

Features

- Input voltage: 3.6V to 20V
- Output voltage: 0.8V to V_{CC}
- Duty ratio: up to 100% PWM control
- Oscillation frequency: 500KHz typical
- Soft-start Current Limit, Enable function
- Thermal Shutdown function
- Built-in internal SW P-channel MOS
- Low ESR output capacitor (MLCC, multi-layer ceramic capacitor) support
- Efficiency 90%
- SOP-8L: Available in "Green" Molding Compound (No Br, Sb)
- Lead Free Finish / RoHS Compliant (Note 1)

General Description

AP5002 consists of step-down switching regulator with PWM control. These devices include a reference voltage source, oscillation circuit, error amplifier, internal PMOS.

AP5002 provides low-ripple power, high efficiency, and excellent transient characteristics. The PWM control circuit is able to vary the duty ratio linearly up to 100%. This converter also contains an error amplifier circuit as well as a soft-start circuit that prevents overshoot at startup. An enable function, an over current protect function and a short circuit protect function are built inside, and when OCP or SCP happens, the operation frequency will be reduced from 500KHz to 50KHz. Also, an internal compensation block is built in to minimum external component count.

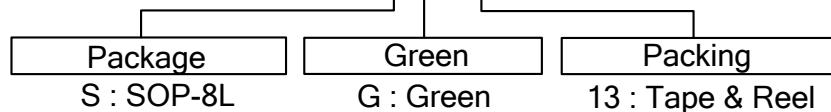
With the addition of an internal P-channel Power MOS, a coil, capacitors, and a diode connected externally, these ICs can function as step-down switching regulators. They serve as ideal power supply units for portable devices when coupled with the SOP-8L mini-package, providing such outstanding features as low current consumption. Since this converter can accommodate an input voltage up to 22V, it is also suitable for the operation via an AC adapter.

Applications

- PC Motherboard
- LCD Monitor
- Graphic Card
- DVD-Video Player
- Telecom Equipment
- ADSL Modem
- Printer and other Peripheral Equipment
- Microprocessor core supply
- Networking power supply

Ordering Information

AP5002 S G - 13

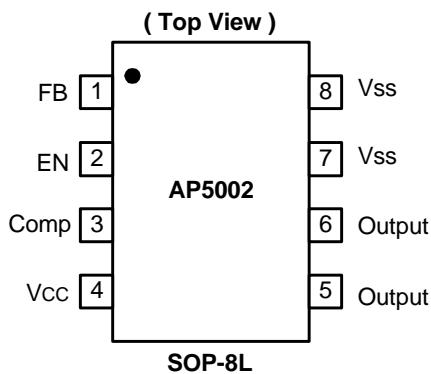


Device	Package Code	Packaging (Note 2)	13" Tape and Reel	
			Quantity	Part Number Suffix
AP5002SG-13	S	SOP-8L	2500/Tape & Reel	-13

Notes: 1. EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied. Please visit our website at http://www.diodes.com/products/lead_free.html.

2. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

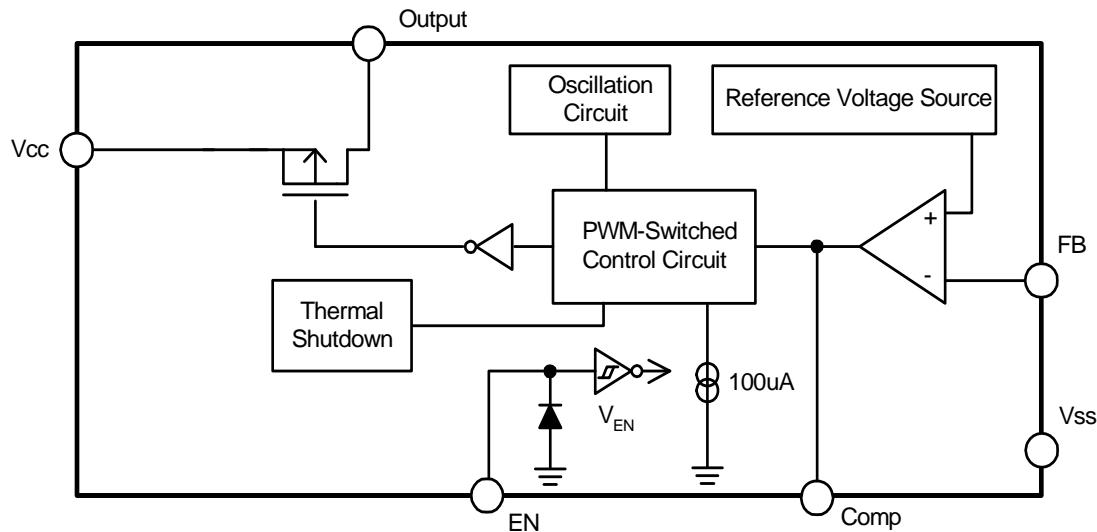
Pin Assignments



Pin Descriptions

Name	Pin	Description
FB	1	Feedback pin
EN	2	Power-off pin H: Normal operation (Step-down operation) L: Step-down operation stopped (All circuits deactivated)
Comp	3	Compensation pin
V _{cc}	4	IC power supply pin
Output	5, 6	Switch Pin. Connect external inductor/diode here. Minimize trace area at this pin to reduce EMI.
V _{ss}	7, 8	GND Pin

Block Diagram



Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
ESD HBM	Human Body Model ESD Protection	5	kV
ESD MM	Machine Model ESD Protection	200	V
V_{CC}	V_{CC} Pin Voltage	$V_{SS} - 0.3$ to $V_{SS} + 22$	V
V_{FB}	Feedback Pin Voltage	$V_{SS} - 0.3$ to V_{CC}	V
V_{EN}	EN Pin Voltage	$V_{SS} - 0.3$ to V_{IN}	V
V_{OUTPUT}	Switch Pin Voltage	$V_{SS} - 0.3$ to V_{IN}	V
P_D	Power Dissipation	1000	mW
T_J	Operating Junction Temperature Range	-20 to +125	°C
T_{ST}	Storage Temperature Range	-65 to +150	°C

Caution: The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

Recommended Operating Conditions

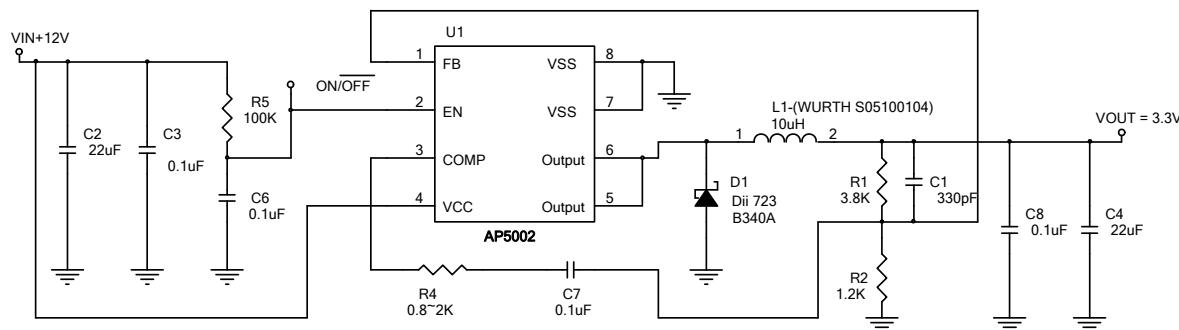
Symbol	Parameter	Min	Max	Unit
V_{IN}	Input Voltage	3.6	20	V
I_{OUT}	Output Current	0	2	A
T_A	Operating Ambient Temperature	-20	85	°C

Electrical Characteristics (V_{IN} = 12V, T_A = 25°C, unless otherwise specified)

