ALPHA & OMEGA SEMICONDUCTOR

AOZ5278QI

High-Current, High-Performance Smart Power Stage

General Description

The AOZ5278QI is a general-purpose Smart Power Stage (SPS) consisting of two asymmetrical MOSFETs and an integrated driver for high current, high frequency DC-DC converters.

The AOZ5278QI provides an output voltage signal (IMON), which represents the real-time module current with a gain of 5 mV/A. The IMON signal can be directly used to replace inductor DCR sensing or resistor sensing in multiphase voltage regulator systems without the need for temperature compensation.

The AOZ5278QI also includes an accurate module temperature monitor (TMON). TMON is a voltage sourced signal with a gain of 8 mV/°C.

The MOSFETs are individually optimized for operation in the synchronous buck configuration. The High-Side (HS) MOSFET is optimized to achieve low capacitance and gate charge for fast switching with low duty cycle operation. The Low-Side (LS) MOSFET has ultra-low ON resistance to minimize conduction loss. The standard 5 mm x 6 mm QFN package is optimally designed to minimize parasitic inductance for minimal EMI signature.

Features

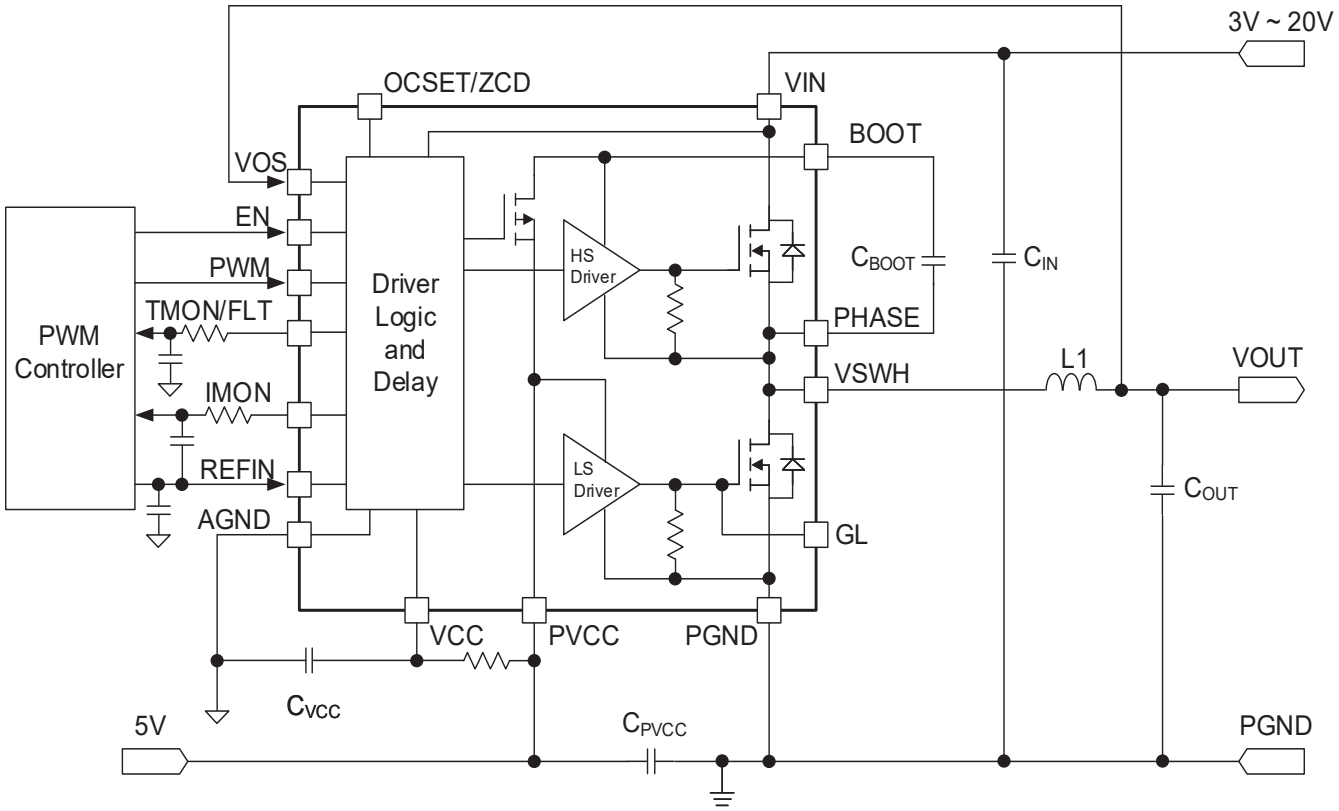
- 3 V to 20 V power supply range
- 30 V HS MOSFET provides better system ruggedness
- 55 A continuous output current
  - Up to 100 A for 10 ms on pulse
  - Up to 150 A for 10 µs on pulse
- Optimized for switching frequency up to 1 MHz
- Integrated current monitor (5 mV/A) with 5% accuracy over temperature
- Integrated temperature monitor (8 mV/°C) with 2% accuracy
- Fault Indicator
- Under-Voltage LockOut (UVLO) on VCC
- Under-Voltage LockOut (UVLO) on VIN
- High-Side MOSFET Over-Current and Short-Circuit Protection
- Zero Current Detect Function (ZCD)
- Over Temperature Protection (OTP)
- Standard QFN5x6-39L package

