Overvoltage Protection Load Switch

Features

- Input clamping voltage：42 V (Typ.)
- Integrated low-R_{ON} FET: 35 mΩ (Typ.)
- 4 A continuous current capability
- Default overvoltage protection(OVP) threshold: 5.95 V
- Fast turn-off response: 80 ns (Typ.)
- Undervoltage lockout (UVLO)
- Overtemperature protection (OTP)
- ESD protection
  - IEC 61000-4-2 air discharge: > 15 kV
  - IEC 61000-4-2 contact discharge: > 8 kV
- Surge protection
  - IEC 61000-4-5: 80 V
- Negative voltage protection (-6 V)

Applications

- Mobile handsets and tablets
- Portable media players
- MP3 players

Package Information

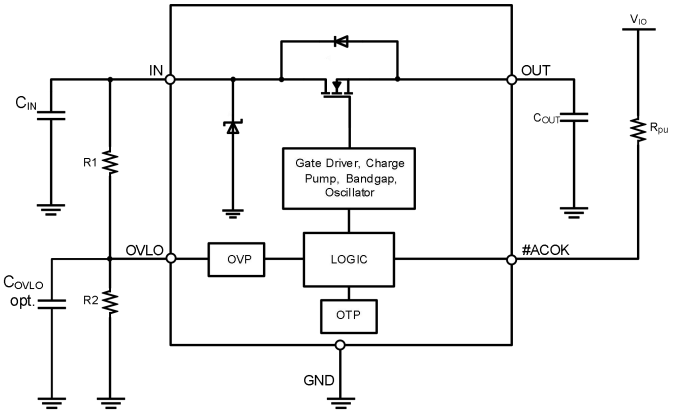
Part Number	Package	Body Size
DIO1266B	WLCSP-12	1.63 mm × 1.17 mm

Description

The DIO1266B features a low- R_{ON} internal FET and an operating range of 2.5 VDC to 40 VDC (absolute maximum of 42 VDC). The DIO1266B features overvoltage protection that powers down the internal FET if the input voltage exceeds the OVP threshold. The OVP threshold is adjustable with optional external resistors. Overtemperature protection also powers down the device at 130°C (Typ.).

The DIO1266B is available in WLCSP-12 package. It is specified over ambient temperature range of -40°C to 85°C.It can be used in a wide range of applications such as mobile phones and tablets.

Simplified Schematic



Ordering Information

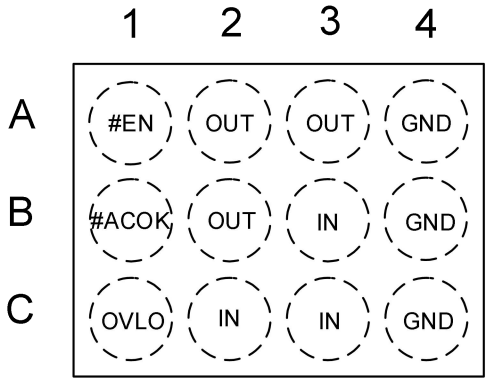
Ordering Part No.	Top Marking	MSL	RoHS	T_A	Package	
DIO1266BWL12	D6FB	1	Green	-40 to 85°C	WLCSP-12	Tape & Reel, 3000

If you encounter any issue in the process of using the device, please contact our customer service at marketing@dioo.com or phone us at (+86)-21-62116882. If you have any improvement suggestions regarding the datasheet, we encourage you to contact our technical writing team at docs@dioo.com. Your feedback is invaluable for us to provide a better user experience.

Table of Contents

List of Figures

1. Pin Assignment and Functions



WLCSP-12 (Top view)

Pin No.	Pin Name	Type	Description		
B3,C2,C3	IN	Input / Supply	Switch input and device supply		
A2,A3,B2	OUT	Output	Switch output to load		
B1	#ACOK	Output	Power good	High	$V_{IN} < V_{IN\_min}$ or $V_{IN} \geq V_{OVLO}$
				Low	Voltage stable
A1	#EN	Input	Device enable. Low is enable		
C1	OVLO	Input	Overvoltage lockout adjustment pin		
A4,B4,C4	GND	Supply	Device ground		

2. Absolute Maximum Ratings

Exceeding the maximum ratings listed under Absolute Maximum Ratings when designing is likely to damage the device permanently. Do not design to the maximum limits because long-time exposure to them might impact the device's reliability. The ratings are obtained over an operating free-air temperature range unless otherwise specified.

