

OBSOLETE – PART DISCONTINUED

Description

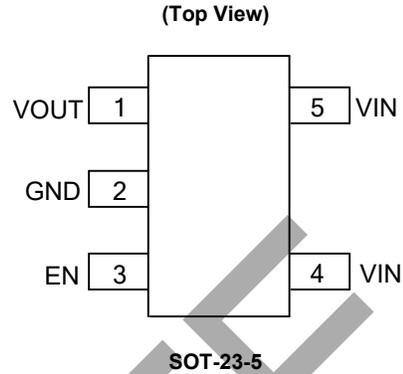
The AP2821 is an integrated high-side power switch that consists of TTL compatible enables input, a charge pump, and n-channel MOSFET. The switch's low $R_{DS(ON)}$, 120m Ω , meets USB voltage drop requirements. It includes soft-start to limit inrush current, overcurrent protection with fold-back, and thermal shutdown to avoid switch failure during hot plug-in. Undervoltage lockout (UVLO) function is used to ensure the device remains off unless there is a valid input voltage present. And no reverse current when power off, with shutdown pull-low resistor to discharge the output capacitor when EN is disabled.

The AP2821 is available in standard package of SOT-23-5.

Features

- Low MOSFET On-Resistance: 120m Ω @ $V_{IN} = 5.0V$
- Compliant to USB Specifications
- Operating Voltage Range: 2.7V to 5.5V
- Low Supply Current: 35 μA (typ)
- Low Shutdown Current: < 1 μA
- Current Limit with Foldback: 2A
- Undervoltage Lockout
- Soft Startup
- Overcurrent Protection
- Overtemperature Protection
- Load Short Protection with Foldback
- No Reverse Current when Power Off
- Pass System ESD: IEC61000-4-2 $\pm 16kV$ (Air Discharge) and $\pm 8kV$ (Contact Discharge) on USB Connector
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](#) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

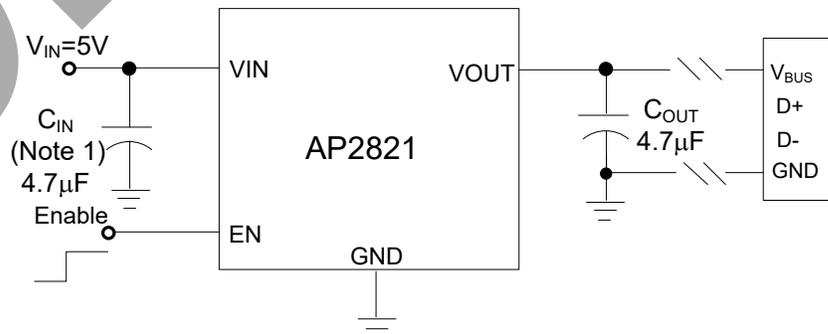
Pin Assignments



Applications

- USB power management
- USB bus/self-powered hubs
- Hot-plug power supplies
- Battery-charger circuits
- Notebooks, motherboard PCs

Typical Applications Circuit

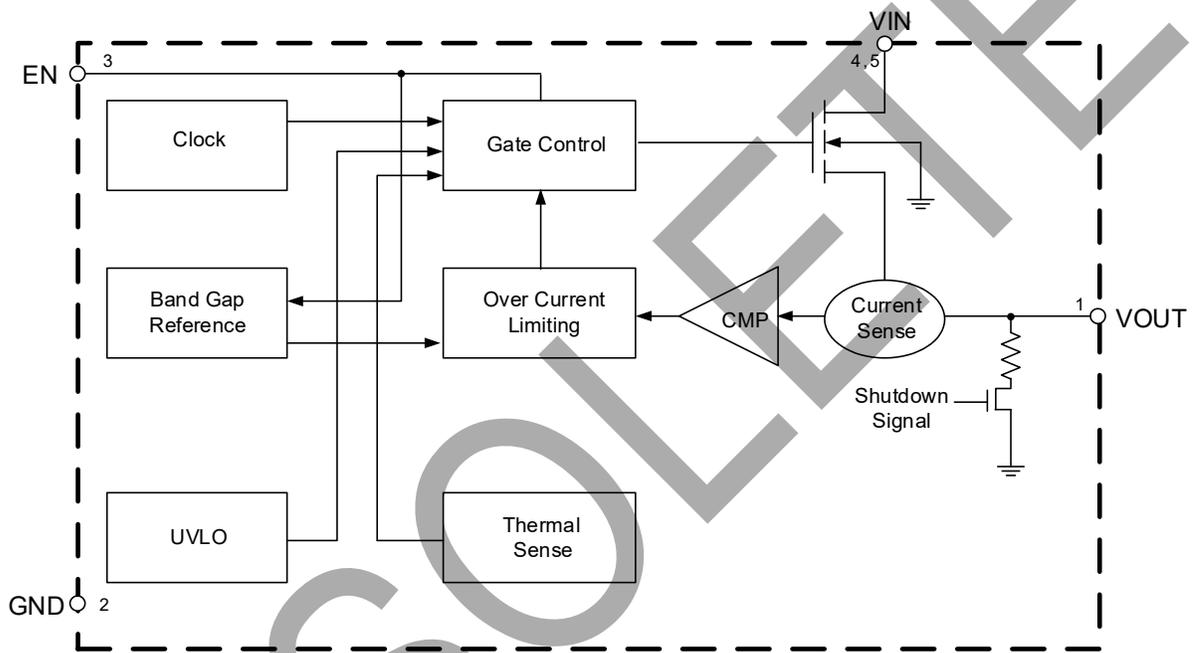


Note: 1. 4.7 μF input capacitor is enough in most application cases. If the PCB trace of power rail to V_{IN} is long, larger input capacitor is necessary.

