

300mA CMOS LDO Regulator



FEATURES

- Guaranteed 300mA output current
- Low dropout voltage of 180mV typical at 300mA
- Stable with 1µF ceramic output capacitor
- External 10nF bypass capacitor for low noise
- Quick-start feature
- No-load ground current of 55µA typical
- Full-load ground current of 80µA typical
- ±1.0% output voltage initial accuracy
- ±2.0% accuracy over temperature
- "Zero" current shutdown mode
- Fold-back current limit and under-voltage lockout
- **■** Thermal protection
- Thin SOT23-5 package

APPLICATIONS

- Cellular phones
- Battery-powered devices
- Consumer Electronics

DESCRIPTION

The CAT6218 is a 300mA CMOS low dropout regulator that provides fast response time during load current and line voltage changes.

The quick-start feature allows the use of an external bypass capacitor to reduce the overall output noise without affecting the turn-on time of just 150µs.

With zero shutdown current and low ground current of 55µA typical, the CAT6218 is ideal for battery-operated devices with supply voltages from 2.3V to 5.5V. An internal under voltage lockout circuit disables the output at supply voltages under 2.1V typical.

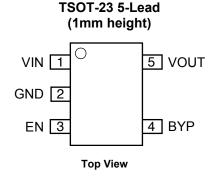
The CAT6218 offers 1% initial accuracy and low dropout voltage, 180mV typical at 300mA. Stable operation is provided with a small value ceramic capacitor, reducing required board space and component cost.

Other features include fold-back current current limit and thermal protection.

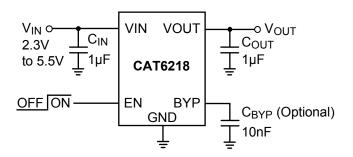
The device is available in the low profile (1mm max height) 5-lead thin SOT23 package.

For Ordering Information details, see page 9.

PIN CONFIGURATION



TYPICAL APPLICATION CIRCUIT





PIN DESCRIPTIONS

Pin#	Name	Function	
1 VIN Supply voltage input.		Supply voltage input.	
2 GND Ground reference.		Ground reference.	
3 EN		Enable input (active high); a $2.5M\Omega$ pull-down resistor is provided.	
4	BYP	Optional bypass capacitor connection for noise reduction and PSRR enhancing.	
5	VOUT	LDO Output Voltage.	

BLOCK DIAGRAM

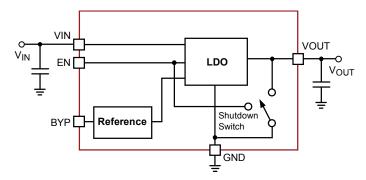


Figure 2. CAT6218 Functional Block Diagram

PIN FUNCTION

VIN is the supply pin for the LDO. A small 1 μ F ceramic bypass capacitor is required between the V_{IN} pin and ground near the device. When using longer connections to the power supply, C_{IN} value can be increased without limit. The operating input voltage range is from 2.3V to 5.5V.

EN is the enable control logic (active high) for the regulator output. It has a $2.5M\Omega$ pull-down resistor, which assures that if EN pin is left open, the circuit is disabled.

VOUT is the LDO regulator output. A small 1 μ F ceramic bypass capacitor is required between the V_{OUT} pin and ground for stability. For better transient response, its value can be increased to 4.7 μ F.

The capacitor should be located near the device. ESR domain is $5m\Omega$ to $500m\Omega.$ V_{OUT} can deliver a maximum guaranteed current of 300mA. For input-to-output voltages higher than 1V, a continuous 300mA output current might turn-on the thermal protection. A 250Ω internal shutdown switch discharges the output capacitor in the no-load condition.

GND is the ground reference for the LDO. The pin must be connected to the ground plane on the PCB.

BYP is the reference bypass pin. An optional $0.01\mu F$ capacitor can be connected between BYP pin and GND to reduce the output noise and enhance the PSRR at high frequency.

ABSOLUTE MAXIMUM RATINGS (1)

Parameter	Rating	Unit
V _{IN}	0 to 6.5	V
V_{EN}, V_{OUT}	-0.3 to V _{IN} + 0.3	V
Junction Temperature, T _J	+150	°C
Power Dissipation, P _D	Internally Limited (2)	mW
Storage Temperature Range, T _S	-65 to +150	°C
Lead Temperature (soldering, 5 sec.)	260	°C
ESD Rating (Human Body Model)	3	kV

RECOMMENDED OPERATING CONDITIONS (3)

Parameter	Range	Unit
V_{IN}	2.3 to 5.5	V
V _{EN}	0 to V _{IN}	V
Junction Temperature Range, T _J	-40 to +125	°C
Package Thermal Resistance (SOT23-5), θ_{JA}	235	°C/W

Typical application circuit with external components is shown on page 1.