Symbol	Parameter		Rating	Unit
V_{IN}	IN to GND (1)		-6 to 42	V
V_{OUT}	OUT to GND		-0.3 to V_{IN} + 0.3	V
V_{OVLO}	OVLO to GND		-0.3 to 30	V
$V_{\#EN\_ACOK}$	Maximum DC voltage allowed on #EN or #ACOK pin		6	V
I_{IN}	Switch I/O current (continuous)		4.5	A
T_{STG}	Storage temperature range		-65 to 150	°C
T_J	Maximum junction temperature		150	°C
T_L	Lead temperature (soldering, 10 seconds)		260	°C
Surge(2)	IEC 61000-4-5, surge protection	V_{IN}	80	V

Note:

(1) Maximum reverse current to IN pin less than 6 A.

(2) No load.

3. Recommended Operating Conditions

Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. The ratings are obtained over an operating free-air temperature range unless otherwise specified.

Symbol	Parameter	Min	Typ	Max	Unit
V_{IN}	Supply voltage	2.5		40	V
T_A	Operating temperature	-40		85	°C
I_{OUT}	Output current			4	A

4. ESD Ratings

When a statically-charged person or object touches an electrostatic discharge sensitive device, the electrostatic charge might be drained through sensitive circuitry in the device. If the electrostatic discharge possesses sufficient energy, damage might occur to the device due to localized overheating.

Model	Condition		Value	Unit
ESD	IEC 61000-4-2 system	Air gap	15	kV
		Contact	8	
	Human body device. JEDEC EIA/JESD22-A114F		±3	

5. Thermal Considerations

The thermal resistance determines the heat insulation property of a material. The higher the thermal resistance is, the lower the heat loss. Accumulation of heat energy degrades the performance of semiconductor components.

Symbol	Metric	Value	Unit
$R_{\theta JA}$	Junction-to-ambient thermal resistance	84.1	°C/W

6. Electrical Characteristics

T_A = -40°C to 85°C, unless otherwise specified. Typical values are V_{IN} = 5.0 V, I_{IN} ≤ 3 A, C_{IN} = 0.1 µF and T_A = 25°C.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN_CLAMP}	Input clamping voltage	I_{IN} = 10 mA		42		V
I_Q	Input quiescent current	V_{IN} = 5 V, #EN = 0 V		80	130	µA
I_{IN_Q}	OVLO supply current	V_{OVLO} = 3 V, V_{IN} = 5 V, V_{OUT} = 0 V		70	96	µA
V_{UVLO}	Undervoltage trip level	V_{IN} rising		2.25	2.4	V
		V_{IN} falling		1.95	2.1	V
V_{IN_OVLO}	Internal overvoltage trip level	V_{IN} rising, OVLO = GND	5.85	5.95	6.05	V
		V_{IN} falling	5.6			V
V_{OVLO_TH}	OVLO set threshold	V_{IN} = 2.5 V to V_{OVLO}	1.18	1.20	1.22	V
V_{OVLO_RNG}	Adjustable OVLO threshold range	V_{IN} = 2.5 V to V_{OVLO}	4		28	V
V_{OVLO_SELECT}	External OVLO select threshold		0.28	0.30	0.32	V
R_{ON}	Resistance from V_{IN} to V_{OUT}	V_{IN} = 5 V, I_{OUT} = 1 A, T_A = 25°C		35	40	mΩ
C_{OUT}	OUT load capacitance	V_{IN} = 5 V			1000	µF
I_{OLVO}	OVLO input leakage current	V_{OVLO} = V_{OVLO_TH}	-100		100	nA
T_{SD}	Thermal shutdown			130		°C
T_{SD_HYS}	Thermal shutdown hysteresis			20		°C
Digital signals						
V_{OL}	#ACOK output low voltage	I_{SINK} = 1 mA			0.4	V
$V_{IH\_\#EN}$	Enable high voltage	V_{IN} = 2.5 V to V_{OVLO}	1.2			V
$V_{IL\_\#EN}$	Enable low voltage	V_{IN} = 2.5 V to V_{OVLO}			0.5	V
I_{Leak_ACOK}	#ACOK leakage current	V_{ACOK} = 3 V, #ACOK deasserted	-0.5		0.5	µA
$I_{Leak\_\#EN}$	#EN leakage current	V_{IN} = 5.0 V, V_{OUT} = Float	-1.0		1.0	µA
Timing characteristics						
t_{DEB}	Debounce time	Time from 2.5 V < V_{IN} < V_{IN_OVLO} to V_{OUT} = 0.1 × V_{IN}		15		ms
t_{START}	Soft-start time	Time from V_{IN} = V_{IN_min} to 0.2 × #ACOK, V_{IO} = 1.8 V with 10 kΩ Pull-up resistor		30		ms
t_{ON}	Switch turn-on time (1)	R_L = 100 Ω, C_L = 22 µF, V_{OUT} from 0.1 x V_{IN} to 0.9 × V_{IN}	1.5	2	4	ms
t_{OFF}	Switch turn-off time(1)	R_L = 100 Ω, C_L = 0 µF, V_{IN} > V_{OVLO} to V_{OUT} = 0.8 × V_{IN}		80		ns