Pin Descriptions

Pin Number	Pin Name	Descriptions
1	VOUT	Switch Output Voltage
2	GND	Ground
3	EN	Chip Enable Control Input, Active High
4, 5	VIN	Supply Input Pin

Functional Block Diagram



Absolute Maximum Ratings (Note 2)

Symbol	Parameter	Rating	Unit
V _{IN}	Power Supply Voltage	6.0	V
T _J	Operating Junction Temperature Range	+150	°C
T _{STG}	Storage Temperature Range	-65 to +150	°C
T _{LEAD}	Lead Temperature (Soldering, 10 Seconds)	+260	°C
θ _{JA}	Thermal Resistance (Junction to Ambient)	235	°C/W
—	ESD (Machine Model)	200	V
—	ESD (Human Body Model)	2000	V

Note: 2. 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

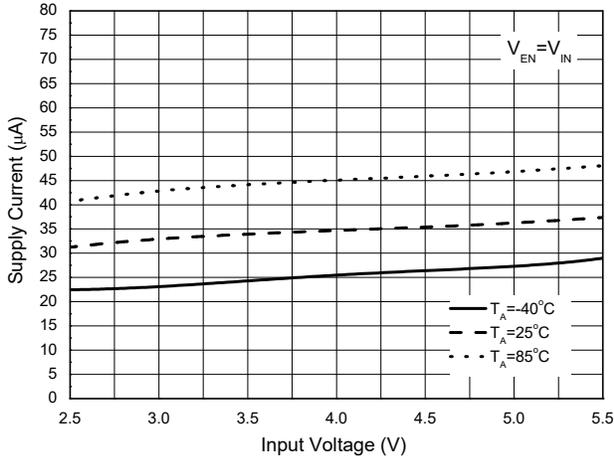
Symbol	Parameter	Min	Max	Unit
V _{IN}	Supply Voltage	2.7	5.5	V
T _A	Ambient Operation Temperature Range	-40	+85	°C

Electrical Characteristics (V_{IN} = 5.0V, C_{IN} = 4.7μF, C_{OUT} = 4.7μF, Typical T_A = +25°C, unless otherwise specified.)

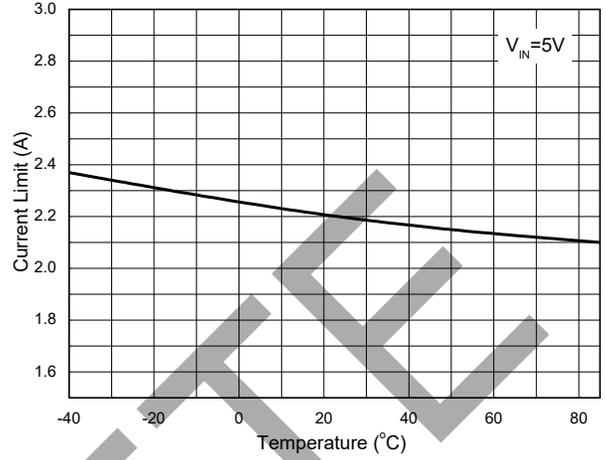
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V _{IN}	Input Voltage Range	—	2.7	—	5.5	V
R _{DS(ON)}	Switch On Resistance	V _{IN} = 5V, I _{OUT} = 0.5A	—	120	140	mΩ
I _{LIMIT}	Current Limit	V _{OUT} = 4.0V	1.5	2.0	2.8	A
I _{SUPPLY}	Supply Current	V _{IN} = 5V, R _{LOAD} Open	—	35	65	μA
I _{SHORT}	Foldback Short Current	V _{OUT} = 0	—	1.5	—	A
I _{SHUTDOWN}	Shutdown Supply Current	V _{EN} = 0, Shutdown Mode	—	0.1	1	μA
I _{LEAKAGE}	Output Leakage Current	V _{EN} = 0, V _{OUT} = 0	—	0.1	1	μA
V _{ENH}	Enable High Voltage	Enable Logic High	2.0	—	6.0	V
V _{ENL}	Enable Low Voltage	Enable Logic Low	0	—	1.2	V
I _{EN}	Enable Pin Input Current	Force 0V to 5.0V at EN Pin	0	—	1.0	μA
V _{UVLO}	Undervoltage Lockout Threshold Voltage	V _{IN} Increasing from 0	2.2	2.5	2.7	V
V _{UVLOHY}	Undervoltage Hysteresis	—	—	0.2	—	V
I _{REVERSE}	Reverse Current	V _{EN} = 0, V _{OUT} > V _{IN}	—	0.1	1.0	μA
R _{DISCHARGE}	Shutdown Pull Low Resistance	V _{EN} is disable	—	100	250	Ω
t _{ON}	Output Turn-On Time	From Enable Active to 90% of Output, R _L = 10Ω	—	1.9	—	ms
T _{TSD}	Thermal Shutdown Temperature	—	—	+145	—	°C
T _{HYOTSD}	Thermal Shutdown Hysteresis	—	—	+20	—	
θ _{JC}	Thermal Resistance (Junction to Case)	—	—	70	—	°C/W

