

Figure 1. Typical Application Circuit

#### **Pin Function**

**VIN** is the supply pin for the LDO. A small 1  $\mu$ F ceramic bypass capacitor is required between the V<sub>IN</sub> pin and ground near the device. When using longer connections to the power supply, C<sub>IN</sub> value can be increased without limit. The operating input voltage range is from 2.3 V to 5.5 V.

EN1 & 2 are the enable control logic (active high) for the regulator outputs.

VOUT1 & 2 are the LDO regulator outputs. A small 1  $\mu$ F ceramic bypass capacitor is required between the VOUT

Figure 2. CAT6221 Functional Block Diagram

pins and ground. For better transient response, its value can be increased to 4.7  $\mu F.$ 

The capacitor should be located near the device. For the TSOT23 6-lead package, a continuous 300 mA output current for both LDOs may turn-on the thermal protection.

On each output, a 250  $\Omega$  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.

**Table 1. ABSOLUTE MAXIMUM RATINGS** 

Parameter	Rating	Unit
V <sub>IN</sub>	0 to 6.5	V
V <sub>EN</sub> , V <sub>OUT</sub>	-0.3 to V <sub>IN</sub> + 0.3	V
Junction Temperature, T <sub>J</sub>	+150	°C
Power Dissipation, P <sub>D</sub>	Internally Limited (Note 1)	mW
Storage Temperature Range, T <sub>S</sub>	-65 to +150	°C
Lead Temperature (soldering, 5 sec.)	260	°C
ESD Rating (Human Body Model)	3	kV

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Table 2. RECOMMENDED OPERATING CONDITIONS (Note 2)

Parameter	Range	Unit
V <sub>IN</sub>	2.3 to 5.5	V
V <sub>EN</sub>	0 to V <sub>IN</sub>	V
Junction Temperature Range, T <sub>J</sub>	-40 to +125	°C
Package Thermal Resistance (TSOT23), θ <sub>JA</sub>	235	°C/W

NOTE: Typical application circuit with external components is shown above.

- 1. The maximum allowable power dissipation at any T<sub>A</sub> (ambient temperature) is P<sub>Dmax</sub> = (T<sub>Jmax</sub> T<sub>A</sub>)/ $\theta$ <sub>JA</sub>. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.
- The device is not guaranteed to work outside its operating rating.

## Table 3. ELECTRICAL OPERATING CHARACTERISTICS (Note 3)

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V <sub>OUT-ACC</sub>	Output Voltage Accuracy	Initial accuracy (Note 4)	-1.0		+1.0	%
			-2.0		+2.0	
TC <sub>OUT</sub>	Output Voltage Temp. Coefficient			40		ppm/°C
V <sub>R-LINE</sub>	Line Regulation	V <sub>IN</sub> = V <sub>OUT</sub> + 1.0 V to 5.5 V	-0.2	±0.1	+0.2	%/V
			-0.4		+0.4	
$V_{R-LOAD}$	Load Regulation	I <sub>OUT</sub> = 100 μA to 300 mA		0.9	1.5	%
					2	
$V_{DROP}$	Dropout Voltage (Note 5)	I <sub>OUT</sub> = 300 mA		210	280	mV
					350	
I <sub>GND</sub> (	Ground Current	Both LDOs Enabled		100	140	μΑ
		I <sub>OUT</sub> = 0 μA			170	
		Both LDOs Enabled I <sub>OUT</sub> = 300 mA		160		
	One LDO Enabled		55	75		
		$I_{OUT} = 0 \mu A$			90	
		One LDO Enabled I <sub>OUT</sub> = 300 mA		85		
I <sub>GND-SD</sub>	Shutdown Ground Current V <sub>EN</sub> < 0.4 V	V <sub>EN</sub> < 0.4 V			2	μΑ
				4		
PSRR	Power Supply Rejection Ratio	f = 1 kHz		60		dB
		f = 20 kHz		45		
I <sub>SC</sub>	Output short circuit current limit	V <sub>OUT</sub> = 0 V		130		mA
T <sub>ON</sub>	Turn-On Time			150		μs
e <sub>N</sub>	Output Noise Voltage (Note 6)	BW = 10 Hz to 100 kHz		95		μVrms
R <sub>OUT-SH</sub>	Shutdown Switch Resistance			250		Ω
V <sub>IN-UVLO</sub>	Under voltage lockout threshold			2.15		V
ESR	C <sub>OUT</sub> equivalent series resistance		5		500	mΩ
ENABLE IN	PUT (EN1, EN2)					
$V_{HI}$	Logic High Level	V <sub>IN</sub> = 2.3 to 5.5 V	1.8			V
$V_{LO}$	Logic Low Level	V <sub>IN</sub> = 2.3 to 5.5 V			0.4	V
I <sub>EN</sub>	Enable Input Current	V <sub>EN</sub> = 0.4 V		0.05	1	μΑ
		V <sub>EN</sub> = V <sub>IN</sub>		0.1	1	
THERMAL	PROTECTION					
T <sub>SD</sub>	Thermal Shutdown			160		°C
T <sub>HYS</sub>	Thermal Hysteresis			10		°C