Note:

(1) Guaranteed by characterization under room temperature.

(2) Specifications subject to change without notice.

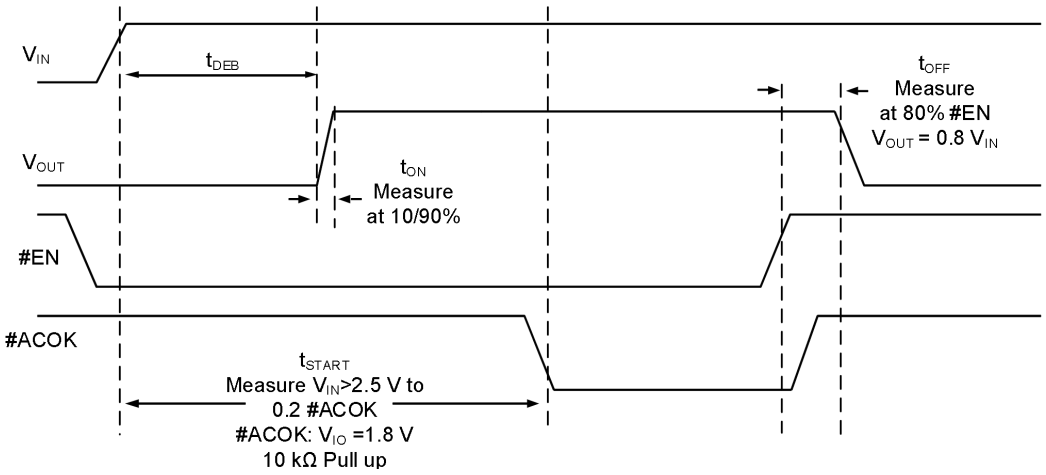


Figure 1. Timing for power up and normal operation

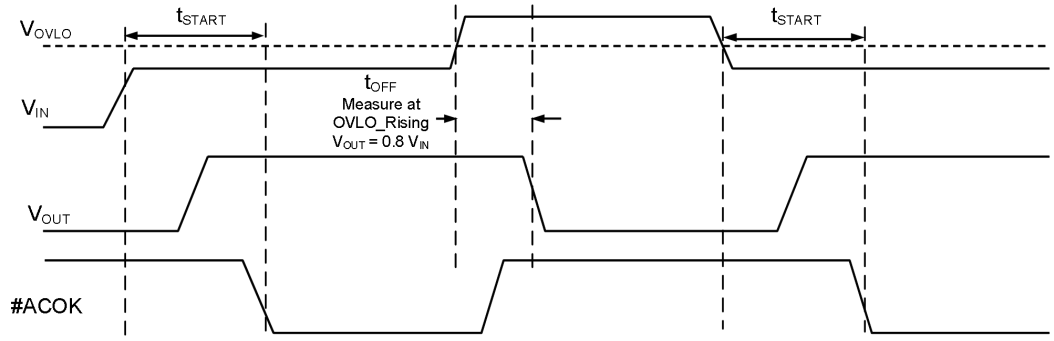


Figure 2. Timing for OVLO trip

7. Typical Characteristics

T_A is 25°C, V_{IN} = 5 V, I_{IN} ≤ 3 A, C_{IN} = 1 μF, C_{OUT} = 1 μF, unless otherwise noted.