Performance Characteristics

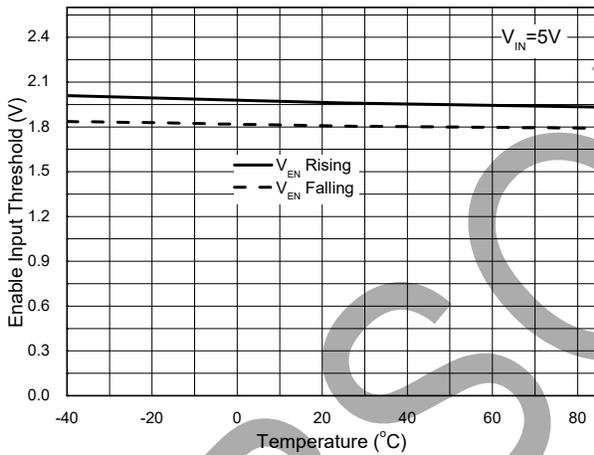
Supply Current vs. Input Voltage



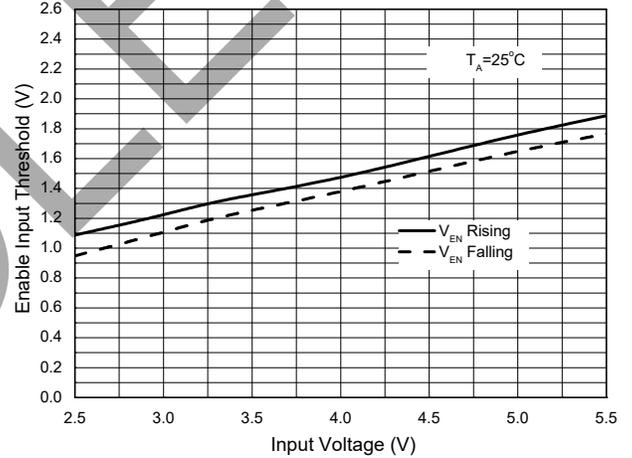
Current Limit vs. Temperature



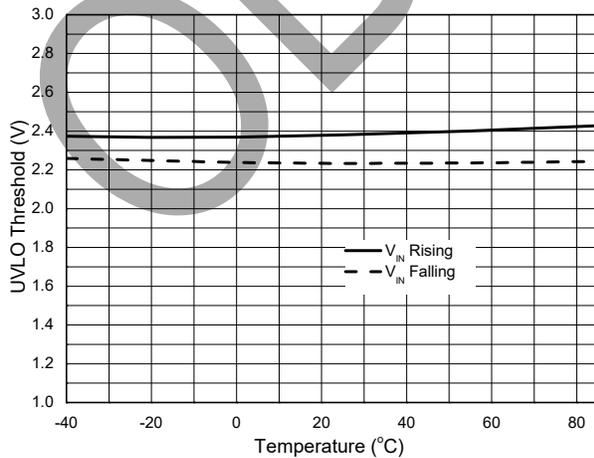
Enable Input Threshold vs. Temperature



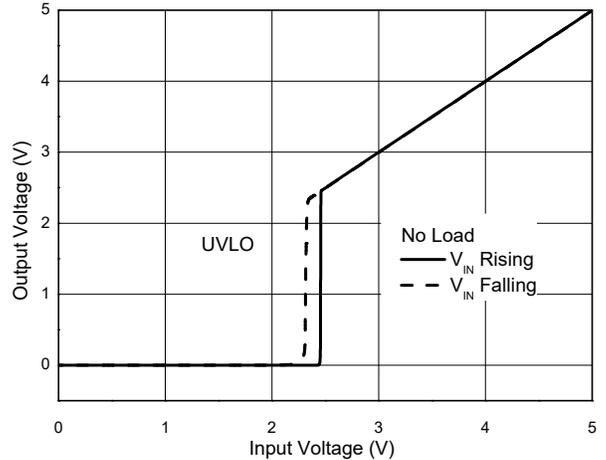
Enable Input Threshold vs. Input Voltage



