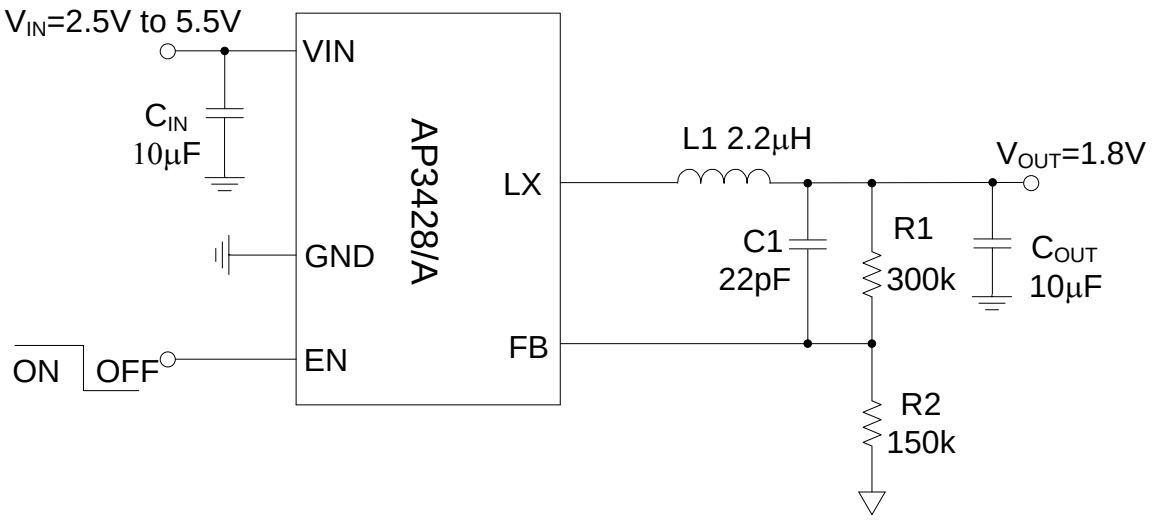
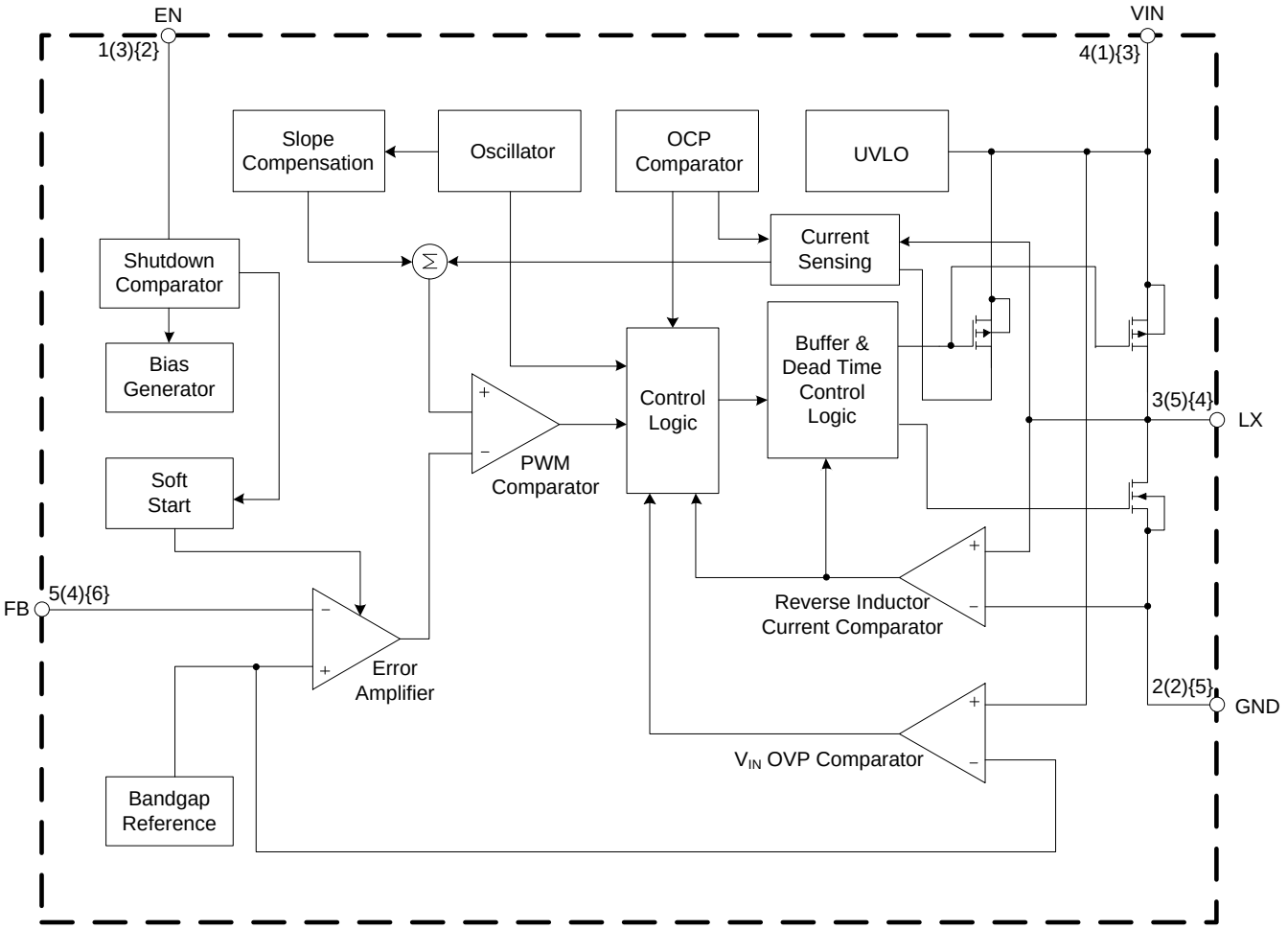
Typical Applications Circuit