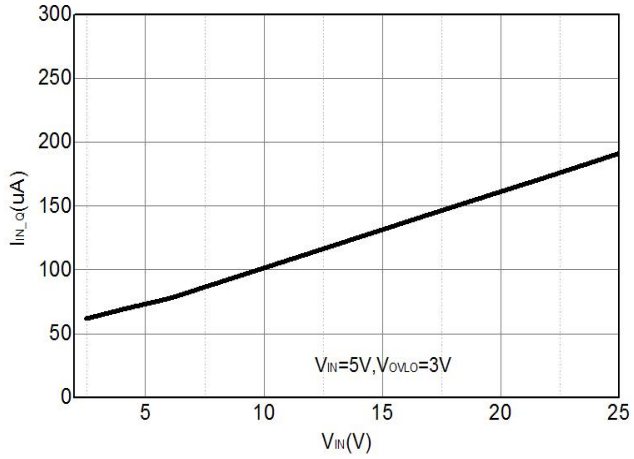


Figure 3. I_{IN_Q} vs. V_{IN}

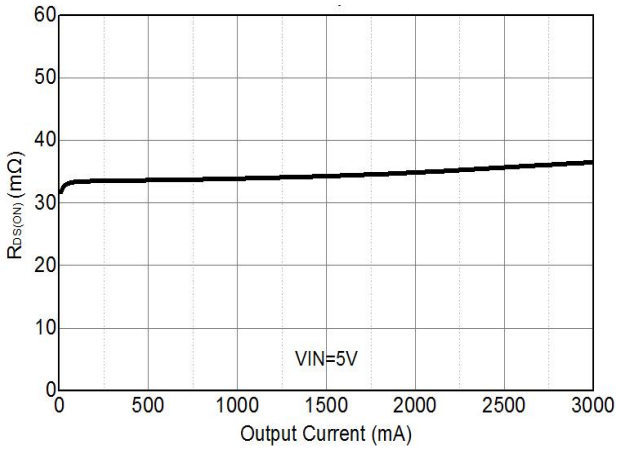


Figure 4. $R_{DS(ON)}$ vs. I_{OUT}

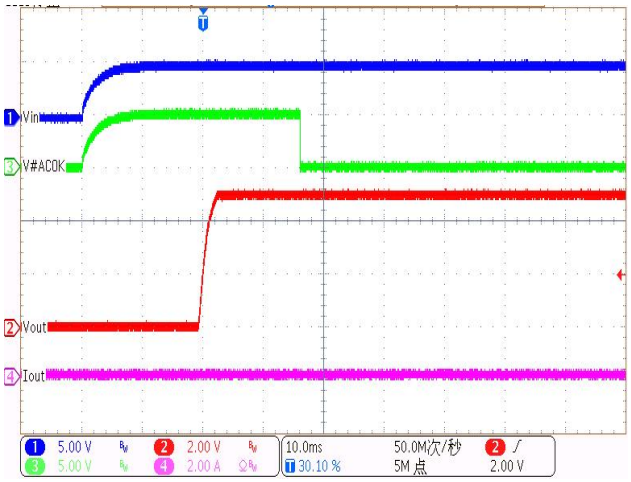


Figure 5. VIN power ON (V_{IN} = 5 V, No Load)

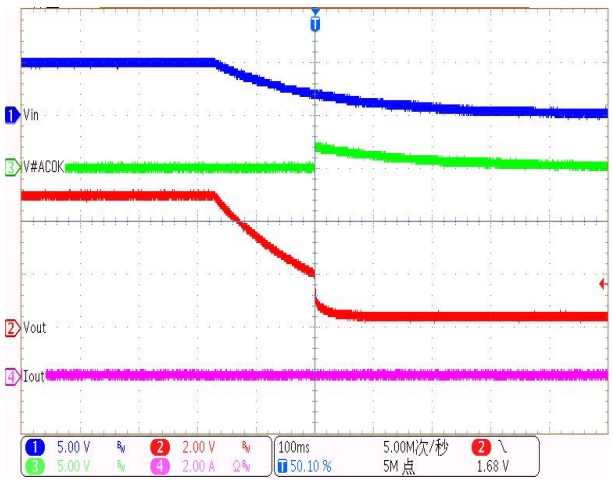


Figure 6. VIN power OFF (V_{IN} = 5 V, No Load)

