THE DATASHEET OF

APDA1806CGCK

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USE AP7375

Lead-free Green

AP7370

WIDE INPUT VOLTAGE RANGE, 300mA ULDO REGULATOR

Description

The AP7370 series is a positive voltage regulator IC.

The AP7370 has features of wide input voltage range, high accuracy, low dropout voltage, current limit, reverse current protection, and ultra-low quiescent current which make it ideal for use in various USB and portable devices and instrument application.

The IC consists of a voltage reference, an error amplifier, a resistor network for setting output voltage, a current limit circuit for current protection, and a chip enable circuit.

The AP7370 is available in 1.2V, 1.5V, 1.8V, 2.8V, 3.0V, 3.3V, 3.6V and 5.0V fixed output voltage versions.

The AP7370 is available in space-saving SOT23, SOT25, SOT89 and U-DFN2020-6 (Type C) packages.

Features

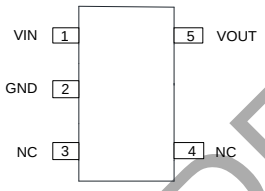
- Wide Input Voltage Range: Up to 18V
- Low Dropout Voltage: V_{DROP} = 500mV @ I_{OUT} = 100mA
- Low Ground Current
- High Output Voltage Accuracy
- Compatible with Low ESR Ceramic Capacitor
- Excellent Line/Load Regulation
- Thermal Shutdown Function
- Short Current Protection
- Reverse Current Protection

Applications

- Battery-Powered Equipment
- Laptop, Palmtops, Notebook Computers
- Portable Information Appliances
- Metering
- Weighing Scales

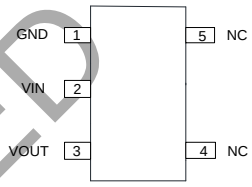
Pin Assignments

(Top View)



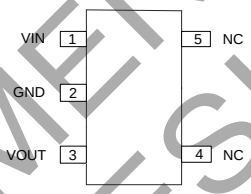
SOT25 (W5)

(Top View)



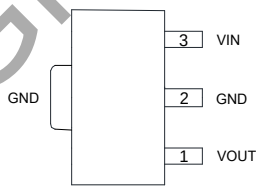
SOT25 (WR)

(Top View)



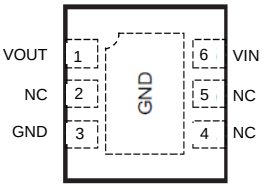
SOT25 (WW)

(Top View)



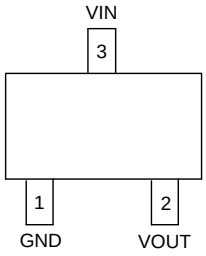
SOT89

(Top View)



U-DFN2020-6 (Type C)

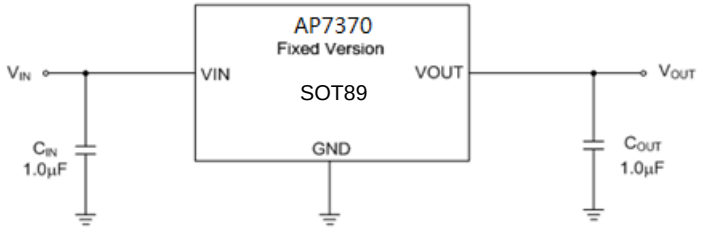
(Top View)



SOT23

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Typical Applications Circuit



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Pin Descriptions

Pin Number						Pin Name	Function
SOT25 (W5)	SOT25 (WR)	SOT25 (WW)	SOT89	SOT23	U-DFN2020-6 (Type C)		
1	2	1	3	3	6	VIN	Input voltage
2	1	2	2	1	3	GND	Ground
3, 4	4, 5	4, 5	—	—	2, 4, 5	NC	Not connected for fixed version
5	3	3	1	2	1	VOUT	Regulated output voltage
—	—	—	—	—	EP	GND	Ground

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Absolute Maximum Ratings

Symbol	Parameter	Rating		Unit
V_{IN}	Supply Input Voltage	20		V
I_{OUT}	Output Current	500		mA
T_{LEAD}	Lead Temperature (Soldering, 10s)	+260		°C
T_J	Operating Junction Temperature	+150		°C
θ_{JA}	Thermal Resistance (Junction to Ambient)	SOT23	205	°C/W
		SOT25	155	
		SOT89	126	
		U-DFN2020-6 (Type C)	54	
θ_{JC}	Thermal Resistance (Junction to Case)	SOT23	37	°C/W
		SOT25	23	
		SOT89	26	
		U-DFN2020-6 (Type C)	9.5	
T_{STG}	Storage Temperature Range	-65 to +150		°C
—	ESD (Change Device Model))	1500		V
—	ESD (Human Body Model)	6000		V

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{IN}	Supply Input Voltage	3.2	18	V
T_J	Operating Junction Temperature	-40	+125	°C

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Electrical Characteristics (@T_A = -40°C to +85°C, V_{IN} = $V_{OUT(Typ)}$ + 1V or 2.7V (whichever is greater), I_{OUT} = 10mA, and C_{IN} = C_{OUT} = 1.0µF ceramic, unless otherwise noted. Typical values are at T_A = +25°C.)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	V_{OUT} > 2.5V	V_{OUT} × 99%	V_{OUT}	V_{OUT} × 101%	V
		V_{OUT} ≤ 2.5V	V_{OUT} × 98%	V_{OUT}	V_{OUT} × 102%	V
V_{IN}	Input Voltage	—	3.2	—	18	V
I_{LIMIT}	Current Limit (Note 4)	V_{OUT} > 2.5V, V_{OUT1} = 98% × V_{OUT}	350	—	—	mA
		V_{OUT} ≤ 2.5V, V_{OUT1} = 98% × V_{OUT}	200	—	—	mA
$\Delta V_{OUT}/\Delta V_{IN}/V_{OUT}$	Line Regulation	($V_{OUT(Nom)}$ + 1V, 3.2V) ≤ V_{IN} ≤ 18V, I_{OUT} = 10mA	—	0.05	—	%/V
$\Delta V_{OUT}/V_{OUT}$	Load Regulation	V_{OUT} > 2.5V, V_{IN} = V_{OUT} + 2V, 1mA ≤ I_{OUT} ≤ 300mA	—	0.5	—	%
		V_{OUT} ≤ 2.5V, V_{IN} = V_{OUT} + 3V, 1mA ≤ I_{OUT} ≤ 150mA	—	0.5	—	%
V_{DROP}	Dropout Voltage (Notes 5, 6)	3.0V ≤ V_{OUT} < 5.0V, I_{OUT} = 100mA	—	500	600	mV
		V_{OUT} = 5.0V, I_{OUT} = 100mA	—	450	550	mV
I_{GND}	Ground Current	I_{OUT} = 0A	—	1.5	2.5	µA
		V_{OUT} > 2.5V, I_{OUT} = 300mA	—	250	300	
		V_{OUT} ≤ 2.5V, I_{OUT} = 150mA				
$\Delta V_{OUT}/(V_{OUT} \times \Delta T)$	Output Voltage Temperature Coefficient	I_{OUT} = 100µA, -40°C ≤ T_J ≤ +125°C	—	±100	—	ppm/°C
T_{OTSD}	Thermal Shutdown Temperature	—	—	+160	—	°C
T_{HYOTSD}	Thermal Shutdown Hysteresis	—	—	+20	—	°C

