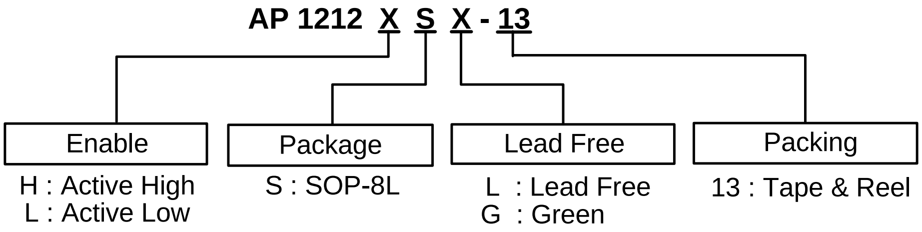
Ordering Information

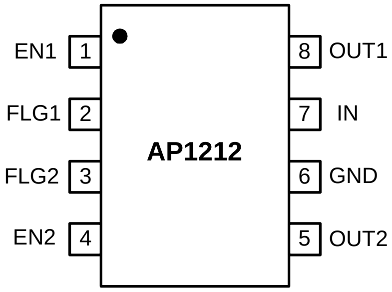


Device	Package Code	Packaging (Note 2)	13" Tape and Reel	
			Quantity	Part Number Suffix
AP1212XSL-13	S	SOP-8L	2500/Tape & Reel	-13
AP1212XSG-13	S	SOP-8L	2500/Tape & Reel	-13

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

(Top View)

