Single Low Ron Load Switch with Soft Start

Features

- **V_{BIAS} Operating Voltage: 2.5V to 5.5V.**
- **Support VIN Range: 0.7V to V_{BAIS}**
- **4A continuous current**
- **Low $R_{DS(ON)}$ of 22mΩ at V_{BIAS} =5.5V**
- **50μA low quiescent current**
- **Adjustable rise time**
- **Integrated quick output discharge resistor**
- **TDFN2X2-8 package**

Applications

- **Portable computers**
- **Ultrabooks**
- **Table PC.**
- **Set top boxes**
- **LCD TVs**
- **Telecom/Networking/Datacom equipment.**
- **SSD**
- **Consumer electronics.**

General Description

The G5029A is a single channel load switch with typical 22mΩ on-resistance in a small package. It contains an N-channel MOSFET for up to 5.5V input voltage operation and 4A current channel with 2.5V to 5.5V bias supply. The load switch is independently controlled by a low voltage control signal through ON pin.

The G5029A integrates an internal 220Ω load resistor for quick output discharge when load switch off. The optional external capacitor connected SS for output slew rate control.

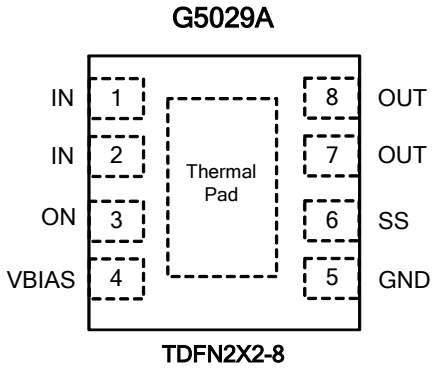
The G5029A is available in a 2mm x 2mm TDFN-8L package.

Ordering Information

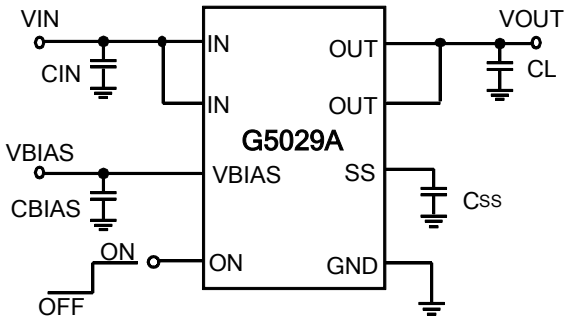
ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
G5029ARC1D	529A	-40°C to 85°C	TDFN2X2-8

Note: RC: TDFN2X2-8
1: Bonding Code
D: Tape & Reel
Green : Lead Free / Halogen Free

Pin configuration



Application circuit



Absolute Maximum Ratings

VBIAS, EN, IN, OUT to GND . . . . . -0.3V to +6V
SS to IN . . . . . -0.3V to +6V
Junction Temperature . . . . . .150°C
Thermal Resistance Junction to Ambient, (θ_{JA})*
TDFN2X2-8 . . . . . .69°C/W
Continuous Power Dissipation (T_A=25°C)*
TDFN2X2-8 . . . . . 1.71W

Thermal Resistance of junction to case (θ_{JC})
TDFN2X2-8 . . . . . 13°C/W
Storage Temperature(Ts) ... .-65°C to 150°C
ESD (HBM) 2KV
ESD (CDM) 1KV

* Please refer to EV Board PCB Layout Section.

Note: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Electrical Characteristics

T_A=25°C, V_{BIAS}=5V, (unless otherwise specified).

The device is not guaranteed to function outside its operating conditions. Parameters with MIN and/or MAX limits are 100% tested at +25°C, unless otherwise specified.

