Coml)—Tin Plate or Hot Solder DIP
Lead Finish (Mil)—Hot Solder DIP

Common Dimensions	Min	Max	Min	Max	Min	Max	Min	Max
A	0.140	0.160	0.140	0.160	0.140	0.160	0.140	0.160
A_1	0.115	0.055	0.020	0.050	0.015	0.060	0.020	0.050
B	0.016	0.023	0.016	0.021	0.014	0.026	0.016	0.021
B_1	0.050	0.065	0.050	0.060	0.038	0.068	0.050	0.060
C	0.008	0.012	0.008	0.012	0.008	0.018	0.008	0.012
D	0.375	0.395	0.760	0.785	0.940	0.960	1040.925	1.060
E	0.245	0.265	0.220	0.291	0.220	0.310	0.2780	0.298
E_1	0.300	0.320	0.300	0.320	0.290	0.320	0.300	0.320
E_2	0.340	0.390	0.340	0.390	0.360	0.410	0.340	0.390
e	0.090	0.110	0.090	0.110	0.090	0.110	0.090	0.110
e_1	0.020	0.055	0.078	0.098	0.068	0.098	0.078	0.098
L	0.125	0.150	0.125	0.150	0.125	0.150	0.130	0.150
N	8-Lead		14-Lead		18-Lead		20-Lead	



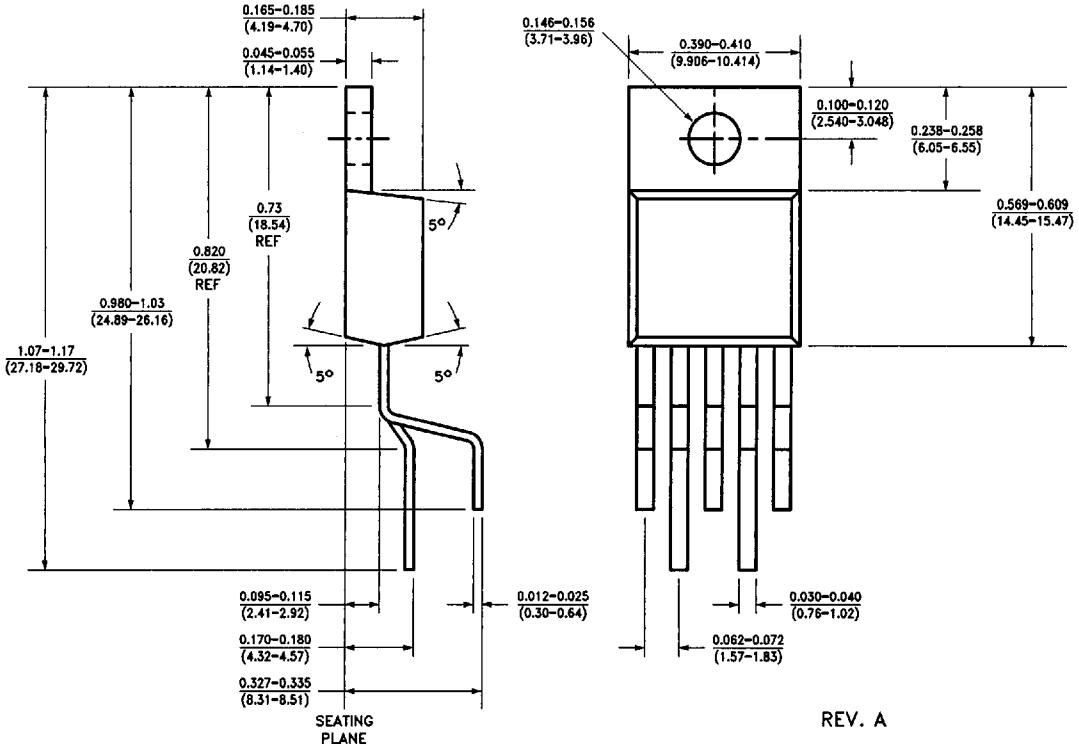
REV. C

Note 1: These dimensions do not include mold flash or protrusions. Mold flash protrusion shall not exceed .006" on any side.
Note 2: SO-8, SO-14, S0-16 packages are narrow body (0.150").
Note 3: Dimensions and tolerancing per ANSI Y14.5M-1982.
Note 4: Flat area of lead foot.
Note 5: SOL-24T2 (thermal package) has 2 fused leads on each side of package.
Note 6: SOL-20T (thermal package) has 4 fused leads on each side of package.
Note 7: SOL-28T contains a thermal metal slug.