Notes:

- (1) Exceeding maximum rating may damage the device
- The maximum allowable power dissipation at any T_A (ambient temperature) is $P_{Dmax} = (T_{Jmax} T_A)/\theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.

2

(3) The device is not guaranteed to work outside its operating rating.



ELECTRICAL OPERATING CHARACTERISTICS (1)

 V_{IN} = V_{OUT} + 1.0V, V_{EN} = High, I_{OUT} = 100 μ A, C_{IN} = C_{OUT} = 1 μ F, ambient temperature of 25°C (over recommended operating conditions unless specified otherwise). **Bold numbers** apply for the entire junction temperature range.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit	
V	Output Voltage Accuracy	Initial accuracy	-1.0		+1.0	%	
$V_{OUT\text{-ACC}}$	Output Voltage Accuracy	Initial accuracy	-2.0		+2.0		
TC _{OUT}	Output Voltage Temp. Coefficient			40		ppm/°C	
V	Line Regulation	$V_{IN} = V_{OUT} + 1.0V \text{ to } 5.5V$	-0.2	±0.1	+0.2	· %/V	
V _{R-LINE} Li	Line Regulation		-0.4		+0.4		
V_{R-LOAD}	Load Regulation	I _{OUT} = 100μA to 300 mA		0.7	1.2	%	
▼ R-LOAD	Load (Vegulation)				1.5		
V_{DROP}	Dropout Voltage (2)	I _{OUT} = 300mA		180	250	mV	
V DROP	Diopout Voltage	1001 00011111			300		
	Ground Current	I _{OUT} = 0μA		55	75	μA	
I _{GND}		Ισοη σμέν			90		
		I _{OUT} = 300mA		80			
I _{GND-SD}	Shutdown Ground Current	V _{EN} < 0.4V			1	μA	
IGND-SD		TEN C.I.			2		
PSRR	Power Supply Rejection Ratio	$f = 1kHz$, $C_{BYP} = 10nF$		64		- dB	
TOTAL		$f = 20kHz$, $C_{BYP} = 10nF$		54			
I _{SC}	Output short circuit current limit	V _{OUT} = 0V		180		mA	
T_ON	Turn-On Time	C _{BYP} = 10nF		150		μs	
e_N	Output Noise Voltage (3)	BW = 10Hz to 100kHz		45		μVrms	
$R_{\text{OUT-SH}}$	Shutdown Switch Resistance			250		Ω	
R_{EN}	Enable pull-down resistor			2.5		МΩ	
V_{UVLO}	Under-voltage lock out (UVLO) threshold			2.1		V	
ESR	C _{OUT} equivalent series resistance		5		500	mΩ	
Enable I	nput						
V_{HI}	Logic High Level	V _{IN} = 2.3 to 5.5V	1.8			V	
V_{LO}	Logic Low Level	V _{IN} = 2.3 to 5.5V			0.4	V	
I _{EN}	Enable Input Current	V _{EN} = 0.4V		0.15	1	μА	
	Lilable iliput Cullelit	V _{EN} = V _{IN}		1.5	4		
Thermal	Thermal Protection						
T_{SD}	Thermal Shutdown			160		°C	
T_{HYS}	Thermal Hysteresis			10		°C	

Notes:

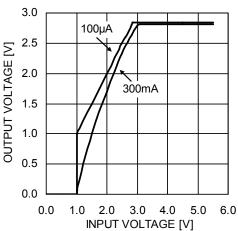
- (1 Specification for 2.85V output version unless specified otherwise.
- (2) Dropout voltage is defined as the input-to-output differential at which the output voltage drops 2% below its nominal value measured at 1V differential. During test, the input voltage stays always above the minimum 2.3V.
- (3) Specification for 1.8V output version.



