

600mA Low Noise, High PSRR, Fast Transient Response LDO

DESCRIPTION

ETA5056 is a 600mA, low noise, and fast transient response low-dropout (LDO) linear voltage regulator with high power-supply rejection ratio (PSRR). Its PSRR can be as high as 58dB with quiescent current is about 37 μ A. Therefore, ETA5056 is an ideal power supply for noise-sensitive applications such as RF transmissions, cellphones, CMOS sensors and audios etc.

ETA5056 is consist of a precise voltage reference, an error amplifier, a compensation network and a low ON-resistance power P-MOSFET. It also integrates many protection circuitries, like current limit and over-temperature protection module.

ETA5056 is available in SOT23-5 and DFN1.6x1.6-6 packages.

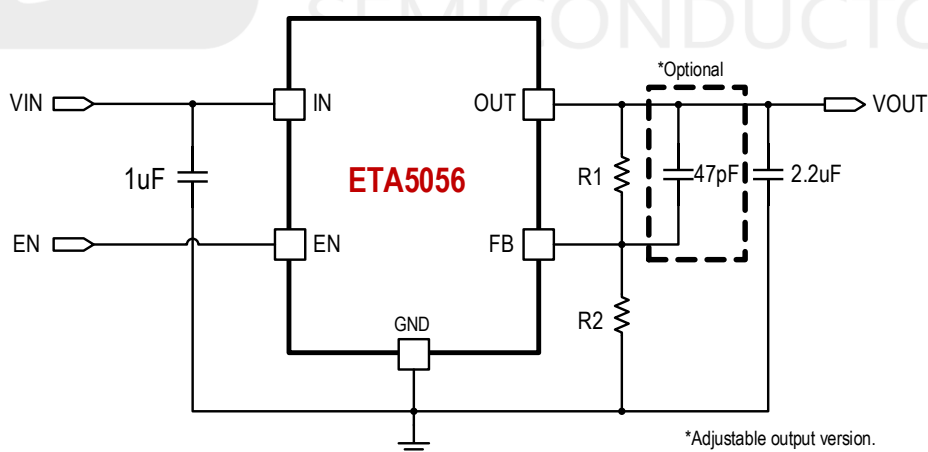
FEATURES

- ◆ 600mA Continues Output Current
- ◆ Adjustable or Fixed Output Voltage
- ◆ Minimum Output Voltage as Low as 0.8V
- ◆ Ultra-Low Dropout Voltage: 370mV@500mA
- ◆ Low Quiescent Current: Typ 37 μ A
- ◆ High PSRR: 58dB@100Hz
- ◆ <1 μ A Shutdown Current
- ◆ Excellent Load and Line Transient Response
- ◆ Short-Circuit Protection
- ◆ Over-Temperature Protection
- ◆ Pb Free, RoHS and REACH Compliant
- ◆ Halogen Free and "Green" Device

APPLICATIONS

- ◆ Set-Top Box
- ◆ Cellphone
- ◆ Security Camera

TYPICAL APPLICATION



ORDERING

INFORMATION

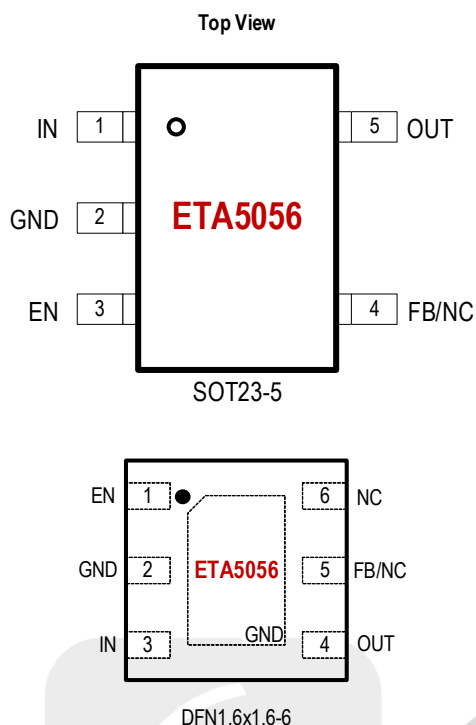
PART No.	PACKAGE	TOP MARK	Pcs/Reel
ETA5056VXXS2F	SOT23-5	PPYW	3000
ETA5056 VXXDCG	DFN1.6x1.6-6	PPYW	3000