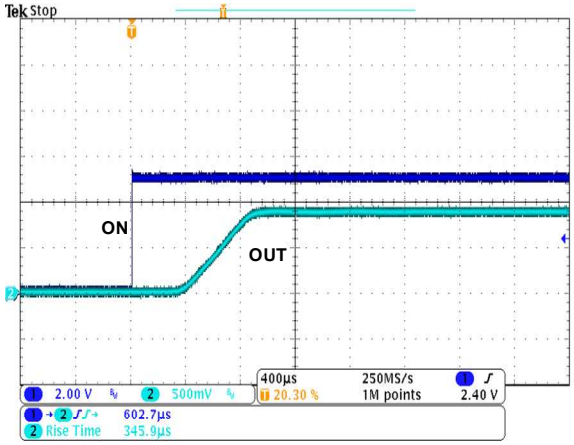
DESCRIPTION	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Power supply Voltage	V_{BIAS}		2.5	---	5.5	V
Input Voltage Range	V_{IN}		0.7	---	V_{BAIS}	V
VBIAS supply Current	I_q	I_{OUT}=0V,V_{ON}=0V, V_{IN}=V_{ON}=5V	---	---	50	μA
IVBIAS Showdown Supply Current	I_{OFF}	V_{ON}=0V, V_{OUT}=0V	---	1	2	μA
Maximum Continuous Current	I_D	V_{IN}=V_{ON}=5V	---	4	---	A
Maximum Pulsed Switch Current	I_{PLS}	V_{IN}=V_{ON}=5V Pulse < 300μs, 2% Duty Cycle	---	6	---	A
IN Shutdown Supply Current	I_{INOFF}	V_{ON}=0V, V_{OUT}=0V,V_{IN}=5V	---	2.1	---	μA
		V_{ON}=0V, V_{OUT}=0V,V_{IN}=3.3V	---	0.3	---	
		V_{ON}=0V, V_{OUT}=0V,V_{IN}=1.8V	---	0.07	---	
		V_{ON}=0V, V_{OUT}=0V,V_{IN}=0.9V	---	0.05	---	
ON Leakage Current	I_{ON}	V_{ON}=5V,with pull low resistance 1MΩ	---	5	---	μA
High input Voltage on ON pin	ON_V_{IH}		0.95	---	---	V
Low input Voltage on ON pin	ON_V_{IL}		---	---	0.3	V
Thermal protection Shutoff	THERM_OFF	Automatic shutoff temperature	---	145	---	°C
Switching ON Resistance						
Switch ON-State Resistance.	R_{ON}	I_{OUT}=-200mA, V_{IN}=0.7 to 5V	---	22	32	mΩ
Output Pull-Down Resistance	R_{PD}	I_{OUT}=15mA, V_{IN}=5V,V_{ON}=0V	---	220	---	Ω

***V_{BIAS} is recommend to be greater than 5V when VIN=0.7V~0.9V, Otherwise R_{ON} will become larger.**

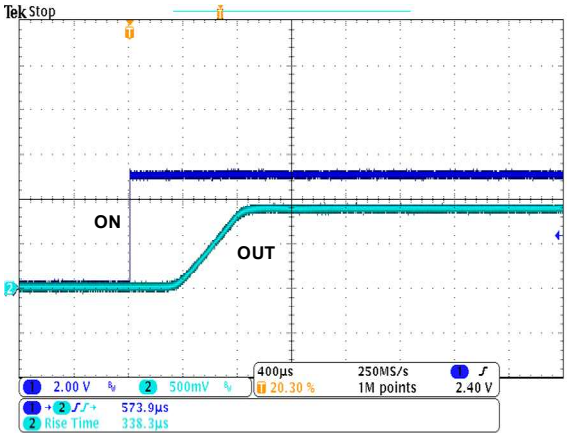
Typical Performance Characteristics

(T_A=25°C unless otherwise specified).

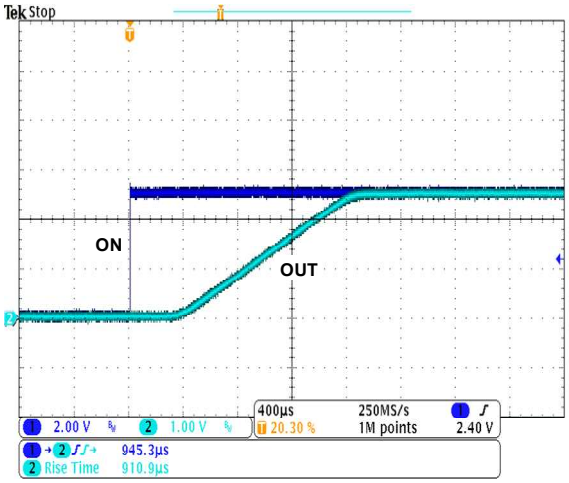
TURN-ON RESPONSE TIME(V_{IN}=0.9V,V_{BIAS}=2.5V)