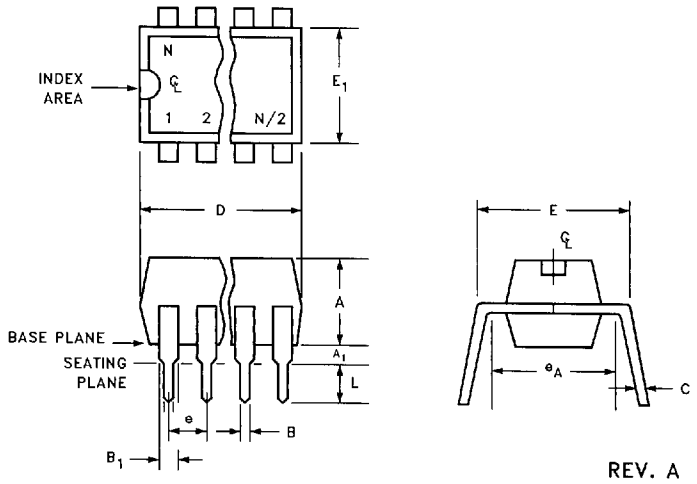
MDP0027 Rev. C
Package Outline—SOIC
Lead Finish—Solder Plate

Symbol	Lead Count													
	SOL-28		SOL-20		SOL-16		SO-16		SO-14		SO-8		SOL-24	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
A	0.096	0.104	0.096	0.104	0.096	0.104	0.061	0.068	0.061	0.068	0.061	0.068	0.096	0.104
A_1	0.004	0.011	0.004	0.011	0.004	0.011	0.004	0.010	0.004	0.010	0.004	0.010	0.004	0.011
B	0.014	0.019	0.014	0.019	0.014	0.019	0.014	0.019	0.014	0.019	0.014	0.019	0.014	0.019
C	0.009	0.012	0.009	0.012	0.009	0.012	0.008	0.010	0.008	0.010	0.008	0.010	0.009	0.012
D	0.696	0.712	0.498	0.510	0.397	0.430	0.386	0.394	0.337	0.344	0.189	0.196	0.598	0.614
E	0.291	0.299	0.291	0.299	0.291	0.299	0.150	0.157	0.150	0.157	0.150	0.157	0.291	0.299
e	0.050 BSC		0.050 BSC		0.050 BSC		0.050 BSC		0.050 BSC		0.050 BSC		0.050 BSC	
H	0.398	0.414	0.398	0.414	0.398	0.414	0.230	0.244	0.230	0.244	0.230	0.244	0.398	0.414
h	0.010	0.016	0.010	0.016	0.010	0.016	0.010	0.016	0.010	0.016	0.010	0.016	0.010	0.016
L	0.016	0.024	0.016	0.024	0.016	0.024	0.016	0.024	0.016	0.024	0.016	0.024	0.016	0.024

Package Outlines



MDP0028 Rev. A
5-Lead TO-220
Lead Finish—Solder Plate



MDP0031 Rev. A
Plastic Package
Lead Finish—Hot Solder DIP

Common Dimensions	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
A_1	0.020	0.040	0.020	0.040	0.020	0.040	0.020	0.040	0.020	0.040
A	0.125	0.145	0.125	0.145	0.125	0.145	0.125	0.145	0.125	0.145
B	0.016	0.020	0.016	0.020	0.016	0.020	0.016	0.020	0.015	0.021
B_1	0.050	0.070	0.050	0.070	0.050	0.070	0.050	0.070	0.050	0.070
C	0.008	0.012	0.008	0.012	0.008	0.012	0.008	0.012	0.008	0.012
D	0.350	0.385	0.745	0.755	0.745	0.755	0.875	0.905	0.925	1.045
E	0.295	0.320	0.295	0.320	0.295	0.320	0.295	0.320	0.295	0.320
E_1	0.245	0.255	0.245	0.255	0.245	0.255	0.245	0.255	0.245	0.255
e	0.100 Typ		0.100 Typ		0.100 Typ		0.100 Typ		0.100 Typ	
e_A	0.300 Ref		0.300 Ref		0.300 Ref		0.300 Ref		0.300 Ref	
L	0.115	0.135	0.115	0.135	0.115	0.135	0.115	0.135	0.115	0.135
N	8		14		16		18		20	

Note: Package outline exclusive of any mold flashes. Mold flash protrusion shall not exceed 0.006" on any side.