<sup>3.</sup> Specification for 2.8 V output version unless specified otherwise.

<sup>4.</sup> For V<sub>OUT</sub> < 2.0 V, the initial accuracy is ±2% and across temp is ±3%.</li>
5. Dropout voltage is defined as the input-to-output differential at which the output voltage drops 2% below its nominal value measured at 1 V differential. During test, the input voltage stays always above the minimum 2.3 V.

<sup>6.</sup> Specification for 1.8 V output version.

## TYPICAL CHARACTERISTICS (shown for 2.8 V/1.8 V outputs option)

 $(V_{IN}=3.8~V,~I_{OUT}=100~\mu\text{A},~EN1=EN2=V_{IN},~C_{IN}=C_{OUT}=1~\mu\text{F},~T_{A}=25^{\circ}C~unless~otherwise~specified.)$ 

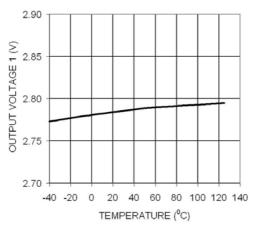


Figure 3. Output Voltage 1 vs. Temperature

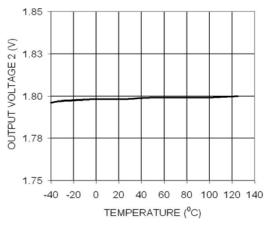


Figure 4. Output Voltage 2 vs. Temperature

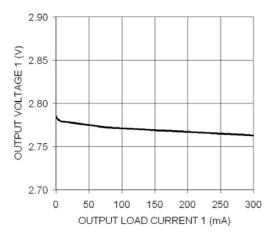


Figure 5. Load Regulation VOUT1

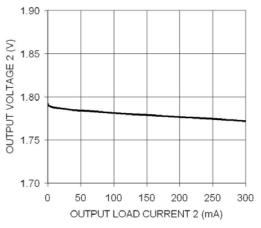


Figure 6. Load Regulation VOUT2

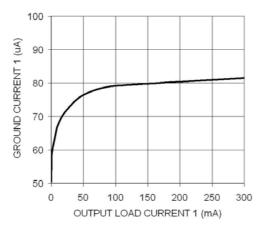


Figure 7. Ground Current (EN2 = GND)

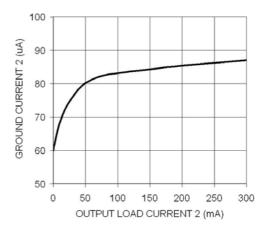


Figure 8. Ground Current (EN1 = GND)