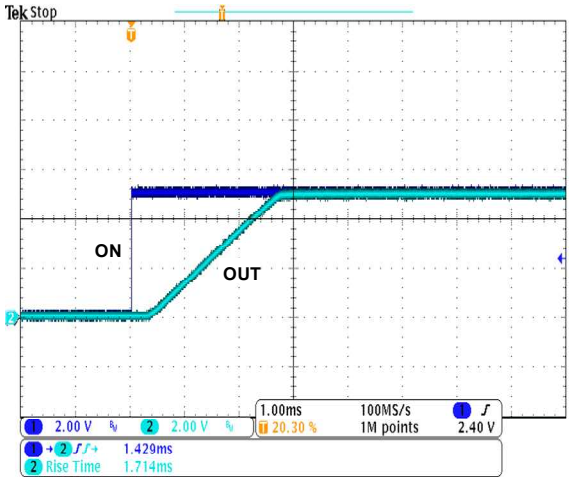
TURN-ON RESPONSE TIME(V_{IN}=0.9V,V_{BIAS}=5V)



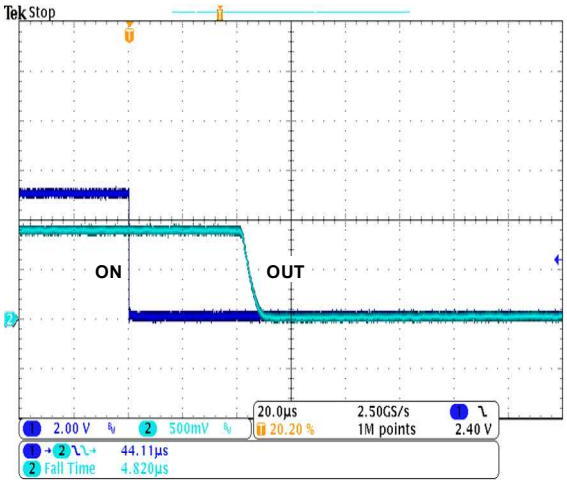
TURN-ON RESPONSE TIME(V_{IN}=2.5V,V_{BIAS}=2.5V)



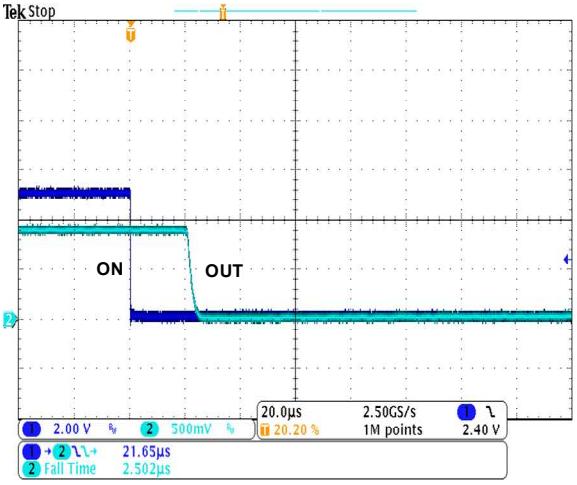
TURN-ON RESPONSE TIME(V_{IN}=5V,V_{BIAS}=5V)



TURN-OFF RESPONSE TIME(V_{IN}=0.9V,V_{BIAS}=2.5V)

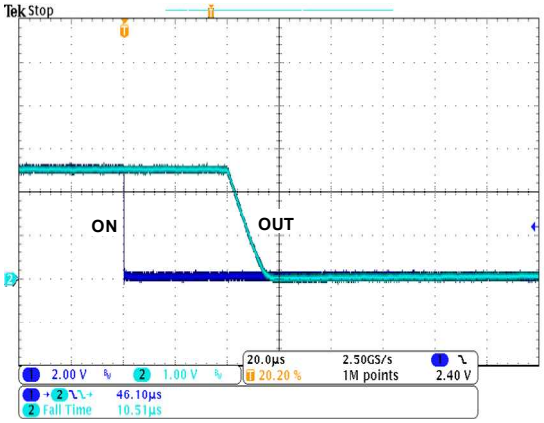


TURN-OFF RESPONSE TIME(V_{IN}=0.9V,V_{BIAS}=5V)

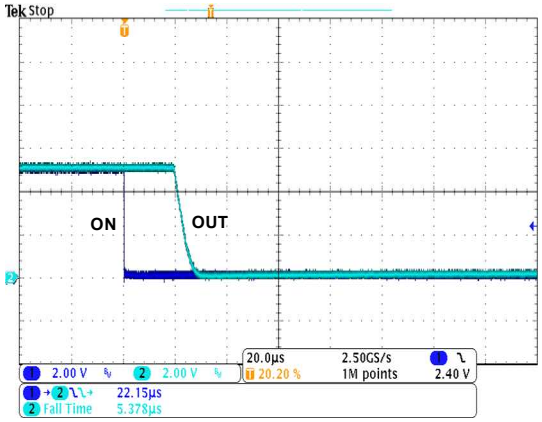


Typical Performance Characteristics (continued)

