GENERAL DESCRIPTION

CM11.6V is designed to boost standby efficiency. It is so called “Efficiency Vitamin " . CM11.6V can supply up to 2A with 12V output.

The CM11.6V is designed to work with standby 11.1V while the main output of power supply is +12V. The CM11.6V is not activated until both “main 12V (input) ” reaches 11.1V and “Standby 11.1V (output) ” reaches 11.1V; then CM11.6V connects between main 12V (input) and standby 11.1V (output). It forces Standby = 12V and (Iload from standby current) x (Rdson of the switch inside of CM11.6V) ~ 11.7V.

The CM11.6V has two current limits + a ~20% duty and ~ 12mS re-try timer.

The CM11.6V series is available in SOP8 packages. A minimum of 10uF ceramic or Electronic capacitor is required at the input and output to ensure the high performance.

FEATURES

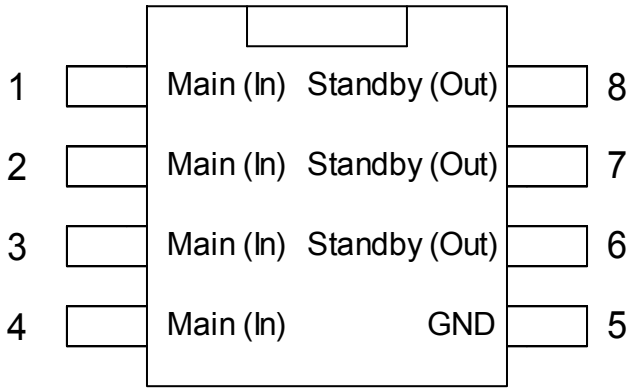
- No diode between input and output (Avoid reverse current)
- Patents Pending
- Efficiency Vitamin and it boost total efficiency at 20%, 50% and 100% load
- Low Rdson ~ 0.15 ohm (room temp.)
- Current Limiting and Thermal Protection to handle rugged application environments
- Short Circuit Protection
- It can handle current up to 2A (for 3A, talk to CMC FAEs)
- Standby-Main Intrusion Protection
- Temperature Range -40℃ to 125℃
- SOP-8 package available

APPLICATIONS

- Work with Standby Output > 11.1V applications

PIN CONFIGURATION

SOP-8 TOP View



ORDERING INFORMATION

Part Number	Operating Temperature Range (T_A)	Package
CM11.6VIS	-40℃ ~ +125℃	SOP-8
CM11.6VISTR*	-40℃ ~ +125℃	SOP-8

*Note: TR : Package is Typing Reel

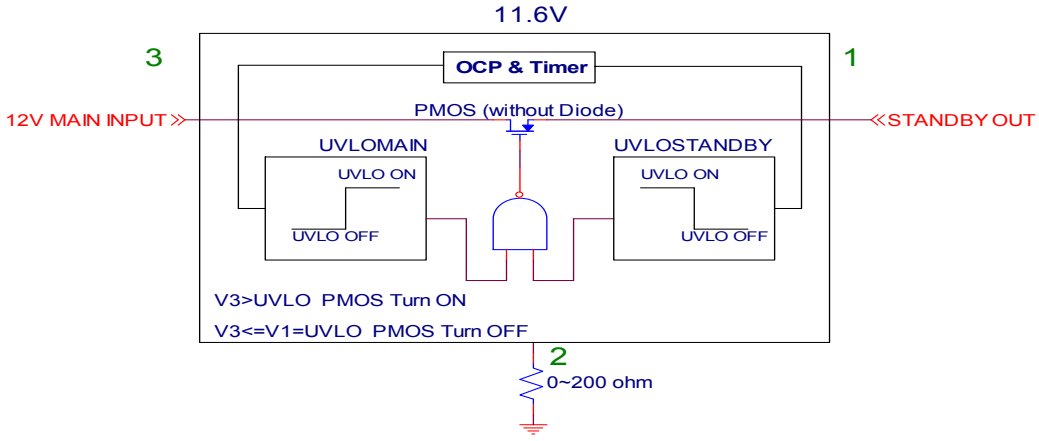
ABSOLUTE MAXIMUM RATINGS

Input Voltage ..... +18V
Output Voltage ..... +17.98V
Peak current accept trough 11.6V.....20A/5ms
Peak current accept trough 11.6V 10A/10ms
Operating Junction Temperature Range, T_J ..... -40℃ to +125℃
Storage Temperature ..... -65℃ to +150℃
Lead Temperature
Metal package (Soldering ,10 sec.) .....300℃
Plastic package (Soldering ,4 sec.) .....260℃
Maximum surface Temperature .....110℃
Internal Over Current Protection (T_J=25℃) 2.8A

