

1A Load Switch with Controlled Inrush Current Profile

Description

The AM6U1701 is a 38mΩ, 1.0A, load switch that switches a power rail ranging from 2.5V to 5.5V. During the power up, internal controlled inrush current profile limits the current through the pFET to the internally fixed value.

The product is packaged in a small 0.85 x 0.85 mm package.

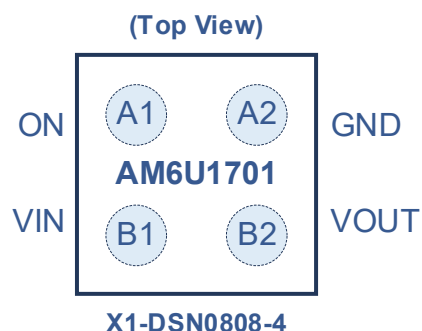
Features

- Operating Voltage: 2.5V to 5.5V
- Operating Temperature: -40°C to 85°C
- 0.85 x 0.85, 0.4mm pitch WLCSP package
- 38.3mΩ RDS_{ON} at V_{IN} = 5.5V
- Discharges load when off
- RoHS Compliant / Halogen-Free / Pb-Free

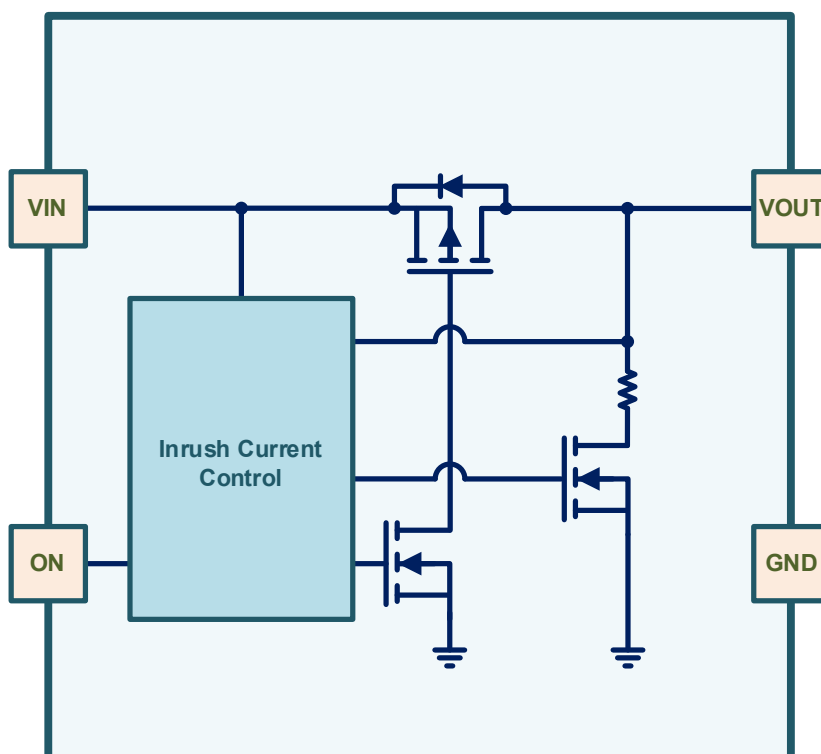
Applications

- Smartphones
- Tablets
- Notebooks

PIN Configuration



Functional Block Diagram



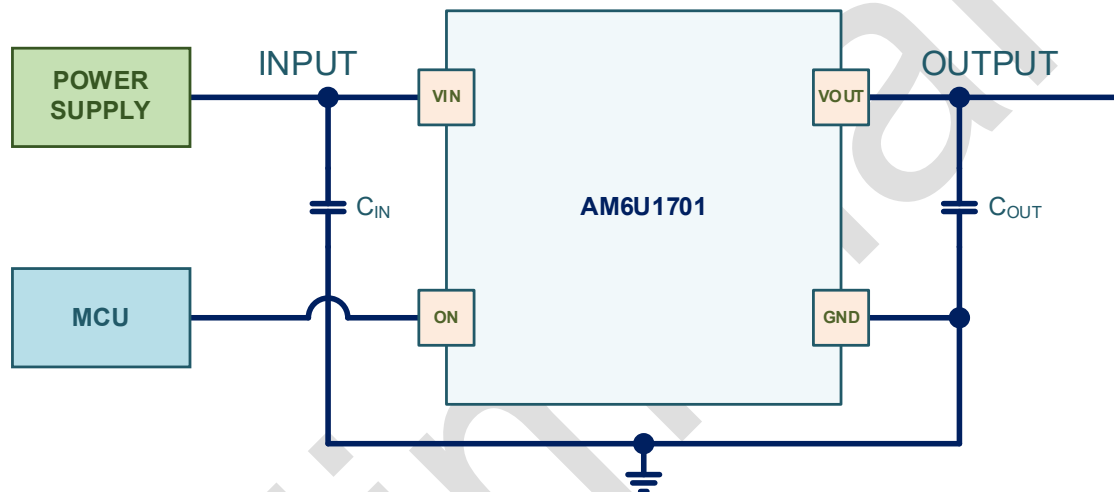


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Pin Description

Pin #	Pin Name	Type	Pin Description
1	ON	Input	Turns on load switch, active HI. Since there is no internal pull-down resistor on the ON pin, connect this pin to GPO of a microcontroller or processor. Do not leave this pin floating.
2	VIN	MOSFET	Input terminal connection for the load switch. Connect at minimum a low-ESR 10 μ F capacitor from this pin to GND.
3	VOUT	MOSFET	Output terminal connection for the load switch.
4	GND	GND	Ground