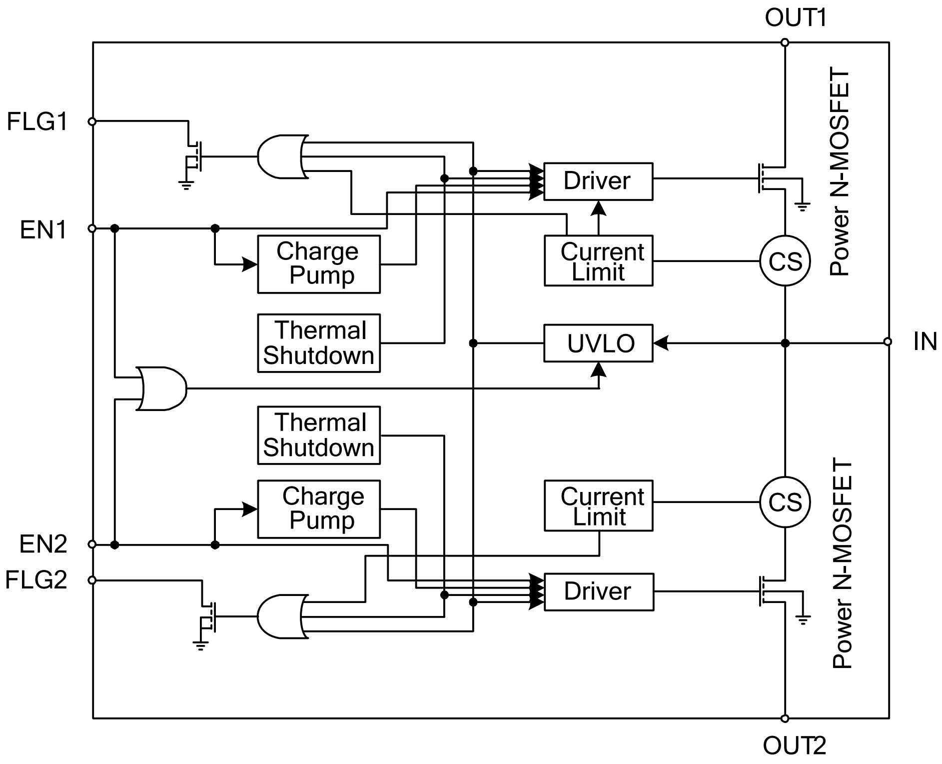


SOP-8L

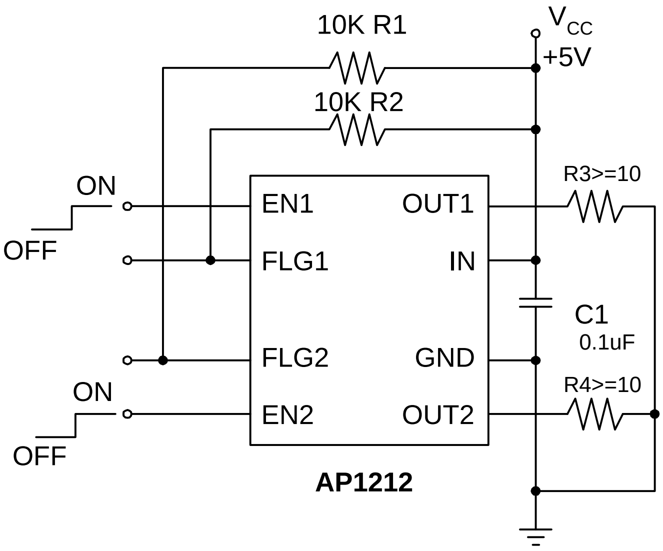
Pin Descriptions

Pin Name	Description
EN1 EN2	Enable: Logic-compatible enable input. (H: active high, L: active low). Do not float.
FLG1 FLG2	Fault Flag: Active-low, open-drain output. Indicates over current, UVLO, and thermal shutdown.
GND	Supply return.
IN	Supply Input: Output MOSFET drain. Also supplies IC's internal circuitry. Connect to positive supply.
OUT1 OUT2	Switch Output: Output MOSFET source. Typically connect to switched side of load.

Block Diagram



Test Circuit (Note 3)



Notes: 3. Before EN is asserted, a delay of 10ms minimum from when the supply voltage, Vcc, becomes stable must be allowed.

Absolute Maximum Ratings (Note 4)

Symbol	Parameter	Rating	Unit
ESD HBM	Human Body Model ESD Protection (Note 5)	500	V
ESD MM	Machine Model ESD Protection (Note 5)	150	V
V_{IN}	Supply Voltage	+7	V
V_{FLG}	Fault Flag Voltage	+7	V
I_{FLG}	Fault Flag Current	50	mA
V_{OUT}	Output Voltage	+7	V
V_{EN}	Control Input Range	-0.3 to V_{IN} +2	V
T_{ST}	Storage Temperature	-65 to +150	°C
MSL	Moisture Sensitivity Level	3	-

Recommended Operating Conditions (Note 6)

Symbol	Parameter	Min	Max	Unit
V_{IN}	Supply Voltage	2.7	5.5	V
T_A	Operating Ambient Temperature	-40	125	^{o}C

Notes:
4. Exceeding the absolute maximum rating may damage the device.
5. Devices are ESD sensitive. Handling precautions are recommended. Human Body model, tested per JEDEC 22-A114. Machine model, tested per JEDEC 22-A115.
6. The device is not guaranteed to function outside its operating rating.

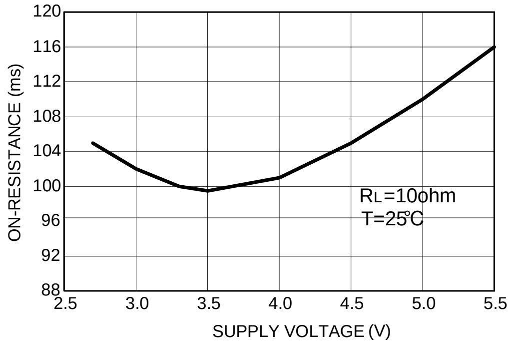
Electrical Characteristics

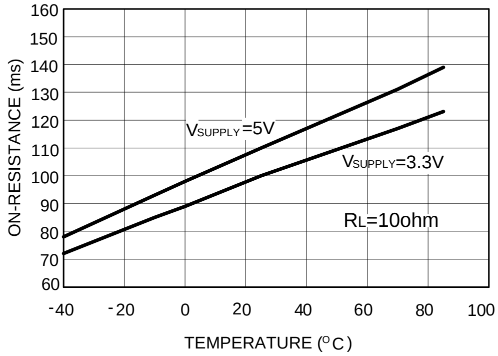
(Under the conditions of V_{IN} =+5V and T_A =25°C, unless otherwise specified)