XX: voltage code e.g., 12 = 1.2V

PP: product code YW: date code

Please check the table at bottom of this document for available part numbers.

PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS

(Note: Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

IN Voltage	-0.3V to 7V
All Other Pin Voltage.....	$V_{IN}-0.3V$ to $V_{IN}+0.3V$
Junction Temperature	150°C
Storage Temperature Range	-55°C to 150°C
Thermal Resistance θ_{JA} θ_{JC}	
SOT23-5.....	180 90..... °C/W
DFN1.6x1.6-6.....	46.5 18.6..... °C/W
Lead Temperature (Soldering 10 sec).....	260°C
ESD HBM (Human Body Mode).....	2KV

Recommended Operating Conditions

(Note: The device is not guaranteed to function outside its operating conditions.)

Ambient Temperature Range	-40°C to 85°C
Junction Temperature Range	-40°C to 125°C

ELECTRICAL CHARACTERISTICS

($V_{IN} = V_{OUT} + 1.5V$, $C_{IN} = 2.2\mu F$, $C_{OUT} = 1\mu F$, unless otherwise specified. Typical values are at $T_A = 25^\circ C$.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range ⁽¹⁾		2.0		6.0	V
Quiescent Current	No Load		37	60	μA
Shutdown Current	$V_{EN} = GND$		0	1	μA
Feedback Voltage	Adjustable version	0.784	0.8	0.816	V
Soft start time			30	60	μs
Dropout Voltage	$I_{OUT} = 300mA$, $V_{OUT} = 1.8V$		350	450	mV
	$I_{OUT} = 300mA$, $V_{OUT} = 3.3V$		225	265	mV
	$I_{OUT} = 500mA$, $V_{OUT} = 3.3V$		370	440	mV
Output Current Limit	$V_{OUT} = 95\%V_{SET}$	0.6	1.05	1.2	A
Line Regulation	$V_{OUT} + 1V \leq V_{IN} \leq 5.5V$, $I_{OUT} = 1mA$		0.06	0.2	%/V
Load Regulation	$1mA < I_{OUT} < 300mA$, $V_{IN} = V_{OUT} + 1V$		15	35	mV
Output Voltage Range	Available in 50mV steps for fixed version	0.8		3.95	V
Power Supply Rejection Ratio	Freq = 100Hz, $I_{OUT} = 10mA$		58		dB
	Freq = 1kHz, $I_{OUT} = 10mA$		55		
EN pin input Logic Low				0.5	V
EN pin input Logic High		1.5			V
EN pin input Logic Low	$V_{IN} = 3.3V$			0.65	V

EN pin input Logic High	$V_{IN} = 3.3V$	1	V
Thermal Shutdown	Rising, Hysteresis = 30°C	150	°C
Output Noise Voltage	BW = 10Hz to 100KHz	65	μV_{RMS}

(1): Minimum V_{IN} is 2.0V or $V_{OUT} + V_{DROPOUT}$, whichever is greater.

