

## GENERAL DESCRIPTION

The HP2606 is a front-end over voltage and over current protection device. It achieves wide input voltage range from 2.8V<sub>DC</sub> to 36V<sub>DC</sub>. The over voltage threshold can be programmed externally or set to internal default setting. The ultra-low resistance of integrated power path nFET switch ensures better performance for battery charging system applications. It can deliver up to 2A current to satisfy the battery supply system. It integrates the over-temperature protection shutdown and auto-recovery circuit with hysteresis to protect against over current events. This device is available in ultra-small CSP-6L footprint, DFN2x2-8L and SOT23-6L package, ideally for small PCB area application.

## FEATURES

- Absolute maximum input voltage: 36V
- Maximum load current: 2A
- Extremely low power path resistance:  
CSP-6L: 80mΩ (typ.)  
DFN2x2-8L: 90mΩ (typ.)  
SOT23-6L: 120mΩ (typ.)
- Fixed Internal OVP threshold:  
5.8 (Typ.), 6.1 (Typ.) or customization
- OVP response time: 50ns
- Internal 15ms Start-Up or OVP Recovery Delay
- Internal over current limit protection: 3A (Min)
- Programmable over voltage threshold: 4V to 11V
- Internal soft start to prevent In-rush current
- Thermal shutdown protection & Auto recovery
- Output short-circuit protection
- RoHS compliant and Halogen free
- Compact package: CSP-6L, DFN2x2-8L, SOT23-6L

## APPLICATIONS

- Wearable Device
- Mobile device
- In-Car device

## TYPICAL APPLICATION CIRCUIT

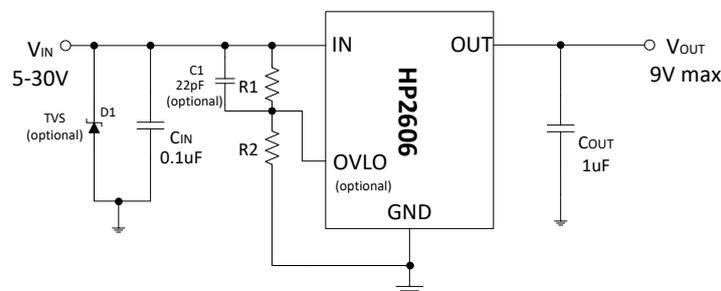


Figure 1. Typical Application Schematic with OVLO

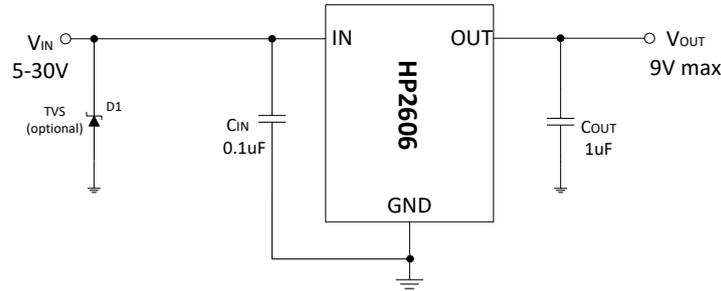


Figure 2. Typical Application Schematic without OVLO

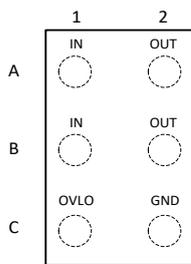
Note:

1. If OVLO is connected to ground, OVP is the internally set OVLO value.
2. R2 is recommend to use 100K, R1 can be calculated from the following formula:  
 $V_{IN\_OVP} = V_{OVLO\_TH} \times (1 + R1/R2)$ ,  $V_{OVLO\_TH}$  is OVLO Preset Threshold, please see electrical characteristics.
3. R1 and R2 is recommend to use high precision resistor, and R2 should be connected to IC's GND, not CIN's or VIN's.
4. D1 is recommended for hot-plug input application, such as USB interface.
5. C1 is recommended for the situation that input voltage is raising very slowly to trigger OVP. It can help to eliminate the shake of output voltage.