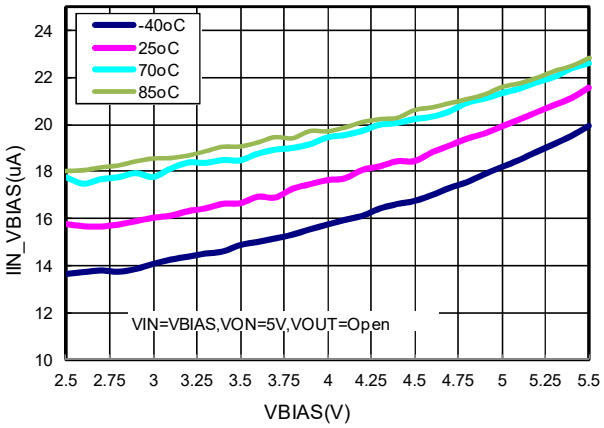
TURN-OFF RESPONSE TIME(V_{IN}=2.5V,V_{BIAS}=2.5V)



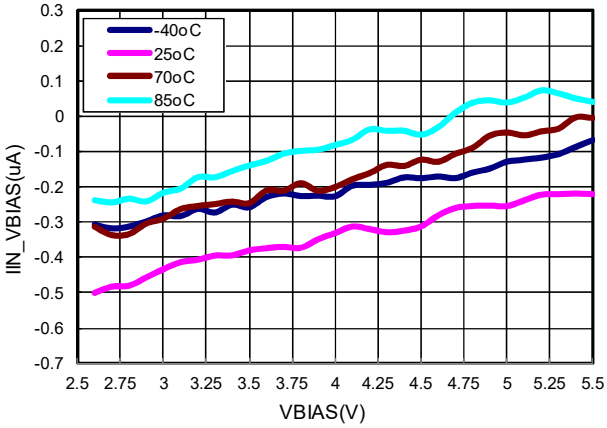
TURN-OFF RESPONSE TIME(V_{IN}=5V,V_{BIAS}=5V)



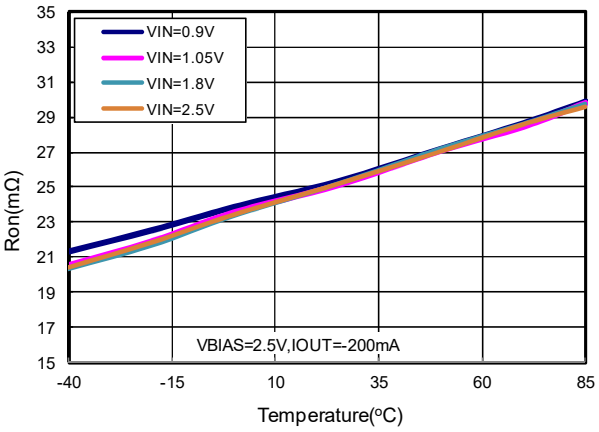
V_{BIAS} vs. QUIESCENT CURRENT



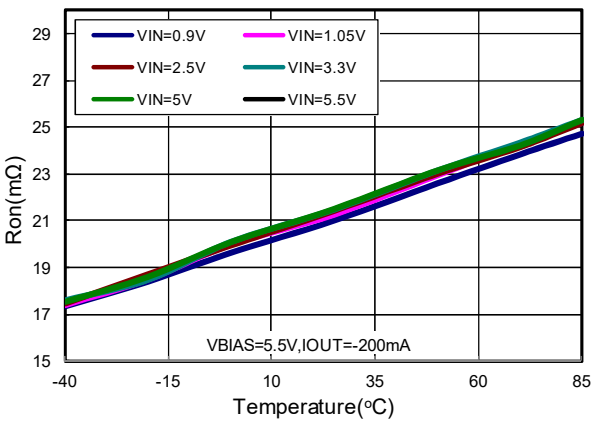
V_{BIAS} vs. SHUTDOWN CURRENT



TEMPERATURE vs. R_{ON}(V_{BIAS}=2.5V)