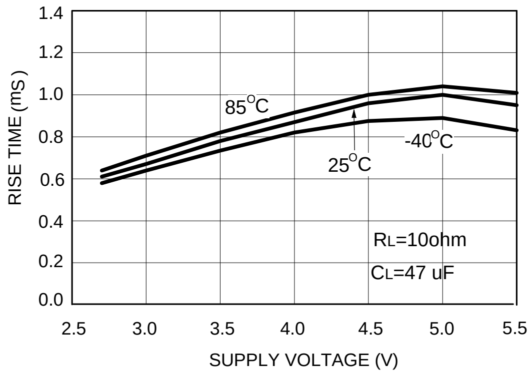
Symbol	Parameter	Conditions	Min	Typ.	Max	Unit
I_{CC}	Supply Current	Switch off, OUT = open (Note 7)		0.50	5	µA
		All switches on, OUT = open (Note 7)		110	160	µA
V_{IT}	Enable Input Threshold	(Note 7)	0.8	1.7	2.40	V
I_{EN}	Enable Input Current	V_{EN} = 0V to 5.5V	-1	±0.01	1	µA
C_{EN}	Enable Input Capacitance			1		pF
$R_{DS(ON)}$	Switch Resistance	V_{IN} = 2.7V ~ 5.5V, I_{OUT} = 500mA, each switch		110	140	mΩ
T_{OND}	Output Turn-On Delay	R_L = 10Ω each output		30		µS
T_R	Output Turn-On Rise Time	R_L = 10Ω each output		1		mS
T_{OFFD}	Output Turnoff Delay	R_L = 10Ω each output		0.5	10	µS
T_F	Output Turnoff Fall Time	R_L = 10Ω each output		0.5	10	µS
I_{LEAK}	Output Leakage Current	Each output (output disabled)			10	µA
I_{OUT}	Continuous Load Current	Each output	0.6			A
I_{OS}	Short-circuit Current Limit	Each output (enable into load), V_{OUT} = 0V	0.8	1.0	1.25	A
I_{LIM}	Current-Limit Threshold	Ramped load applied to enabled output	1.0	1.2	1.4	A
T_{TS}	Over-temperature Shutdown Threshold	T_J increasing		140		°C
		T_J decreasing		130		°C
R_{FO}	Error Flag Output Resistance	V_{IN} = 5V, I_L = 10mA		10	25	Ω
		V_{IN} = 3.3V, I_L = 10mA		15	40	Ω
I_{FOH}	Error Flag Off Current	V_{FLAG} = 5V		0.01	1	µA
UVLO	UVLO Threshold	V_{IN} = increasing		2.5		V
		V_{IN} = decreasing		2.3		V
θ_{JA}	Thermal Resistance Junction-to-Ambient	SOP-8L		165		°C/W
θ_{JC}	Thermal Resistance Junction-to-Case	SOP-8L		26		°C/W

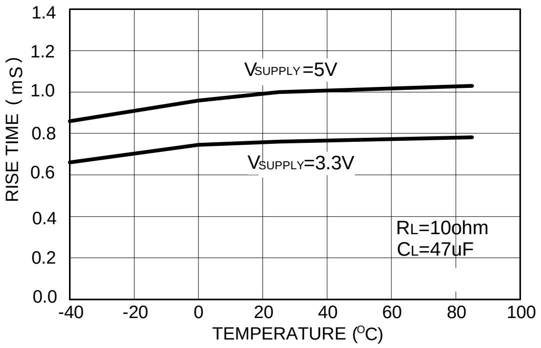
Notes: 7. Off is $V_{EN} \leqq 0.8V$ and on is $V_{EN} \geqq 2.4V$ for the AP1212H. Off is $V_{EN} \geqq 2.4V$ and on is $V_{EN} \leqq 0.8V$ for the AP1212L.