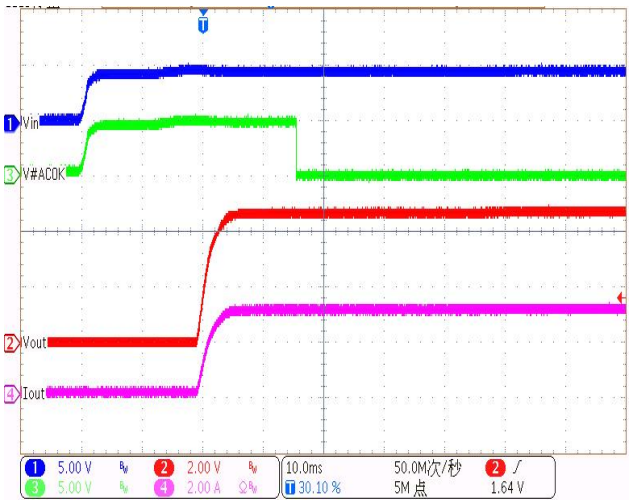


Figure 7. VIN power ON (V_{IN} = 5 V, R_{Load} = 1.6 Ω)

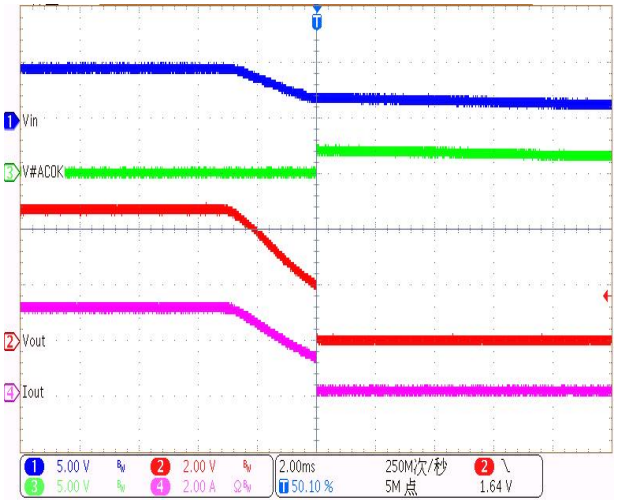


Figure 8. VIN power OFF (V_{IN} = 5 V, R_{Load} = 1.6 Ω)

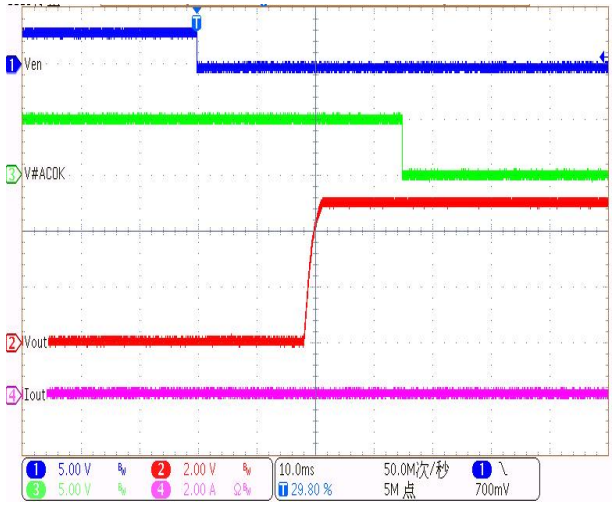


Figure 9. EN power ON (V_{IN} = 5 V, No load)

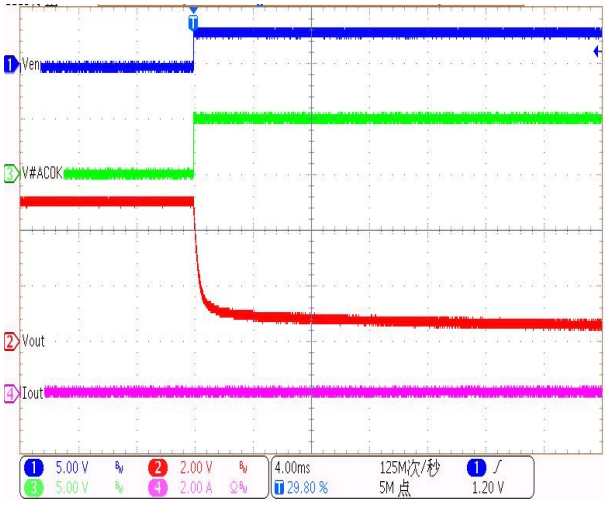


Figure 10. EN power OFF (V_{IN} = 5 V, No load)