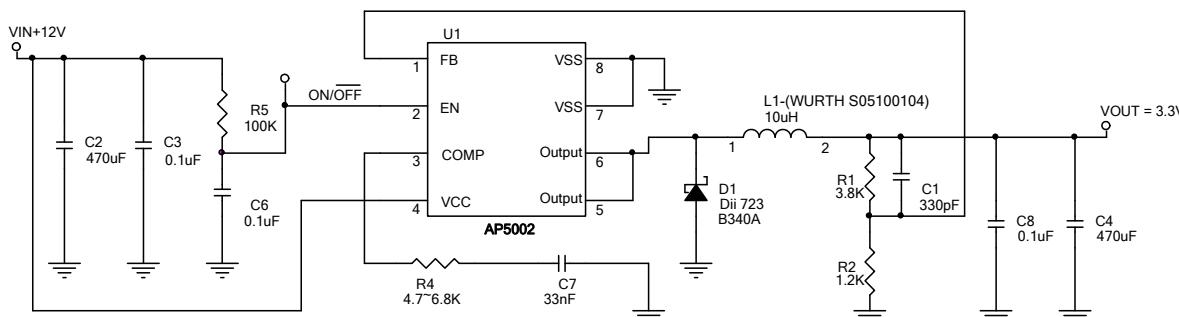
Symbol	Parameter	Conditions	Min	Typ.	Max	Unit
V _{FB}	Feedback Voltage	I _{OUT} = 0.1A	0.784	0.8	0.816	V
I _{FB}	Feedback Bias Current	I _{OUT} = 0.1A	-	0.1	0.5	µA
I _{CCQ}	Quiescent Current	V _{FB} = 1.2 force drive off	-	3	5	mA
I _{SW}	Switch Current	--	3.5	-	-	A
I _{SD}	Shutdown Supply Current	V _{EN} = 0V	-	10	-	µA
ΔV _{OUT} / V _{OUT}	Line Regulation	V _{IN} = 4V~20V, I _{OUT} = 0.2A	-	1	2	%
ΔV _{OUT} / V _{OUT}	Load Regulation	I _{OUT} = 0.1 to 2A	-	0.5	1	%
f _{OSC}	Oscillation Frequency	Measure waveform at SW pin	400	500	600	KHz
V _{SH}	EN Pin Input Voltage	Evaluate oscillation at SW pin	2.0	-	-	V
V _{SL}		Evaluate oscillation stop at SW pin	-	-	0.8	
I _{SH}	EN Pin Input Leakage Current	V _{EN} = 2V	-10	-	10	µA
I _{SL}		V _{EN} = 0.8V	-10	-	10	µA
T _{SS}	Soft-Start Time	--	-	3	-	ms
R _{DSON}	Internal MOSFET R _{dson}	V _{IN} = 5V, V _{FB} = 0V	-	110	150	mΩ
		V _{IN} = 12V, V _{FB} = 0V	-	70	100	
	Thermal shutdown			140		°C
	Minimum Duty Cycle			6.5		%
θ _{JA}	Thermal Resistance Junction-to-Ambient	SOP-8L (Note 3)		124		°C/W
θ _{JC}	Thermal Resistance Junction-to-Case	SOP-8L (Note 3)		25		°C/W

Notes: 3. Test condition: Device mounted on 2oz copper, minimum recommended pad layout, FR-4 PCB.

