

TPS7B69xx-Q1 Pin FMEA

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ABSTRACT

The TPS7B69xx-Q1 is a low-dropout (LDO) linear regulator designed for up to 40-V V_{IN} operations. With only 15- μ A typical quiescent current at light load, they are quite suitable for standby micro control unit systems especially in automotive applications.

The devices feature an integrated short-circuit and overcurrent protection. The devices operate during -40°C to 125°C temperature range. Because of these features, these devices are well suited in power supplies for various automotive applications.

Pin FMEA

This application note provides a Failure Modes and Effects Analysis (FMEA) for the device pins of the TPS7B69xx-Q1 LDO Regulator. The failure conditions covered in this document include the typical pin-by-pin failure scenarios:

- Pin short-circuited to Ground
- Pin short-circuited to TPS7B69xx-Q1 V_{IN}
- Pin short-circuited to an adjacent pin
- Pin is open-circuited

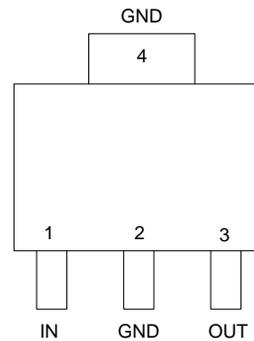
This application note also details how these pin conditions affect the device:

- Does the pin condition cause permanent damage?
- Is the device functional under the pin condition?
- How does the particular pin condition affect the device operation?

For purposes of this report:

- Unless otherwise specified, the voltage applied to the IN pin is within the TPS7B69xx-Q1 Recommended Operating Range.
- Functionality = YES indicates the normal device operation.
- Damage = YES indicates damage to the device

Pin Configuration and Functions



Pin No.	Pin Name	Type	Description
SOT223			
1	IN	P	Input power supply voltage
2, 4	GND	G	Ground reference
3	OUT	P	Output voltage

Table 1. Pin FMEA Analysis for Pin Short-Circuit to Ground

Pin		Short to Ground		
Number	Name	Damage	Functionality	Comments
1	IN	No	No	No output voltage. Either input supply is at 0.0 V, or input fuse is blown.
2	GND	No	Yes	No effect
3	OUT	No	No	Output is forced OFF, V_{OUT} is 0.0 V, current limit is triggered
4	GND	No	Yes	No effect

Table 2. Pin FMEA Analysis for Pin Short-Circuit to V_{IN}

Pin		Short to V_{IN}		
Number	Name	Damage	Functionality	Comments
1	IN	No	Yes	No effect
2	GND	No	No	No output voltage. Either input supply is at 0.0 V, or input fuse is blown.
3	OUT	Yes	No	No V_{OUT} regulation. Output voltage is same as input voltage. Device may be damaged if V_{IN} is greater than 7 V.
4	GND	No	No	No output voltage. Either input supply is at 0.0 V, or input fuse is blown.

Table 3. Pin FMEA Analysis for Pin Short-Circuit to an Adjacent Pin

Pin		Shorted To		Short to Adjacent Pin		
Number	Name	Number	Name	Damage	Functionality	Comments
1	IN	2	GND	No	No	No output voltage. Either input supply is 0.0 V, or input fuse is blown.
2	GND	3	OUT	No	No	Output is forced OFF, V_{OUT} is 0.0 V, current limit is triggered
3	OUT	4	GND	No	No	Output is forced OFF, V_{OUT} is 0.0 V, current limit is triggered
4	GND	1	IN	No	No	No output voltage. Either input supply is 0.0 V, or input fuse is blown.

Table 4. Pin FMEA Analysis for Pin Open-Circuit

Pin		Open		
Number	Name	Damage	Functionality	Comments
1	IN	No	No	No output voltage
2	GND	No	Yes	No effect
3	OUT	No	No	No output voltage to load
4	GND	No	Yes	No effect

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