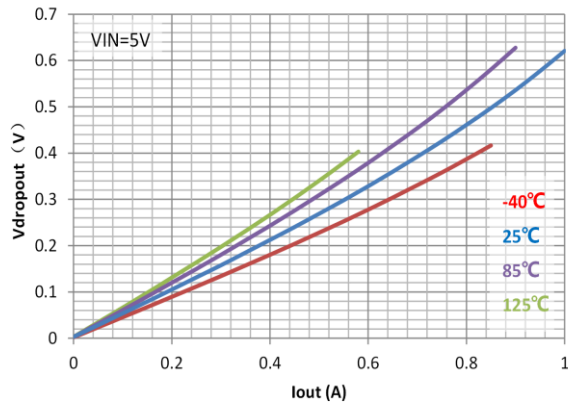
PIN DESCRIPTION

SOT23-5 PIN #	DFN1.6x1.6-6 PIN #	NAME	DESCRIPTION
1	3	IN	Input Supply Pin
2	2	GND	Ground Pin
3	1	EN	Enable Pin. Drive it high to enable IC, drive it low to disable. EN can be connected to IN if not used.
4	5	FB/NC	Feedback pin. Feedback voltage is set to be 0.8V. Output voltage is programmed by a resistor divider from OUT through FB to GND, and by the equation $0.8V \times \frac{R1+R2}{R2} = V_{OUT}$ This pin is not connected for fixed output version.
5	4	OUT	Output of regulator.
NA	6	NC	No connection

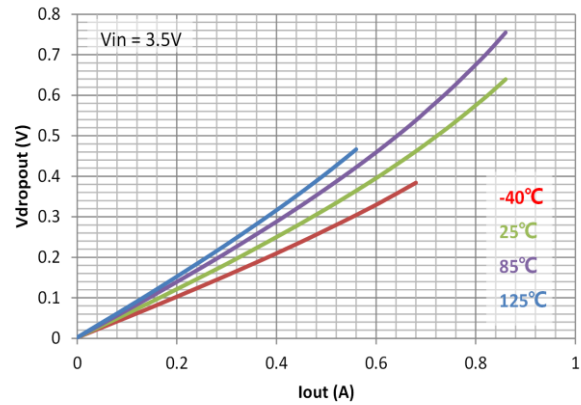
TYPICAL CHARACTERISTICS

(Typical values are at $T_A = 25^\circ\text{C}$ unless otherwise specified.)