Typical Application Circuit

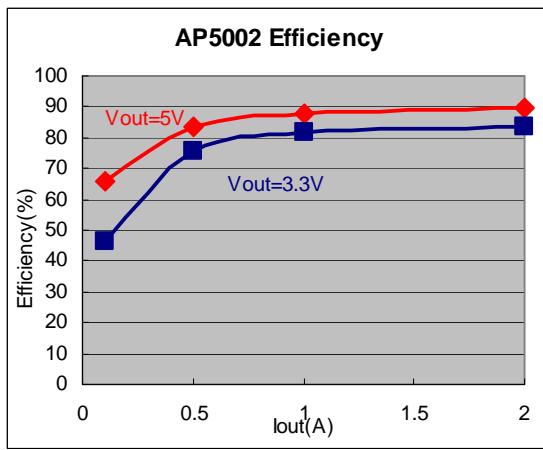
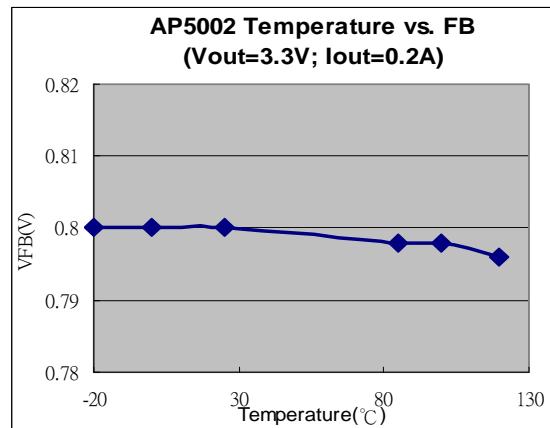
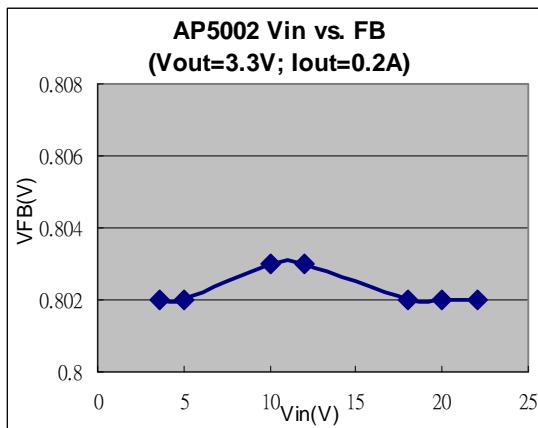
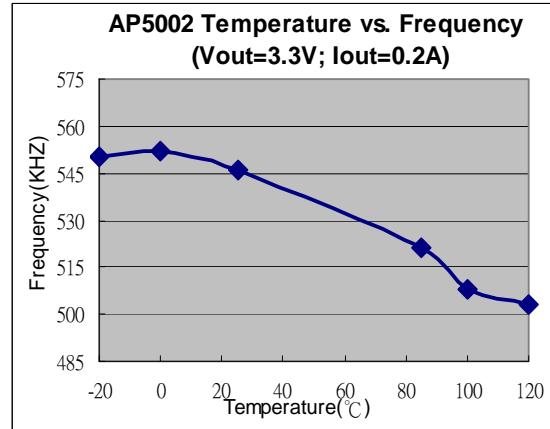
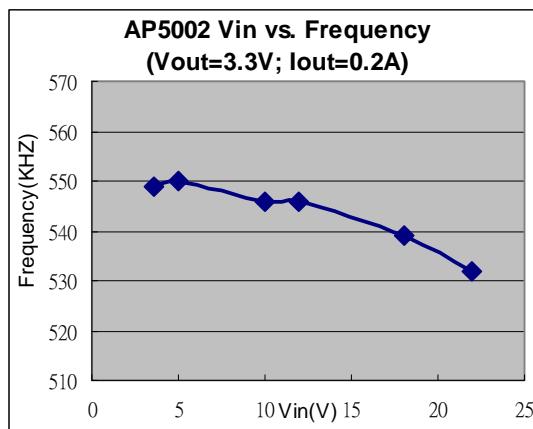


Compensation Capacitor Selection(MLCC)				