## TYPICAL CHARACTERISTICS (shown for 2.8 V/1.8 V outputs option)

 $(V_{IN}=3.8~V,~I_{OUT}=100~\mu\text{A},~EN1=EN2=V_{IN},~C_{IN}=C_{OUT}=1~\mu\text{F},~T_{A}=25^{\circ}C~unless~otherwise~specified.)$ 

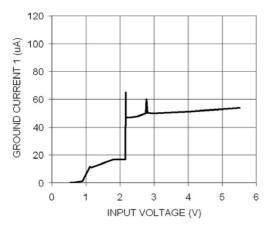


Figure 9. Ground Current (EN2 = GND)

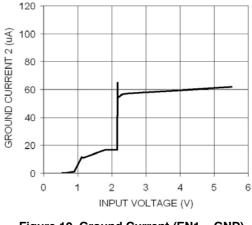


Figure 10. Ground Current (EN1 = GND)

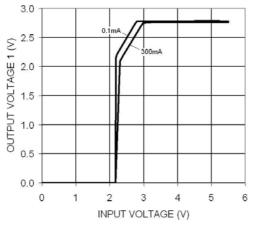


Figure 11. Output 1 Dropout Characteristics

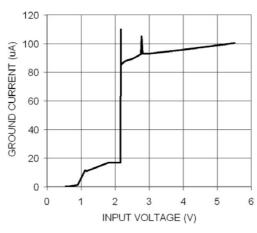


Figure 12. Ground Current vs. Input Voltage

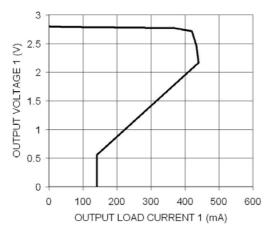


Figure 13. Output Voltage 1 vs. Load Current 1

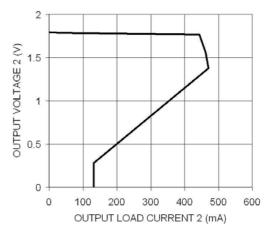
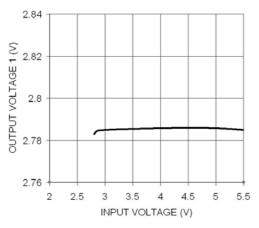


Figure 14. Output Voltage 2 vs. Load Current 2

# TYPICAL CHARACTERISTICS (shown for 2.8 V/1.8 V outputs option)

 $(V_{IN}=3.8~V,~I_{OUT}=100~\mu\text{A},~EN1=EN2=V_{IN},~C_{IN}=C_{OUT}=1~\mu\text{F},~T_{A}=25^{\circ}C~unless~otherwise~specified.)$ 



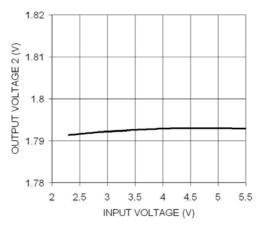


Figure 15. Line Regulation VOUT1

Figure 16. Line Regulation VOUT2

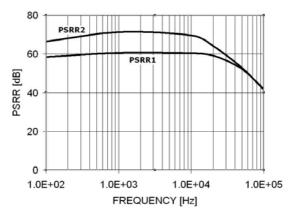


Figure 17. PSRR 1 & 2 vs. Frequency (30 mA Load)

## TRANSIENT CHARACTERISTICS (shown for 2.8 V/1.8 V outputs option)

 $(V_{IN}=3.8~V,~I_{OUT}=100~\mu\text{A},~EN1=EN2=V_{IN},~C_{IN}=C_{OUT}=1~\mu\text{F},~T_{A}=25^{\circ}C~unless~otherwise~specified.)$ 

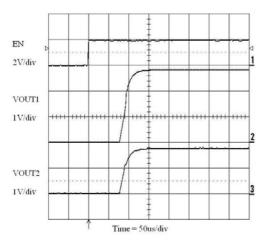


Figure 18. Enable Turn-on (100 μA Loads)