## ORDERING INFORMATION

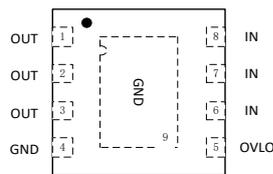
PART NO	OVP TYPE	PACAKGE	TEMPERATUR	TAPE & REEL	Active
HP2606C6-61	6.1V/adj	CSP-6L	-40 ~ +85°C	3000/REEL	Yes
HP2606D8-61	6.1V/adj	DFN-2x2-8L	-40 ~ +85°C	4000/REEL	Yes
HP2606S6-61	6.1V	SOT23-6L	-40 ~ +85°C	3000/REEL	Yes
HP2606S6-58	5.8V	SOT23-6L	-40 ~ +85°C	3000/REEL	Yes
HP2606S6-XX	customization	SOT23-6L	-40 ~ +85°C	3000/REEL	No

## PIN ASSIGNMENT



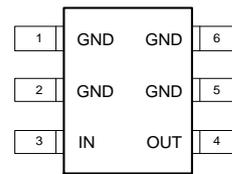
Top View

CSP-6L



Top View

DFN2x2-8L



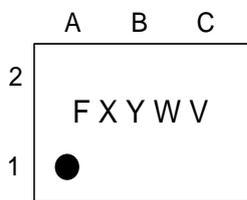
SOT23-6L

## PIN DESCRIPTION

PIN (CSP)	PIN (DFN)	PIN (SOT)	SYMBOL	TYPE	PIN DESCRIPTION
A1/B1	6/7/8	3	IN	I	Power input pin. Connect IN pin together. Decouple high frequency noise by connecting at least 0.1uF MLCC to ground.
A2/B2	1/2/3	4	OUT	O	Output voltage pin. Source side of the internal FET. Connect OUT pins together for normal operation.
C1	5	/	OVLO	I	External OVLO program pin. Connect resistor divider to this pin to program the OVLO threshold. Make sure $V_{OVLO}$ is higher than the internal pre-set threshold; otherwise the internal default threshold will be activated. Pull down this pin to ground to disable external program function.
C2	4	1/2/5/6	GND	Ground	Power ground pin.

## MARKING DESCRIPTION

### CSP-6L:



“F”: Product Code.

“F” stands for HP2606

“XY”: Internal Control Code.

“W”: The week of manufacturing.

“A” stands for week 1,

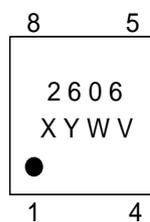
“Z” stands for week 26,

“a” stands for week 27,

“z” stands for week 52.

“V”: Version.

### DFN2x2-8L:



“XY”: Internal Control Code

“W”: The week of manufacturing.

“A” stands for week 1,

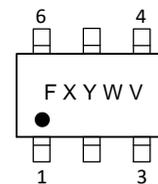
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## PART NUMBER RULES

**HP2606** [1] - [2]

Code	Description
[1]	Package: C6: CSP-6L D8: DFN2x2-8L S6: SOT23-6L
[2]	OVP version: XX: OVP threshold voltage Example: 58: 5.8V 61: 6.1V

## ABSOLUTE MAXIMUM RATINGS (Note)

SYMBOL	ITEMS		VALUE	UNIT
$V_{IN}$	Input Voltage		-0.3~36	V
$V_{OUT}$	Output Voltage		-0.3~15	V
$V_{OVLO}$	OVLO Voltage		-0.3~20	V
$I_{OMAX}$	Maximum Output Continues Load Current		2	A
$P_{DMAX}$	Power Dissipation	CSP-6L	1.1	W
		DFN2x2-8L	1	
		SOT23-6L	0.5	
$R_{\theta JA}$	Thermal Resistance	CSP-6L	110	°C/W
		DFN2x2-8L	118	
		SOT23-6L	220	
$T_J$	Junction Temperature		-40~150	°C
$T_{stg}$	Storage Temperature		-55~150	°C
$T_{solder}$	Package Lead Soldering Temperature (10s)		260	°C
HBM	ESD Susceptibility, Human Body Model		8	KV

**Note:** Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

## RECOMMENDED OPERATING RANGE

SYMBOL	ITEMS	VALUE	UNIT
$V_{IN}$	Input Supply Voltage	5 to 30	V
$V_{OUT}$	Output Voltage	≤10	V
$I_{OUT}$	Continue Output Current	≤2	A
	Peak Output Current	≤4	A
$V_{OVLO}$	OVLO Voltage	0 to 12	V
$T_{OPR}$	Operating Temperature	-40 to +85	°C