THERMAL INFORMATION

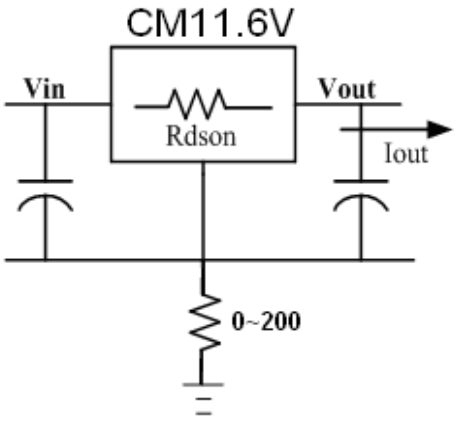
Parameter	Package	Maximum	Unit
Thermal Resistance (θ_{jc})	SOP8	23.5	℃/W
Thermal Resistance (θ_{ja}) (No heat sink)	SOP8	140	℃/W
Internal Power Dissipation (P_D) (ΔT = 100℃, No Heat sink)	SOP8	900	mW
Maximum Junction Temperature		150	℃
Maximum Lead Temperature (10 Sec)		300	℃
Maximum surface Temperature		110	℃

BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS

Electrical Characteristics at I_{OUT} = 10mA, and T_J = +25℃; unless otherwise noted
Test Circuit:



Symbol	Parameter	Conditions	Min	Typ	Max	Units
Iccq	CM11.6V quiescent current	GND Pin Current (On state)			70	uA
V_{OUT}	Vout Voltage (Note 1,2,3)	Vin = 12V ;I_{OUT} =0.1A ; T_J=25℃	11.98	11.99	12.0	V
		Vin = 12V ;I_{OUT} =0.5A ; T_J=25℃	11.915	11.93	11.945	V
		Vin = 12V ;I_{OUT} =1.5A ; T_J=25℃	11.73	11.78	11.82	V
		Vin = 12V ;I_{OUT} =2A ; T_J=25℃	11.62	11.68	11.74	V
UVLO	Under voltage Lockout Threshold		10.9	11.05	11.1	V
OCP	Internal O.C.P test	Vin = 12.7V ; T_J=-20℃ Vin = 14V ; T_J=-20℃		3		A
		Vin = 12.7V ; T_J=25℃ Vin = 14V ; T_J=25℃		2.7		A
		Vin = 12.7V ; T_J=50℃ Vin = 14V ; T_J=50℃		2.6		A
	Thermal Resistance Junction-to-Case	SOP8		23.5		℃/W
	Thermal Resistance Junction-to-Ambient (No heat sink; No air flow)	SOP8		140		℃/W

Note 1: Typical Values represent the most likely parametric norm.
Note 2: All limits are guaranteed by testing or statistical analysis.
Note 3: Rds-on=(Vin-Vout) / Iout.
Note 4: Minimum pad size of 0.038in^2

THERMAL DATA:

Product:11.6V(SOP8)				
Ambient Temp.	Main voltage=12.7V	I Load(A)	PKG Temp.(C) Burn in 2 Hours	Rdson(ohm)
25°C	12.7	0.5	27	0.139
25°C	12.7	1	31	0.148
25°C	12.7	1.5	41	0.157
25°C	12.7	2	55	0.171
25°C	12.7	2.3	68	0.184
25°C	12.7	2.5	82	0.187
Product:11.6V(SOP8)				
Ambient Temp.	Main voltage=12.7V	I Load(A)	PKG Temp.(C) Burn in 2 Hours	Rdson(ohm)
50°C	12.7	0.5	51	0.155
50°C	12.7	1	53	0.159
50°C	12.7	1.5	59	0.167
50°C	12.7	2	69	0.180
50°C	12.7	2.3	76	0.188
50°C	12.7	2.5	94	0.195
Product:11.6V(SOP8)				
Ambient Temp.	Main voltage=12.7V	I Load(A)	PKG Temp.(C) Burn in 2 Hours	Rdson(ohm)
-20°C	12.7	0.5	-19	0.127
-20°C	12.7	1	-17	0.129
-20°C	12.7	1.5	-8	0.135
-20°C	12.7	2	0	0.145
-20°C	12.7	2.3	6	0.154
-20°C	12.7	2.5	10	0.161

APPLICATION NOTE

Like any linear circuit, CM11.6V requires external capacitors to ensure stability and high performance.