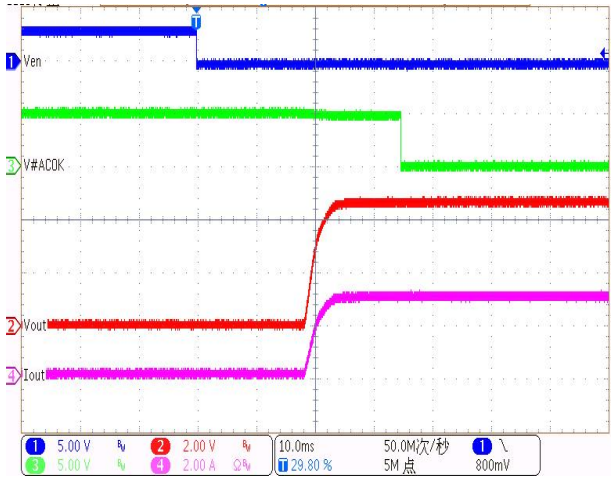


Figure 11. EN power ON (V_{IN} = 5 V, R_{Load} = 1.6 Ω)

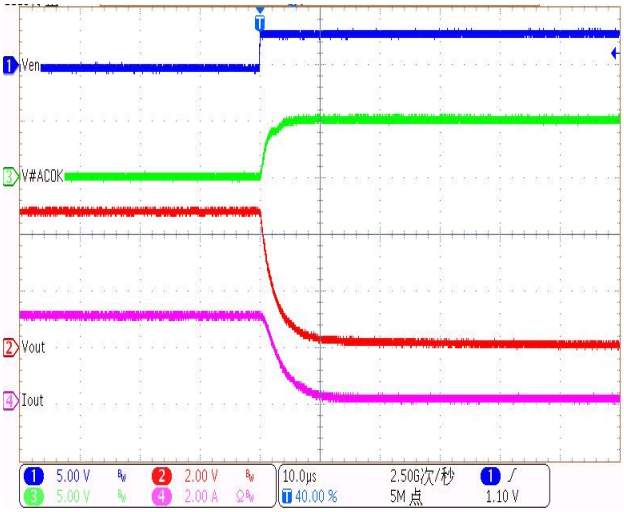
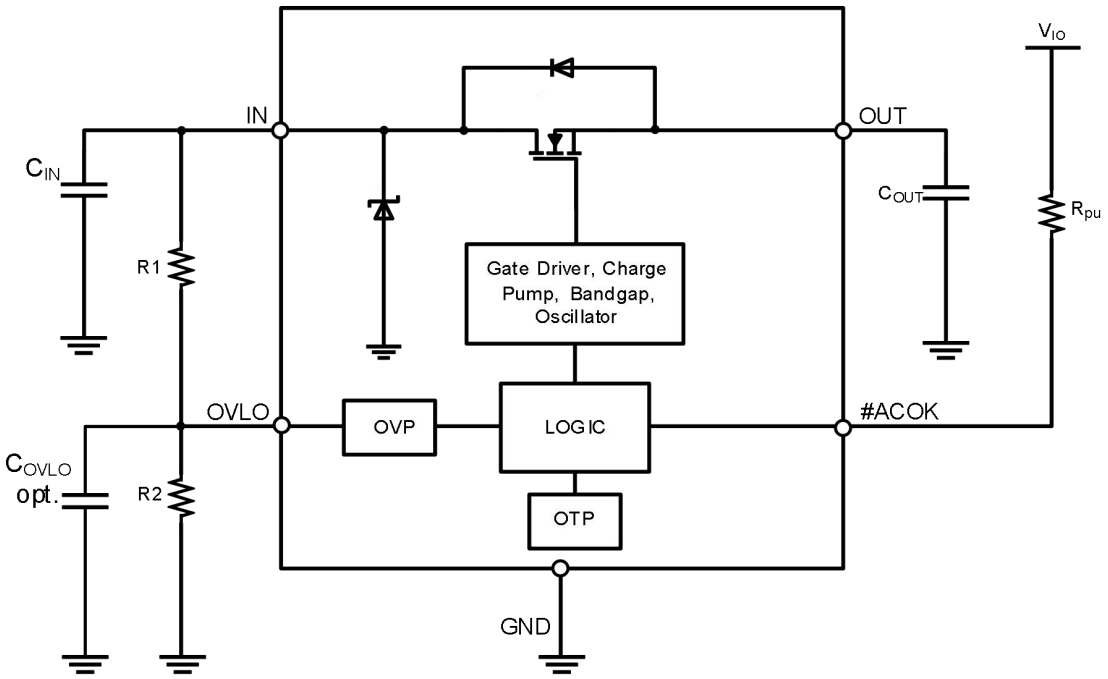


Figure 12. EN power OFF (V_{IN} = 5 V, R_{Load} = 1.6 Ω)

8. Block Diagram



9. Application Information

Important notice: Validation and testing are the most reliable ways to confirm system functionality. The application information is not part of the specification and is for reference purposes only.