Notes: 4. Measured with V_{IN} = V_{OUT} + 3V for V_{OUT} ≤ 2.5V. Measured with V_{IN} = V_{OUT} + 2.5V for V_{OUT} > 2.5V.

5. V_{DROP} is measured with V_{IN} = 0.98 × $V_{OUT(Nom)}$.

6. Dropout is only valid when V_{OUT} ≥ 2.8V because of the minimum input voltage limits.

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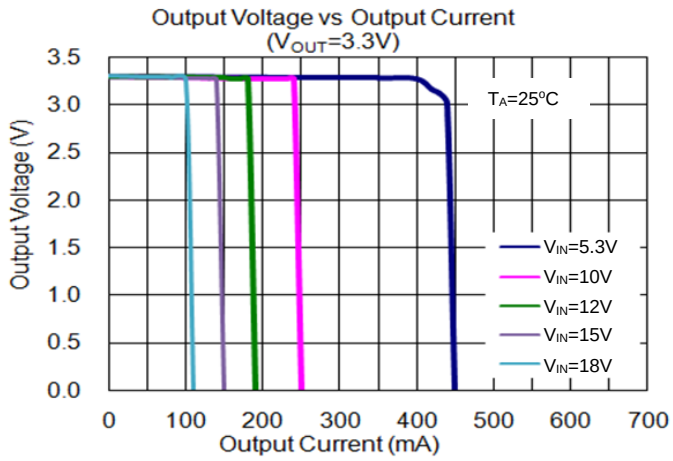
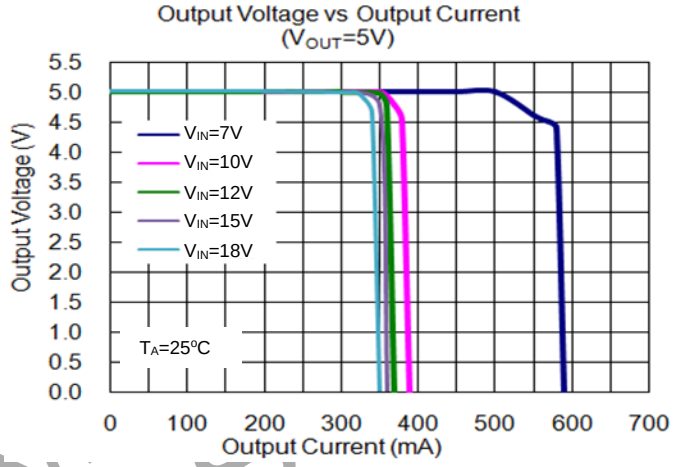
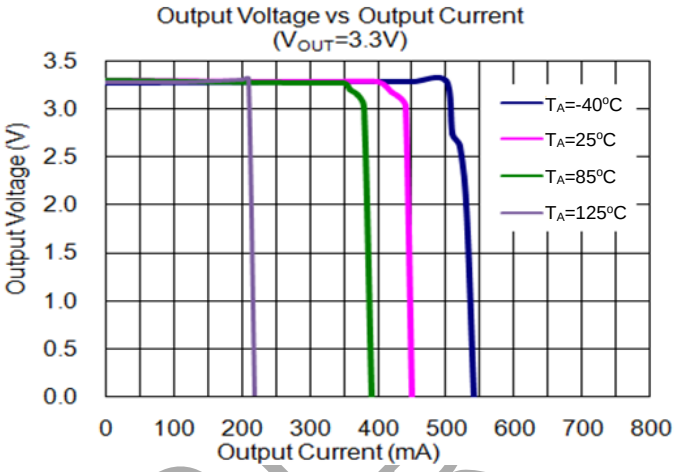
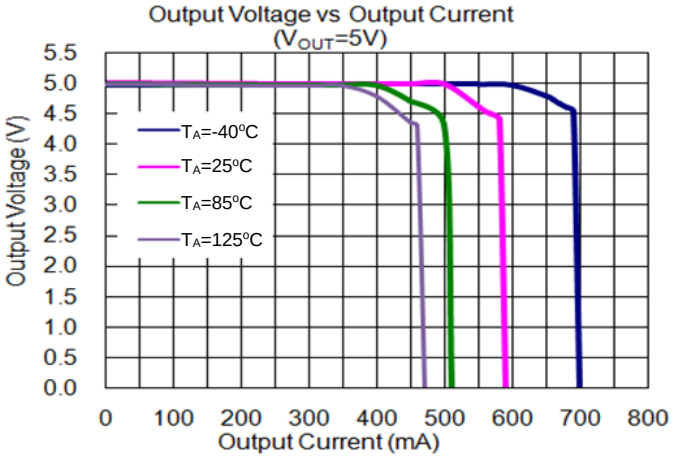
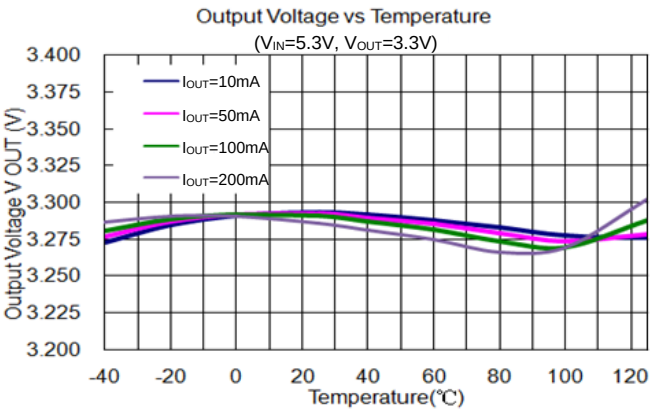
Performance Characteristics