Pin Descriptions

Pin Number			Pin Name	Function
TSOT25/ TSOT25 (Type SM) for AP3428	TSOT25/ TSOT25 (Type SM) for AP3428A	U-DFN2020-6 (Type J)		
1	3	2	EN	Enable control input. Force this pin voltage above 1.5V enables the chip, and below 0.4V shuts down the device.
2	2	5	GND	Ground pin
3	5	4	LX	The drains of the internal main and synchronous power MOSFET.
4	1	3	VIN	Bias supply. Chip main power supply pin
5	4	6	FB	Feedback voltage to internal error amplifier, the threshold voltage is 0.6V.
—	—	1	NC	NC

Functional Block Diagram



(A): TSOT25/TSOT25 (Type SM) for AP3428
(B): TSOT25/TSOT25 (Type SM) for AP3428A
(C): U-DFN2020-6 (Type J)

Absolute Maximum Ratings (Note 4)

Symbol	Parameter	Rating		Unit
V_{IN}	Input Voltage	-0.3 to 6		V
V_{EN}	EN Pin Voltage	-0.3 to V_{IN}+0.3		V
V_{LX}	LX Pin Voltage	-0.3 to V_{IN}+0.3		V
		-3V to 7V (<40ns)		V
V_{FB}	Feedback Pin Voltage	-0.3 to V_{IN}+0.3		V
P_D	Power Dissipation (on PCB, T_A = +25°C)	TSOT25 TSOT25 (Type SM)	0.4	W
		U-DFN2020-6 (Type J)	1.89	
θ_{JA}	Thermal Resistance (Junction to Ambient)	TSOT25 TSOT25 (Type SM)	220	°C/W
		U-DFN2020-6 (Type J)	53	
θ_{JC}	Thermal Resistance (Junction to Case, Simulation)	TSOT25 TSOT25 (Type SM)	130	ºC/W
		U-DFN2020-6 (Type J)	25	
T_J	Operating Junction Temperature	+155		°C
T_{STG}	Storage Temperature	-55 to +150		°C
V_{MM}	ESD (Machine Model)	200		V
V_{HBM}	ESD (Human Body Model)	2000		V
V_{CDM}	ESD (Charge Device Mode)	1000		V

Note 4: Stresses greater than those listed under *Absolute Maximum Ratings* can cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to *Absolute Maximum Ratings* for extended periods can affect device reliability.

Recommended Operating Conditions

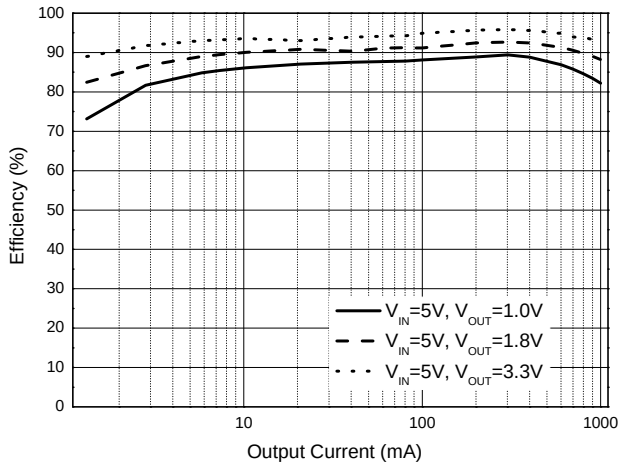
Symbol	Parameter	Min	Max	Unit
V_{IN}	Supply Voltage	2.5	5.5	V
T_J	Junction Temperature Range	-40	+125	°C
T_A	Operating Ambient Temperature	-40	+85	°C

Electrical Characteristics (@T_A = +25ºC, V_{IN} = 5.0V, V_{OUT} = 2.5V, C_{OUT} = 10µF, L = 2.2µH, unless otherwise specified.)

