CAT6217

150 mA CMOS LDO Regulator

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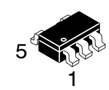
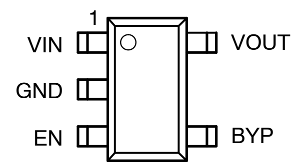


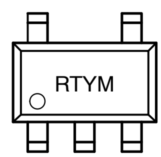
TSOT−23
TD SUFFIX
CASE 419AE

PIN CONNECTIONS



(Top View)

MARKING DIAGRAM



RT = CAT6217 Device Code
Y = Production Year (last digit)
M = Production Month: 1 − 9, A, B, C

PIN FUNCTION

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

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 9 of this data sheet.

Description

The CAT6217 is a 150 mA 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 150 μs.

With zero shutdown current and low ground current of 55 μA typical, the CAT6217 is ideal for battery−operated devices with supply voltages from 2.3 V to 5.5 V. An internal under voltage lockout circuit disables the output at supply voltages under 2.1 V typical.

The CAT6217 offers 1% initial accuracy and low dropout voltage, 90 mV typical at 150 mA. Stable operation is provided with a 1 μF ceramic capacitor, reducing required board space and component cost.

Other features include output short−circuit current limit and thermal protection.

The device is available in the low profile (1 mm max height) 5−lead TSOT−23 package.

Features

- Guaranteed 150 mA Output Current
- Low Dropout Voltage of 90 mV Typical at 150 mA
- Stable with 1 μF Ceramic Output Capacitor
- External 10 nF Bypass Capacitor for Low Noise
- Quick−start Feature
- No−load Ground Current of 55 μA Typical
- Full−load Ground Current of 80 μA Typical
- ±1.0% Initial Accuracy ($V_{OUT} \geq 2.0$ V)
- ±2.0% Accuracy Over Temperature ($V_{OUT} \geq 2.0$ V)
- “Zero” Current Shutdown Mode
- Current Limit and Under Voltage Lockout
- Thermal Protection
- 5−lead TSOT−23 Package
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Cellular Phones
- Battery−powered Devices
- Consumer Electronics

January, 2011 − Rev. 6

Publication Order Number:
CAT6217/D

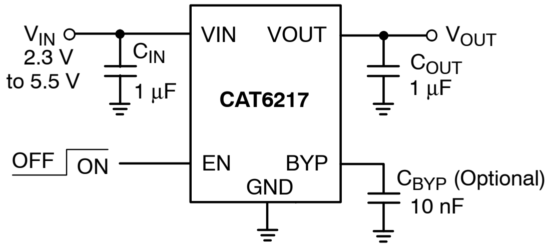


Figure 1. Typical Application Circuit

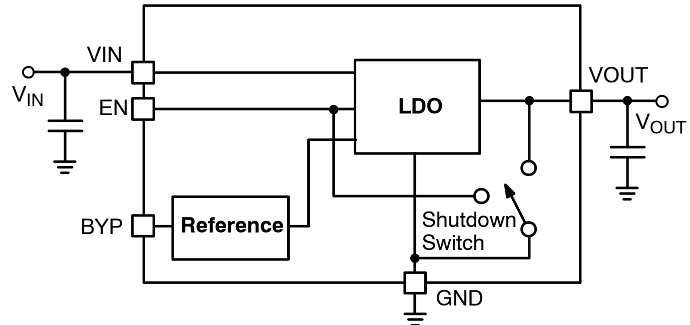


Figure 2. CAT6217 Functional Block Diagram

Pin Function

VIN is the supply pin for the LDO. A small 1 μF 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 2.3 V to 5.5 V.

EN is the enable control logic (active high) for the regulator output. It has a 2.5 MΩ 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 μF 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 μF. The capacitor should be located near the device. ESR domain is 5 mΩ to 500 mΩ. V_{OUT} can deliver a maximum guaranteed current of 150 mA. A 250 Ω 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 μF capacitor can be connected between BYP pin and GND to reduce the output noise and enhance the PSRR at high frequency.