Applications

- Server systems
- High end CPU/GPU power stage
- Communications Infrastructure

Green Product

Typical Application

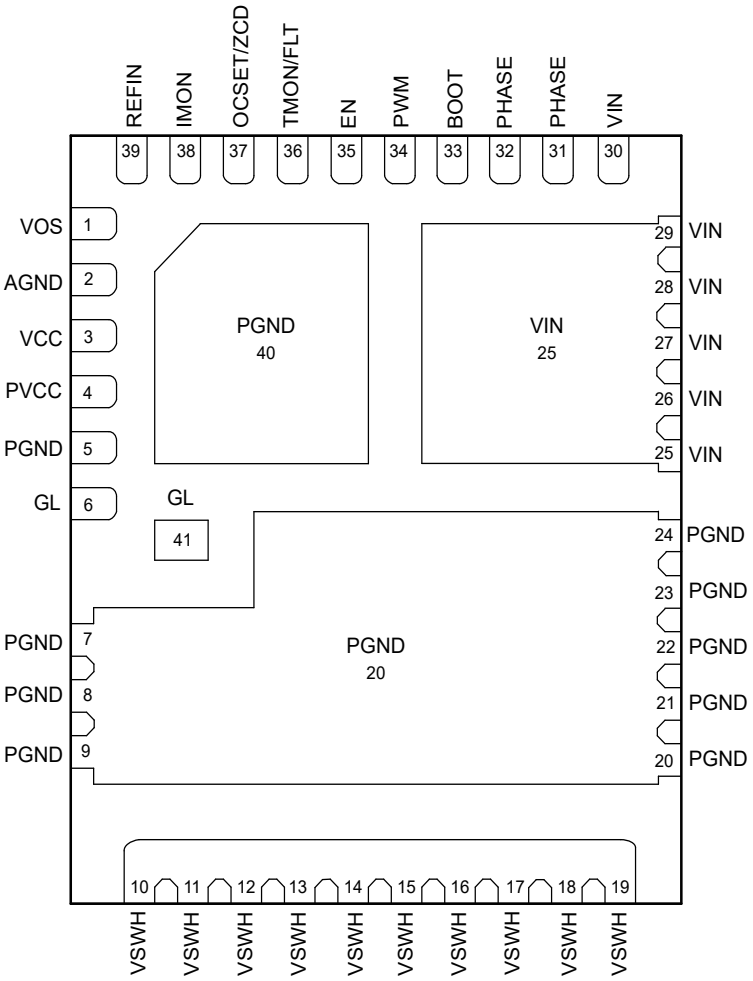


Ordering Information

Part Number	Ambient Temperature Range	Package	Environmental
AOZ5278QI	-40 °C to 125 °C	QFN5x6-39L	RoHS

AOS products are offered in packages with Pb-free plating and compliant to RoHS standards.
Please visit www.aosmd.com/media/AOSGreenPolicy.pdf for additional information.