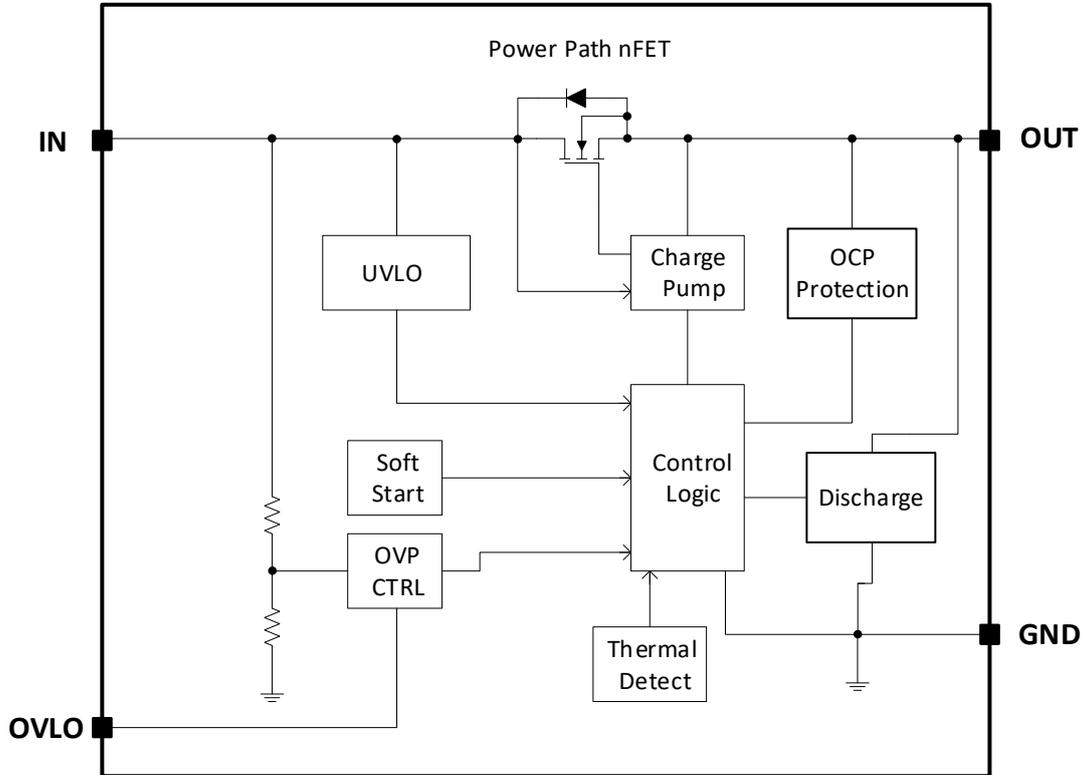
**ELECTRICAL CHARACTERISTICS**

Parameter	Symbol	Test Conditions		MIN	TYP	MAX	UNIT
Input Voltage	$V_{IN}$			2.8		30	V
Input UVLO Threshold	$V_{UVLO}$				2.5		V
UVLO Hysteresis	$V_{HYS}$				260		mV
Input Quiescent Current	$I_Q$	$V_{IN}=5V, V_{IN}<V_{OVLO}$			210		$\mu A$
OVLO Input Leakage Current	$I_{OVLO}$	$V_{OVLO}=V_{OVLO\_TH}$		-100		100	nA
Internal Default OVP Threshold	$V_{OVLO}$	Rising	HP2606xx-58	5.6	5.8	6.0	V
			HP2606xx-61	5.9	6.1	6.3	V
Internal OVP Hysteresis	$V_{OVLO\_HYS}$	Falling			190		mV
Internal OCP Threshold		Thermal foldback limited		3		5	A
OVLO Preset Threshold	$V_{OVLO\_TH}$	Rising, 6.1V OVP version		1.218	1.25	1.281	V
OVLO Hysteresis		Falling			40		mV
External OVLO Select Threshold	$V_{OVLO\_SEL}$	Falling			0.25	0.30	V
Programmable OVLO range	$V_{OVPPR}$			4		11	V
On Resistance of power path	$R_{ON}$	$V_{IN}=5V,$ $I_{OUT}=500mA,$ from IN to OUT	CSP-6L		80		m $\Omega$
			DFN2x2-8L		90		
			SOT23-6L		120		
Startup or OVP Recovery Debounce Time	$T_{DEB}$	Time from $2.5V < V_{IN} < V_{OVLO}$ to $V_{OUT}=10\%$ of $V_{IN}$			15		mS
Soft start Turn-On Time	$t_{ON}$	$V_{IN}=5V, R_L=100, C_{OUT}=100\mu F;$ $V_{OUT}=10\%$ of $V_{IN}$ to $90\% V_{IN}$			0.2		mS
OVP Switch Turn-Off Time	$t_{OFF}$	$V_{IN} > V_{OVLO}$ to $V_{OUT}$ stop rising			50	100	nS
Output Discharge Resistance	$R_{DISC}$	OVP Triggered, $V_{OUT}=1V$			500		$\Omega$
Thermal Shutdown Temperature	$T_{SD}$				150		$^{\circ}C$
Thermal Shutdown Hysteresis	$T_{HYS}$				25		$^{\circ}C$