Typical Application Circuit





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Absolute Maximum Ratings

Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
V_{IN}	Switch Input Voltage		—	—	6	V
T_S	Storage Temperature		-65	—	140	°C
ESD_{HBM}	ESD Protection	Human Body Model	2000	—	—	V
MSL	Moisture Sensitivity Level		1			
W_{DIS}	Package Power Dissipation		—	—	0.5	W
MOSFET $I_{OUT(PK)}$	Peak Current from VIN to VOUT	For no more than 1ms with 1% duty cycle	—	—	1.5	A

Electrical Characteristics

$T_A = -40^{\circ}\text{C}$ to 85°C unless otherwise stated. Typical values at $T_A = 25^{\circ}\text{C}$ (unless otherwise stated).

Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
V_{IN}	Switch Input Voltage	-40°C to 85°C	2.5	—	5.5	V
V_{IH}	High Input Voltage on the ON pin		0.85	—	V_{IN}	V
V_{IL}	Low Input Voltage on the ON pin		-0.3	0	0.3	V
I_{SHDN}	Input Shutdown Current	Disabled, $V_{IN} = 5.5\text{V}$, no Load	—	0.053	0.60	μA
		Disabled, $V_{IN} = 5.0\text{V}$, no Load	—	0.040	0.52	
		Disabled, $V_{IN} = 3.8\text{V}$, no Load	—	0.025	0.37	
		Disabled, $V_{IN} = 3.3\text{V}$, no Load	—	0.021	0.33	
		Disabled, $V_{IN} = 2.5\text{V}$, no Load	—	0.015	0.27	
I_Q	Input Quiescent Current	Enabled, $V_{ON} = V_{IN} = 5.5\text{V}$, no Load	—	0.046	0.34	μA
		Enabled, $V_{ON} = V_{IN} = 5.0\text{V}$, no Load	—	0.041	0.32	
		Enabled, $V_{ON} = V_{IN} = 3.8\text{V}$, no Load	—	0.028	0.27	
		Enabled, $V_{ON} = V_{IN} = 3.3\text{V}$, no Load	—	0.022	0.24	
		Enabled, $V_{ON} = V_{IN} = 2.5\text{V}$, no Load	—	0.014	0.21	
		Enabled, $V_{ON} = 1.8\text{V}$, $V_{IN} = 5.5\text{V}$, no Load	—	0.47	0.77	
		Enabled, $V_{ON} = 1.8\text{V}$, $V_{IN} = 5.0\text{V}$, no Load	—	0.43	0.71	
		Enabled, $V_{ON} = 1.8\text{V}$, $V_{IN} = 3.8\text{V}$, no Load	—	0.32	0.56	
		Enabled, $V_{ON} = 1.8\text{V}$, $V_{IN} = 3.3\text{V}$, no Load	—	0.28	0.50	
		Enabled, $V_{ON} = 1.8\text{V}$, $V_{IN} = 2.5\text{V}$, no Load	—	0.063	0.26	
I_{ON_LKG}	ON Pin Leakage Current		—	—	0.10	μA
I_{OUT}	Output Current	Continuous	0	—	1.0	A
I_{RISE}	Rise Time Charging Current	10% V_{OUT} to 90% V_{OUT} $V_{IN} = 5.0\text{V}$, $C_{OUT} = 30\mu\text{F}$	10.3	17.7	25	mA
$R_{DS_{ON}}$	Switch ON Resistance	$V_{IN} = 5.5\text{V}$, $T_A = 25^{\circ}\text{C}$; $I_{OUT} = 100\text{mA}$	—	38.3	40.4	m Ω
		$V_{IN} = 3.3\text{V}$, $T_A = 25^{\circ}\text{C}$; $I_{OUT} = 100\text{mA}$	—	46.4	49.0	
		$V_{IN} = 2.5\text{V}$, $T_A = 25^{\circ}\text{C}$; $I_{OUT} = 100\text{mA}$	—	54.5	62.5	
		$V_{IN} = 5.5\text{V}$, $T_A = 85^{\circ}\text{C}$; $I_{OUT} = 100\text{mA}$	—	44.4	45.5	
		$V_{IN} = 3.3\text{V}$, $T_A = 85^{\circ}\text{C}$; $I_{OUT} = 100\text{mA}$	—	53.7	55.2	
		$V_{IN} = 2.5\text{V}$, $T_A = 85^{\circ}\text{C}$; $I_{OUT} = 100\text{mA}$	—	62.7	64.4	
R_{DIS}	Discharge Resistance	$V_{IN} = 2.5\text{V}$ to 5.5V , $V_{OUT} = 0.4\text{V}$ Input Bias	85	95	105	Ω