UVLO Threshold Voltage vs. Temperature



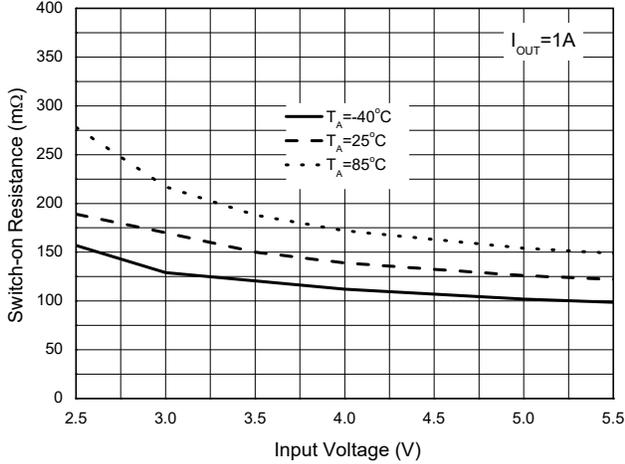
UVLO Function



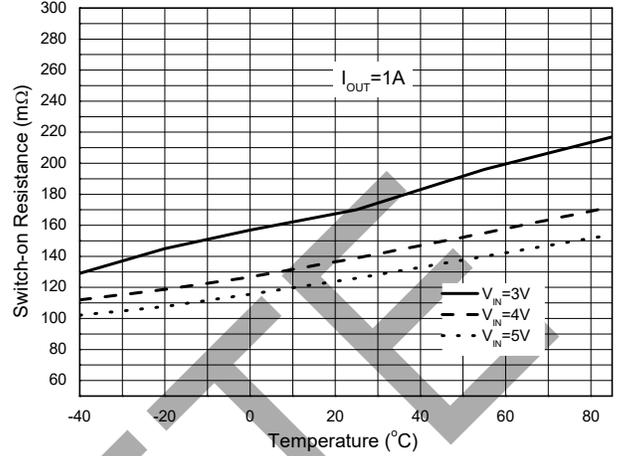
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Performance Characteristics (continued)

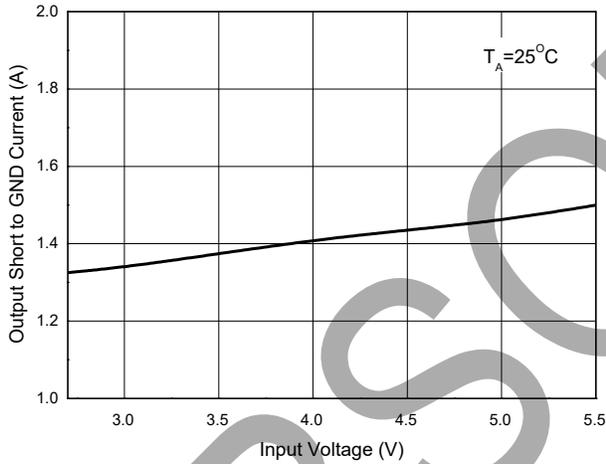
Switch-On Resistance vs. Input Voltage



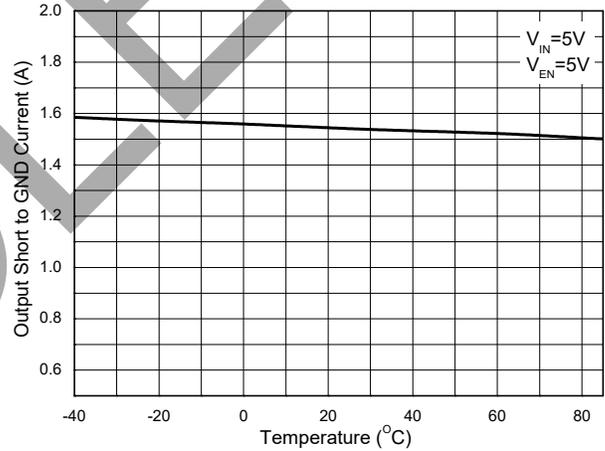
Switch-On Resistance vs. Temperature



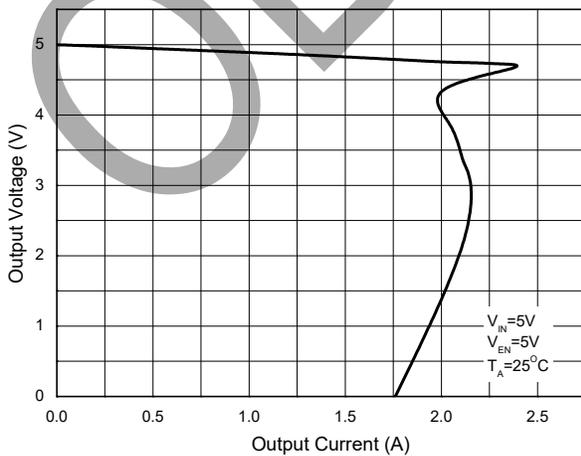
Output Short to GND Current vs. Input Voltage



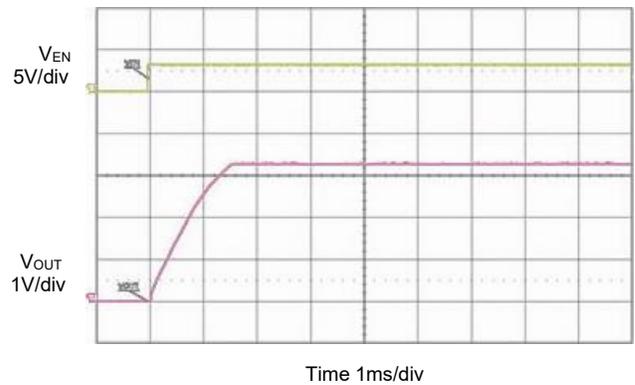
Output Short to GND Current vs. Temperature