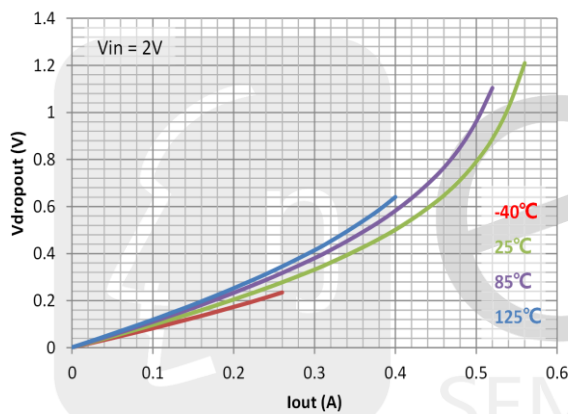
Dropout Voltage $V_{IN} = 5\text{V}$



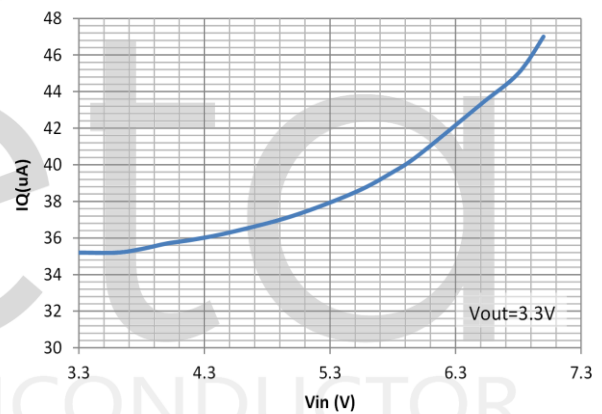
Dropout Voltage $V_{IN} = 3.5\text{V}$



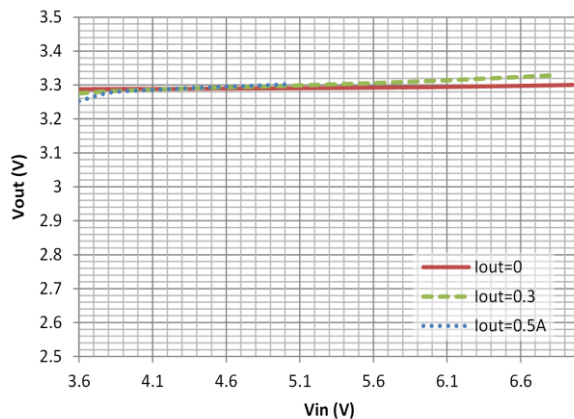
Dropout Voltage $V_{IN} = 2\text{V}$



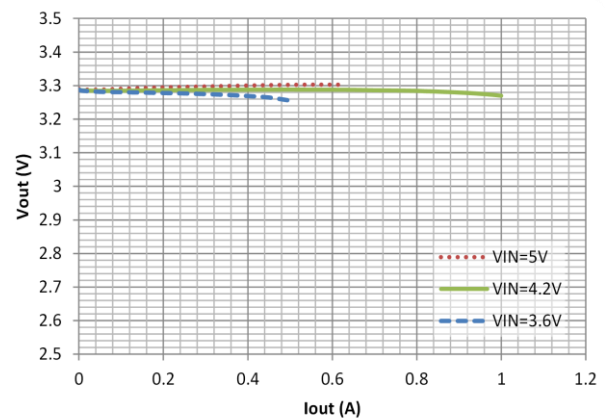
Quiescent current $V_{OUT} = 3.3\text{V}$



Line Regulation $V_{OUT} = 3.3\text{V}$



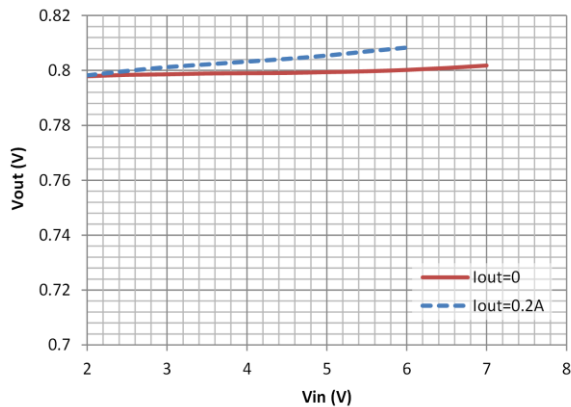
Load Regulation $V_{OUT} = 3.3\text{V}$



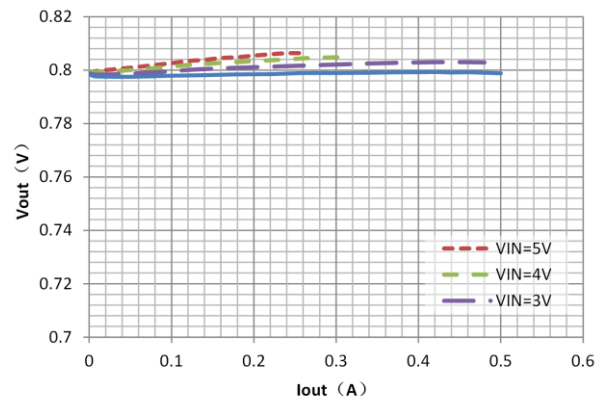
TYPICAL CHARACTERISTICS (Cont'd)

(Typical values are at $T_A = 25^\circ\text{C}$ unless otherwise specified.)