9.1. Overvoltage lockout (OVLO) calculation

OVLO can be set externally and override default OVP. By connecting an external resistor-driver to the OVLO pin. Equation (1) can produce the desired trip voltage and resistor values.

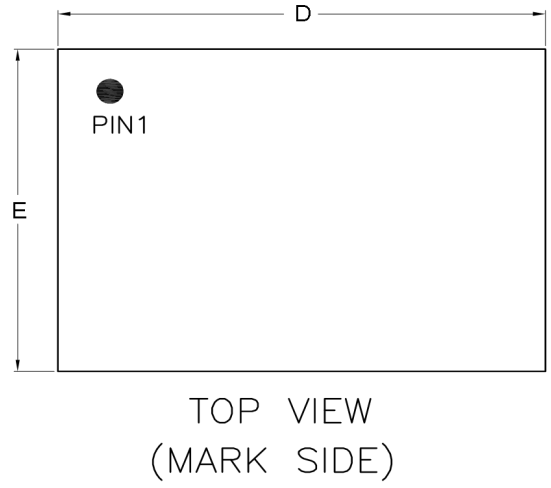
$$V_{IN\_OVLO} = V_{OVLO\_TH} \times (1 + R_1/R_2) \quad (1)$$

Recommended minimum R1 = 820 kΩ.

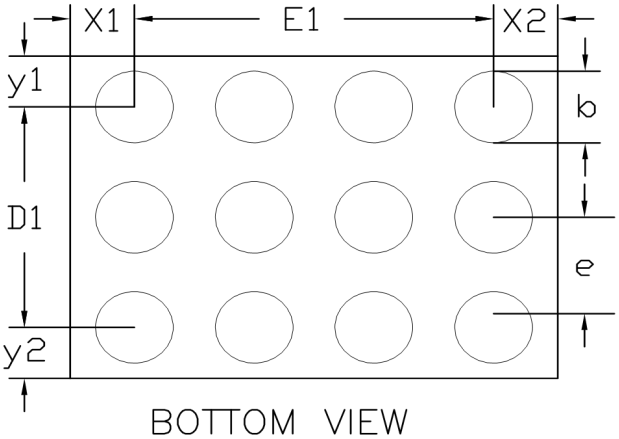
9.2. On-The-Go (OTG) functionality

During OTG operation, the DIO1266B is initially disabled and the power FET's bulk diode is forward biased. The bulk diode represents ~0.7 V drop across the device, which remains until the V_{IN} voltage increases past 2.5 V, when the device is fully enabled. While the device is disabled and the body diode is forward biased, the max DC current through the diode is 1.8 A. This current is limited by the thermal performance of the device (0.7 V x 1.8 A = 1.36 W). The #EN pin must be pulled LOW to ensure the device fully enables and the transient should not exceed the RC time constant of the C_{IN} and C_{OUT} capacitors. At the system level, overvoltage and current protection should be provided outside the DIO1266B.

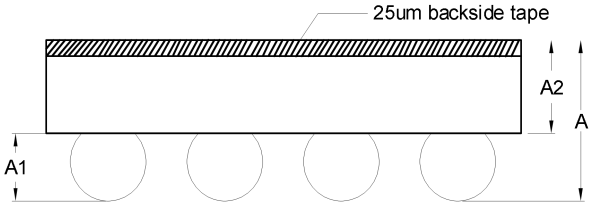
10. Physical Dimensions: WLCSP-12



TOP VIEW
(MARK SIDE)



BOTTOM VIEW
(BALL SIDE)



SIDE VIEW

Common Dimensions (Units of measure = Millimeter)			
Symbol	**Min**	**Nom**	**Max**
A	0.560	0.605	0.650
A1	0.180	0.200	0.220
A2	0.380	0.405	0.430
D	1.615	1.630	1.645
D1		0.800 BSC	
E	1.155	1.170	1.185
E1		1.200 BSC	
b	0.240	0.260	0.280
e		0.400 BSC	
x1		0.215 REF	
x2		0.215 REF	
y1		0.185 REF	
y2		0.185 REF	

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