VIN	VOUT	R4	C7	C1
12V	5/ 3.3/ 2.5/ 1.8/ 1.5V	0.8~2K	0.1μF	330pF
5V	3.3/ 2.5/ 1.8/ 1.5V	0.8~2K	27nF	330pF

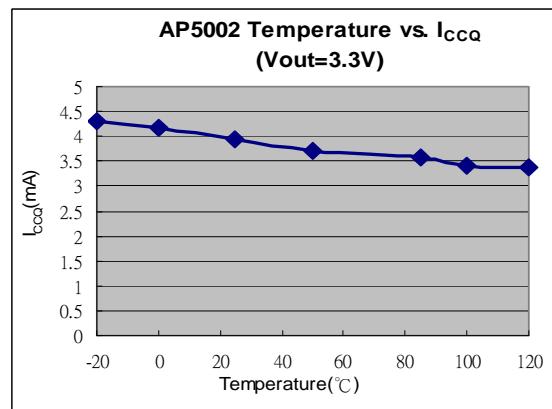
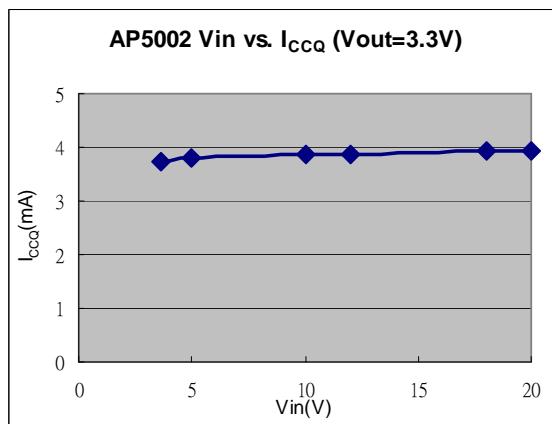
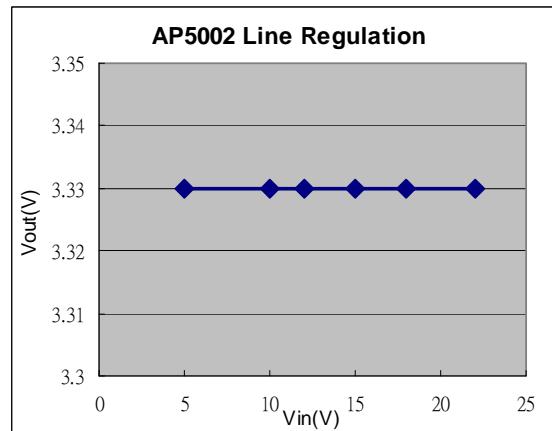
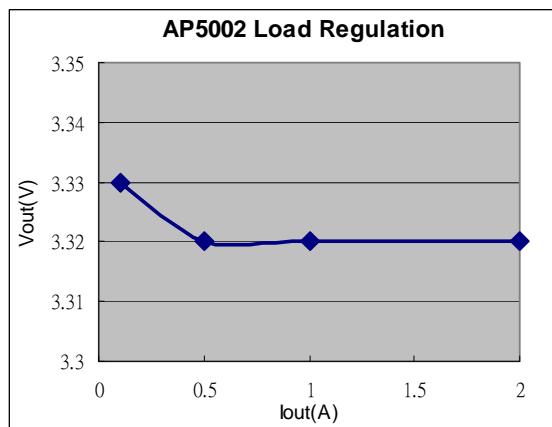