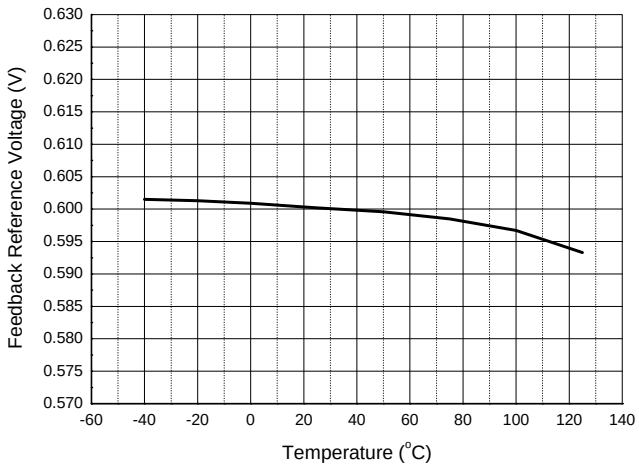
Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range	—	2.5	—	5.5	V
V_{OUT}	Output Voltage Range	—	0.6	—	V_{IN}	V
I_Q	Quiescent Current	V_{FB} = 0.65V	—	40	—	µA
I_{SD}	Shutdown Current	V_{EN} = 0V	—	0.1	1	µA
V_{FB}	Regulated Feedback Voltage	—	0.588	0.6	0.612	V
I_{FB}	FB Leakage Current	V_{FB} = 1V	—	—	0.2	µA
I_{LIM}	Peak Inductor Current	—	1.3	—	—	A
f_{OSC}	Oscillator Frequency	—	—	1.5	—	MHz
$R_{DS(ON)}$	Drain-Source On-State Resistance	I_{SW} = 100mA High Side	—	250	—	mΩ
		I_{SW} = 100mA Low Side	—	170	—	mΩ
R_{DISCH}	Output Discharge Switch On Resister	—	—	2.1	—	kΩ
V_{ENH}	EN Threshold High	—	1.5	—	—	V
V_{ENL}	EN Threshold Low	—	—	—	0.4	V
I_{EN}	EN Leakage Current	V_{IN} = V_{EN} = 5V	-1.0	—	1.0	µA
V_{UVLO}	Input UVLO Threshold	—	—	2.4	2.7	V
V_{HYS}	UVLO Hysteresis	—	—	0.1	—	V
T_{OTP}	Over Temperature Protection	—	—	+160	—	°C
T_{OTH}	OTP Hysteresis	—	—	+15	—	°C
t_{SS}	Soft-Start Time	—	—	2	—	ms

Performance Characteristics (@T_A = +25°C, V_{IN} = 5V, V_{OUT} = 1.8V, unless otherwise specified.)

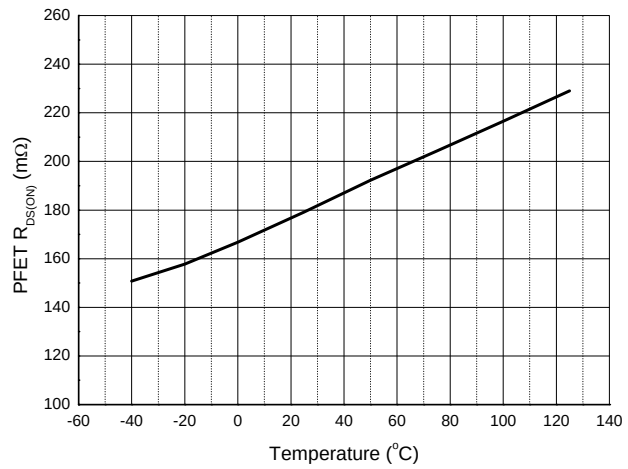
Efficiency vs. Load Current



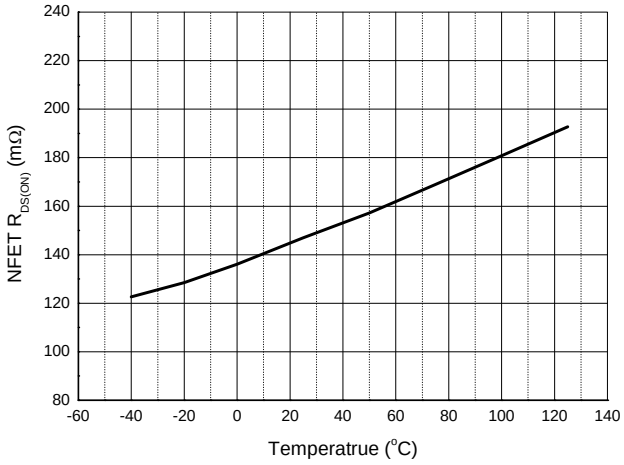
Feedback Reference Voltage vs. Temperature