Note:

1. The OVLO pad is bounding to GND for SOT23-6L package and its OVP threshold is setting internally.

## SIMPLIFIED BLOCK DIAGRAM



## TIMING DIAGRAM

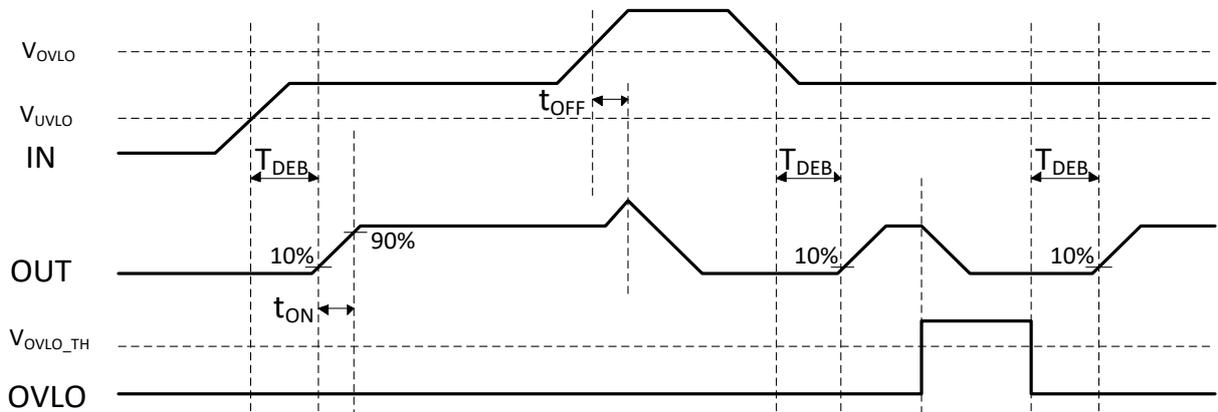
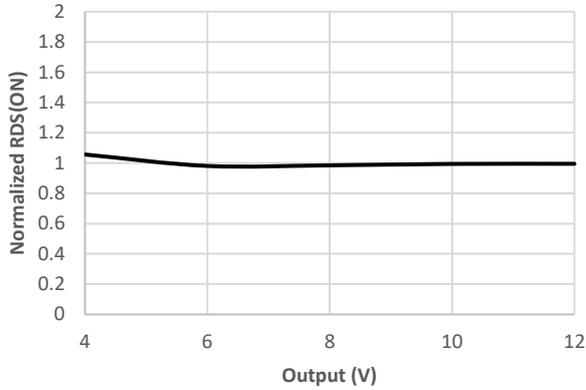