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Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
$V_{OUT(SR)}$	Output Slew Rate	10% V_{OUT} to 90% V_{OUT} $V_{IN} = 5.0V$, $C_{OUT} = 30\mu F$	0.34	0.59	1.0	V/ms
t_{RISE}	Rise Time	10% V_{OUT} to 90% V_{OUT} $V_{IN} = 5.0V$, $C_{OUT} = 30\mu F$	3.1	6.8	9.4	ms
		10% V_{OUT} to 90% V_{OUT} $V_{IN} = 2.5V$, $C_{OUT} = 30\mu F$	1.8	4.1	5.6	
t_{ON}	Total Turn On Time	V_{IH} to 90% V_{OUT} $V_{IN} = 5.0V$, $C_{OUT} = 30\mu F$	3.5	7.6	10	ms
		V_{IH} to 90% V_{OUT} $V_{IN} = 2.5V$, $C_{OUT} = 30\mu F$	2.1	4.6	6.2	
t_{OFF_Delay}	OFF Delay Time	50% ON to V_{OUT} Fall Start, $V_{IN} = 5.0V$ $R_{LOAD} = 10\Omega$, no C_{OUT}	5.1	5.7	6.3	μs
C_{OUT}	Output Load Capacitance	C_{OUT} connected from VOUT to GND	—	—	30	μF



1A Load Switch with Controlled Inrush Current Profile

Typical Performance Characteristics

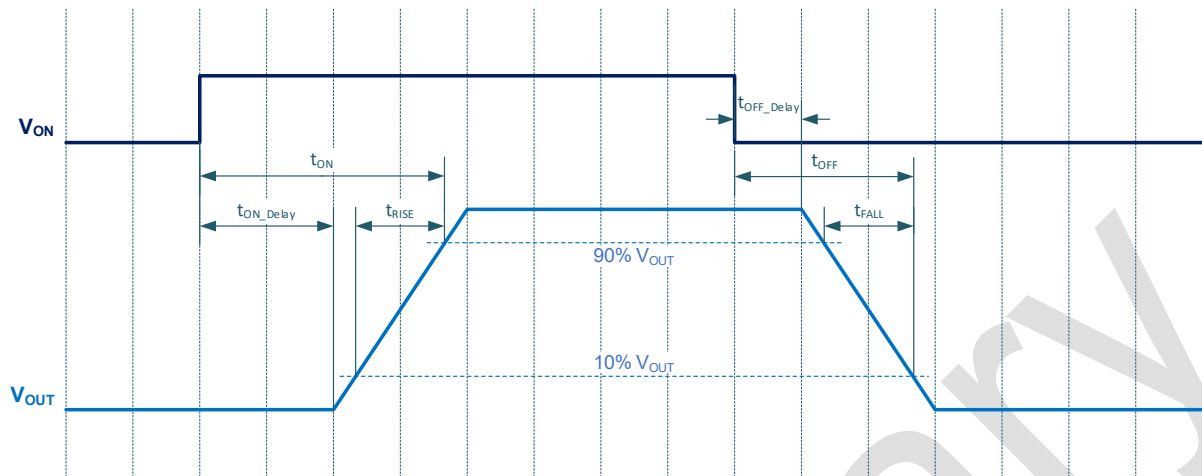
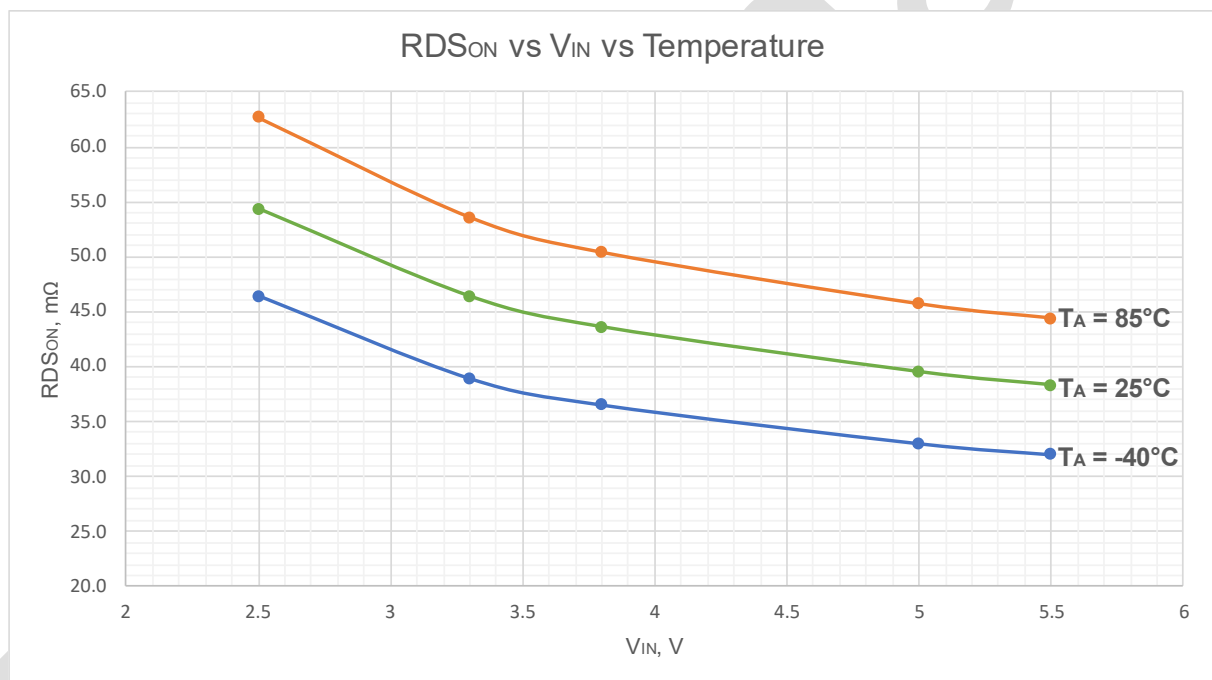