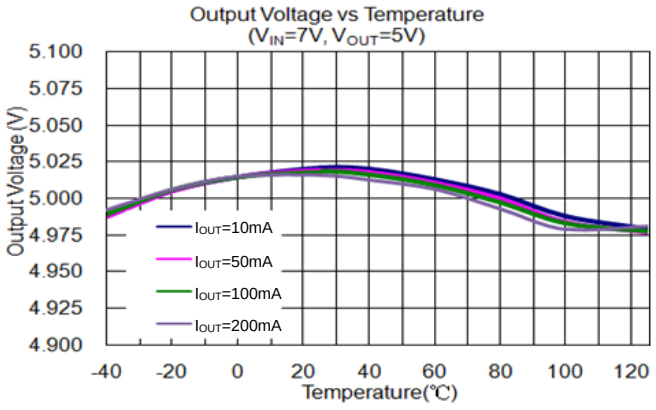












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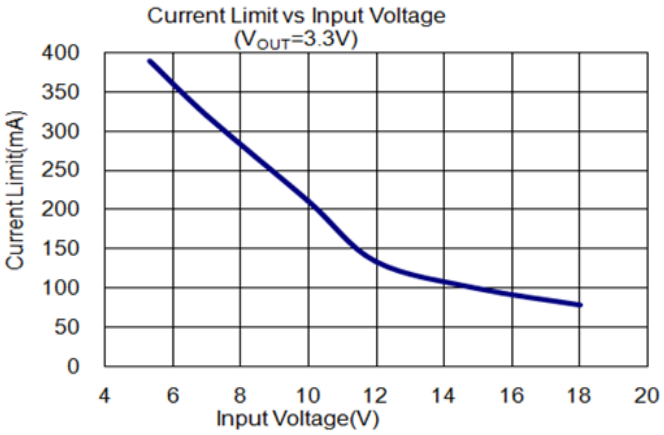
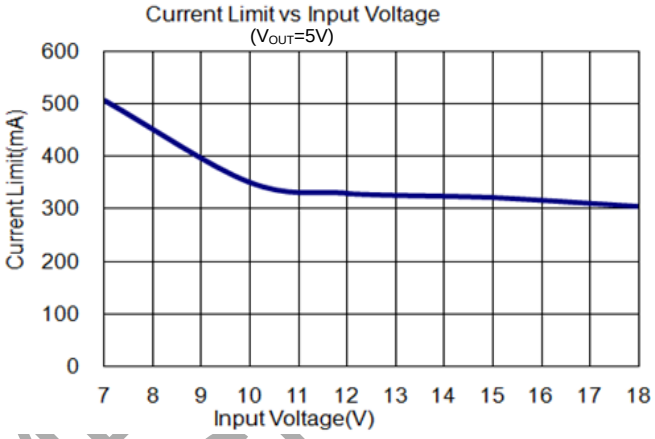
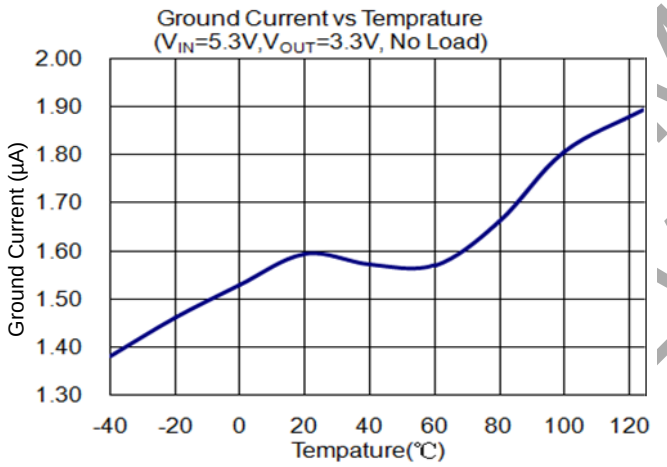
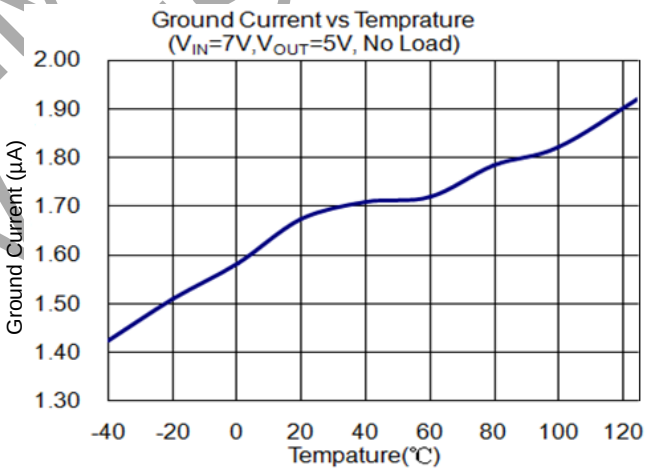
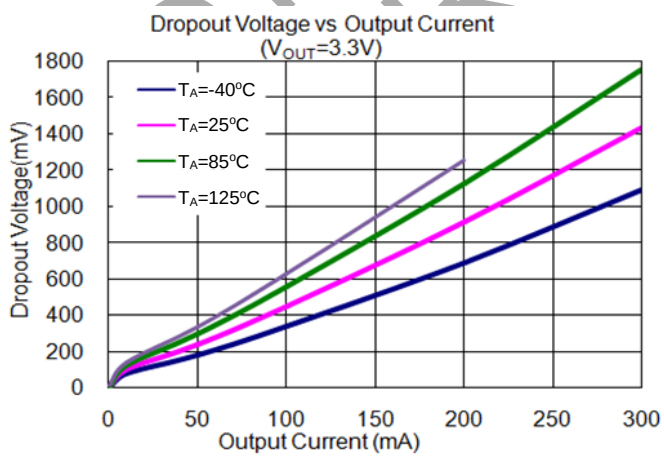
Performance Characteristics (continued)