Input By Pass Capacitor

An input capacitor of at least 10μF is required. Ceramic or Electronic capacitor can be used. The value can be increase without upper limit.

A Ceramic or Electronic capacitor on the input is a suitable input bypassing for almost all applications

Output Capacitor

An output capacitor is required for high performance. The minimum value is 10μF but may be increase without limit.

GND resistor (Rg) 0~200 ohm

Add Rg (0~200 ohm) resistor in series with GND will improve immunity against abnormal condition such as lighting surge, ESD.

No Diode between input and output

CM11.6V is not like switch MOS. There is no diode between input and output. Therefore, either input is shorted or output is shorted will not effect each other.

Two Current limit:

UVLO protect:

The CM11.6V has two current limit U.V.L.O and internal thermal shutdown to protect the device from over-heating.

The first Current limit = (Vin-11.1V**(U.V.L.O)**) / Rdson

The second Current limit ~ 0.45V/Rdson~3A(Room temp.)

Internal OCP Protect:

25mS ~ 20ms off + ~5mS on, Retry Timer:

When the internal current limit protecting circuitry is triggered, the retry timer and protection logic turn off the switch until 20mS timer finished. After that, it allows ~5mS to retry.

Thermal Considerations

It is important that the thermal limit of the package is not exceeded. The CM11.6V has built-in thermal protection. When the thermal limit is exceeded, the IC will enter protection. The power dissipation for a given application can be calculated as following:

The power dissipation (P_D) is

$P_D = I_{OUT} * [V_{IN} – V_{OUT}]$

$I_{IN} = I_L + I_G$

$P_D = (V_{IN} – V_{OUT}) I_L + V_{IN} I_G$

Figure 1 shows the voltages and currents which are present in the circuit.

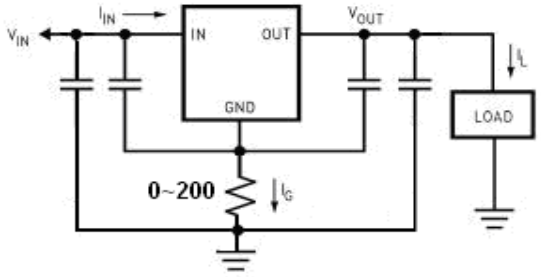


FIGURE 1. Power Dissipation Diagram

Heat-sink May Required

When an integrated circuit operates with an appreciable current, its junction temperature is elevated. It is important to quantify its thermal limits in order to achieve acceptable performance and reliability. This limit is determined by summing the individual parts consisting of a series of temperature rises from the semiconductor junction to the operating environment. A one-dimensional steady-state model of conduction heat transfer is demonstrated if Figure 7. The heat generated at the device junction flows through

the die to the die attach pad, through the lead frame to the surrounding case material, to the printed circuit board, and eventually to the ambient environment. Below is a list of variables that may affect the thermal resistance and in turn the need for a heat-sink.

$R^{\theta JC}$(Component Variables)	$R^{\theta CA}$ (Application Variables)
Leadframe Size & Material	Mounting Pad Size, Material, & Location
No. of Conduction Pins	Placement of Mounting Pad
Die Size	PCB Size & Material
Die Attach Material	Traces Length & Width
Molding Compound Size and Material	Adjacent Heat Sources
	Volume of Air
	Ambient Temperatue
	Shape of Mounting Pad