Line Regulation $V_{OUT} = 0.8\text{V}$



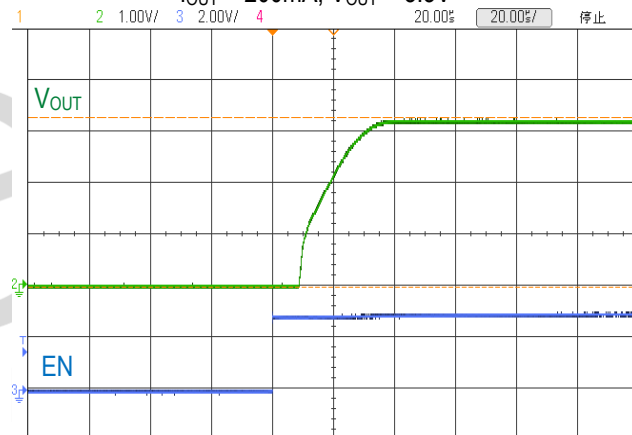
Load Regulation $V_{OUT} = 0.8\text{V}$



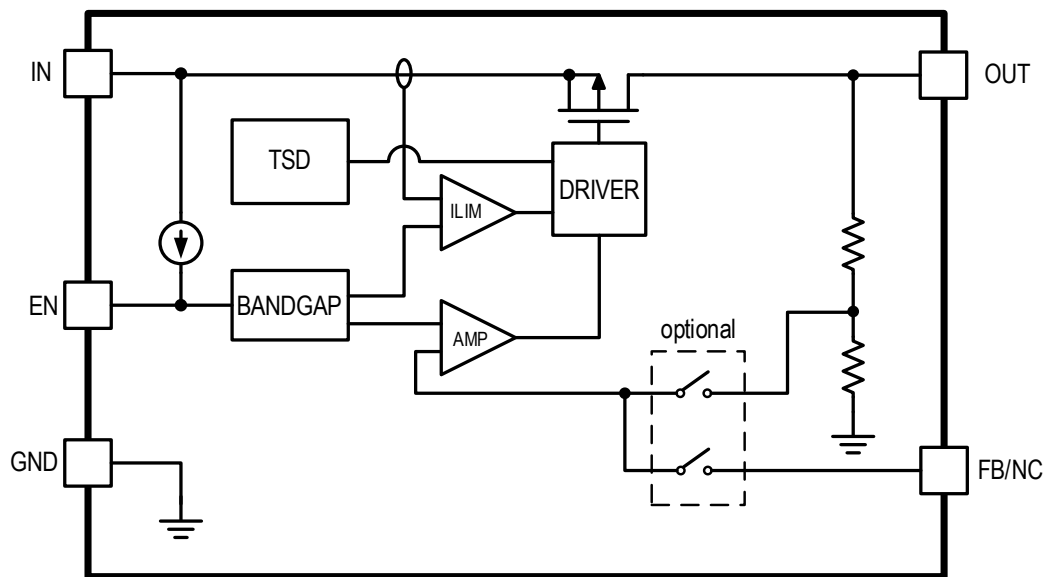
Load Transient Response
 $I_{OUT} = 1 \sim 500\text{mA}$, $V_{OUT} = 3.3\text{V}$



Startup Waveform
 $I_{OUT} = 200\text{mA}$, $V_{OUT} = 3.3\text{V}$



FUNCTIONAL BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

The ETA5056 family of LDO regulators has been optimized for application in noise-sensitive equipment. The device features low dropout voltages, high PSRR, low quiescent current, and enable-input to reduce supply currents to less than 1 μ A when the regulator is turned off.

Enable Sequence

ETA5056 is enabled when all below conditions happen. Otherwise, ETA5056 is in standby mode.

- ◆ EN pin voltage above Logic High level
- ◆ Junction Temperature is not at Over-Temperature Protection level.

Once all above conditions happen, ETA5056 first enables BANDGAP and BIAS then enables LDO core.

ETA5056 is completed forced in shutdown mode when EN pin is at below LOGIC_LOW that supply current is less than 1 μ A. Otherwise, part only shutdown the VOUT while other circuit still in operation.