Notes: 4. $V_{OUT} = V_{FB} \times \left(1 + \frac{R1}{R2}\right)$

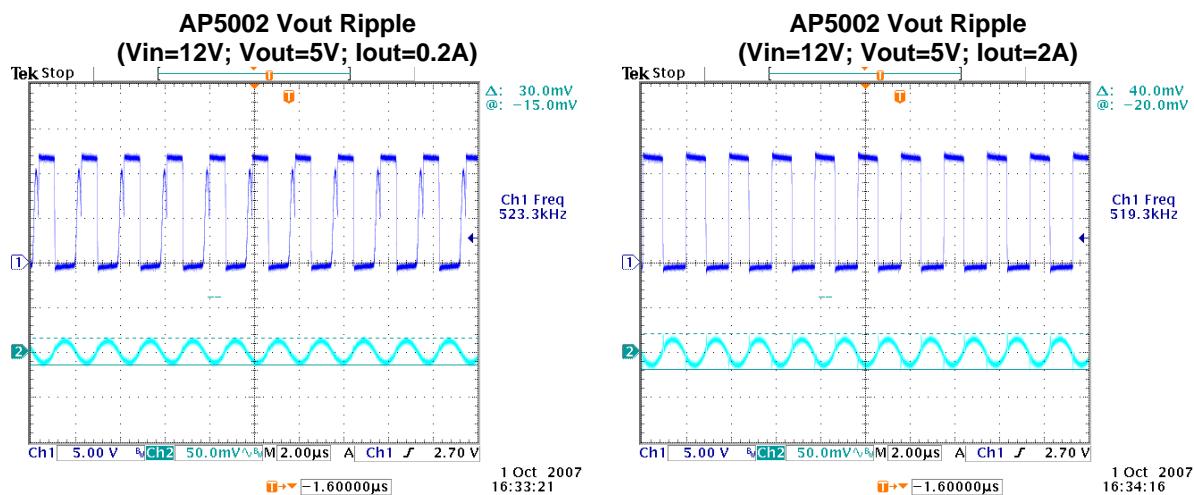
Typical Performance Characteristics



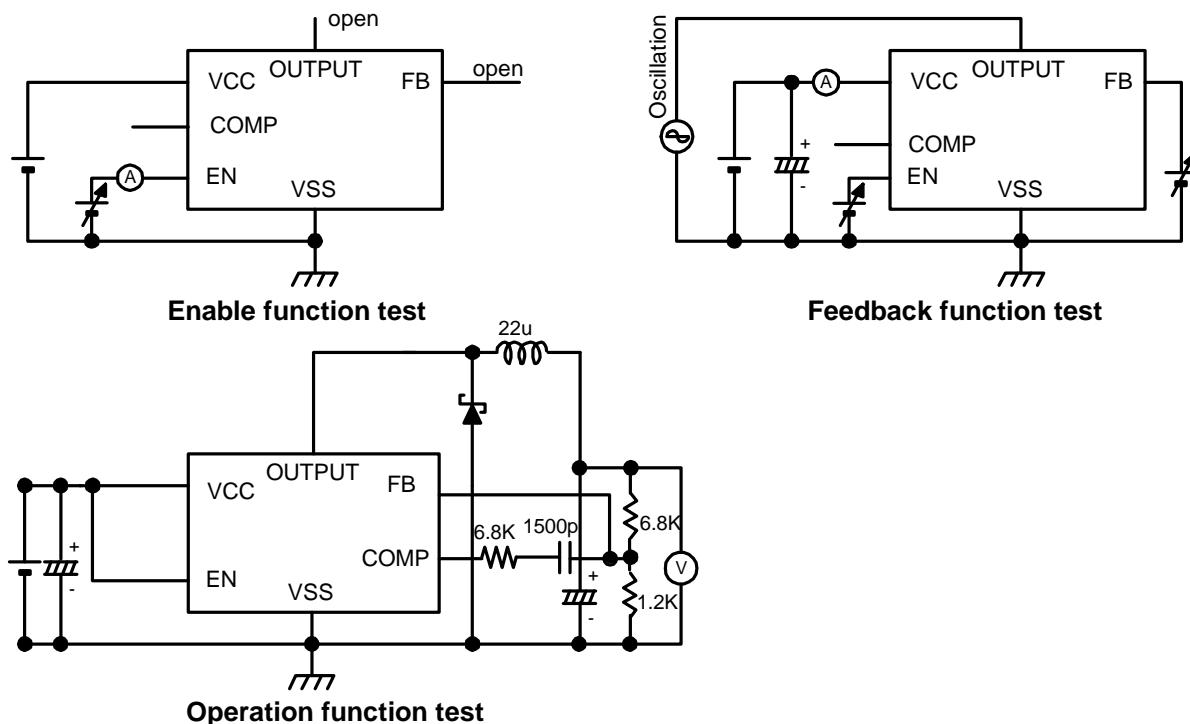
Typical Performance Characteristics (Continued)



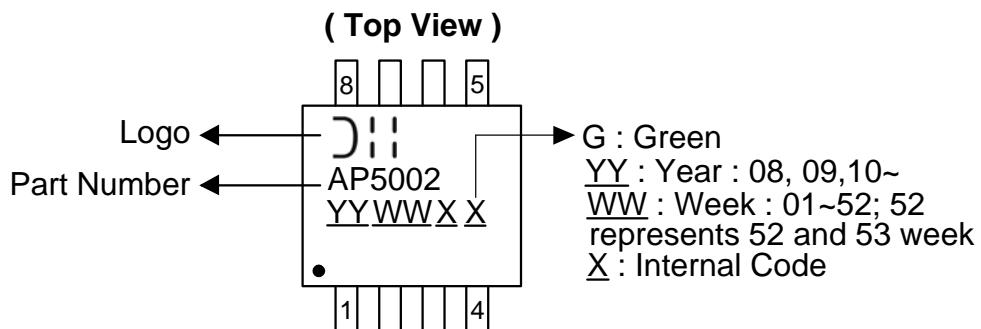
Typical Performance Characteristics (Continued)



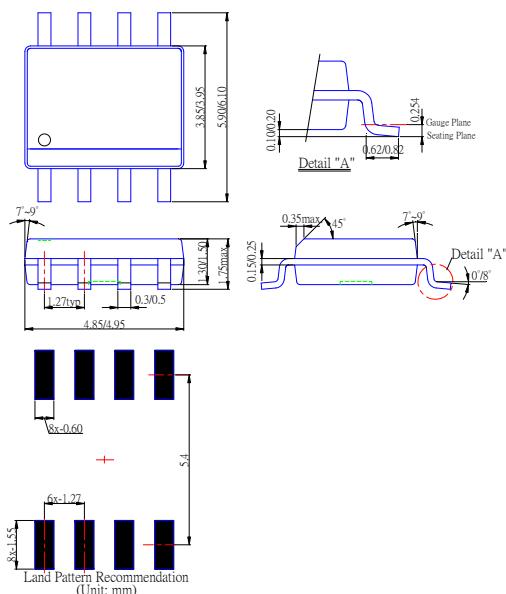
Test Circuit



Marking Information



Package Information (All Dimensions in mm)



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