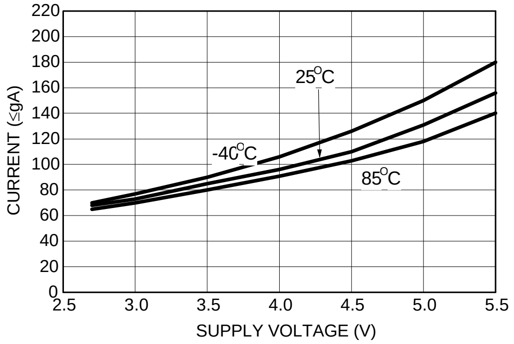
Typical Performance Characteristics

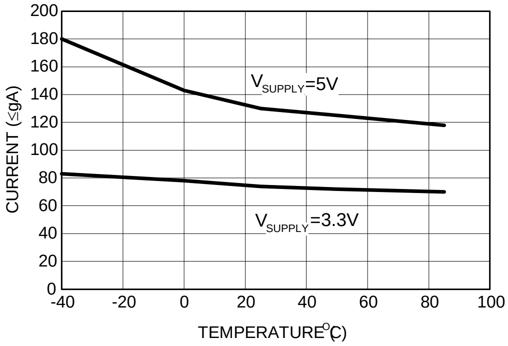

On-Resistance vs. Supply Voltage


On-Resistance vs. Temperature

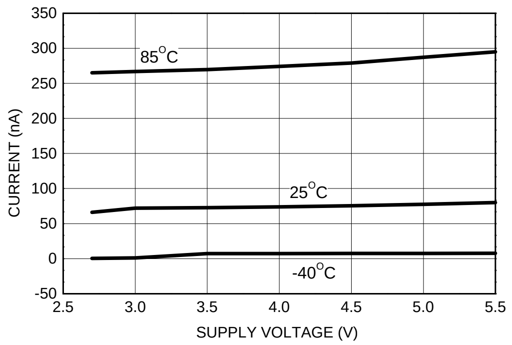

Turn-On Rise Time vs. Supply Voltage


Turn-On Rise Time vs. Temperature

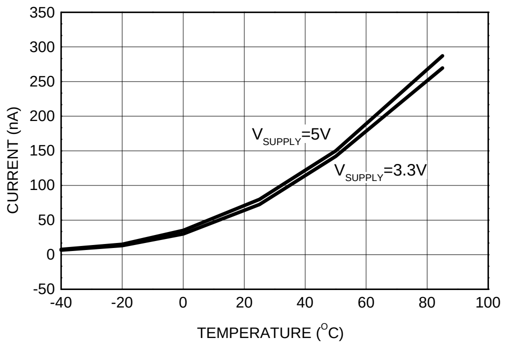

On-Current vs. Supply Voltage


On-Current vs. Temperature

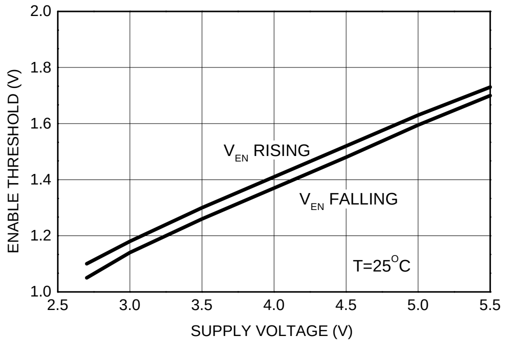
Typical Performance Characteristics (Continued)