Pin Configuration

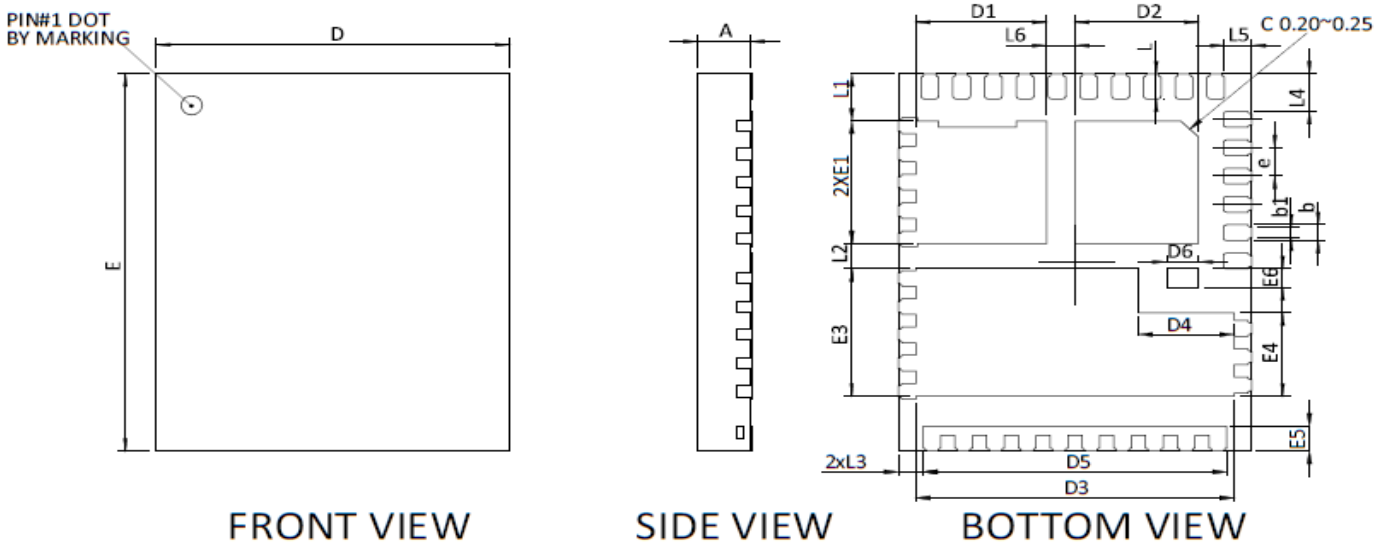


QFN5x6-39L
(Top Transparent View)