Output Voltage vs. Output Current



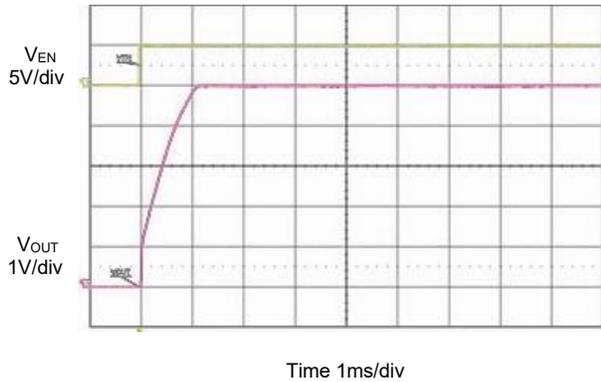
Switch Turn-On and Rise Time
(VIN=3.3V, COUT=4.7μF, No Load)



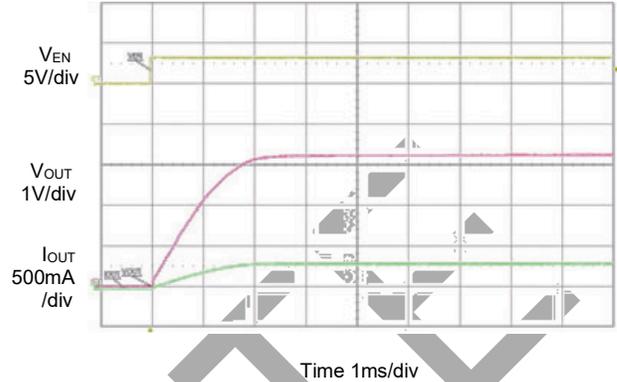
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Performance Characteristics (continued)

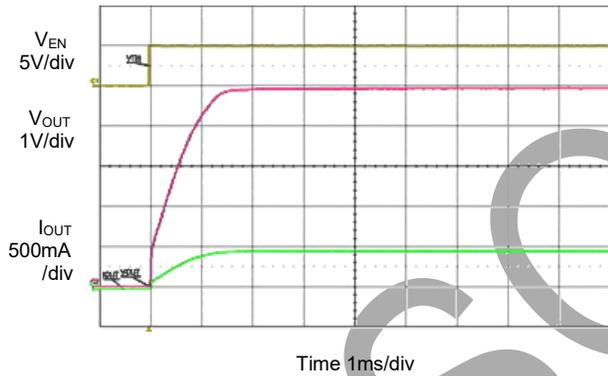
Switch Turn-On and Rise Time
($V_{IN}=5.0V$, $C_{OUT}=4.7\mu F$, No Load)



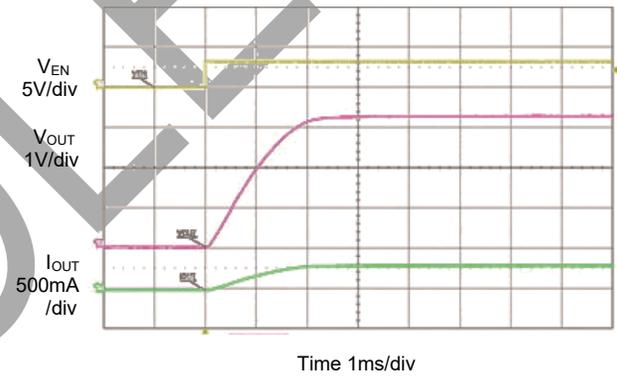
Switch Turn-On and Rise Time
($V_{IN}=3.3V$, $C_{OUT}=4.7\mu F$, $R_L=10\Omega$)



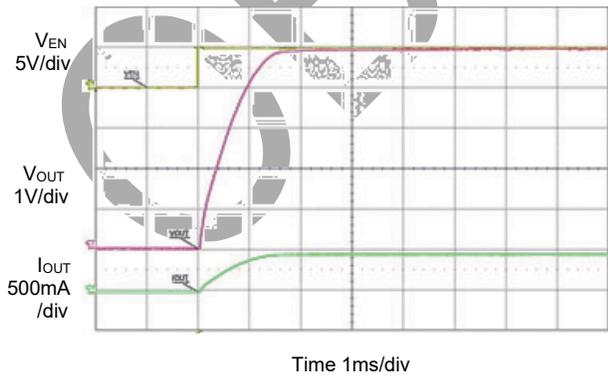
Switch Turn-On and Rise Time
($V_{IN}=5.0V$, $C_{OUT}=4.7\mu F$, $R_L=10\Omega$)



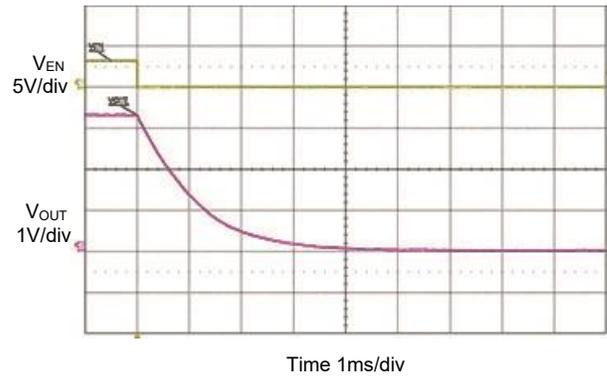
Switch Turn-On and Rise Time
($V_{IN}=3.3V$, $C_{OUT}=100\mu F$, $R_L=10\Omega$)