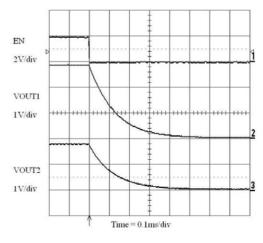


Figure 19. Enable Turn-off (100 μA Loads)

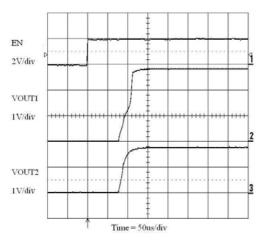


Figure 20. Enable Turn-on (300 mA/100 μA Loads)

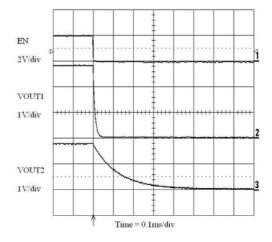


Figure 21. Enable Turn-off (300 mA/100 μA Loads)

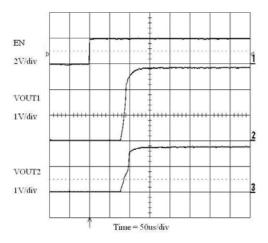


Figure 22. Enable Turn-on (100 μA/300 mA Loads)

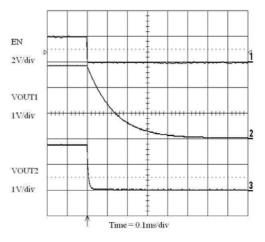


Figure 23. Enable Turn-off (100 μA/300 mA Loads)

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

## TRANSIENT CHARACTERISTICS (shown for 2.8 V/1.8 V outputs option)

 $(V_{IN}=3.8~V,~I_{OUT}=100~\mu\text{A},~EN1=EN2=V_{IN},~C_{IN}=C_{OUT}=1~\mu\text{F},~T_{A}=25^{\circ}C~unless~otherwise~specified.)$ 

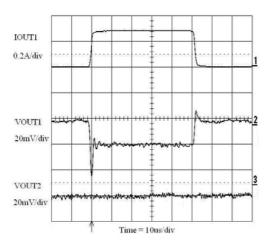


Figure 24. VOUT1 Load Transient Response (0.1 to 300 mA)

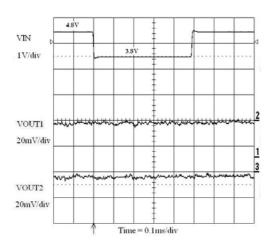


Figure 26. Line Transient Response (0.1 mA Loads)

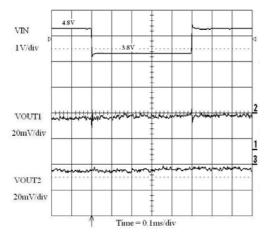


Figure 28. Line Transient Response (100/0.1 mA Loads)

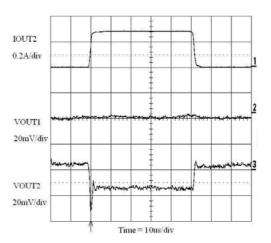


Figure 25. VOUT2 Load Transient Response (0.1 to 300 mA)

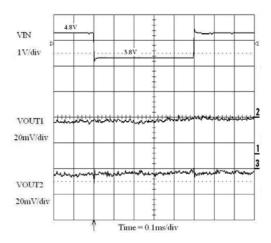


Figure 27. Line Transient Response (0.1/100 mA Loads)

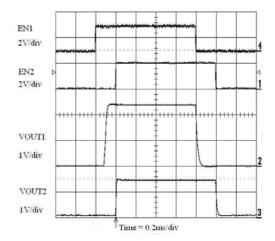
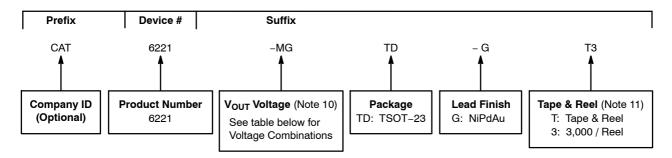