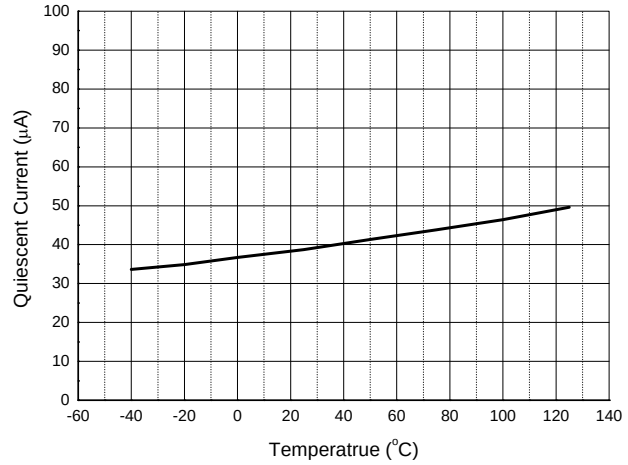
PFET Drain-Source On-State Resistance vs. Temperature



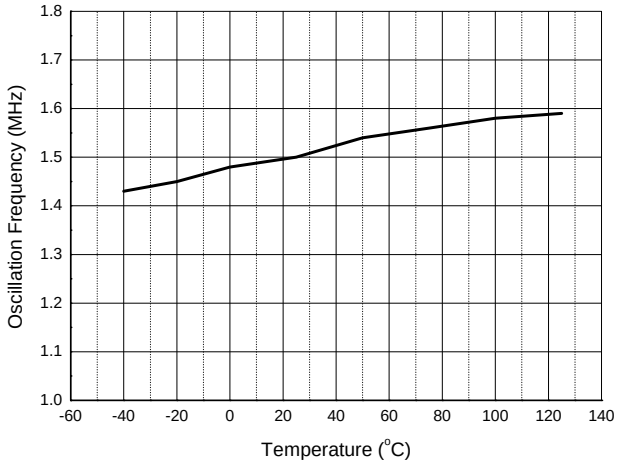
NFET Drain-Source On-State Resistance vs. Temperature



Quiescent Current vs. Temperature

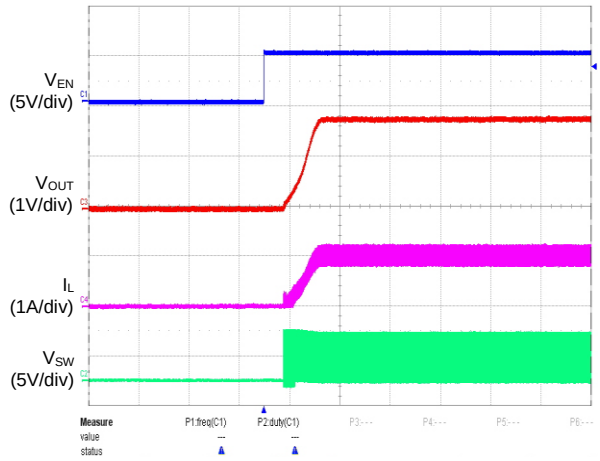


Oscillation Frequency vs. Temperature

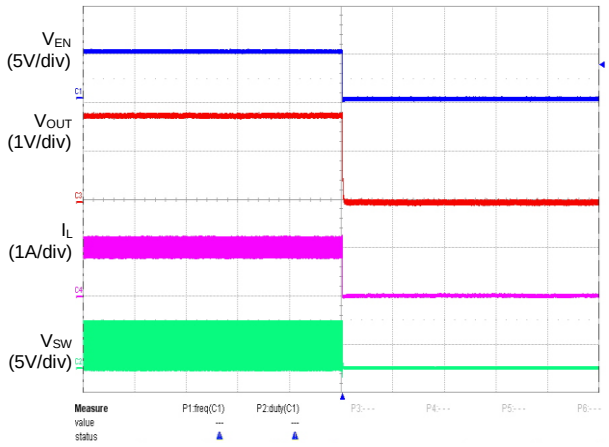


Performance Characteristics (@T_A = +25°C, V_{IN} = 5V, V_{OUT} = 1.8V, unless otherwise specified.) (continued)