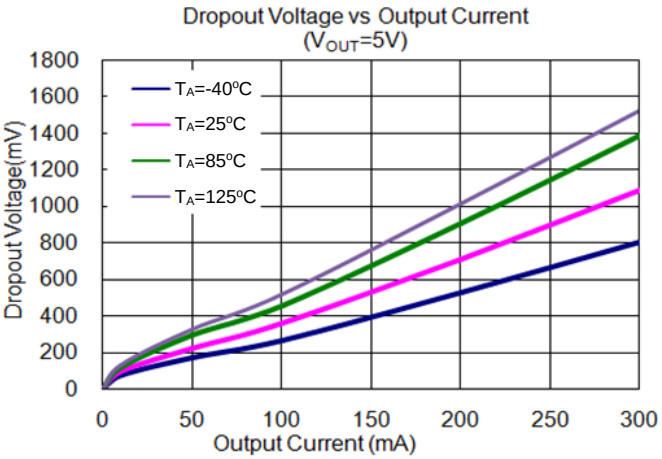












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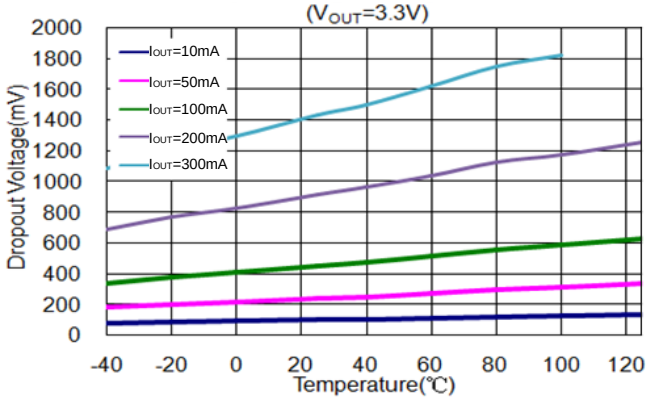
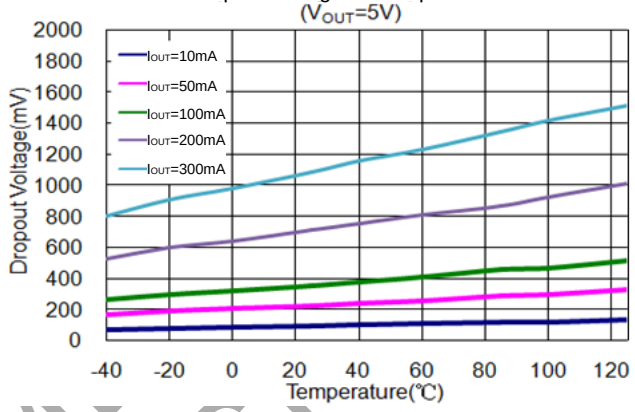
Performance Characteristics (continued)

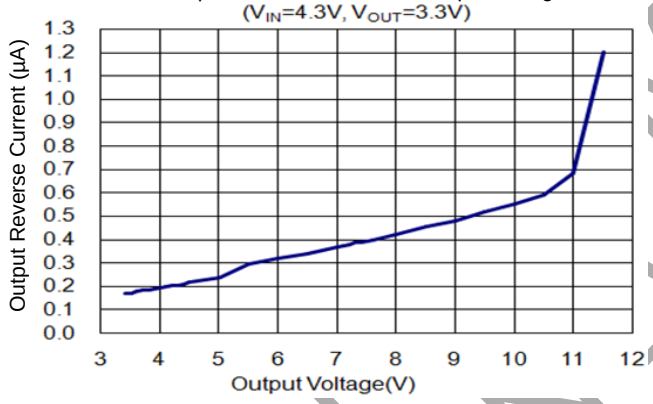
Dropout Voltage vs Temperature
(V_{OUT}=3.3V)



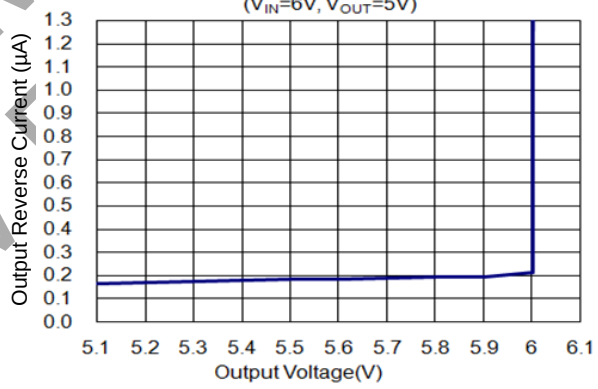
Dropout Voltage vs Temperature
(V_{OUT}=5V)



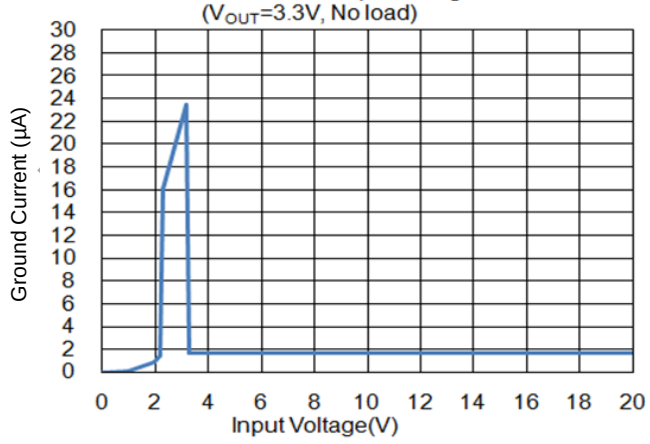
Output Reverse Current vs Output Voltage
(V_{IN}=4.3V, V_{OUT}=3.3V)



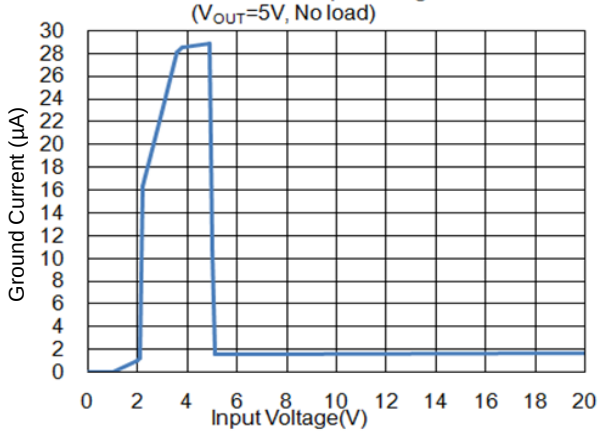
Output Reverse Current vs Output Voltage
(V_{IN}=6V, V_{OUT}=5V)