Table 1. ABSOLUTE MAXIMUM RATINGS

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 (Note 1)	mW
Storage Temperature Range, T_S	−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_{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

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

1. 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. The device is not guaranteed to work outside its operating rating.

Table 3. ELECTRICAL OPERATING CHARACTERISTICS (Note 3)
(V_{IN} = V_{OUT} + 1.0 V, V_{EN} = High, I_{OUT} = 100 μA, C_{IN} = C_{OUT} = 1 μF, 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	Typ	Max	Unit
$V_{OUT-ACC}$	Output Voltage Accuracy	Initial accuracy for V_{OUT} ≥ 2.0 V (Note 6)	−1.0		+1.0	%
			−2.0		**+2.0**	
TC_{OUT}	Output Voltage Temp. Coefficient			40		ppm/°C
V_{R-LINE}	Line Regulation	V_{IN} = V_{OUT} + 1.0 V to 5.5 V	−0.2	±0.1	+0.2	%/V
			−0.4		**+0.4**	
V_{R-LOAD}	Load Regulation	I_{OUT} = 100 μA to 150 mA		0.6	1.0	%
					1.3	
V_{DROP}	Dropout Voltage (Note 4)	I_{OUT} = 150 mA		90	125	mV
					150	
I_{GND}	Ground Current	I_{OUT} = 0 μA		55	75	μA
					90	
		I_{OUT} = 150 mA		80		
I_{GND-SD}	Shutdown Ground Current	V_{EN} < 0.4 V			1	μA
					2	
PSRR	Power Supply Rejection Ratio	f = 1 kHz, C_{BYP} = 10 nF		64		dB
		f = 20 kHz, C_{BYP} = 10 nF		54		
I_{SC}	Output short circuit current limit	V_{OUT} = 0 V		350		mA
T_{ON}	Turn−On Time	C_{BYP} = 10 nF		150		μs
e_N	Output Noise Voltage (Note 5)	BW = 10 Hz to 100 kHz		45		μVrms
R_{OUT-SH}	Shutdown Switch Resistance			250		Ω
R_{EN}	Enable pull−down resistor			2.5		MΩ
V_{UVLO}	Under−voltage lock out (UVLO) threshold			2.1		V
ESR	C_{OUT} equivalent series resistance		5		500	mΩ
ENABLE INPUT						
V_{HI}	Logic High Level	V_{IN} = 2.3 to 5.5 V	**1.8**			V
		V_{IN} = 2.3 to 5.5 V, 0°C to +125°C junction temperature	1.6			
V_{LO}	Logic Low Level	V_{IN} = 2.3 to 5.5 V			**0.4**	V
I_{EN}	Enable Input Current	V_{EN} = 0.4 V		0.15	**1**	μA
		V_{EN} = V_{IN}		1.5	**4**	
THERMAL PROTECTION						
T_{SD}	Thermal Shutdown			160		°C
T_{HYS}	Thermal Hysteresis			10		°C

3. Specification for 2.80 V output version unless specified otherwise.
4. Dropout voltage is defined as the input−to−output differential at which the output voltage drops 2% below its nominal value. During test, the input voltage stays always above the minimum 2.3 V.
5. Specification for 1.8 V output version.
6. For V_{OUT} < 2.0 V, the initial accuracy is ±2% and across temperature ±3%.

TYPICAL CHARACTERISTICS (shown for 2.80 V output option)

(V_{IN} = 3.85 V, I_{OUT} = 100 μA, C_{IN} = C_{OUT} = 1 μF, C_{BYP} = 10 nF, T_A = 25°C unless otherwise specified.)