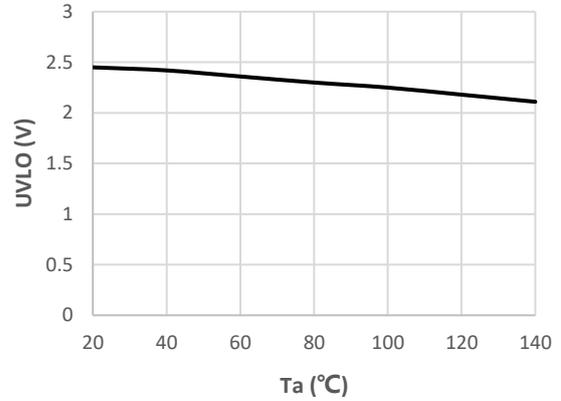
Figure 2. Timing diagram

## TYPICAL PERFORMANCE CHARACTERISTICS

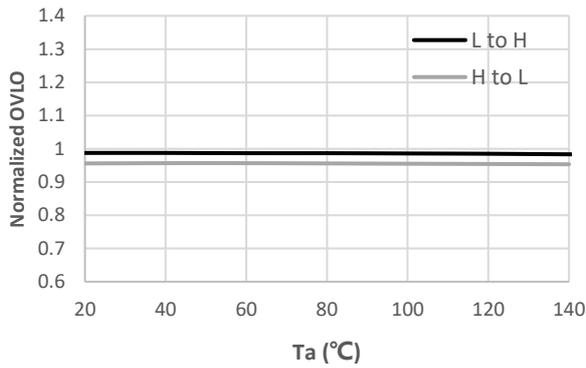
Normalized RDS(ON) vs Output Voltage



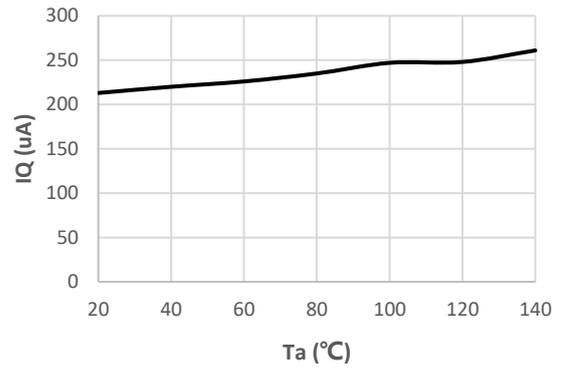
UVLO vs Ta



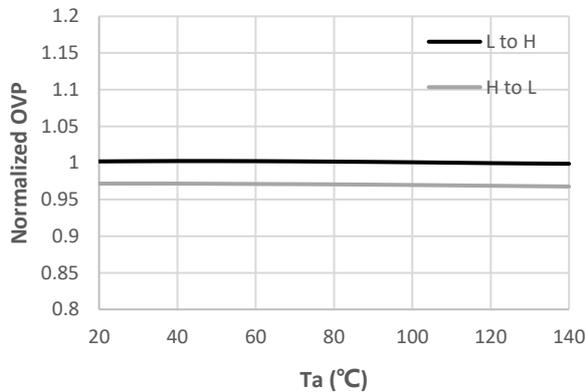
Normalized OVLO Preset vs Ta



IQ vs Ta



Normalized Internal OVP vs Ta



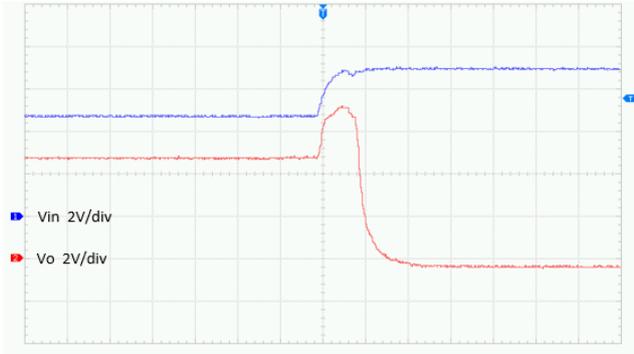


Figure-1 OVP Protection Response

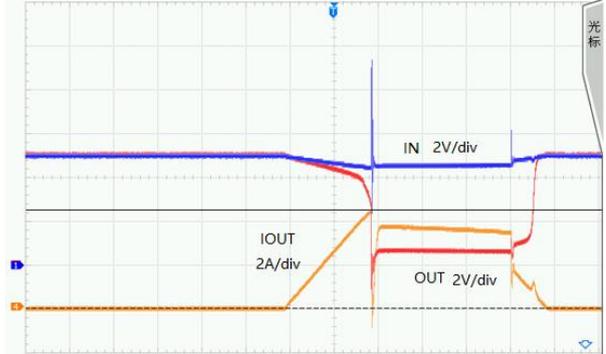


Figure 2 OCP Protection & Recovery

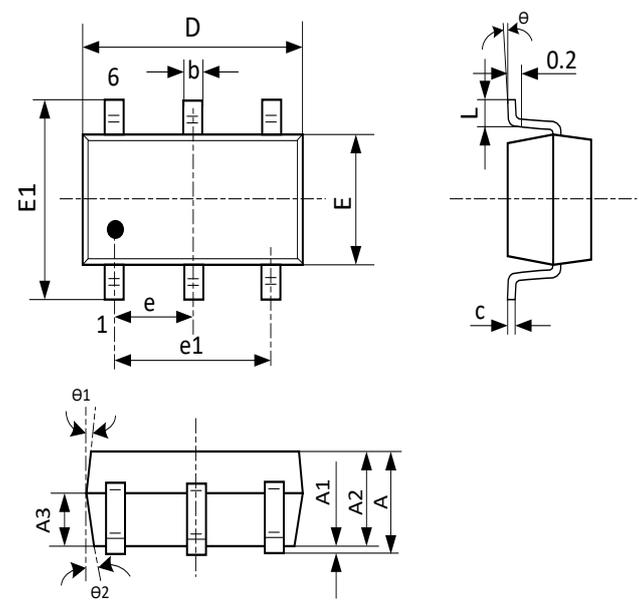
## PACKAGE OUTLINE

Package	CSP-6L	Devices per reel	3000	Unit	mm																																											
Package Dimension:																																																
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Symbol</th> <th colspan="3">Dimensions In Millimeter</th> </tr> <tr> <th>Min.</th> <th>Typ.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>0.520</td> <td>0.570</td> <td>0.620</td> </tr> <tr> <td>A1</td> <td>0.164</td> <td>0.194</td> <td>0.224</td> </tr> <tr> <td>A2</td> <td>0.316</td> <td>0.351</td> <td>0.386</td> </tr> <tr> <td>A3</td> <td>0.020</td> <td>0.025</td> <td>0.030</td> </tr> <tr> <td>d</td> <td>0.190</td> <td>0.230</td> <td>0.270</td> </tr> <tr> <td>D</td> <td>0.750</td> <td>0.785</td> <td>0.820</td> </tr> <tr> <td>E</td> <td>1.340</td> <td>1.375</td> <td>1.410</td> </tr> <tr> <td>e</td> <td colspan="3" style="text-align: center;">0.400 Typ.</td> </tr> <tr> <td>e1</td> <td colspan="3" style="text-align: center;">0.800 Typ.</td> </tr> </tbody> </table>						Symbol	Dimensions In Millimeter			Min.	Typ.	Max.	A	0.520	0.570	0.620	A1	0.164	0.194	0.224	A2	0.316	0.351	0.386	A3	0.020	0.025	0.030	d	0.190	0.230	0.270	D	0.750	0.785	0.820	E	1.340	1.375	1.410	e	0.400 Typ.			e1	0.800 Typ.		