Switch Turn-On and Rise Time
($V_{IN}=5.0V$, $C_{OUT}=100\mu F$, $R_L=10\Omega$)



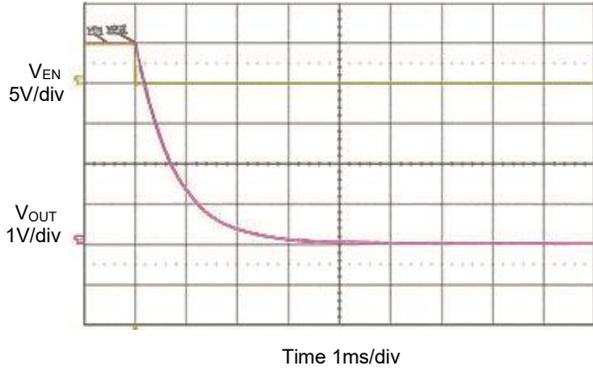
Switch Turn-Off and Fall Time
($V_{IN}=3.3V$, $C_{OUT}=4.7\mu F$, No Load)



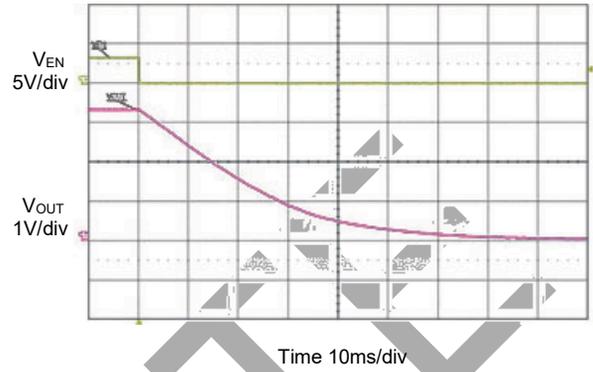
OBSOLETE - PART DISCONTINUED

Performance Characteristics (continued)

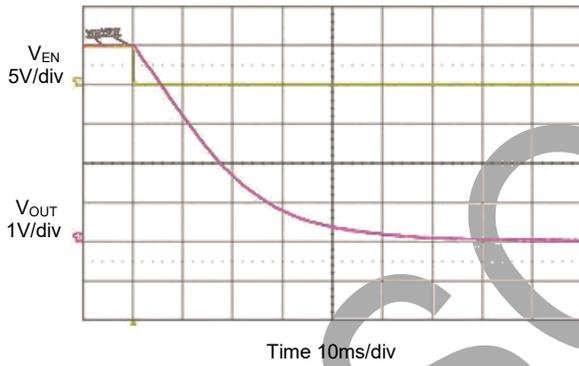
Switch Turn-Off and Fall Time
($V_{IN}=5.0V$, $C_{OUT}=4.7\mu F$, No Load)



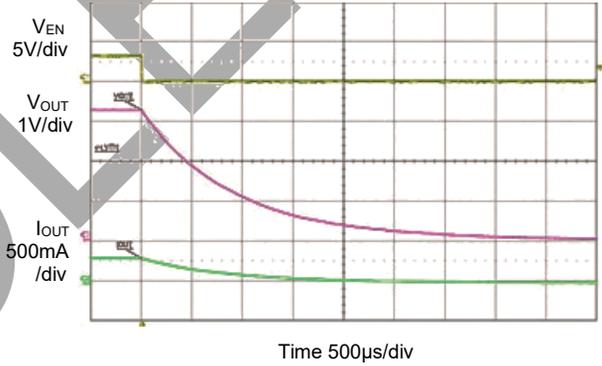
Switch Turn-Off and Fall Time
($V_{IN}=3.3V$, $C_{OUT}=100\mu F$, No Load)



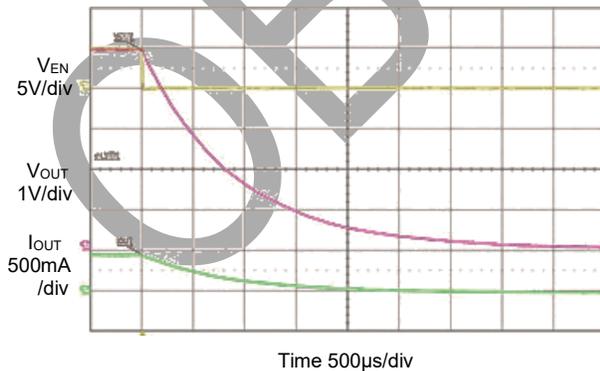
Switch Turn-Off and Fall Time
($V_{IN}=5.0V$, $C_{OUT}=100\mu F$, No Load)