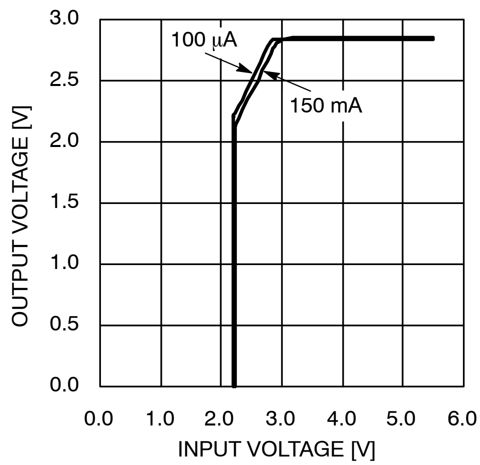


Figure 3. Dropout Characteristics

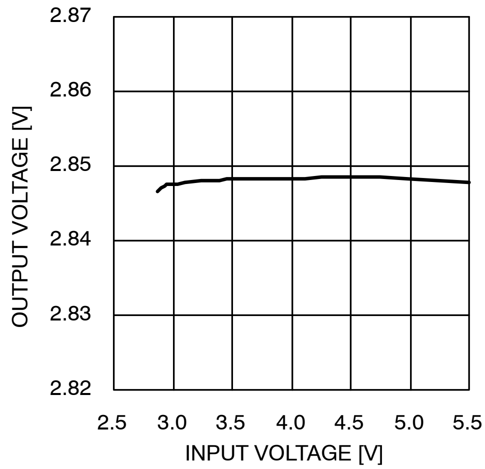


Figure 4. Line Regulation

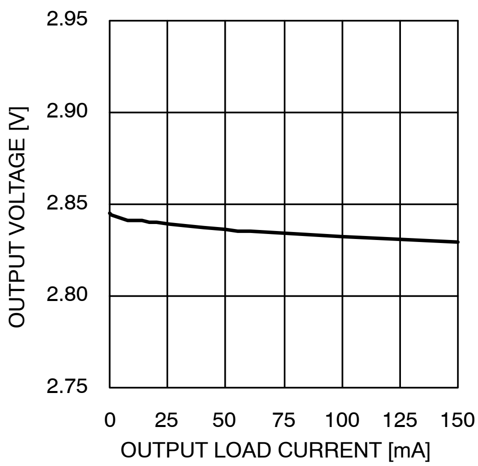


Figure 5. Load Regulation

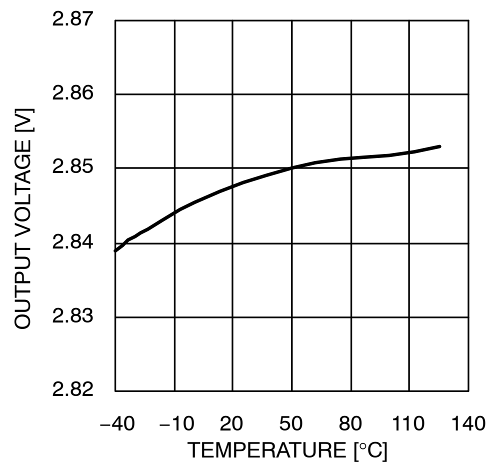


Figure 6. Output Voltage vs. Temperature

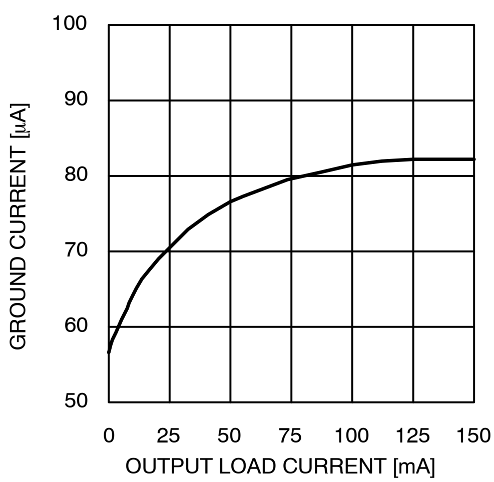


Figure 7. Ground Current vs. Load Current

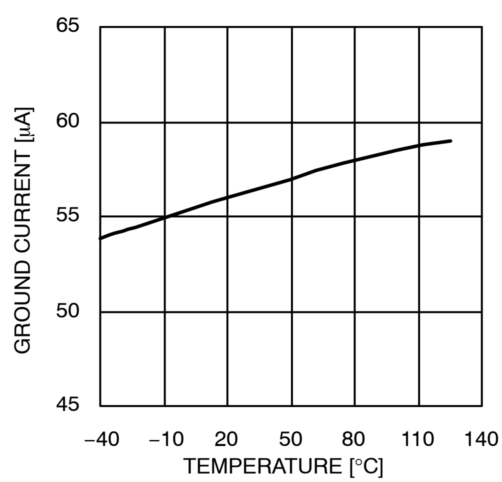


Figure 8. Ground Current vs. Temperature