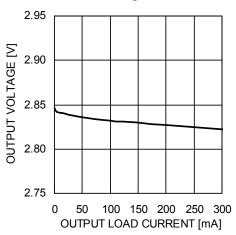
TYPICAL CHARACTERISTICS (shown for 2.85V output version)

 $V_{\text{IN}} = 3.85 \text{V}, \ I_{\text{OUT}} = 100 \mu\text{A}, \ C_{\text{IN}} = C_{\text{OUT}} = 1 \mu\text{F}, \ C_{\text{BYP}} = 10 \text{nF}, \ T_{\text{A}} = 25 ^{\circ}\text{C} \ \text{unless otherwise specified}.$

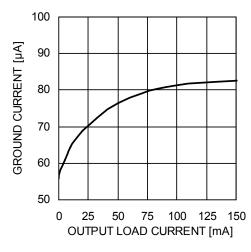
Dropout Characteristics



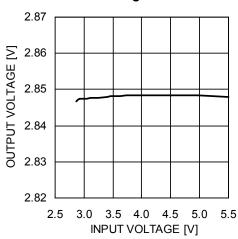
Load Regulation



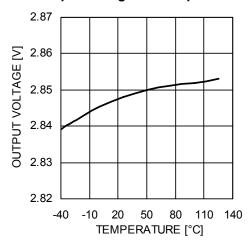
Ground Current vs. Load Current



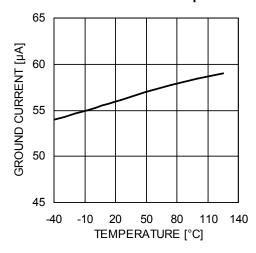
Line Regulation



Output Voltage vs. Temperature



Ground Current vs. Temperature

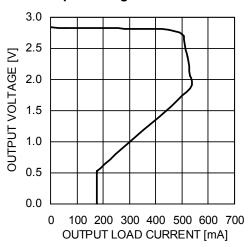




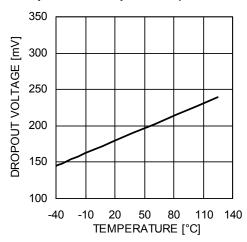
TYPICAL CHARACTERISTICS (shown for 2.85V output option)

 V_{IN} = 3.85V, I_{OUT} = 100 μ A, C_{IN} = C_{OUT} = 1 μ F, C_{BYP} = 10nF, T_A = 25°C unless otherwise specified.

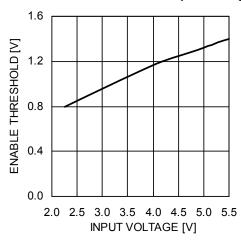
Output Voltage vs. Load Current



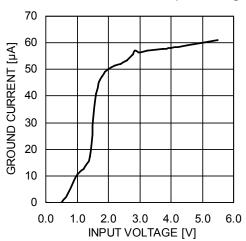
Dropout vs. Temperature (300mA Load)



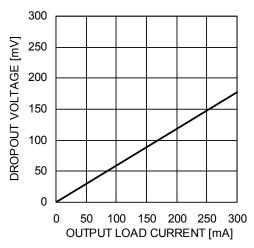
Enable Threshold vs. Input Voltage



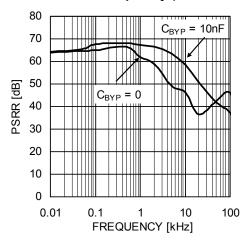
Ground Current vs. Input Voltage



Dropout vs. Load Current



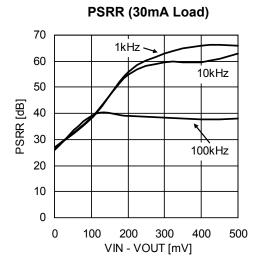
PSRR vs. Frequency (10mA Load)

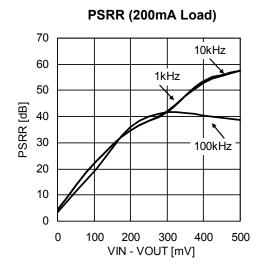




TYPICAL CHARACTERISTICS (shown for 2.85V output option)

 V_{IN} = 3.85V, I_{OUT} = 100 μ A, C_{IN} = C_{OUT} = 1 μ F, C_{BYP} = 10nF, T_A = 25°C unless otherwise specified.



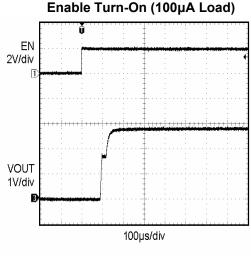




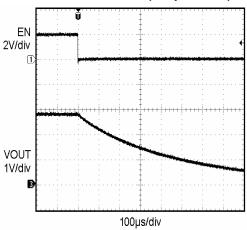
TRANSIENT CHARACTERISTICS (shown for 2.85V output option)

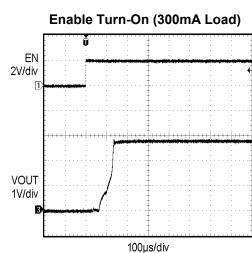
 V_{IN} = 3.85V, I_{OUT} = 100 μ A, C_{IN} = C_{OUT} = 1 μ F, C_{BYP} = 10nF, T_A = 25°C unless otherwise specified.