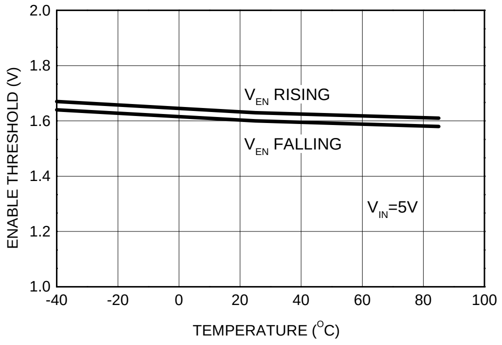
Off-Current vs. Supply Voltage



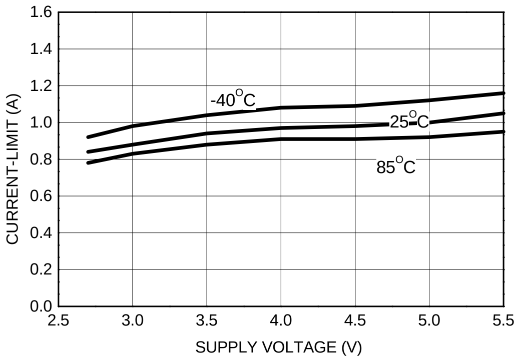
Off-Current vs. Temperature



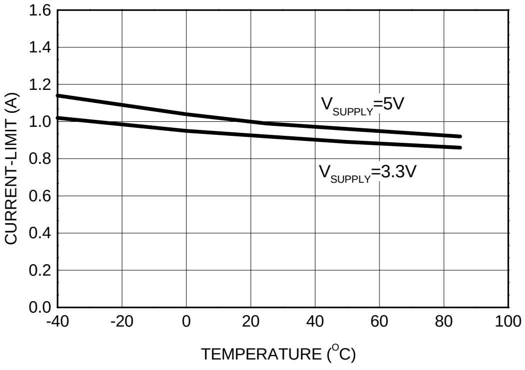
Enable Threshold vs. Supply Voltage



Enable Threshold vs. Temperature



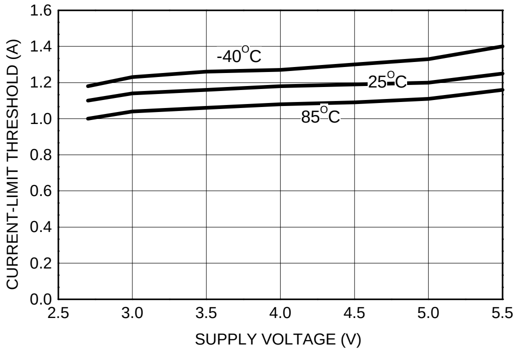
Short-Circuit Current-Limit vs. Supply Voltage



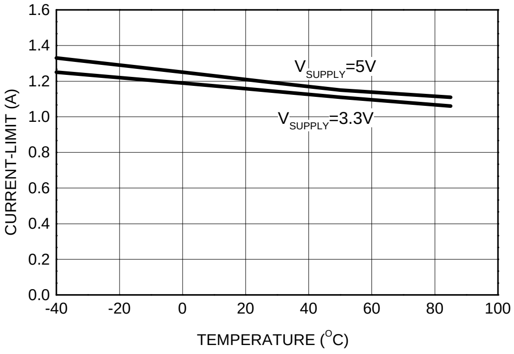
Short-Circuit Current-Limit vs. Temperature

Typical Performance Characteristics (Continued)

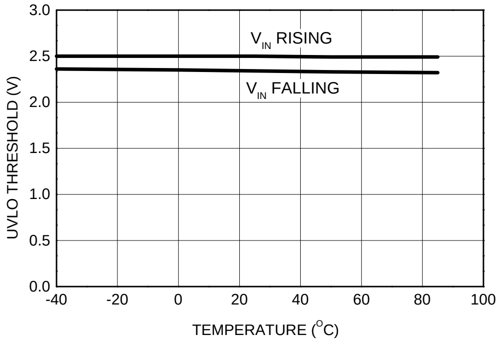
Current-Limit Threshold vs. Supply Voltage



Current-Limit Threshold vs. Temperature

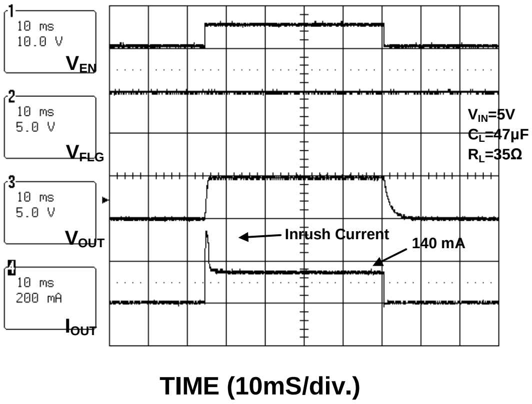


UVLO Threshold vs. Temperature

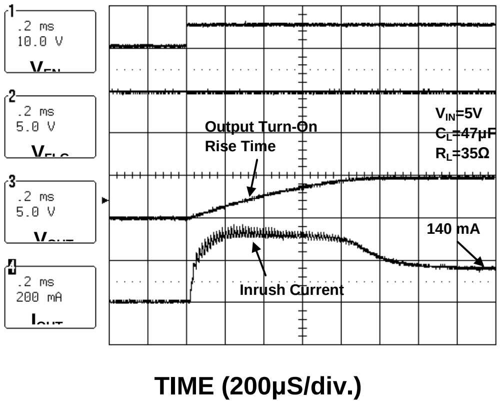


Typical Performance Characteristics (Continued)