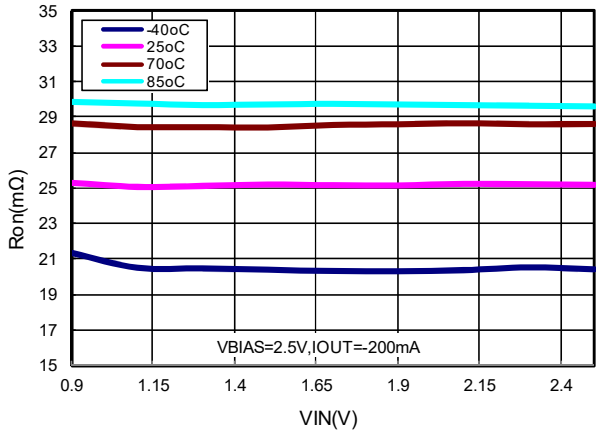


TEMPERATURE vs. R_{ON}(V_{BIAS}=5.5V)

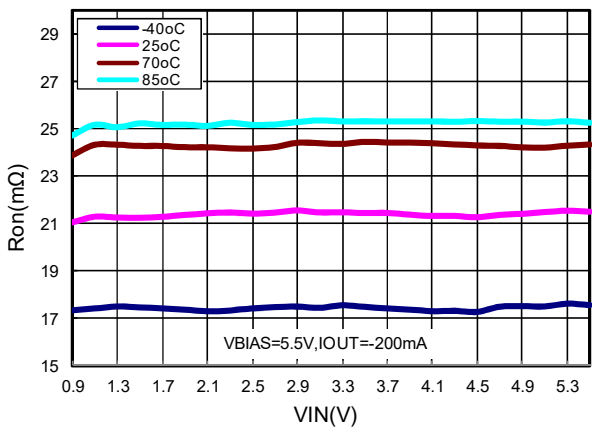


Typical Performance Characteristics (continued)

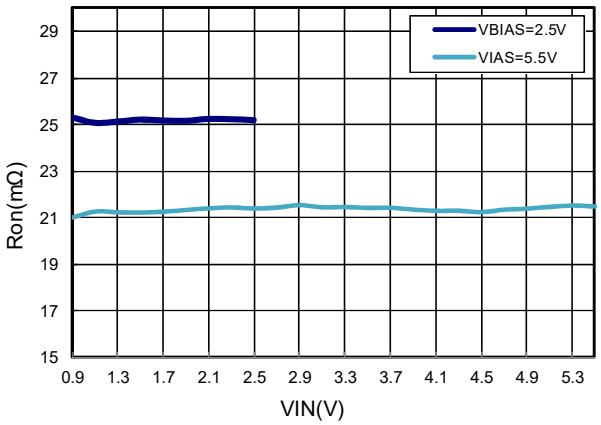
V_{IN} vs. R_{ON}(V_{BIAS}=2.5V)



V_{IN} vs. R_{ON}(V_{BIAS}=5.5V)



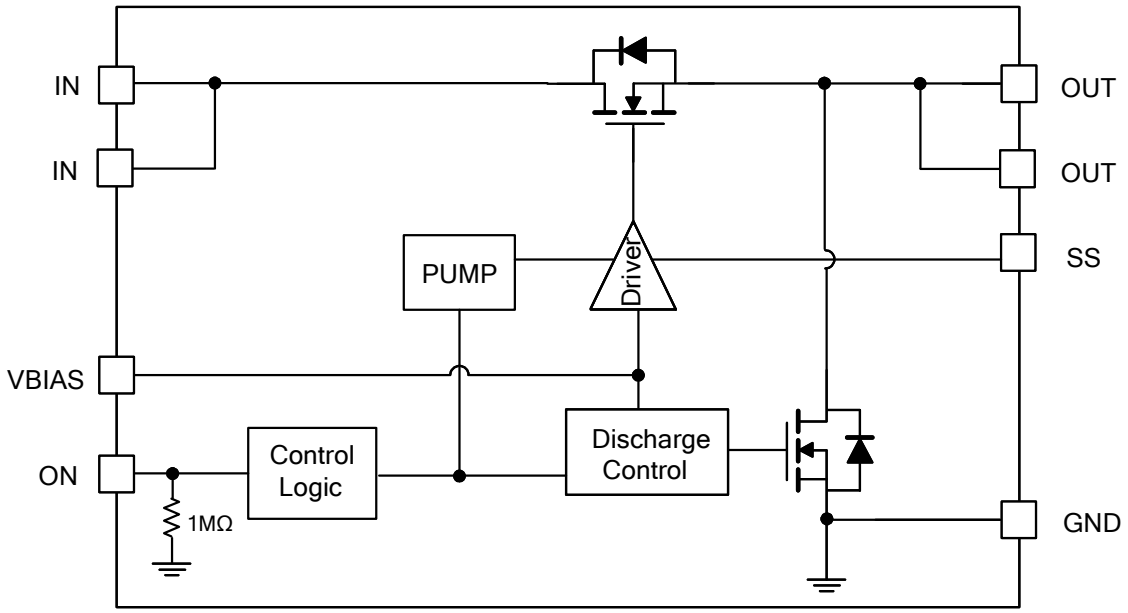
V_{IN} vs. R_{ON}(T_A=25°C)