Output Current Limit

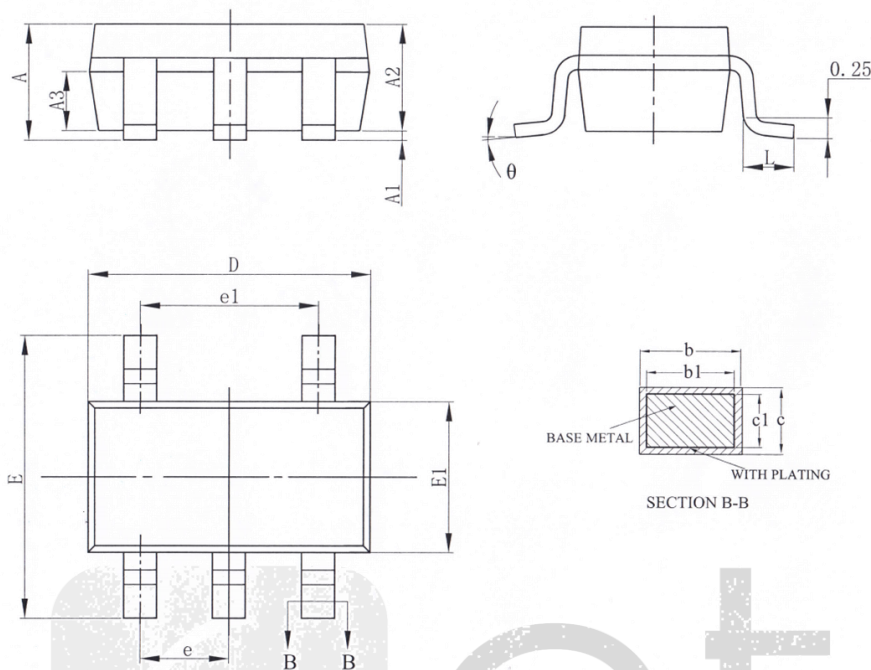
ETA5056 family features an internal current limit. In normal operation, the ETA5056 limits output current to approximately 1.05A. When current limiting engages, the output voltage scales back linearly until the over current condition ends.

Over-Temperature Protection

Thermal protection disables the output when the junction temperature rises to approximately 150°C, allowing the device to cool down. When the junction temperature cools to approximately 120°C, the output circuitry is again enabled. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may cycle on and off. This cycling limits regulator dissipation, protecting the device from damage as a result of overheating.