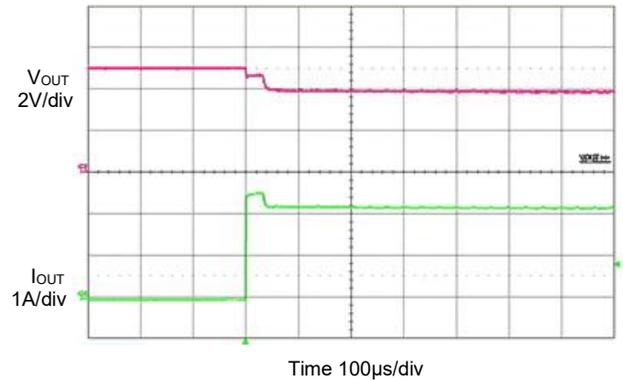
Switch Turn-Off and Fall Time
($V_{IN}=3.3V$, $C_{OUT}=100\mu F$, $R_L=10\Omega$)



Switch Turn-Off and Fall Time
($V_{IN}=5.0V$, $C_{OUT}=100\mu F$, $R_L=10\Omega$)



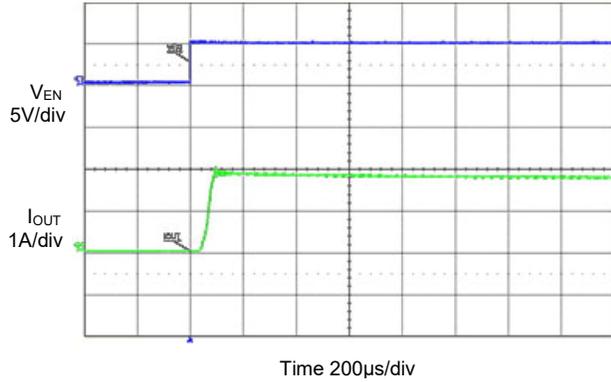
Resistance Load Inrush Response
($C_{OUT}=4.7\mu F$, $R_L=1.65\Omega$)



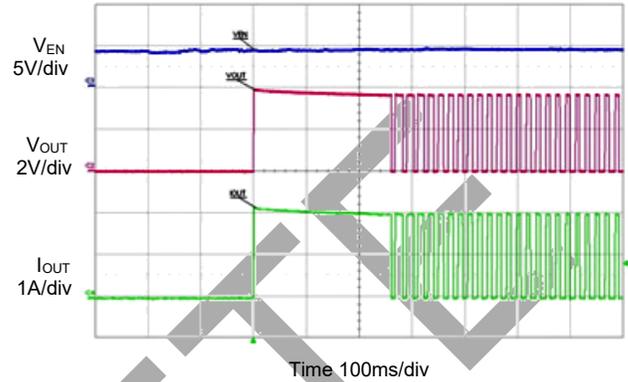
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Performance Characteristics (continued)

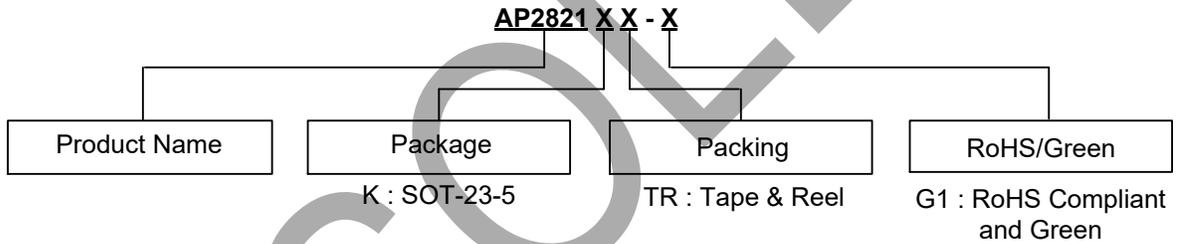
Short-Circuit Current, Device Enable into Short
($V_{IN}=5.0V$, $C_{OUT}=4.7\mu F$)



Thermal Shutdown Response
($V_{IN}=5.0V$, $C_{OUT}=4.7\mu F$, $R_L=1.65\Omega$)



Ordering Information (Note 3)



Orderable Part Number	Package	Temperature Range	Marking ID	Packing
AP2821KTR-G1	SOT-23-5	-40 to +85°C	G4E	Tape & Reel