Figure 1. Basic Timing Parameters

Figure 2. $R_{DS(on)}$ vs. V_{IN} and Temperature at 100mA



1A Load Switch with Controlled Inrush Current Profile

Application Information

During power up, the internal inrush current control system limits the current passing through the power FET to a I_{RISE} value specified in the EC table. To avoid improper startup, the AM6U1701 should be powered up only with a capacitive load. After V_{OUT} reaches its nominal voltage, a resistive load can be applied.

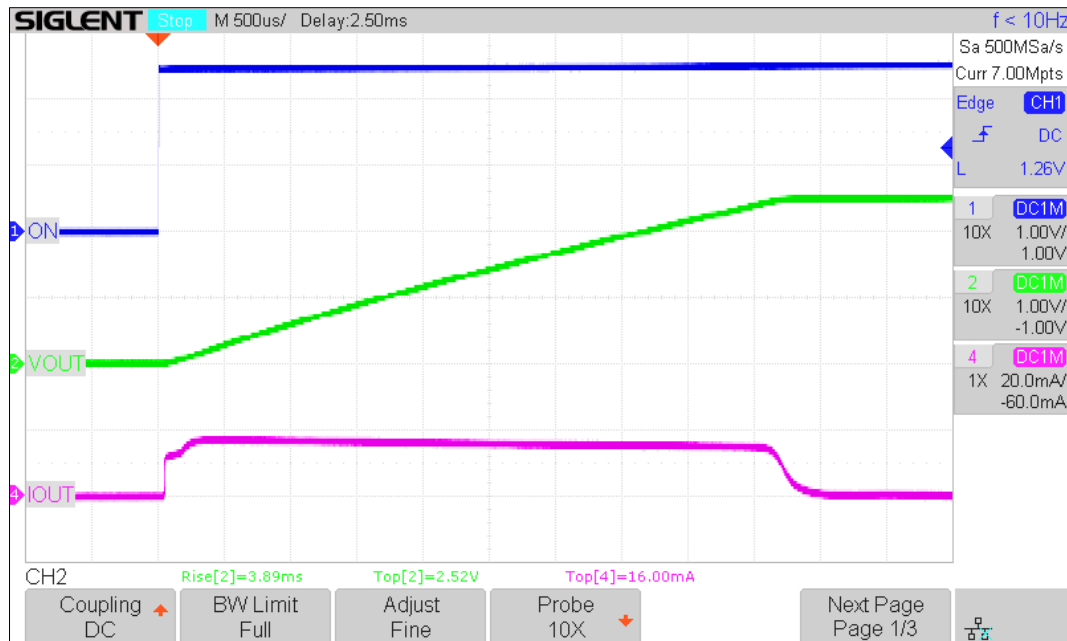


Figure 3. AM6U1701 Typical Power-Up Operation Waveform. $V_{IN} = 2.5V$, $C_{OUT} = 30\mu F$