TYPICAL CHARACTERISTICS (shown for 2.80 V output option)

(V_{IN} = 3.85 V, I_{OUT} = 100 μA, C_{IN} = C_{OUT} = 1 μF, C_{BYP} = 10 nF, T_A = 25°C unless otherwise specified.)

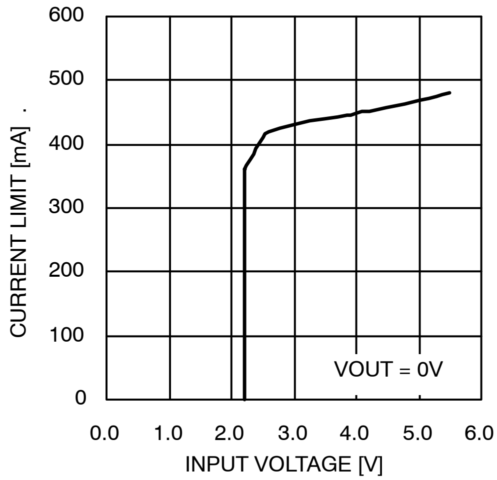


Figure 9. Output Short−circuit Current Limit

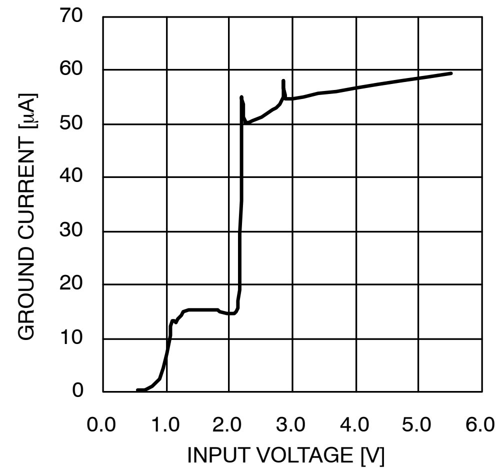


Figure 10. Ground Current vs. Input Voltage

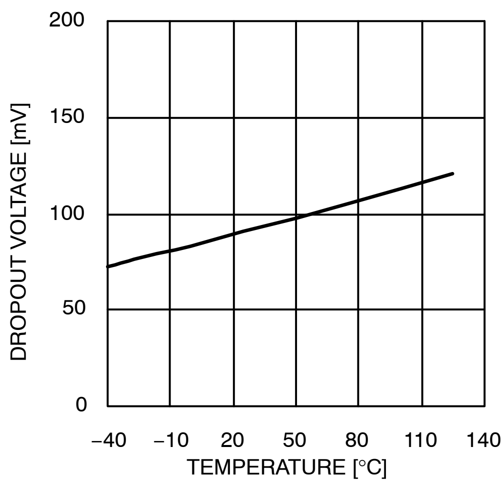


Figure 11. Dropout vs. Temperature (150 mA Load)