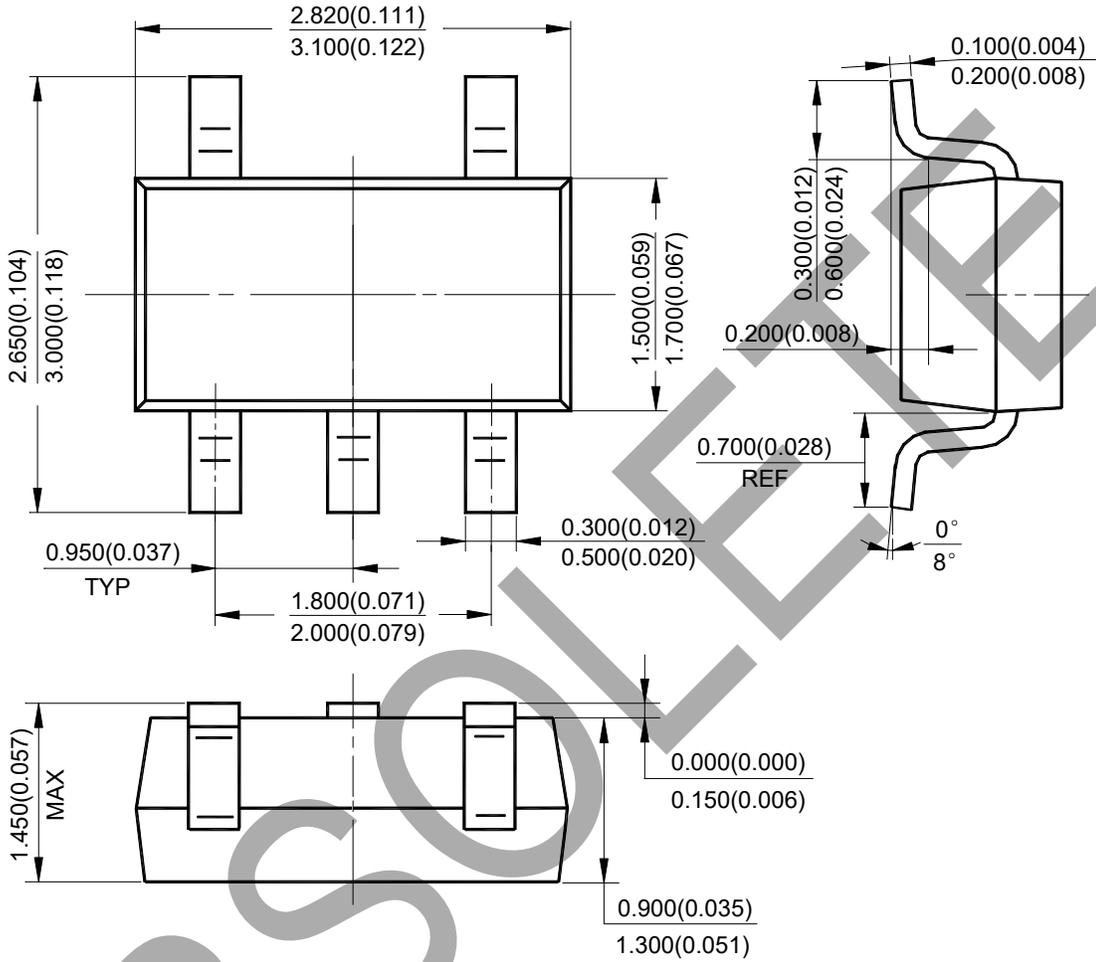
Note: 3. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

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Package Outline Dimensions (All dimensions in mm(inch).)

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

(1) Package Type: SOT-23-5



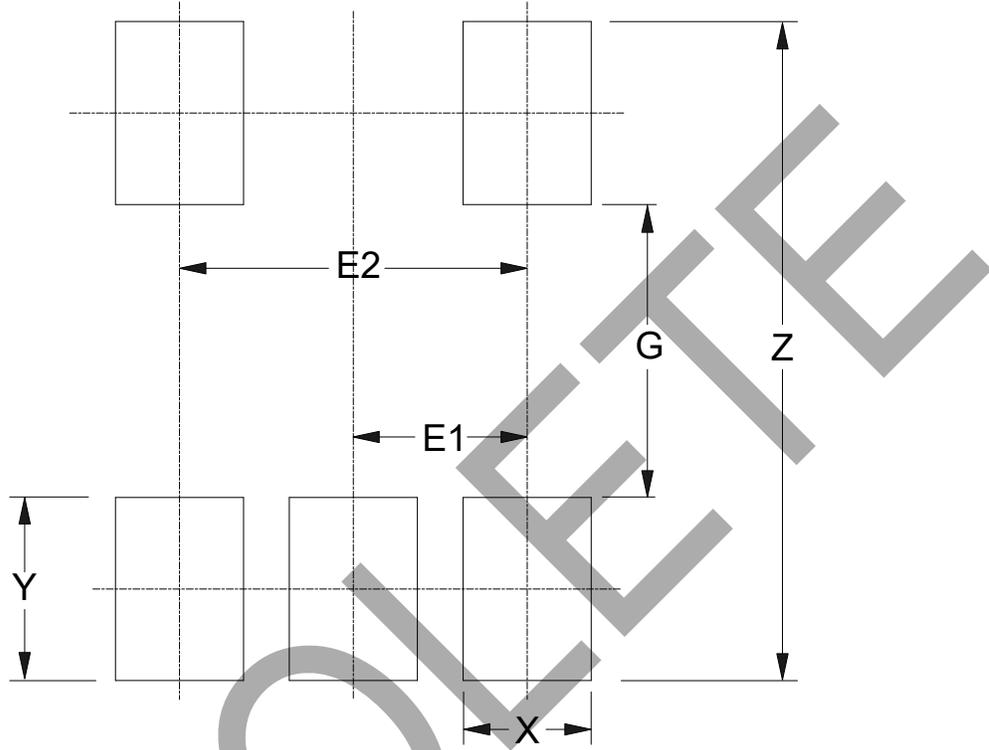
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OBsolete

Suggested Pad Layout

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

(1) Package Type: SOT-23-5



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075

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