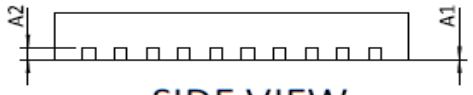
Pin Description

Pin Number	Pin Name	Pin Function
1	VOS	Output voltage sense.
2	AGND	Signal Ground.
3	VCC	5 V Bias for Internal Logic Blocks. Ensure to position a 1 µF MLCC directly between VCC and AGND (Pin 2).
4	PVCC	5 V Power Rail for High-Side and Low-Side MOSFET Drivers. Ensure to position a 1 µF MLCC directly between PVCC and PGND (Pin 5).
5, 40	PGND	Power Ground for High-Side and Low-Side MOSFET Gate Drivers. Ensure to connect 1 µF MLCC directly between PGND and PVCC (Pin 4).
6, 41	GL	Low-Side MOSFET Gate connection. This is for test purposes only.
7, 8, 9, 20, 21, 22, 23, 24	PGND	Power Ground pin for power stage (Source connection of Low-Side MOSFET).
10, 11, 12, 13, 14, 15, 16, 17, 18, 19	VSWH	Switching node connected to the Source of High-Side MOSFET and the Drain of Low-Side MOSFET.
25, 26, 27, 28, 29, 30	VIN	Power stage High Voltage Input (Drain connection of High-Side MOSFET).
31, 32	PHASE	This pin is dedicated for bootstrap capacitor AC return path connection from BOOT (Pin 33).
33	BOOT	High-Side MOSFET Gate Driver supply rail. Connect a 100 nF ceramic capacitor between BOOT and the PHASE (Pin 31 and 32).
34	PWM	PWM input signal from Controller IC. This input is compatible with 3.3 V and 5 V Tri-State logic levels.
35	EN	Output enable pin. When this pin is pulled to a logic low level, the IC disables most blocks. EN=HIGH enables all blocks inside IC and requires 4 µs power up time.
36	TMON/FLT	Temperature Monitor and Fault Flag Pin. TMON/FLT will be pulled HI (~ 3.3 V) or LOW (0 V) to indicate a fault condition (see Table 5). For multi-phase application, the TMON/FLT pin can be connected together as a common bus. The highest voltage representing the highest temperature among all phases will be sent to the PWM controller. No more than 470 pF total capacitance can be directly connected across TMON/FLT and AGND (Pin 2). A higher capacitance load is allowed with a series resistor (~ 1 kΩ) for up to 1 nF. At 0°C and in normal operation, the output voltage is 0.6 V with a temperature coefficient value of 8 mV/°C. There is an internal pull up source to 3.3 V when a fault condition occurs.
37	OCSET/ZCD	Setting control for OCP limit threshold and Zero Cross Detect function (ZCD). OCP limit threshold is detected and latched 120 µs after device enabled. Refer to Table 3 for the resistor value for each current limit threshold level. After 120 µs, the OCP limit is set and this pin becomes ZCD control only. ZCD is active when this pin is floating or pulled HI.
38	IMON	Current Monitor output signal referenced to REFIN (Pin 39). Connect the IMON output to the appropriate Current Sense input of the controller. No more than 47 pF capacitance can be directly connected across IMON and REFIN pins. With a 100 Ω series resistor, up to 470 pF may be used.
39	REFIN	Input for external reference voltage for IMON (Pin 38). This voltage should be between 0.7 V and 2.0 V. Nominal value is 1.2 V. Place a low ESR ceramic capacitor (~ 0.1 µF) from this pin to AGND (Pin 2). Connect REFIN to the appropriate Current Sense Reference output from the controller.