PACKAGE OUTLINE

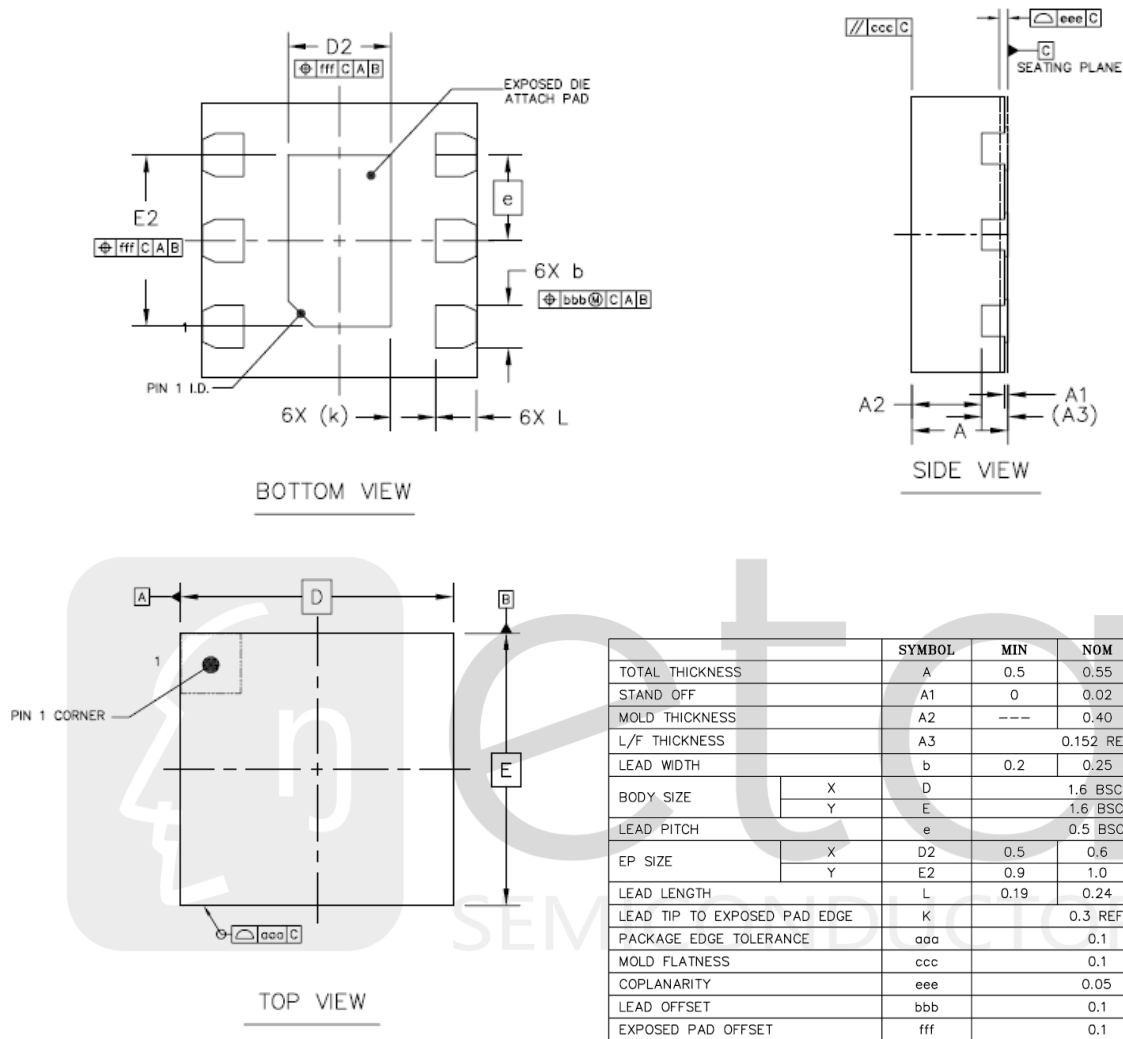
Package: SOT23-5



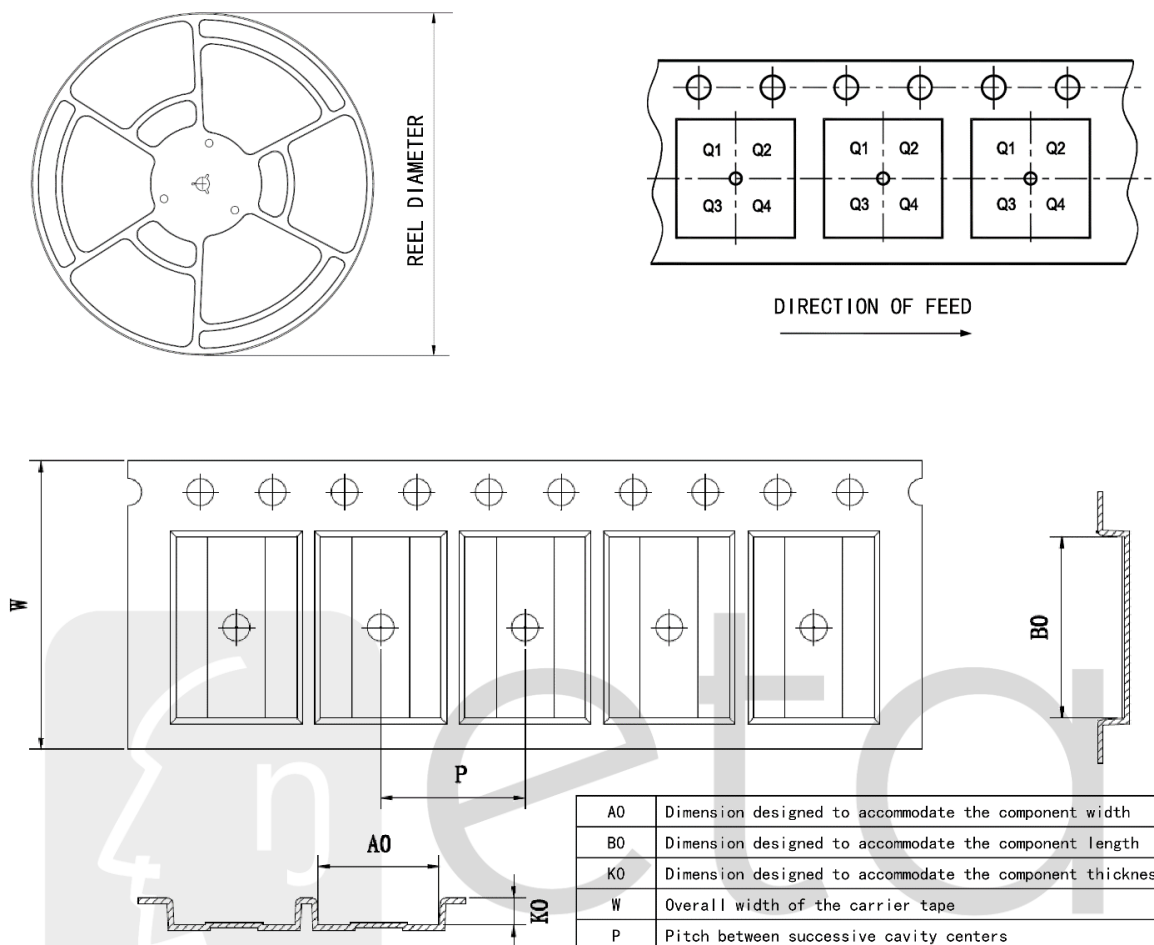
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.25
A1	0.04	—	0.10
A2	1.00	1.10	1.20
A3	0.55	0.65	0.75
b	0.33	—	0.39
b1	0.32	0.35	0.38
c	0.11	—	0.21
c1	0.10	0.15	0.16
D	2.82	2.92	3.02
E	2.60	2.80	3.00
E1	1.55	1.65	1.75
e	0.95BSC		
e1	1.90BSC		
L	0.30	—	0.60
θ	0	—	8°

PACKAGE OUTLINE (Cont'd)

Package: DFN1.6x1.6-6



TAPE AND REEL INFORMATION



Device	Package Type	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P (mm)	W (mm)	Pin1 Quadrant
ETA5056VXXS2F	SOT23-5	5	3000	180	9.5	3.23	3.17	1.37	4	8	Q3
ETA5056VXXDCG	DFN1.6x1.6-6	6	3000	180	9.5	1.73	1.73	0.72	4	8	Q1

AVAILABLE PART NUMBER

Part Description	Part Number	Package	Mark	Pcs/Reel
Adjustable No Discharge	ETA5056V0S2F	SOT23-5	OUYW	3000
Adjustable No Discharge	ETA5056V0DCG	DFN1.6x1.6-6	OUYW	3000
1.2V No Discharge	ETA5056V12S2F	SOT23-5	OAYW	3000
1.8V No Discharge	ETA5056V18S2F	SOT23-5	F5YW	3000
2.5V No Discharge	ETA5056V25S2F	SOT23-5	FhYW	3000
2.8V No Discharge	ETA5056V28S2F	SOT23-5	OKYW	3000
3.3V No Discharge	ETA5056V33S2F	SOT23-5	FvYW	3000