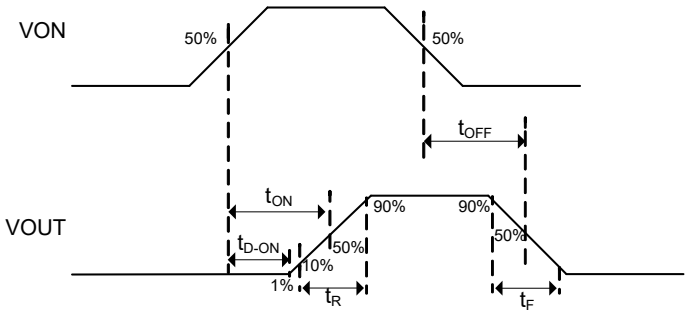
Pin Description

PIN	PIN NAME	TYPE	FUNCTION
1	IN	MOSFET	Load Switch Input. Bypass IN and GND with ceramic capacitor.
2	IN	MOSFET	Load Switch Input. Bypass IN and GND with ceramic capacitor.
3	ON	Input	Enable input. Load switch is on when ON is pulled high, Load switch is off when ON is pulled low.
4,	VBIAS	PWR	Supply input for the device.
5	GND	GND	Ground
6	SS	CAP	Load switch slew rage control.
7	OUT	MOSFET	Load switch output
8	OUT	MOSFET	Load switch output
EP	Exposed Pad		The exposed bottom pad must be connected to GND.

Block Diagram



Switching Characteristics

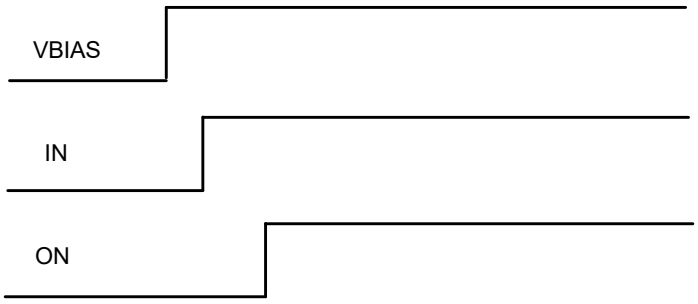


Test conditions: T_A=25°C, C_{IN}=1µF, C_{SS}=1nF, C_L=0.1µF, R_L=10Ω, unless otherwise Specified).

SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
VIN=5V,VBIAS=VON=5V					
t_{ON}	Turn-ON Time	---	1400	---	µs
t_{D-ON}	Turn-ON Delay Time	---	500	---	
t_R	Turn-ON Rise Time	---	1750	---	
t_{OFF}	Turn-OFF Time	---	20	---	
t_F	Turn-OFF Fall Time	---	5	---	
VIN=0.9V,VBIAS=VON=5V					
t_{ON}	Turn-ON Time	---	580	---	µs
t_{D-ON}	Turn-ON Delay Time	---	380	---	
t_R	Turn-ON Rise Time	---	400	---	
t_{OFF}	Turn-OFF Time	---	21	---	
t_F	Turn-OFF Fall Time	---	2.5	---	

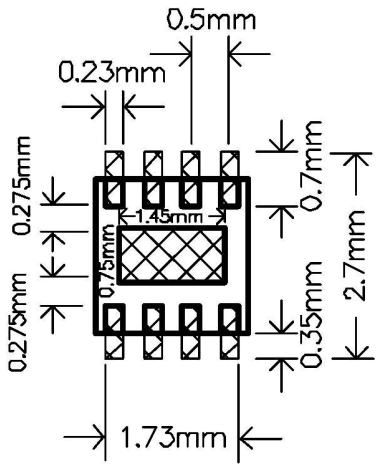
C_{SS} (PF)	Rise time (µs): VOUT 10%~90%, T_A=25°C, VBIAS=5V, R_L=10Ω, C_{IN}=1µF, C_L=0.1µF, 25V X7R MLCC						
	VIN=5V	3.3V	1.8V	1.5V	1.2V	1.05V	0.9V
0	134	106	72	64	55	52	48
220	509	354	210	180	152	136	120
470	894	618	358	304	247	225	199
1,000	1,800	1,200	684	578	474	424	372
2,200	3,550	2,360	1,332	1,136	926	8,24	732
4,700	8,500	5,720	3,210	2,632	2,204	1,928	1,668
10,000	17,560	11,880	6,610	5,630	4,570	4,040	3,580