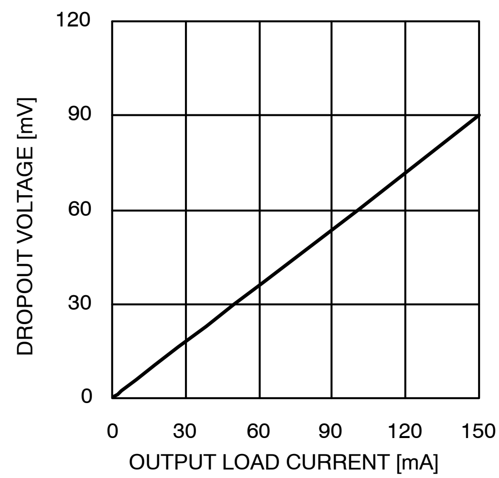


Figure 12. Dropout vs. Load Current

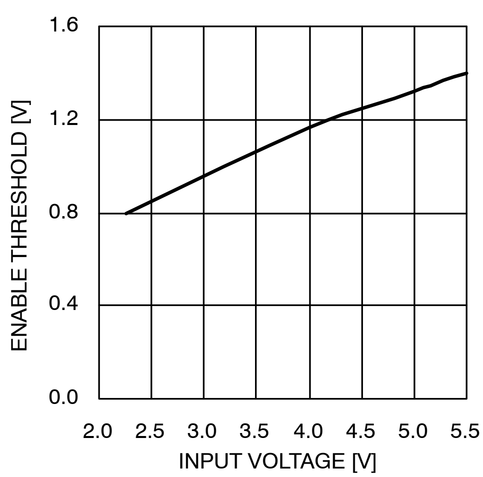


Figure 13. Enable Threshold vs. Input Voltage

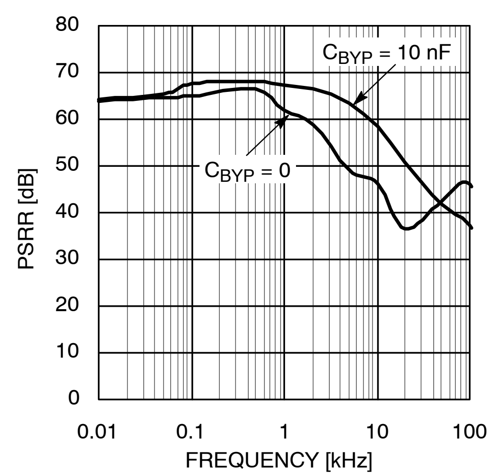


Figure 14. PSRR vs. Frequency (10 mA Load)

TYPICAL CHARACTERISTICS (shown for 2.80 V output option)

(V_{IN} = 3.85 V, I_{OUT} = 100 μA, C_{IN} = C_{OUT} = 1 μF, C_{BYP} = 10 nF, T_A = 25°C unless otherwise specified.)

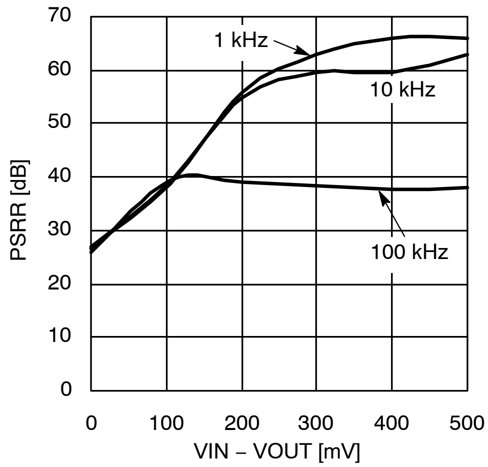


Figure 15. PSRR (30 mA Load)

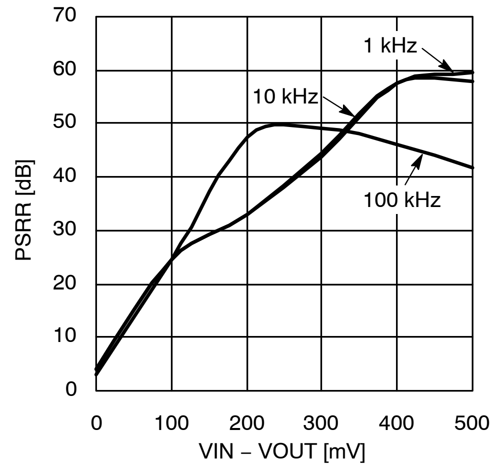


Figure 16. PSRR (150 mA Load)