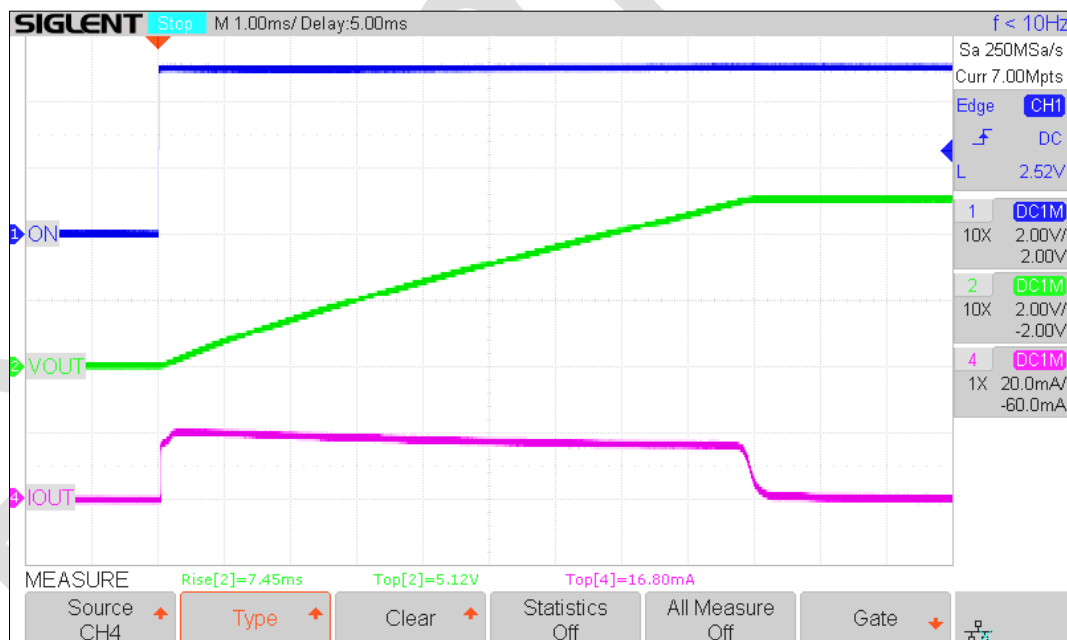
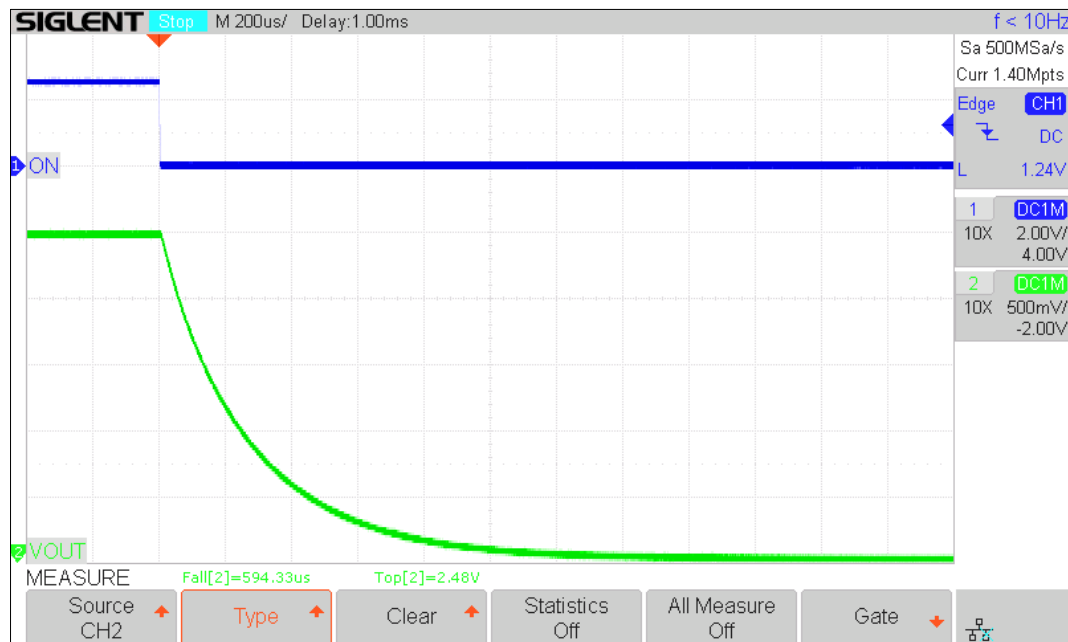
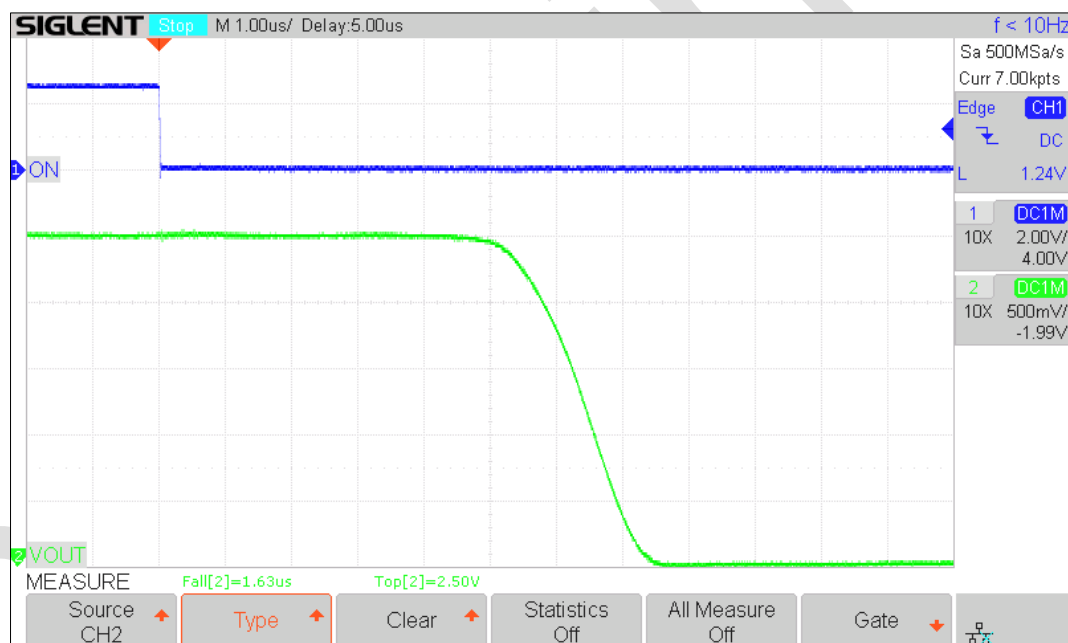