Figure 29. Separate Enable Operation (100 mA Loads)

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

# **Example of Ordering Information** (Note 9)



## **ORDERING INFORMATION**

Orderable Part Number	V <sub>OUT</sub> Voltage V <sub>OUT1</sub> / V <sub>OUT2</sub>	Package	Shipping
CAT6221-JFTD-GT3	2.5 V / 1.5 V	TSOT-23	3,000 / Tape & Reel
CAT6221-JGTD-GT3	2.5 V / 1.8 V	TSOT-23	3,000 / Tape & Reel
CAT6221-JLTD-GT3	2.5 V / 2.7 V	TSOT-23	3,000 / Tape & Reel
CAT6221-JPTD-GT3	2.5 V / 3.0 V	TSOT-23	3,000 / Tape & Reel
CAT6221-MFTD-GT3	2.8 V / 1.5 V	TSOT-23	3,000 / Tape & Reel
CAT6221-MGTD-GT3	2.8 V / 1.8 V	TSOT-23	3,000 / Tape & Reel
CAT6221-MLTD-GT3	2.8 V / 2.7 V	TSOT-23	3,000 / Tape & Reel
CAT6221-MPTD-GT3	2.8 V / 3.0 V	TSOT-23	3,000 / Tape & Reel
CAT6221-PFTD-GT3	3.0 V / 1.5 V	TSOT-23	3,000 / Tape & Reel
CAT6221-PGTD-GT3	3.0 V / 1.8 V	TSOT-23	3,000 / Tape & Reel
CAT6221-PLTD-GT3	3.0 V / 2.7 V	TSOT-23	3,000 / Tape & Reel
CAT6221-PPTD-GT3	3.0 V / 3.0 V	TSOT-23	3,000 / Tape & Reel
CAT6221-SFTD-GT3	3.3 V / 1.5 V	TSOT-23	3,000 / Tape & Reel
CAT6221-SGTD-GT3	3.3 V / 1.8 V	TSOT-23	3,000 / Tape & Reel
CAT6221-SLTD-GT3	3.3 V / 2.7 V	TSOT-23	3,000 / Tape & Reel
CAT6221-SPTD-GT3	3.3 V / 3.0 V	TSOT-23	3,000 / Tape & Reel

<sup>7.</sup> All packages are RoHS-compliant (Lead-free, Halogen-free).

 <sup>7.</sup> All packages are fished compliant (2543 fise), halogs: 1.25,
 8. The standard finish is NiPdAu pre-plated (PPF) lead frames.
 9. The device used in the above example is a CAT6221-MGTD-GT3 (V<sub>OUT1</sub> = 2.8 V, V<sub>OUT2</sub> = 1.8 V, in a TSOT-23 package, NiPdAu, Tape

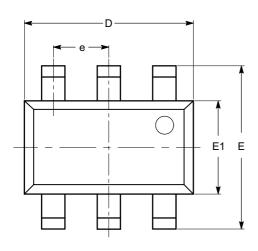
<sup>10.</sup> For other voltage options, please contact your nearest ON Semiconductor Sales office.

<sup>11.</sup> For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

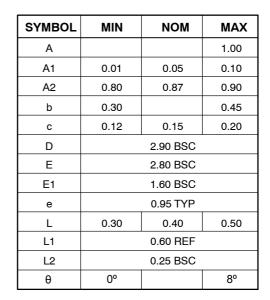


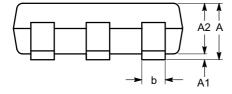
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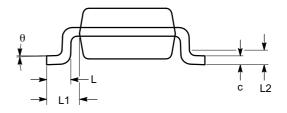


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SIDE VIEW



**END VIEW** 

#### Notes:

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-193.

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