Ground Current vs Input Voltage
(V_{OUT}=3.3V, No load)



Ground Current vs Input Voltage
(V_{OUT}=5V, No load)



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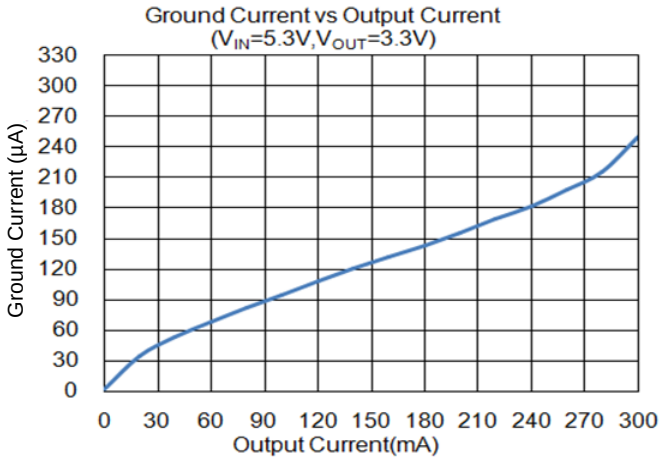
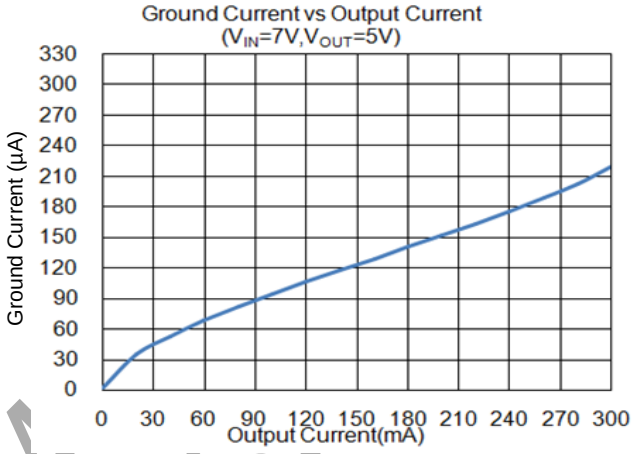
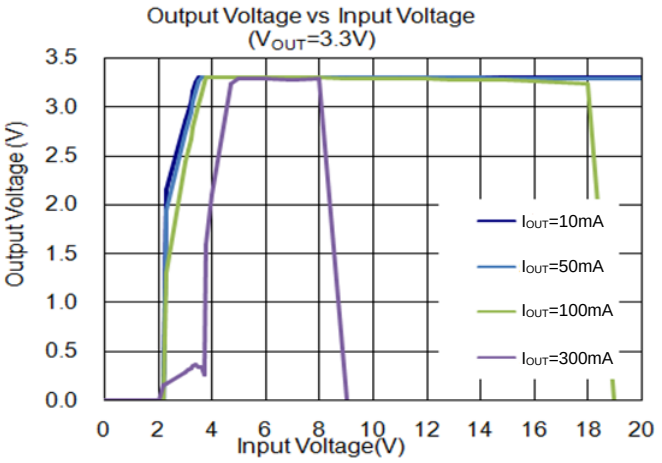
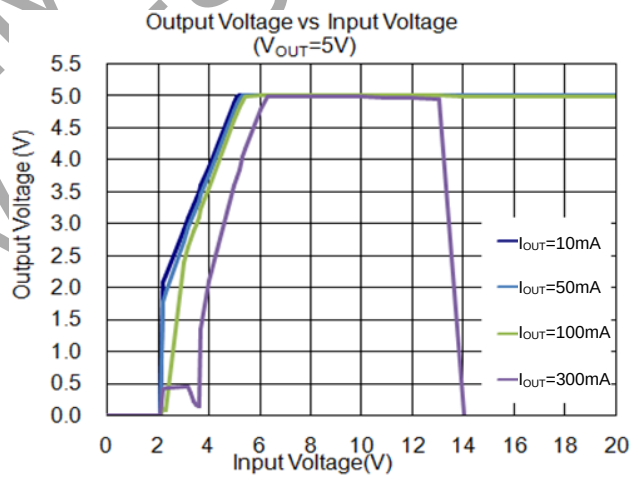
Performance Characteristics (continued)

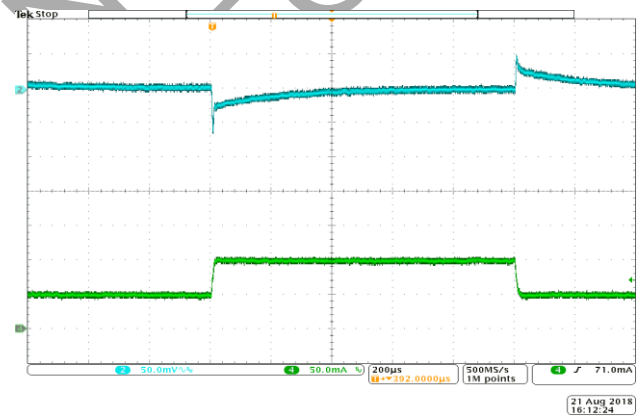




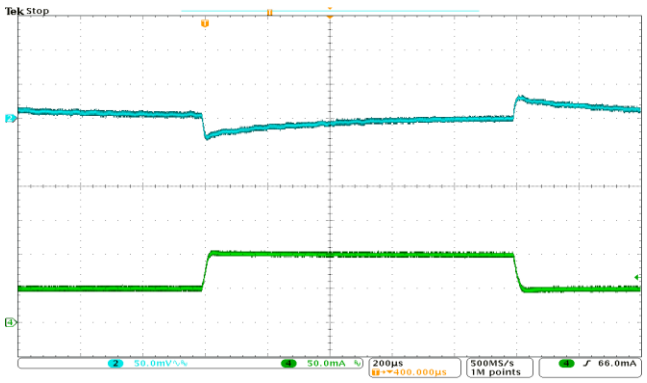




Load Transient
(V_{IN} = 5.3V, V_{OUT} = 3.3V, Load = 50mA to 100mA, T_A = +25°C)



Load Transient
(V_{IN} = 7V, V_{OUT} = 5V, Load = 50mA to 100mA, T_A = +25°C)