Figure 4. AM6U1701 Typical Power-Up Operation Waveform. $V_{IN} = 5.0V$, $C_{OUT} = 30\mu F$

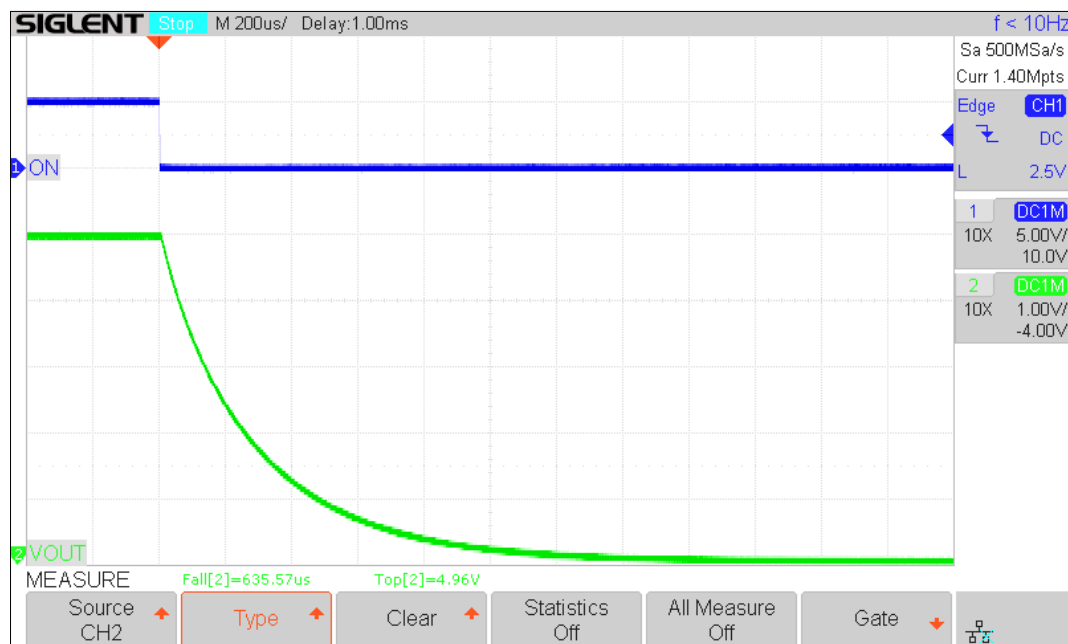
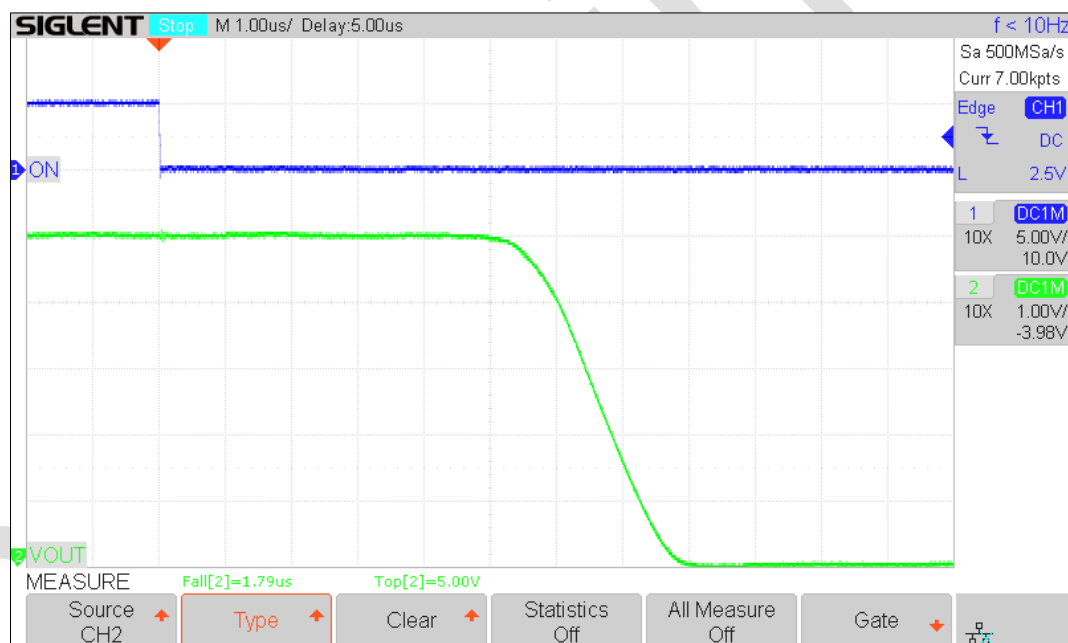


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Figure 5. AM6U1701 Typical Power-Down Operation Waveform. $V_{IN} = 2.5V$, $C_{OUT} = 30\mu F$, $R_{LOAD} = 10\Omega$ Figure 6. AM6U1701 Typical Power-Down Operation Waveform. $V_{IN} = 2.5V$, no C_{OUT} , $R_{LOAD} = 10\Omega$