Power sequence



Minimum Footprint PCB Layout Section

TDFN2X2-8



Detailed Description

ON/OFF Control

The G5029A is enabled when the ON pin is on active high with 0.95V or above voltage. The device is disabled when the ON pin voltage is 0.3V or lower. The ON input is compatible with both TTL and CMOS logic.

VBIAS Voltage Range

For optimal $R_{DS(on)}$ performance, make sure $V_{IN} \leqq V_{BIAS}$. The device will still be functional if $V_{IN} > V_{BIAS}$ but it will exhibit $R_{DS(on)}$ greater than what is listed in the Electrical characteristics table.. Notice the increasing $R_{DS(on)}$ as V_{IN} exceeds V_{BIAS} voltage. Be sure to never exceed the maximum voltage rating for V_{IN} and V_{BIAS}.

Application Information

The basic G5029A application circuit is shown in the first page. Component selection is explained blew.

Input Capacitor

A capacitor of 1 µF or higher value is recommended to be place close to the IN pins of G5029A. This capacitor can reduce the voltage drop caused by the in-rush current during the turn-on transient of the load switch. A higher value capacitor can be used to further reduce the voltage drop during high-current application.

Output Capacitor

A capacitor of 0.1µF or higher value is recommended to be place between the OUT pins and GND. The switching times are affected by the capacitance. A large capacitor makes the initial turn-on transient smoother. This capacitor must be large enough to supply a fast transient load in order to prevent the output from dropping.

Thermal Considerations

To ensure proper operation, the maximum junction temperature of the G5029A should not exceed 145°C. Several factors attribute to the junction temperate rise: load current MOSFET on-resistance, junction-to-ambient thermal resistance, and ambient temperature. The maximum load current can be determined by:

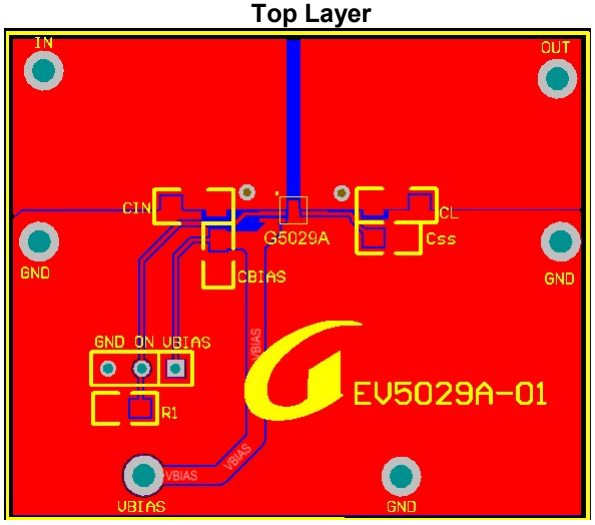
It is noted that the maximum continuous load current is 4A.

Layout Guidelines

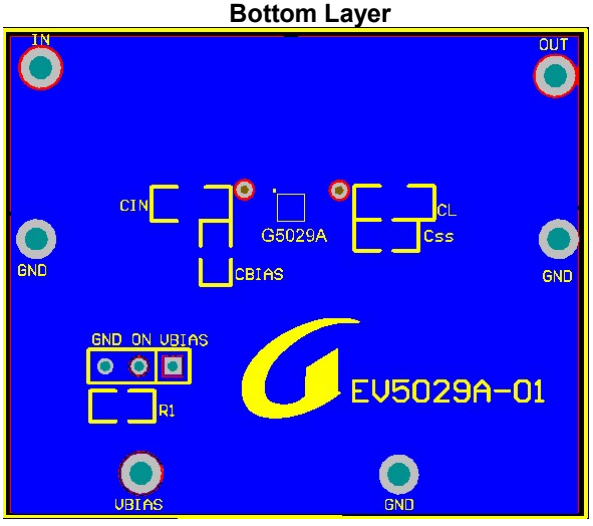
Good PCB is important for improving the thermal performance of G5029A. Place the input and output bypass capacitors close to the IN and OUT pins. The input and output PCB traces should be as wide as possible for the given PCB space. Use a ground plane to enhance the power dissipation capability of the device.