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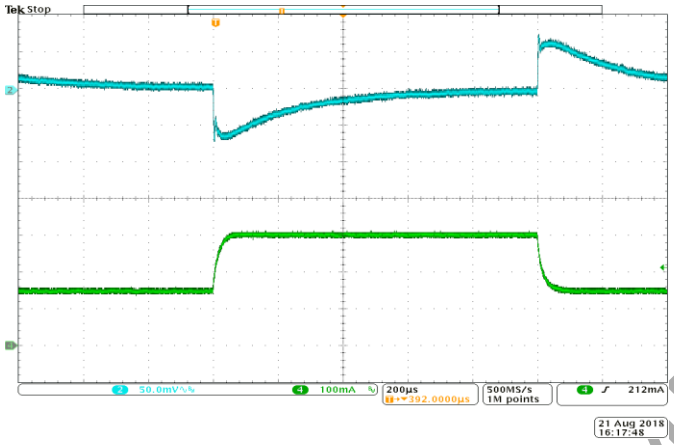
Performance Characteristics (continued)

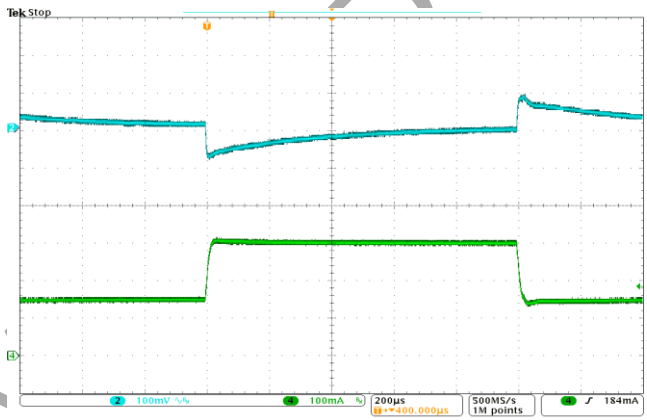
Load Transient

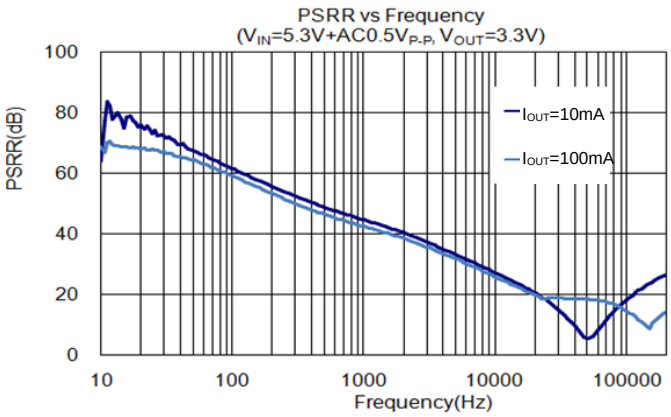
V_{IN} = 5.3V, V_{OUT} = 3.3V, Load = 150mA to 300mA, T_A = +25°C



Load Transient

(V_{IN} = 7V, V_{OUT} = 5V, Load = 150mA to 300mA, T_A = +25°C)





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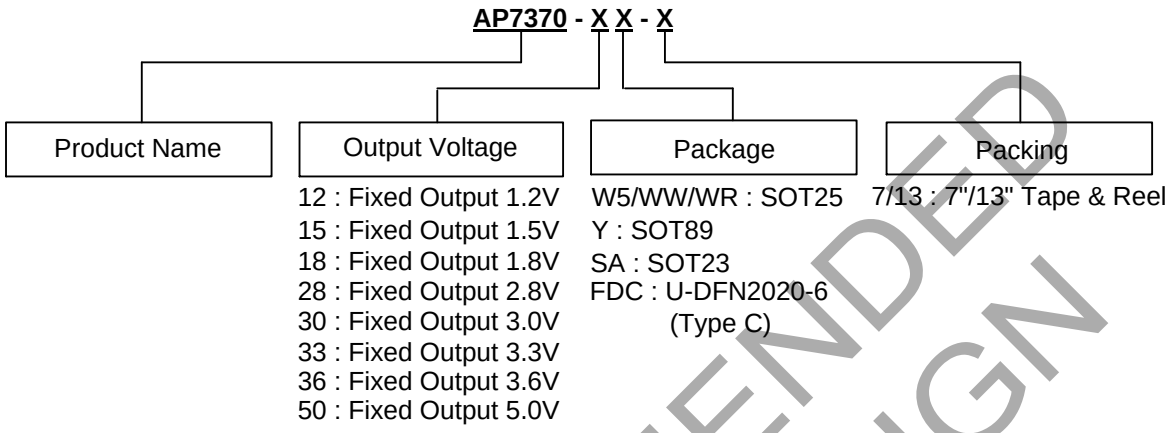
Ordering Information



Part Number	Package Code	Package	7"/13" Tape and Reel	
			Quantity	Part Number Suffix
AP7370-XXW5-7	W5	SOT25	3000/Tape & Reel	-7
AP7370-XXWR-7	WR	SOT25	3000/Tape & Reel	-7
AP7370-XXWW-7	WW	SOT25	3000/Tape & Reel	-7
AP7370-XXY-13	Y	SOT89	2500/Tape & Reel	-13
AP7370-XXSA-7	SA	SOT23	3000/Tape & Reel	-7
AP7370-XXFDC-7	FDC	U-DFN2020-6 (Type C)	3000/Tape & Reel	-7

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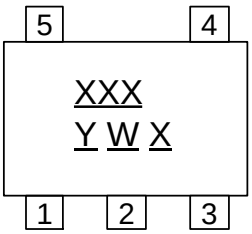
Marking Information

(1) SOT25

(Top View)



XXX : Identification Code
Y : Year 0 to 9
W : Week : A to Z : 1 to 26 week;
a to z : 27 to 52 week; z represents 52 and 53 week
X : Internal Code