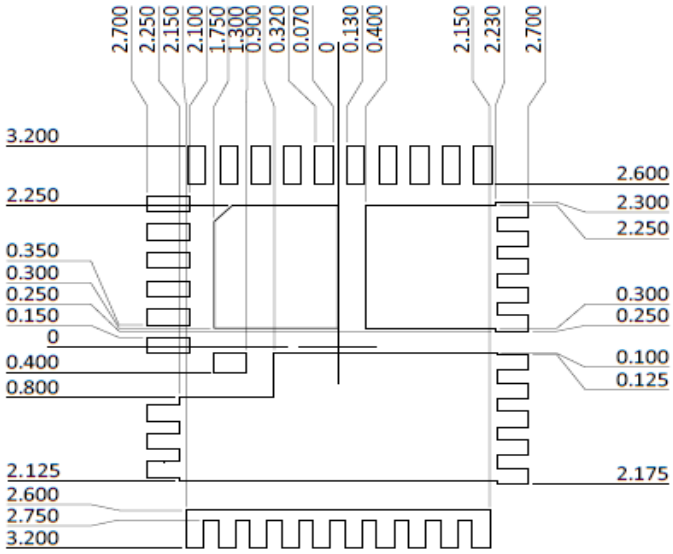
Package Dimensions, QFN5x6-39L



FRONT VIEW SIDE VIEW BOTTOM VIEW



SIDE VIEW



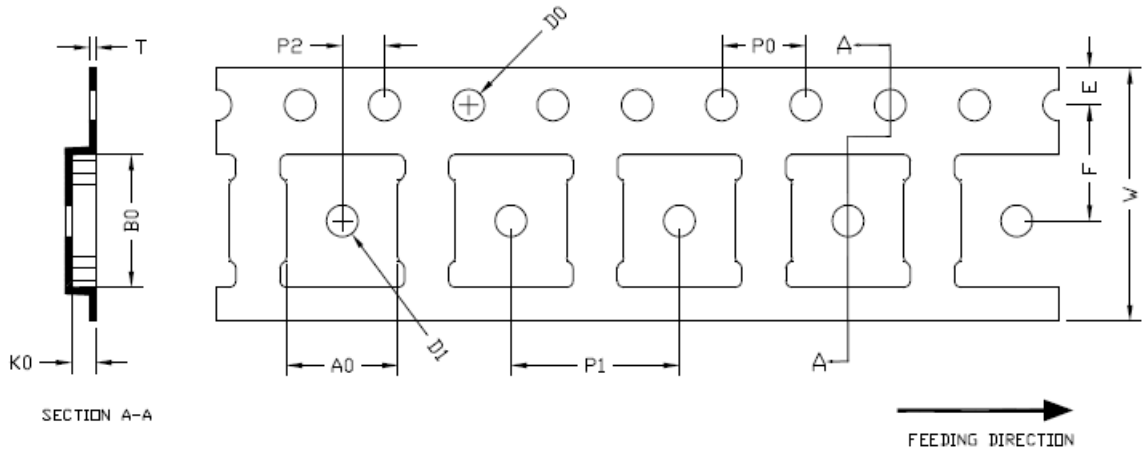
RECOMMANDED LAND PATTERN

SYMBOLS	DIMENSION IN MM.			DIMENSION IN INCH.		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	-	0.05	0.000	-	0.002
A2		0.20REF			0.008REF	
D	4.90	5.00	5.10	0.193	0.197	0.201
D1	1.75	1.85	1.95	0.069	0.073	0.077
D2	1.65	1.75	1.85	0.065	0.069	0.073
D3	4.40	4.50	4.60	0.173	0.177	0.181
D4	1.26	1.36	1.46	0.050	0.054	0.057
D5	4.20	4.30	4.40	0.165	0.169	0.173
D6	0.35	0.45	0.55	0.014	0.018	0.022
E	5.90	6.00	6.10	0.232	0.236	0.240
E1	1.85	1.95	2.05	0.073	0.077	0.081
E3	1.93	2.03	2.13	0.076	0.080	0.084
E4	1.20	1.30	1.40	0.047	0.051	0.055
E5	0.30	0.40	0.50	0.012	0.016	0.020
E6	0.20	0.30	0.40	0.008	0.012	0.016
L	0.30	0.40	0.50	0.012	0.016	0.020
L1	0.65	0.75	0.85	0.026	0.030	0.033
L2	0.30	0.40	0.50	0.012	0.016	0.020
L3	0.25	0.35	0.45	0.010	0.014	0.018
L4	0.50	0.60	0.70	0.020	0.024	0.028
L5	0.28	0.38	0.48	0.011	0.015	0.019
L6	0.30	0.40	0.50	0.012	0.016	0.020
b	0.15	0.25	0.35	0.006	0.010	0.014
b1	0.08	0.18	0.28	0.003	0.007	0.011
e		0.45BSC			0.018BSC	