TRANSIENT CHARACTERISTICS (shown for 2.80 V output option)

(V_{IN} = 3.85 V, I_{OUT} = 100 μA, C_{IN} = C_{OUT} = 1 μF, C_{BYP} = 10 nF, T_A = 25°C unless otherwise specified.)

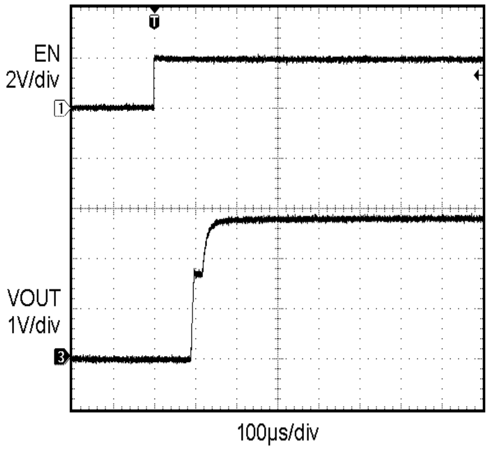


Figure 17. Enable Turn−on (100 μA Load)

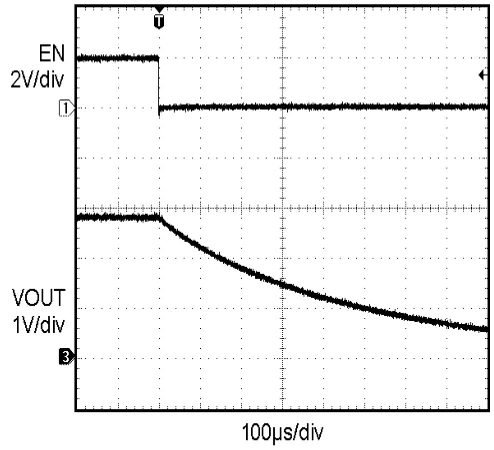


Figure 18. Enable Turn−off (100 μA Load)

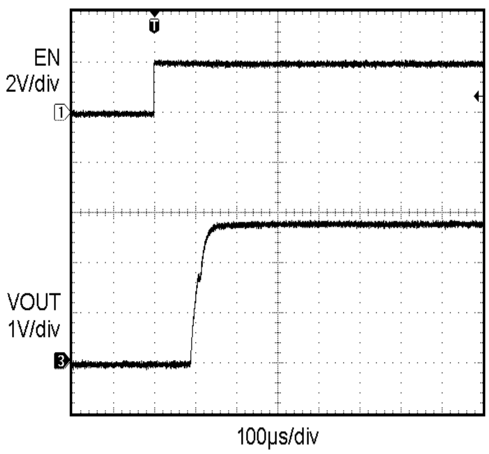


Figure 19. Enable Turn−on (150 mA Load)

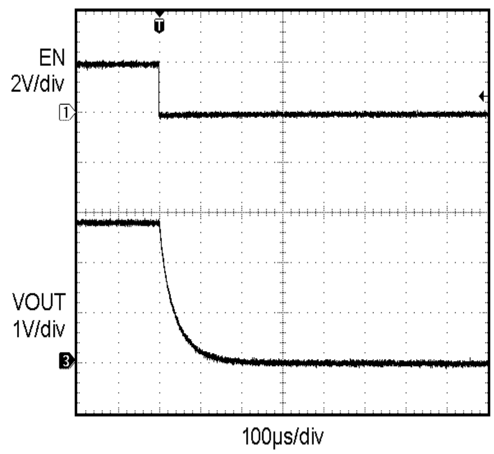


Figure 20. Enable Turn−off (150 mA Load)