Part Number	Package	Identification Code
AP7370-12W5-7	SOT25	B8A
AP7370-15W5-7	SOT25	B8F
AP7370-18W5-7	SOT25	B8B
AP7370-28W5-7	SOT25	B8G
AP7370-30W5-7	SOT25	B8C
AP7370-33W5-7	SOT25	B8D
AP7370-36W5-7	SOT25	B8E
AP7370-50W5-7	SOT25	B8H
AP7370-12WR-7	SOT25	B8J
AP7370-15WR-7	SOT25	B8R
AP7370-18WR-7	SOT25	B8K
AP7370-28WR-7	SOT25	B8S
AP7370-30WR-7	SOT25	B8M
AP7370-33WR-7	SOT25	B8N
AP7370-36WR-7	SOT25	B8P
AP7370-50WR-7	SOT25	B8T
AP7370-12WW-7	SOT25	B8U
AP7370-15WW-7	SOT25	B8Z
AP7370-18WW-7	SOT25	B8V
AP7370-28WW-7	SOT25	B82
AP7370-30WW-7	SOT25	B8W
AP7370-33WW-7	SOT25	B8X
AP7370-36WW-7	SOT25	B8Y
AP7370-50WW-7	SOT25	B83

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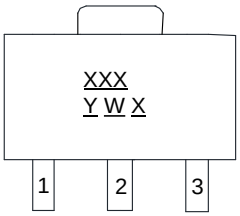
Marking Information (continued)

(2) SOT89

(Top View)

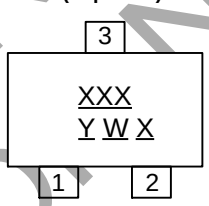


XXX : Identification Code
Y : Year : 0 ~ 9
W : Week : A ~ Z : 1 ~ 26 Week;
a ~ z : 27 ~ 52 Week;
z Represents 52 and 53 Week
X : Internal Code

Part Number	Package	Identification Code
AP7370-12Y-13	SOT89	B8A
AP7370-15Y-13	SOT89	B8F
AP7370-18Y-13	SOT89	B8B
AP7370-28Y-13	SOT89	B8G
AP7370-30Y-13	SOT89	B8C
AP7370-33Y-13	SOT89	B8D
AP7370-36Y-13	SOT89	B8E
AP7370-50Y-13	SOT89	B8H

(3) SOT23

(Top View)



XXX : Identification Code
Y : Year 0 to 9
W : Week : A to Z : 1 to 26 week;
a to z : 27 to 52 week; z represents 52 and 53 week
X : Internal Code

Part Number	Package	Identification Code
AP7370-12SA-7	SOT23	B8J
AP7370-15SA-7	SOT23	B8R
AP7370-18SA-7	SOT23	B8K
AP7370-28SA-7	SOT23	B8S
AP7370-30SA-7	SOT23	B8M
AP7370-33SA-7	SOT23	B8N
AP7370-36SA-7	SOT23	B8P
AP7370-50SA-7	SOT23	B8T

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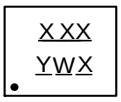
Ordering Information (continued)

(4) U-DFN2020-6 (Type C)

(Top View)



XXX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents
52 and 53 week
X : Internal Code

Device	Package	Identification Code
AP7370-12FDC-7	U-DFN2020-6 (Type C)	B8U
AP7370-15FDC-7	U-DFN2020-6 (Type C)	B8Z
AP7370-18FDC-7	U-DFN2020-6 (Type C)	B8V
AP7370-28FDC-7	U-DFN2020-6 (Type C)	B82
AP7370-30FDC-7	U-DFN2020-6 (Type C)	B8W
AP7370-33FDC-7	U-DFN2020-6 (Type C)	B8X
AP7370-36FDC-7	U-DFN2020-6 (Type C)	B8Y
AP7370-50FDC-7	U-DFN2020-6 (Type C)	B83

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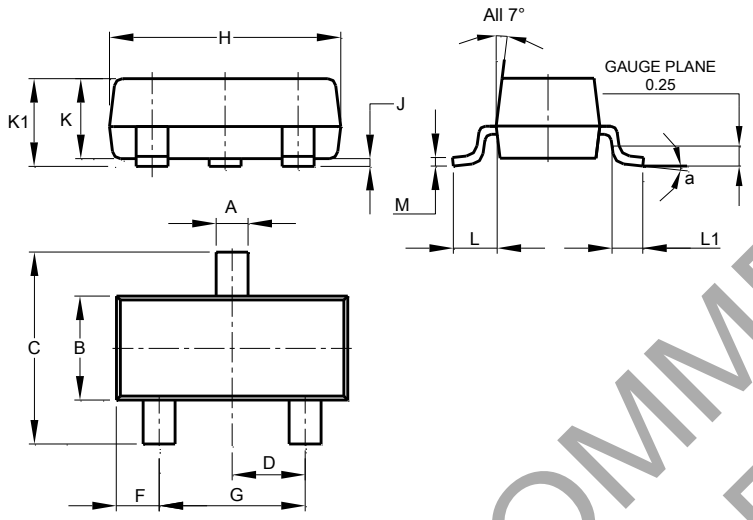
Package Outline Dimensions

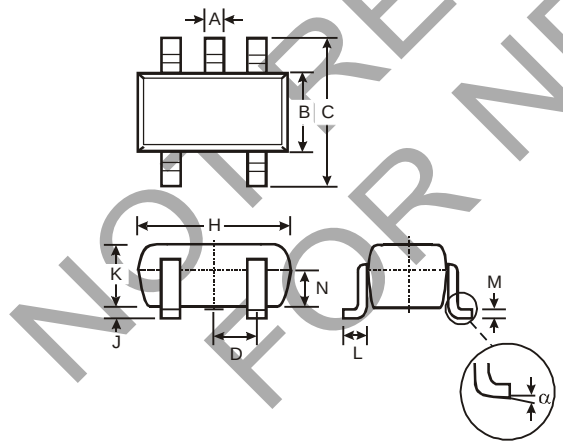
Please see http://www.diodes.com/package-outlines.html for the latest version.