EV Board PCB Layout Section

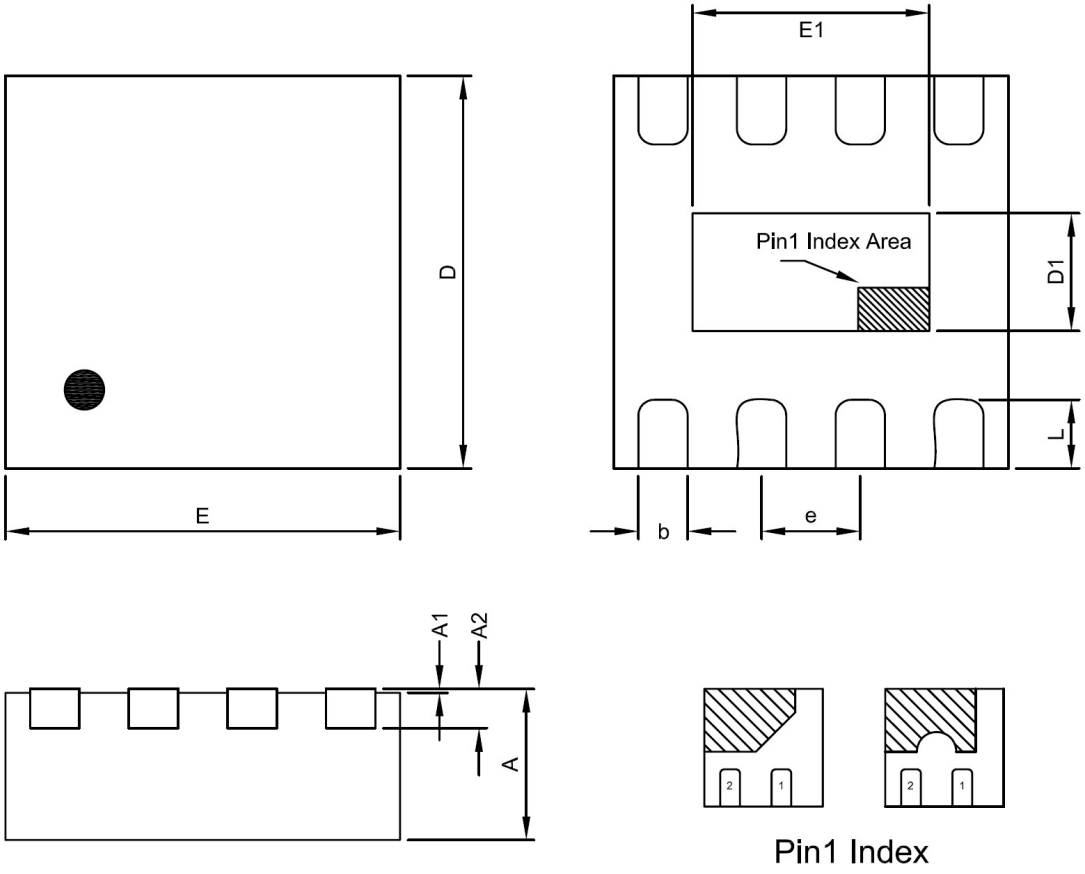
Top Layer



Bottom Layer



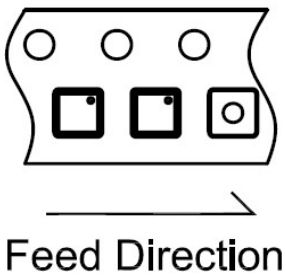
Package Information



TDFN2X2-8 Package

Symbol	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.0276	0.0295	0.0315
A1	0.00	- - -	0.05	0.0000	- - -	0.0020
A2	0.20 REF			0.0079 REF		
D	1.95	2.00	2.05	0.0768	0.0787	0.0807
E	1.95	2.00	2.05	0.0768	0.0787	0.0807
D1	0.55	0.75	0.95	0.0217	0.0295	0.0374
E1	1.15	1.40	1.65	0.0453	0.0551	0.0650
b	0.15	0.23	0.30	0.0059	0.0091	0.0118
e	0.50 BSC			0.0197 BSC		
L	0.30	0.35	0.40	0.0118	0.0138	0.0157

Taping Specification



PACKAGE	Q'TY/REEL
TDFN2X2-8	3,000 ea