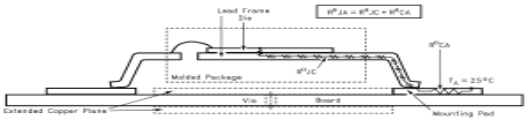
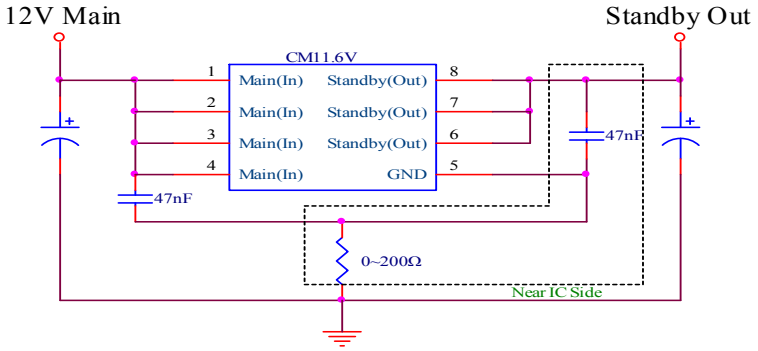
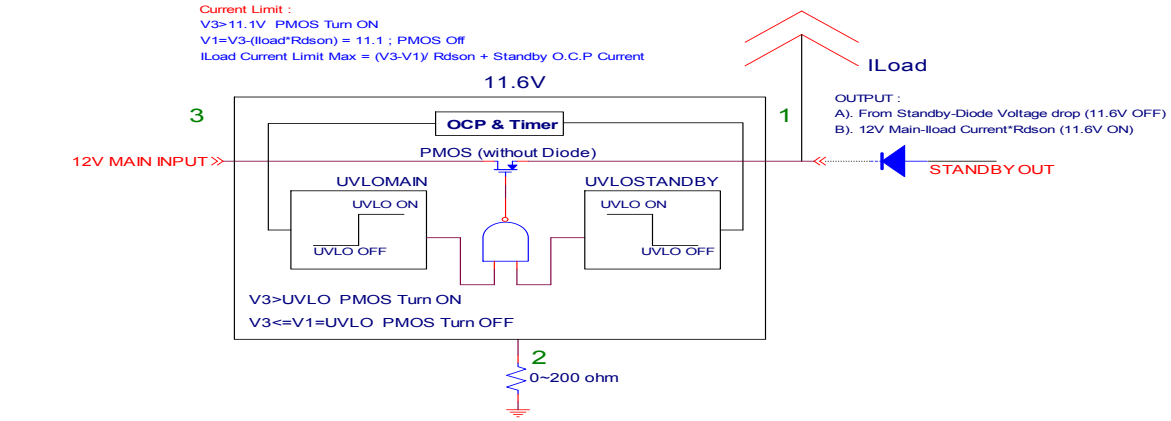


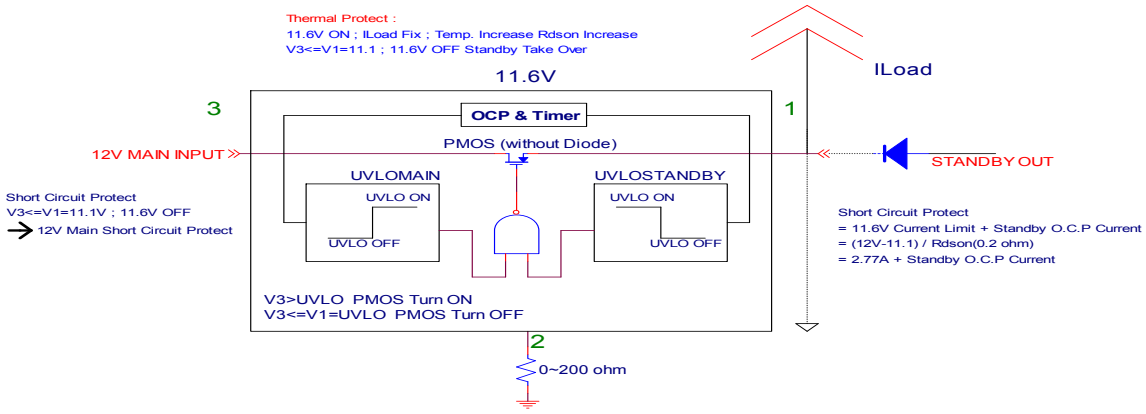
FIGURE 2. Cross-sectional view of Integrated Circuit Mounted on a printed circuit board. Note that the case temperature is measured at the point where the leads contact with the mounting pad surface