(1) Package Type: SOT23



SOT23			
Dim	**Min**	**Max**	**Typ**
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--
All Dimensions in mm			

(2) Package Type: SOT25



SOT25			
Dim	**Min**	**Max**	**Typ**
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			

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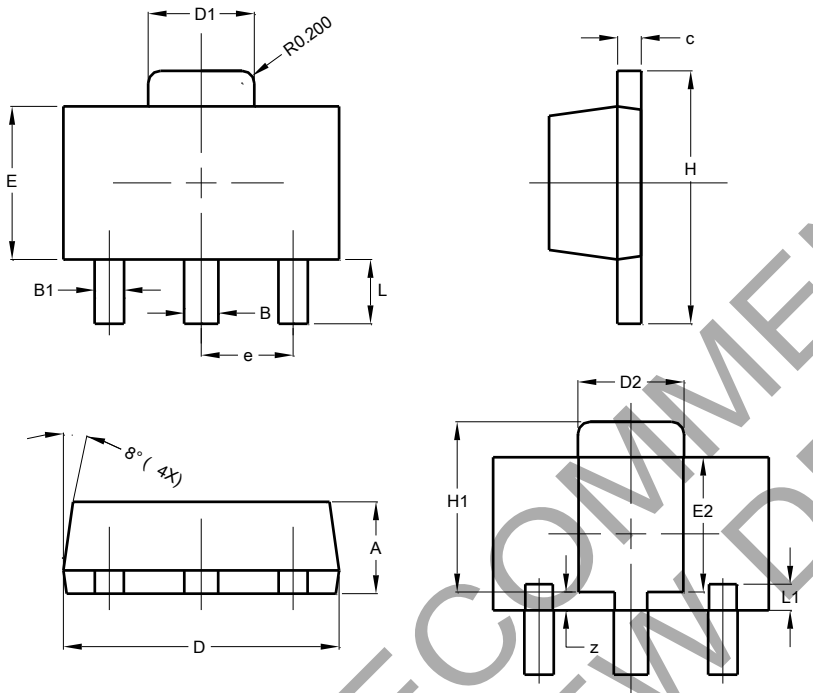
Package Outline Dimensions (continued)

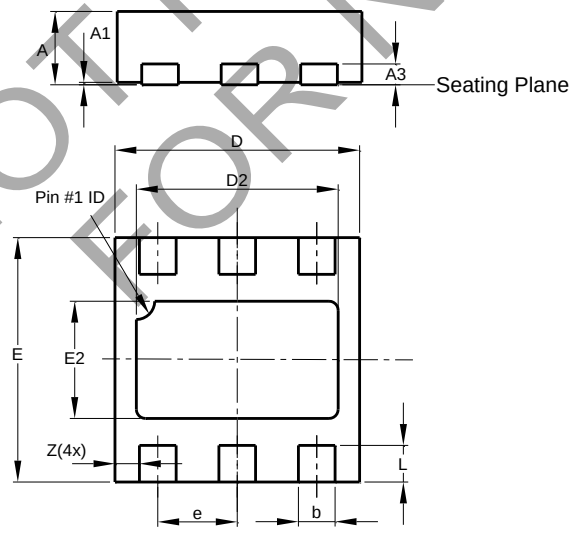
Please see http://www.diodes.com/package-outlines.html for the latest version.

(3) Pakcage Type: SOT89



SOT89			
Dim	**Min**	**Max**	**Typ**
A	1.40	1.60	1.50
B	0.50	0.62	0.56
B1	0.42	0.54	0.48
c	0.35	0.43	0.38
D	4.40	4.60	4.50
D1	1.62	1.83	1.733
D2	1.61	1.81	1.71
E	2.40	2.60	2.50
E2	2.05	2.35	2.20
e	-	-	1.50
H	3.95	4.25	4.10
H1	2.63	2.93	2.78
L	0.90	1.20	1.05
L1	0.327	0.527	0.427
z	0.20	0.40	0.30
All Dimensions in mm			

(4) Package Type: U-DFN2020-6 (Type C)



U-DFN2020-6 Type C			
Dim	**Min**	**Max**	**Typ**
A	0.57	0.63	0.60
A1	0.00	0.05	0.02
A3	—	—	0.15
b	0.25	0.35	0.30
D	1.95	2.075	2.00
D2	1.55	1.75	1.65
E	1.95	2.075	2.00
E2	0.86	1.06	0.96
e	—	—	0.65
L	0.25	0.35	0.30
Z	—	—	0.20
All Dimensions in mm			

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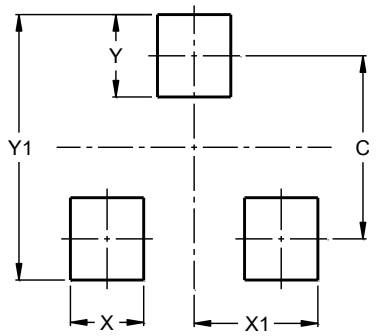
Suggested Pad Layout

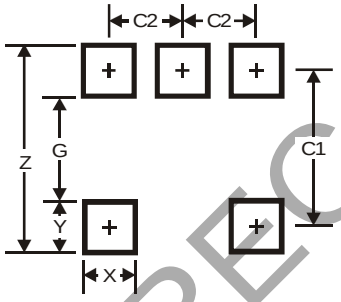
Please see http://www.diodes.com/package-outlines.html for the latest version.

(1) Package Type: SOT23



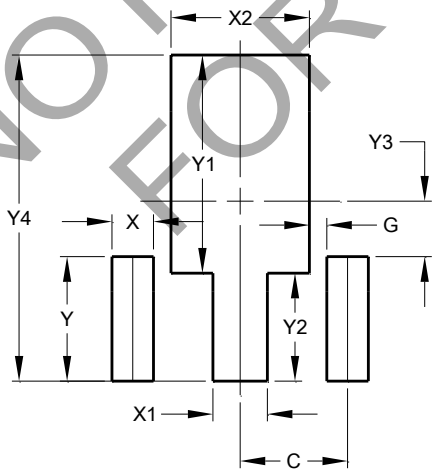
Dimensions	Value (in mm)
C	2.0
X	0.8
X1	1.35
Y	0.9
Y1	2.9

(2) Package Type: SOT25



Dimensions	Value
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

(3) Package Type: SOT89



Dimensions	Value (in mm)
C	1.500
G	0.244
X	0.580
X1	0.760
X2	1.933
Y	1.730
Y1	3.030
Y2	1.500
Y3	0.770
Y4	4.530

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Suggested Pad Layout (continued)

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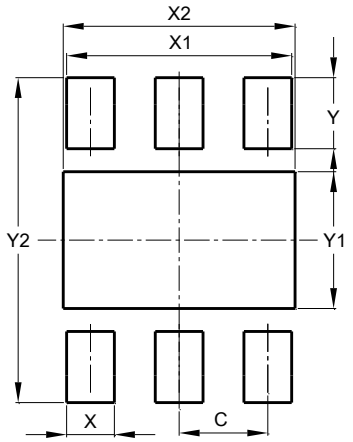
(4) Package Type: U-DFN2020-6 (Type C)



Dimensions	Value (in mm)
C	0.650
X	0.350
X1	1.650
X2	1.700
Y	0.525
Y1	1.010
Y2	2.400

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