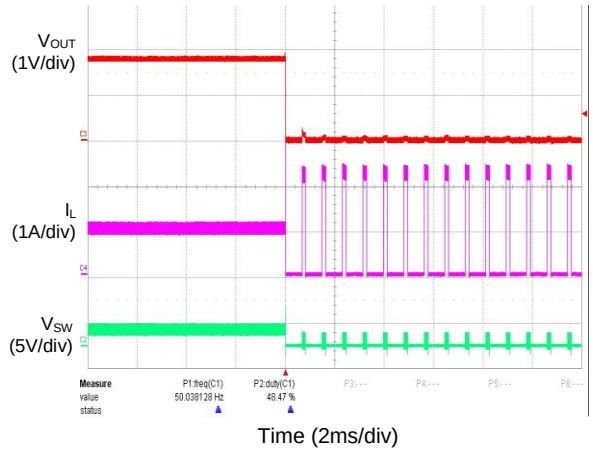
Enable Turn On Characteristic (I_{OUT} = 1A)



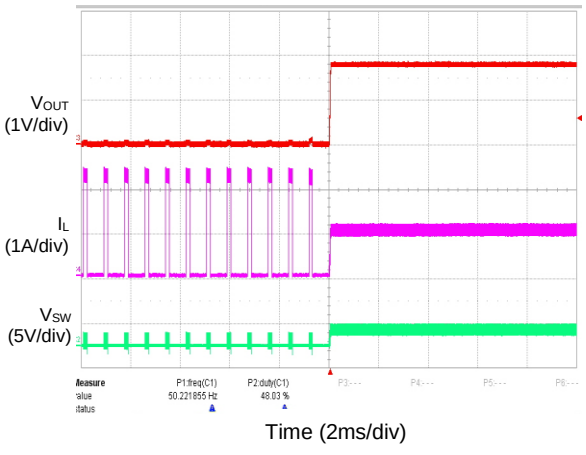
Enable Turn Off Characteristic (I_{OUT} = 1A)



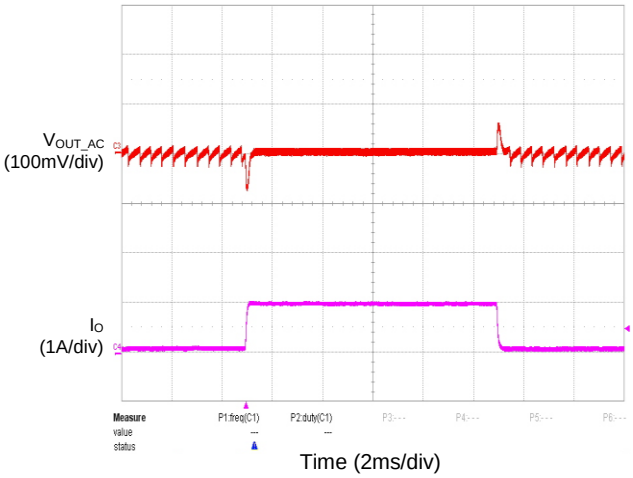
Short Current Protection (I_{OUT} = 1A)



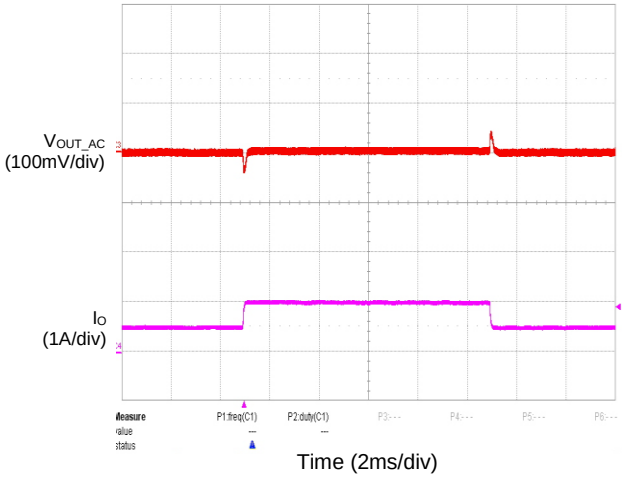
SCP Recovery (I_{OUT} = 1A)



Load Transient (I_{OUT}=0.1A to 1A)



Load Transient (I_{OUT}=0.5A to 1A)



Application Information

Typical application circuit is shown in the *Typical Applications Circuit* and for the circuit parameters setting please refers to the following descriptions.

Under Voltage Lockout (UVLO) Circuit

When the V_{IN} drops lower than the UVLO detector threshold, the UVLO circuit starts to operate, V_{REF} stops, and high-side switch and low-side switch built-in switch transistors turn "OFF". As a result, V_{OUT} drops according to the C_{OUT} capacitance value and the load. When the V_{IN} is rising higher than UVLO released voltage, the IC will restart the operation.

Short Circuit Protection and Recovery

When the AP3428/A output node is shorted to GND that V_{FB} drops under 0.42V, AP3428/A will enter hiccup mode to protect itself. If short circuit is removed, and V_{FB} rises over 0.42V, the AP3428/A recovers to normal operation again. If the AP3428/A reaches OCP threshold while short circuit, the AP3428/A will enter cycle by cycle current limit mode until the current under OCP threshold.