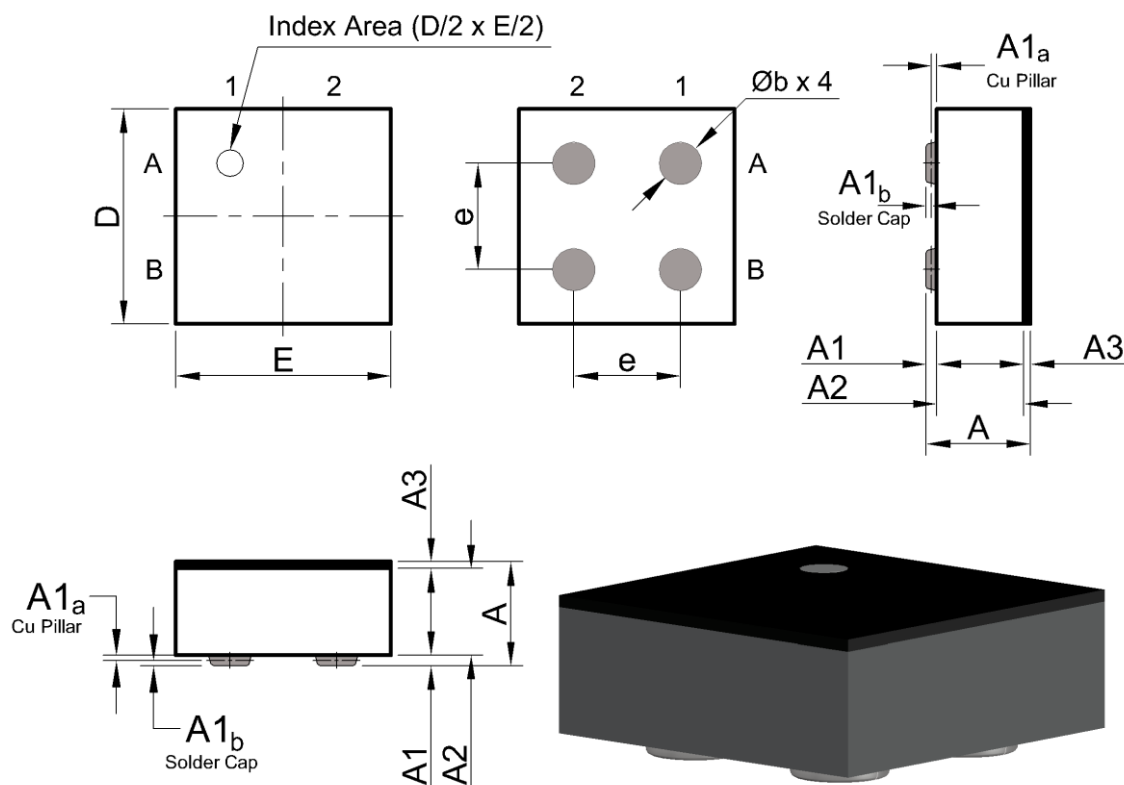
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Figure 7. AM6U1701 Typical Power-Down Operation Waveform. $V_{IN} = 5.0V$, $C_{OUT} = 30\mu F$, $R_{LOAD} = 10\Omega$ Figure 8. AM6U1701 Typical Power-Down Operation Waveform. $V_{IN} = 5.0V$, no C_{OUT} , $R_{LOAD} = 10\Omega$



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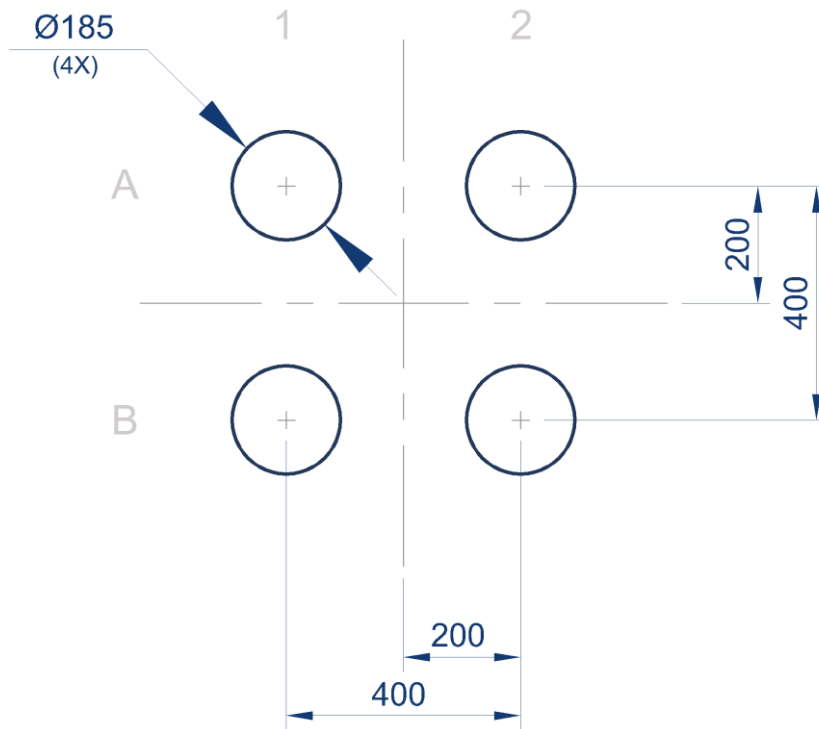
Package Outline Dimensions