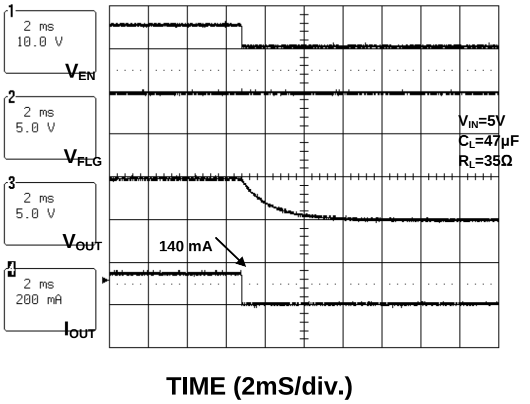
Turn-On/Turn-Off (AP1212H)



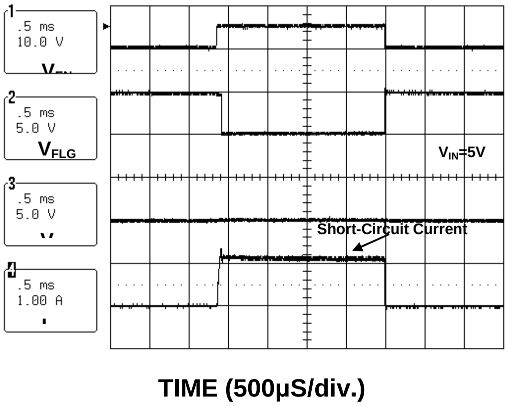
Turn-On (AP1212H)



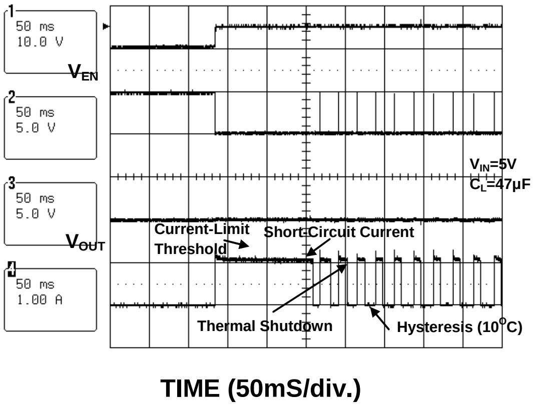
Turn-Off (AP1212H)



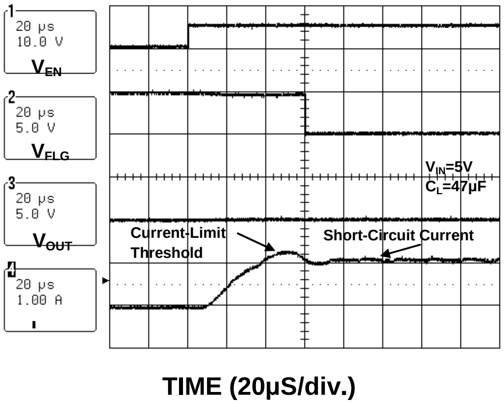
Enabled Into Short (AP1212H)



Current-Limit Response (AP1212H)



Current-Limit Response (AP1212H)



Functional Description

Error Flag
An open-drained output of N-channel MOSFET, the FLG output is pulled low to signal the following fault conditions: input under voltage, output current limit, and thermal shutdown.

Current Limit
The current limit threshold is preset internally. It protects the output MOSFET switches from damage due to undesirable short circuit conditions or excess inrush current often encountered during hot plug-in. The low limit of the current limit threshold of the AP1212 allows a minimum current of 0.5A through the MOSFET switches. A current limit condition will signal the error flag.

Thermal Shutdown
When the chip temperature exceeds 140ºC for any reason other than over current fault of either one of the two MOSFET switches, the thermal shutdown function turns off both MOSFET switches and signals the error flag. A hysteresis of 10ºC prevents the MOSFETs from turning back on until the chip temperature drops to below 130ºC.