Over Temperature Protection

The internal thermal temperature protection circuitry is provided to protect the integrated circuit in the event that the maximum junction temperature is exceeded. When the junction temperature exceeds +160°C, it shuts down the internal control circuit and switching power MOSFET. The AP3428/A will restart automatically under the control of soft start circuit when the junction temperature decreases to +145°C.

Setting the Output Voltage

The output voltage can be adjusted from 1 to 5V using an external resistor divider. Table 1 shows a list of resistor selections for common output voltages. Resistor R1 is selected based on a design tradeoff between efficiency and output voltage accuracy. For high values of R1 there is less current consumption in the feedback network. However the tradeoff is output voltage accuracy due to the bias current in the error amplifier. R1 can be determined by the following equation. Meanwhile, the input capacitor should close to IC for preventing unexpected influences.

$$R1 = R2 \cdot \left(\frac{Vout}{0.6} - 1\right)$$

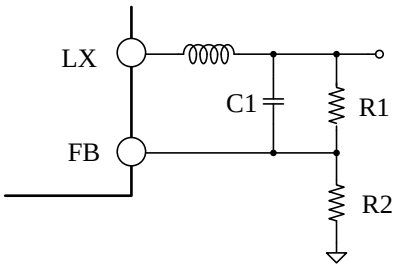
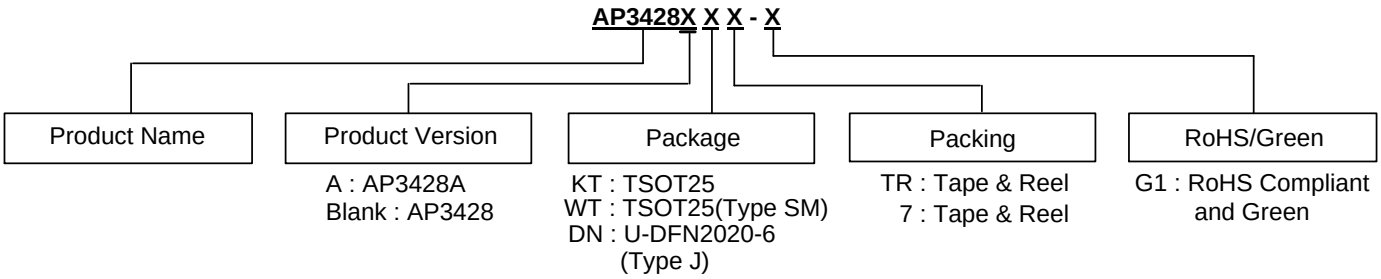


Figure 1. Feedback Divider Network

Out Voltage	R1	R2	C1
1.0V	91kΩ	120kΩ	22pF
1.2V	100kΩ	100kΩ	22pF
1.5V	150kΩ	100kΩ	22pF
1.8V	300kΩ	150kΩ	22pF
2.5V	380kΩ	120kΩ	22pF
2.8V	440kΩ	120kΩ	22pF
3.3V	430kΩ	100kΩ	22pF

Table 1. Resistor Selection for Common Output

Ordering Information



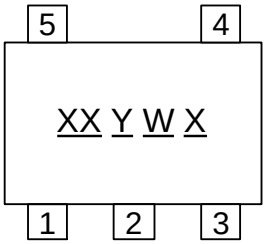
Part Number	Status	Package	Identification Code	Temperature Range	Packing
AP3428AKTTR-G1	NRND	TSOT25	L2J	-40 to +85°C	3000/Tape & Reel
AP3428KTTR-G1	NRND	TSOT25	L2H	-40 to +85°C	3000/Tape & Reel
AP3428DNTR-G1	Active	U-DFN2020-6(Type J)	CQ	-40 to +85°C	3000/Tape & Reel
AP3428AWT-7	Active	TSOT25 (Type SM)	BD	-40 to +85°C	3000/Tape & Reel
AP3428WT-7	Active	TSOT25 (Type SM)	BC	-40 to +85°C	3000/Tape & Reel

Note 5: NRND = Not Recommended for New Design.

Marking Information

TSOT25 (Type SM) for AP3428WT-7 and AP3428AWT-7

(Top View)



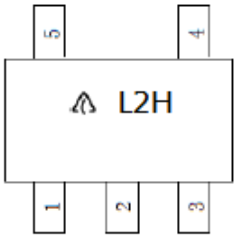
XX : Identification Code
Y : Year 0 to 9
W : Week : A to Z : 1 to 26 week;
a to z : 27 to 52 week; z represents
52 and 53 week
X : Internal Code

Part Number	Package	Identification Code
AP3428WT-7	TSOT25 (Type SM)	BC
AP3428AWT-7	TSOT25 (Type SM)	BD

Marking Information (continued)