Symbol	Min.	Typ.	Max.	Symbol	Min.	Typ.	Max.
A	—	0.400	0.450	A3	0.015	0.020	0.025
A1	0.034	0.040	0.046	b	0.200	0.215	0.230
A1a	0.015	0.020	0.025	D	0.820	0.850	0.880
A1b	0.017	0.020	0.023	E	0.820	0.850	0.880
A2	0.325	0.335	0.345	e	—	0.400	—
All Dimensions in mm							



Suggested Pad Layout



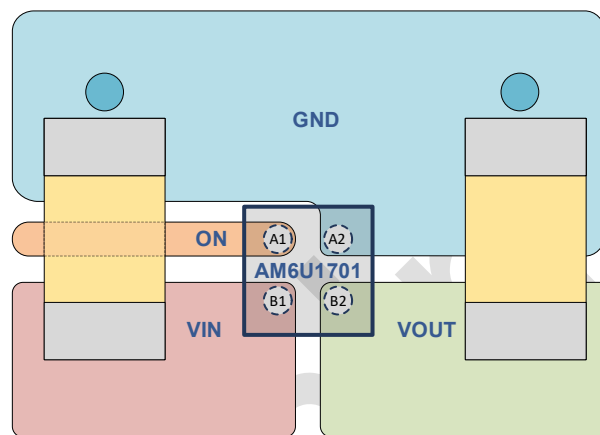


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Recommended Layout

It is important to have a proper PCB layout for high-performance device operation. The list below provides some basic rules for PCB layout.

- Place high-quality low-ESR input C_{IN} (10 μ F min) and output C_{OUT} capacitors close to the device VIN and VOUT pins to minimize the effects of parasitic inductance.
- Make sure to have a solid Ground connection.
- All traces should be as short, wide and direct as possible.
- VIN and VOUT pins have the most heat dissipation during max current operations. Use polygon planes and/or 2 oz. copper for VIN and VOUT connections.



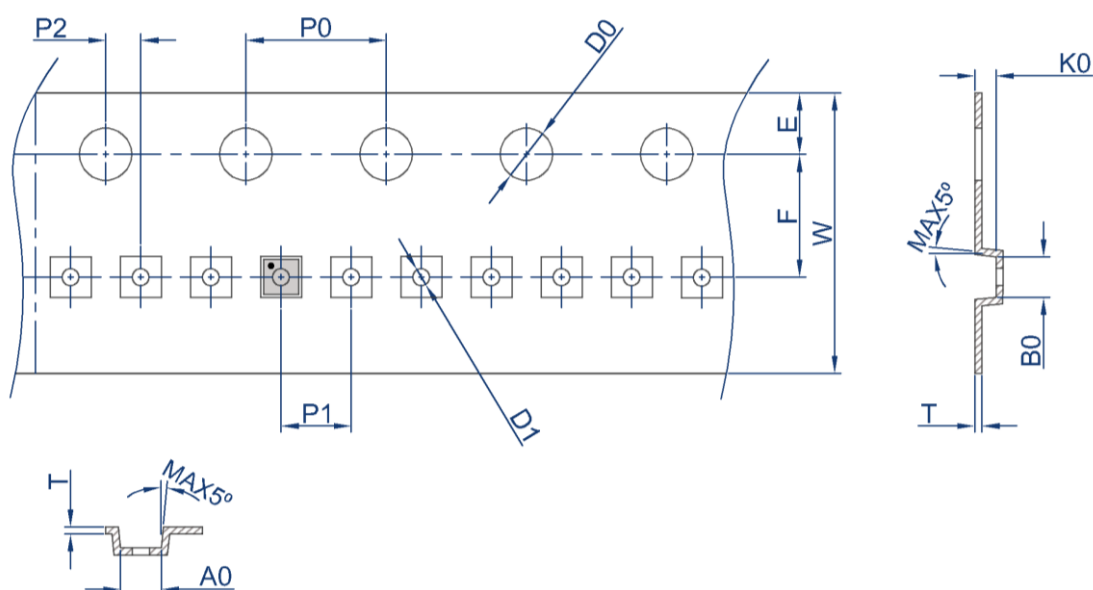


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Tape and Reel Specifications

Package Type	# of Pins	Nominal Package Size [mm]	Max Units		Reel & Hub Size [mm]	Leader (min)		Trailer (min)		Tape Width [mm]	Part Pitch [mm]
			per Reel	per Box		Pockets	Length [mm]	Pockets	Length [mm]		
X1-DSN0808-4	4	1.0 x1.0 x 0.55	8000	8000	178/60	200	400	200	400	8	2

Package Type	A0	B0	K0	P0	P1	P2	T	D0	D1	E	F	W
X1-DSN0808-4	1.16	1.16	0.63	4.00	2.00	1.00	0.20	1.50	0.50	1.75	3.50	8.00



**Revision History**

Date	Version	Change
November 3, 2023	Rev.001	Initial release
February 6, 2024	Rev.002	Updated pinout and POD
June 11, 2025	Rev.003	Updated EC table, Application Information and Recommended Layout



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