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## PACKAGE OUTLINE

Package	DFN-2x2-8L	Devices per reel	4000pcs	Unit	mm																																															
Package Dimension:																																																				
<p>TOP VIEW</p>		<p>SIDE VIEW</p>																																																		
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Package	SOT23-6L	Devices per reel	3000Pcs	Unit	mm
Package Dimension:					
					
Symbol	Dimensions In Millimeters				
	Min	Nom	Max		
A	-	-	1.260		
A1	0.010	0.060	0.110		
A2	1.050	1.100	1.150		
A3	0.620	0.650	0.680		
b	0.350 BSC				
c	0.126	0.127	0.130		
D	2.870	2.920	2.970		
E	1.550	1.600	1.650		
E1	2.700	2.800	2.900		
e	0.950 BSC				
e1	1.900 BSC				
L	0.320	0.400	0.480		
θ	0°	-	6°		
θ1		10°			
θ2		12°			

## Revision History

Version No.	Date	Description
Preliminary	2020-02-06	- Initial preliminary release
0.1	2020-07-22	- Change DFN2x2-6L to DFN2x2-8L - Modify minimum Vin from 2.5V to 2.8V
0.2	2020-08-01	- Add typical characteristics curve
0.3	2020-09-17	- Add SOT23-6 Package and related information - Add Ordering information
0.4	2021-03-05	- Add OCP related information - Modify OVLO Preset Threshold of 6.1V version
0.5	2021-04-20	- Update SOT23-6L package size information
0.6	2021-05-19	- Update SOT23-6L package
0.7	2021-06-20	- Update recommended operating range
0.8	2021-08-28	- Update DFN2*2-8L package - Update absolute maximum input voltage
0.9	2021-11-30	- Update CSP-6L package dimensions - Delete 14V OVP version, modify some incorrect descriptions.
1.0	2022-01-05	- Modify power switch resistance parameters.
1.1	2022-04-28	- Modify DFN2*2-8L package - Add CSP marking description
1.2	2022-05-31	- Modify OVLO Preset Threshold - Modify TYPICAL APPLICATION CIRCUIT
1.3	2022-08-18	- Add OVLO Preset Threshold of 5.8V version