(1) TSOT25 for AP3428

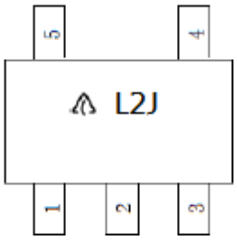
(Top View)



First Line: Logo and Marking ID

(2) TSOT25 for AP3428A

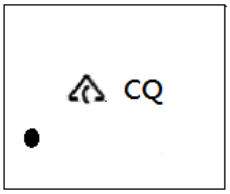
(Top View)



First Line: Logo and Marking ID

(3) U-DFN2020-6 (Type J)

(Top View)

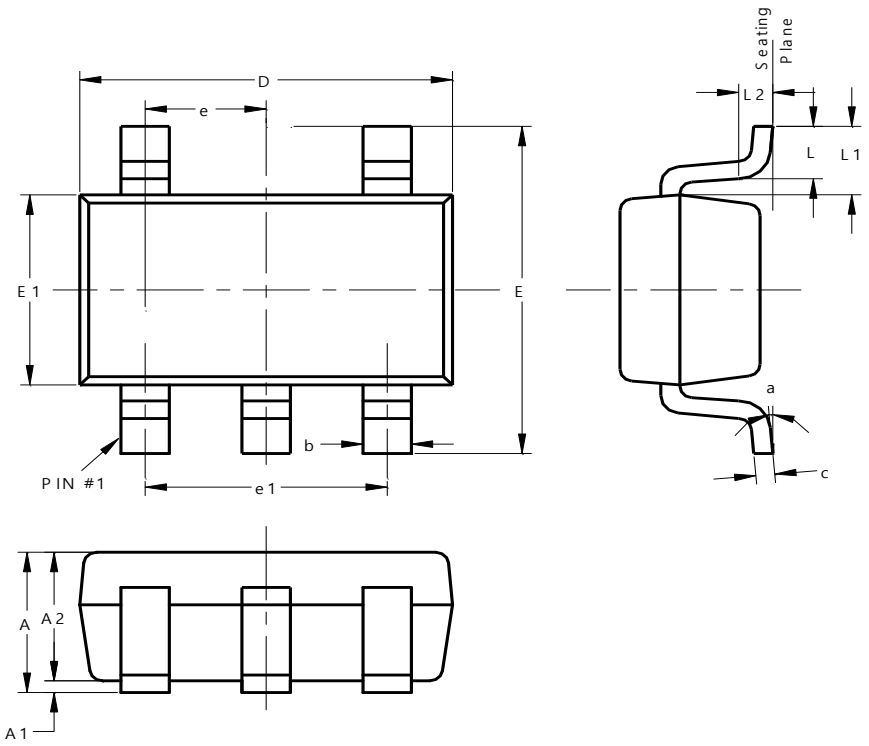


First Line: Logo and Marking ID

Package Outline Dimensions

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

(1) Package Type: TSOT25 (Type SM)

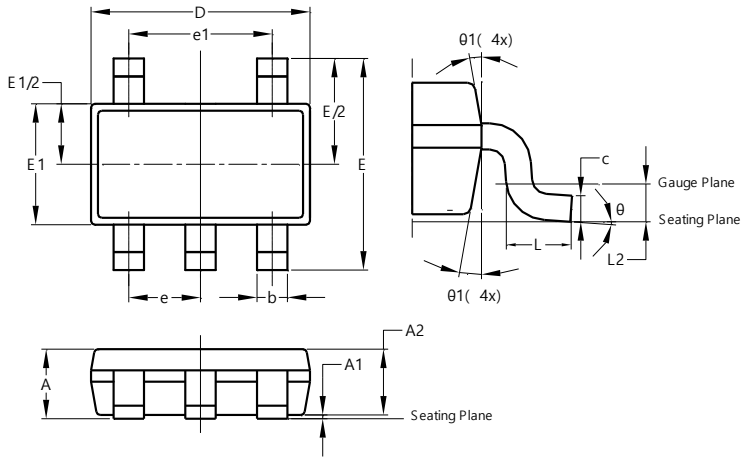


TSOT25 (Type SM)			
Dim	**Min**	**Max**	**Typ**
A	0.70	0.90	--
A1	0.00	0.10	--
A2	0.70	0.80	0.75
b	0.35	0.50	--
c	0.08	0.20	--
D	2.82	3.02	2.92
E	2.65	2.95	2.80
E1	1.60	1.70	1.65
e	0.95 BSC		
e1	1.90 BSC		
L	0.30	0.60	0.40
L1	0.59 REF		
L2	0.25 BSC		
a	0°	8°	--
All Dimensions in mm			

Package Outline Dimensions (continued)