NOTE
1.CONTROLLING DIMENSION IS MILLIMETER.
2.CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

Tape and Reel Dimensions, QFN5x6-39L

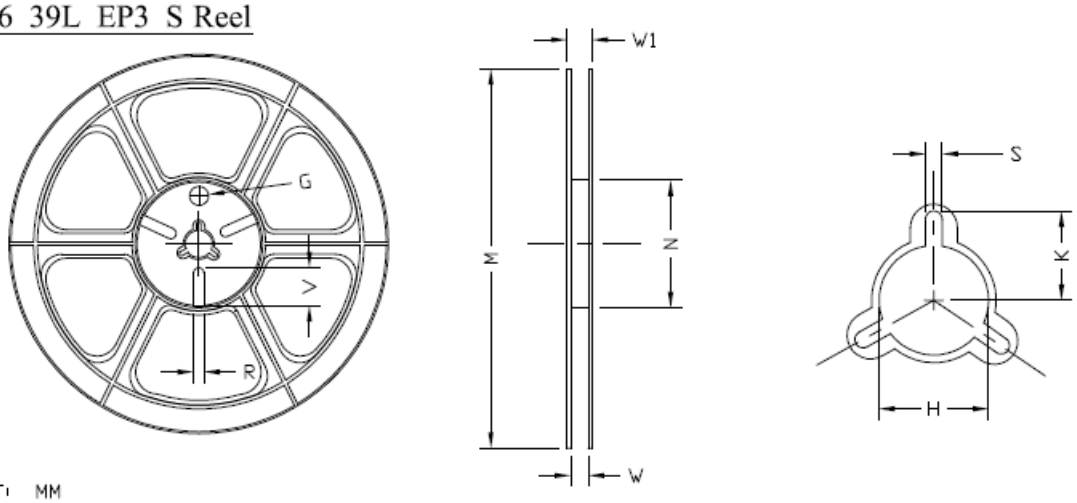
QFN5x6_39L_EP3_S Carrier Tape



UNIT: MM

PACKAGE	A0	B0	K0	D0	D1	W	E	F	P0	P1	P2	T
QFN5X6	5.30 ±0.10	6.30 ±0.10	1.15 ±0.10	ø1.50 +0.10 −0.00	ø1.50 +0.20 −0.00	12.00 +0.30 −0.10	1.75 ±0.10	5.50 ±0.05	4.00 ±0.10	8.00 ±0.10	2.00 ±0.05	0.30 ±0.03

QFN5x6_39L_EP3_S Reel



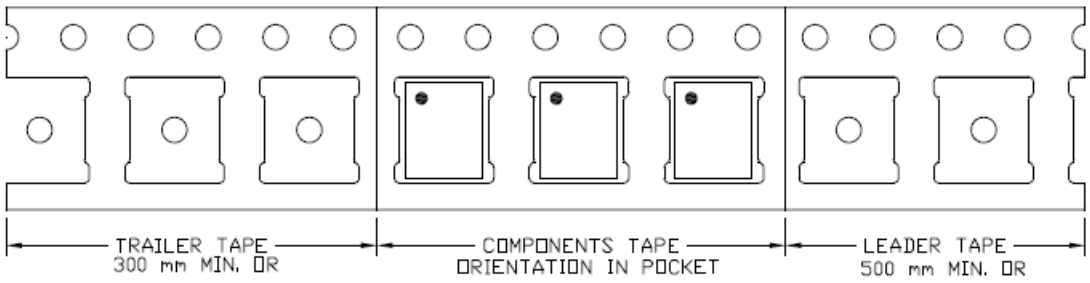
UNIT: MM

TAPE SIZE	REEL SIZE	M	N	W	W1	H	K	S	G	R	V
12 mm	ø330	ø330 ±0.50	ø97.00 ±0.10	13.0 ±0.30	17.40 ±1.00	ø13.0 +0.5 −0.2	10.6	2.00 ±0.50	---	---	---

QFN5x6_39L_EP3_S Tape

Leader / Trailer & Orientation

Unit Per Reel: 3000pcs



Part Marking