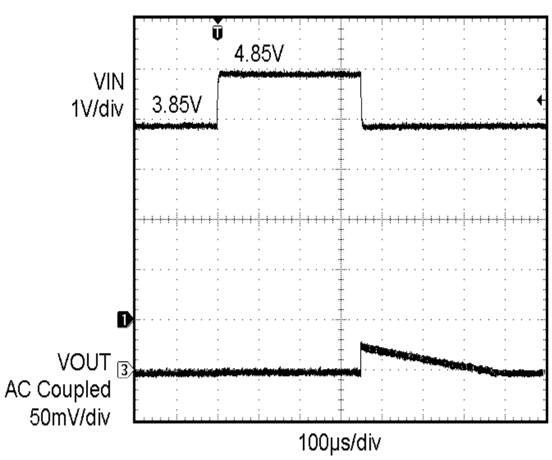


Figure 21. Line Transient Response (3.85 V to 4.85 V)

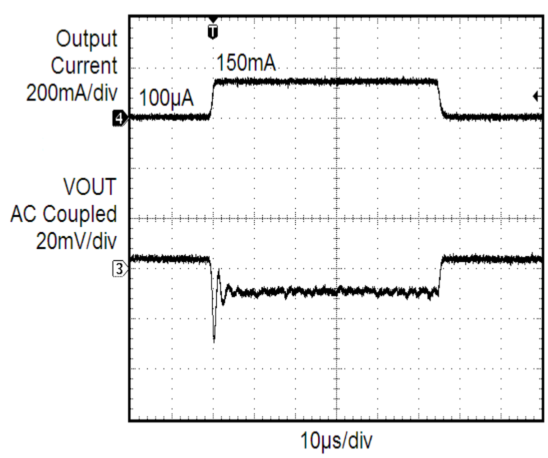


Figure 22. Load Transient Response (0.1 mA to 150 mA)

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

TSOT−23, 5 LEAD
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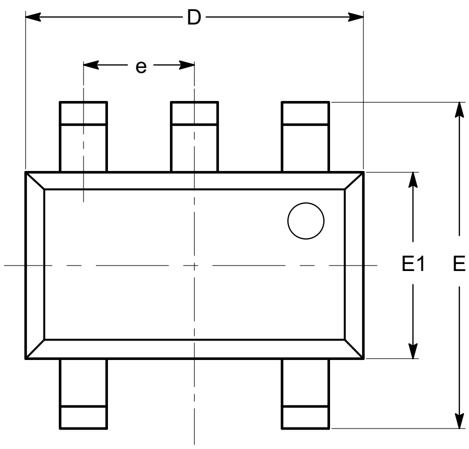
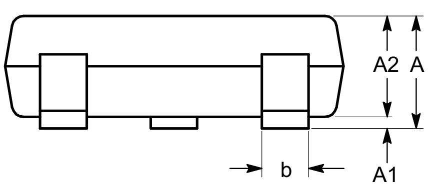
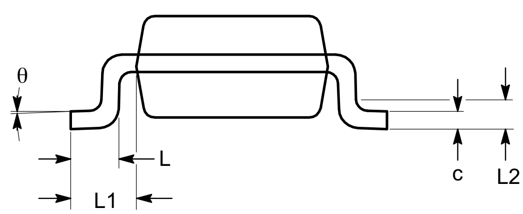


TOP VIEW

SYMBOL	MIN	NOM	MAX
A			1.00
A1	0.01	0.05	0.10
A2	0.80	0.87	0.90
b	0.30		0.45
c	0.12	0.15	0.20
D	2.90 BSC		
E	2.80 BSC		
E1	1.60 BSC		
e	0.95 TYP		
L	0.30	0.40	0.50
L1	0.60 REF		
L2	0.25 BSC		
θ	0º		8º



SIDE VIEW



END VIEW

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

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DESCRIPTION:	TSOT−23, 5 LEAD	PAGE 1 OF 1

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