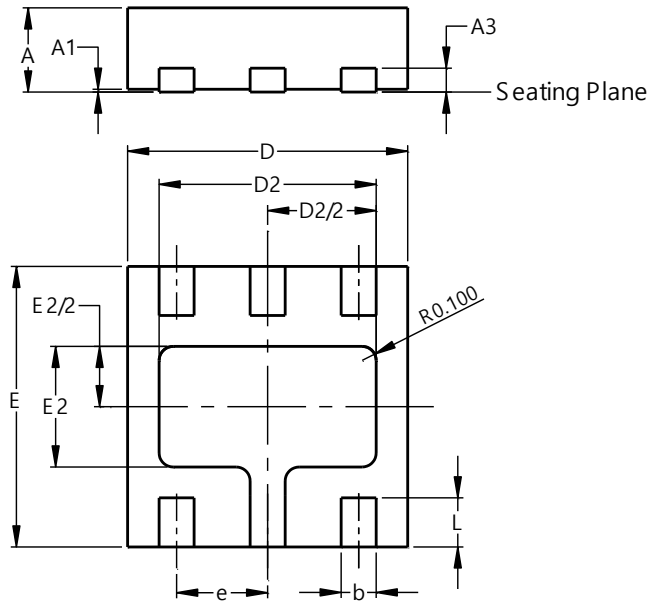
Please see http://www.diodes.com/package-outlines.html for the latest version.

(2) Package Type: TSOT25



TSOT25			
Dim	**Min**	**Max**	**Typ**
A	-	1.00	-
A1	0.01	0.10	-
A2	0.84	0.90	-
b	0.30	0.45	-
c	0.12	0.20	-
D	-	-	2.90
E	-	-	2.80
E1	-	-	1.60
e	0.95 BSC		
e1	1.90 BSC		
L	0.30	0.50	-
L2	0.25 BSC		
θ	0°	8°	4°
θ1	4°	12°	-
All Dimensions in mm			

(3) Package Type: U-DFN2020-6 (Type J)

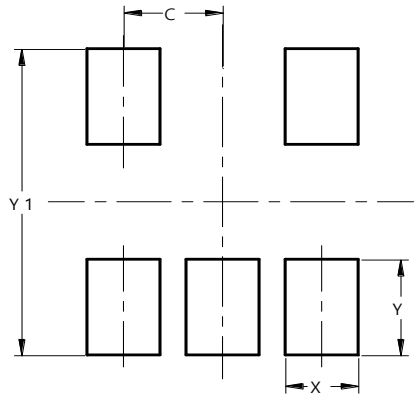


U-DFN2020-6 (Type J)			
Dim	**Min**	**Max**	**Typ**
A	0.50	0.60	--
A1	0.00	0.05	0.03
A3	--	--	0.203
b	0.20	0.30	0.25
D	1.95	2.075	2.00
D2	1.45	1.65	1.55
E	1.95	2.075	2.00
E2	0.76	0.96	0.86
e	0.65 BSC		
L	0.30	0.40	0.35
All Dimensions in mm			

Suggested Pad Layout

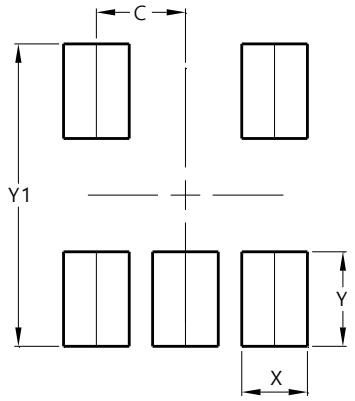
Please see http://www.diodes.com/package-outlines.html for the latest version.

(1) Package Type: TSOT25 (Type SM)



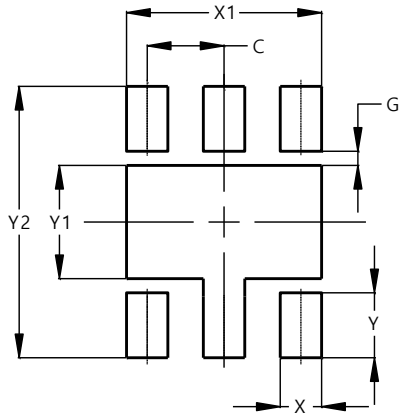
Dimensions	Value (in mm)
C	0.950
X	0.700
Y	1.000
Y1	3.199

(2) Package Type: TSOT25



Dimensions	Value (in mm)
C	0.950
X	0.700
Y	1.000
Y1	3.199

(3) Package Type: U-DFN2020-6 (Type J)



Dimensions	Value (in mm)
C	0.650
G	0.120
X	0.350
X1	1.650
Y	0.550
Y1	0.960
Y2	2.300

Mechanical Data

TSOT25/TSOT25 (Type SM)

- Moisture Sensitivity: Level 3 per J-STD-020
- Terminals: Finish - Mate Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.014 grams (Approximate)

U-DFN2020-6 (Type J)

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - NiPdAu over Copper Leads, Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.007 grams (Approximate)