Note: All transient characteristics are generated using the evaluation board CAT621XEVAL1.

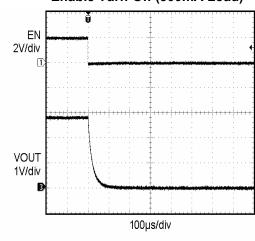


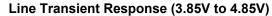
Enable Turn-Off (100µA Load)

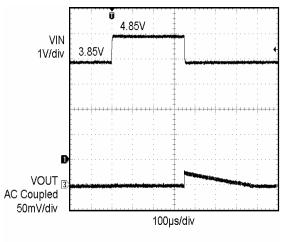




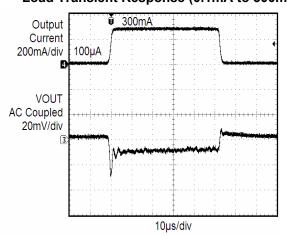








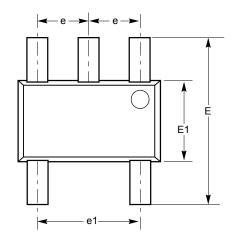
Load Transient Response (0.1mA to 300mA)



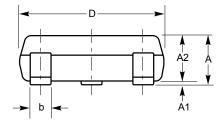


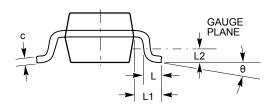
PACKAGE DIMENSIONS

5-LEAD TSOT-23 (1)(2)



SYMBOL	MIN	NOM	MAX
Α		_	1.00
A1	0.01	0.05	0.10
A2	0.80	0.87	0.90
b	0.30	_	0.45
С	0.12	0.15	0.20
D	2.90 BSC		
Е	2.80 BSC		
E1	1.60 BSC		
е	0.95 BSC		
e1	1.90 BSC		
L	0.30	0.40	0.50
L1	0.60 REF		
L2	0.25 BSC		
θ	0°		8°





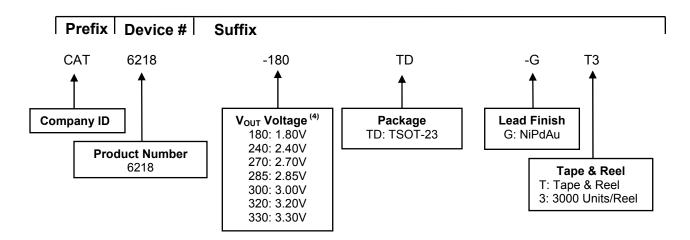
For current Tape and Reel information, download the PDF file from: http://www.catsemi.com/documents/tapeandreel.pdf.

Notes:

- (1) All dimensions are in millimeters, angles in degrees.
- (2) Refer JEDEC MO-193.



EXAMPLE OF ORDERING INFORMATION



Part Number	V _{out} Voltage	Package	Quantity per Reel
CAT6218-180TD-GT3 ⁽⁴⁾	1.80V	TSOT-23	3000
CAT6218-240TD-GT3	2.40V	TSOT-23	3000
CAT6218-270TD-GT3	2.70V	TSOT-23	3000
CAT6218-285TD-GT3 ⁽⁴⁾	2.85V	TSOT-23	3000
CAT6218-300TD-GT3	3.00V	TSOT-23	3000
CAT6218-320TD-GT3 ⁽⁴⁾	3.20V	TSOT-23	3000
CAT6218-330TD-GT3	3.30V	TSOT-23	3000

Notes:

- (1) All packages are RoHS-compliant (Lead-free, Halogen-free).
- (2) The standard finish is NiPdAu.
- (3) The device used in the above example is a CAT6218-180 TD-GT3 (V_{OUT} = 1.8V, in an TSOT-23 package, NiPdAu, Tape and Reel, 3000 units).
- (4) Standard voltages are 2.4V, 2.7V, 3.0V, and 3.3V. For other voltage options, please contact your nearest Catalyst Semiconductor Sales office.
- (5) Top marking for CAT6218 is RU.

REVISION HISTORY

Date	Rev.	Reason
06/19/2007	Α	Preliminary Revision

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