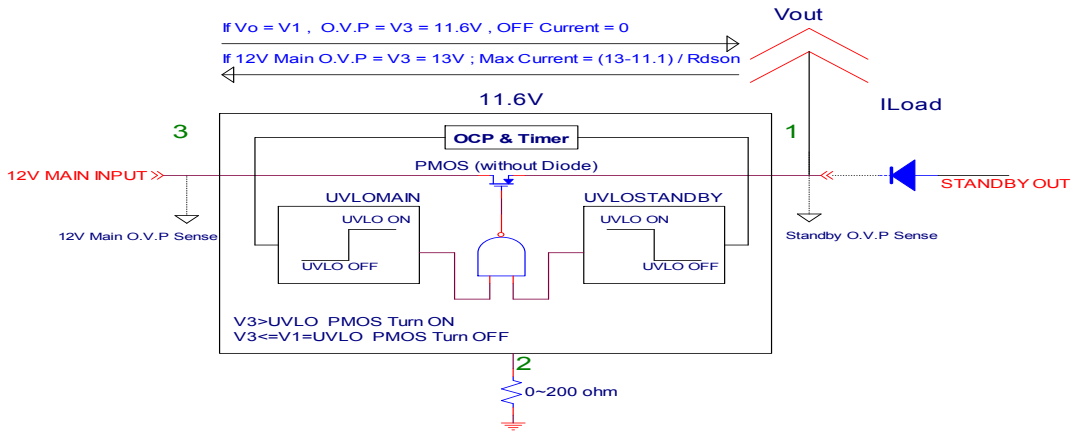
TYPICAL APPLICATION CIRCUIT



PROTECTION: Internal O.C.P/Short-circuit/U.V.L.O current limit







WAVEFORM TEST

Turn on / off

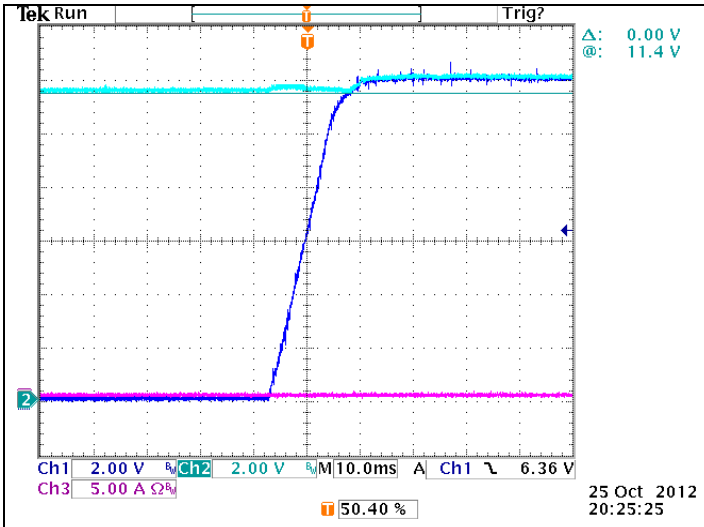


FIGURE 3. CH1 : Standby voltage

CH2 : Main voltage Standby load 0A

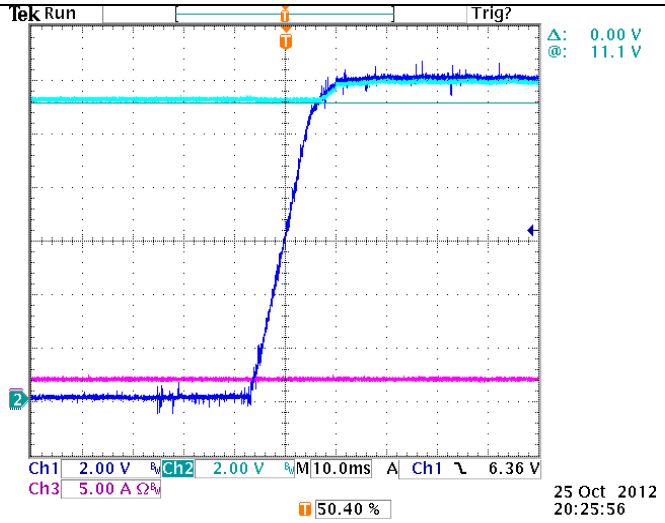


FIGURE 4. CH1 : Standby voltage

CH2 : Main voltage Standby full load 1.3A

CH1 : Standby voltage >11.1V 11.6V can be work

→Main voltage turn on→standby voltage from main

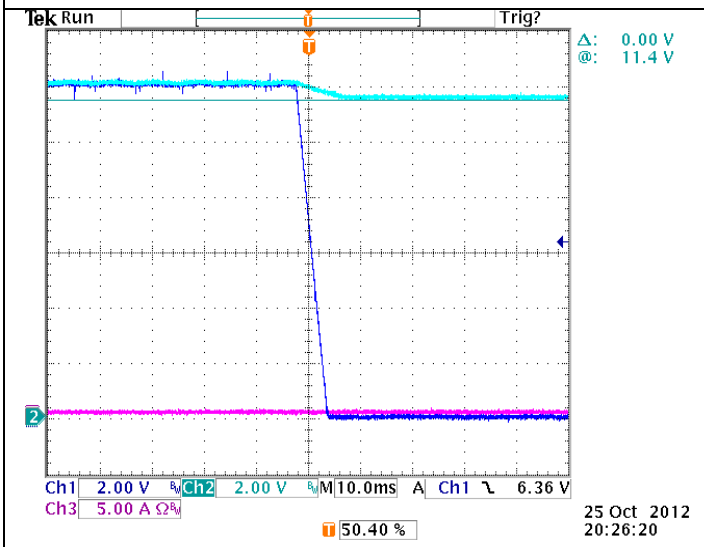