Enable
Before EN is asserted, a delay of 10ms minimum from when the supply voltage, Vcc, becomes stable must be allowed.

Supply Filtering
A 0.1µF to 1µF bypass capacitor from IN to GND, located near the device, is strongly recommended to control supply transients. Without a bypass capacitor, an output short may cause sufficient ringing on the input (from supply lead inductance) to damage internal control circuitry.

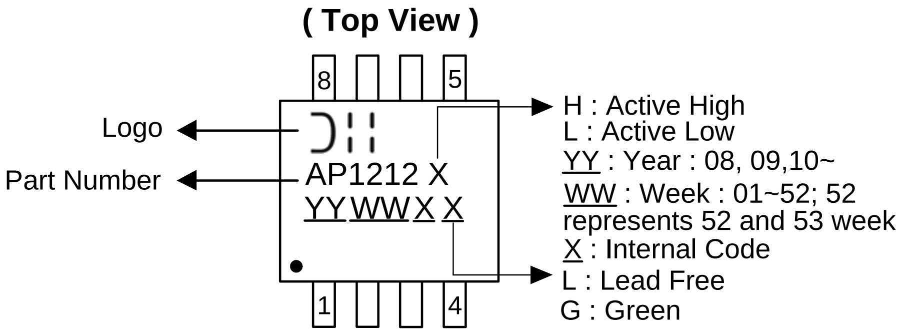
Transient Droop Requirements
USB applications support dynamic attachment (hot plug-in) of peripherals. A current surge is caused by the input capacitance of downstream device. Ferrite beads are recommended in series with all power and ground connector pins. Ferrite beads reduce EMI and limit the inrush current during hot-attachment by filtering high-frequency signals.

Short Circuit Transient
Bulk capacitance provides the short-term transient current needed during a hot-attachment event. With a 33µF, 16V tantalum or 100µF, 10V electrolytic capacitor mounted close to downstream connector per port should provide transient drop protection.

Printed Circuit Layout
The power circuitry of USB printed circuit boards requires a customized layout to maximize thermal dissipation and to minimize voltage drop and EMI.

Marking Information

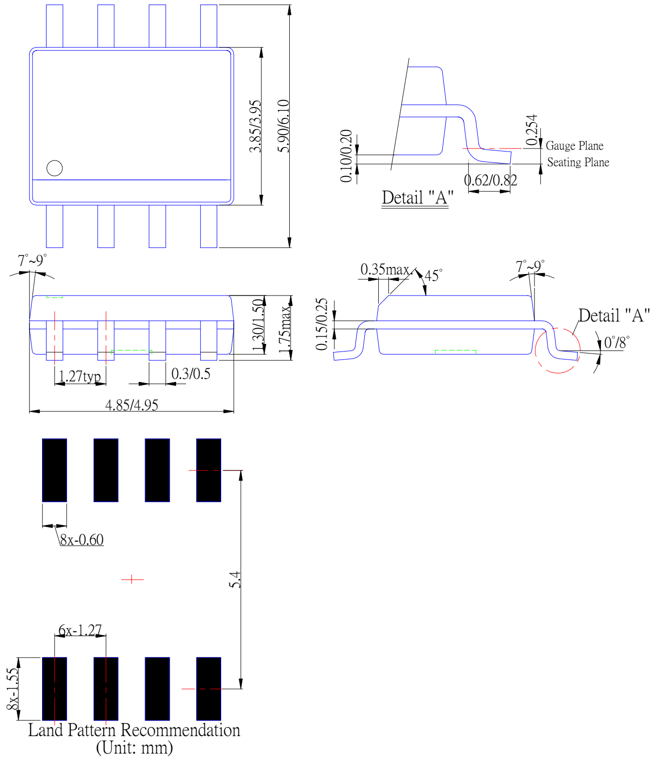
(1) SOP-8L



H : Active High
L : Active Low
YY : Year : 08, 09,10~
WW : Week : 01~52; 52 represents 52 and 53 week
X : Internal Code
L : Lead Free
G : Green

Package Information (All Dimensions in mm)

(1) Package Type: SOP-8L



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