FIGURE 5. CH1 : Standby voltage

CH2 : Main voltage Standby load 0A

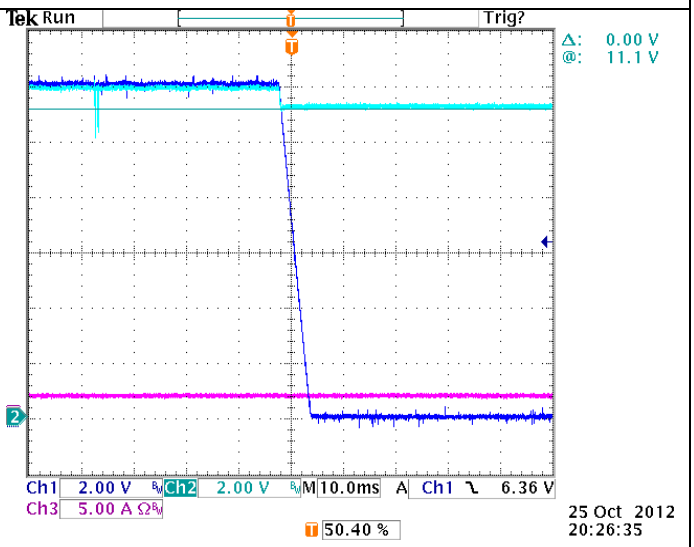


FIGURE 6. CH1 : Standby voltage

CH2 : Main voltage Standby full load 1.3A

When 11.6V turn on→ Remote off: main voltage<11.1V 11.6V turn off

Dynamic

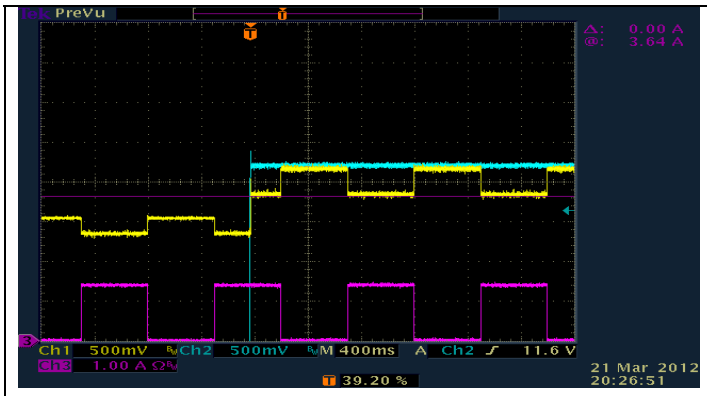


FIGURE7. Stand by dynamic than main on

CH1:standby voltage/CH3:standby current/11.6V current

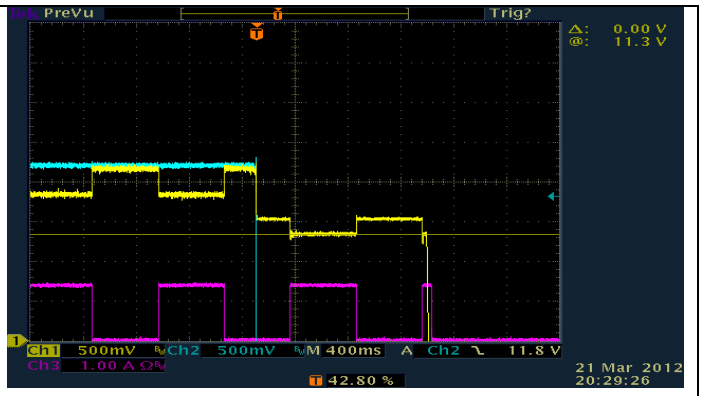


FIGURE 8. Stand by dynamic than AC off

CH1:standby voltage/CH3:11.6V current/standby current

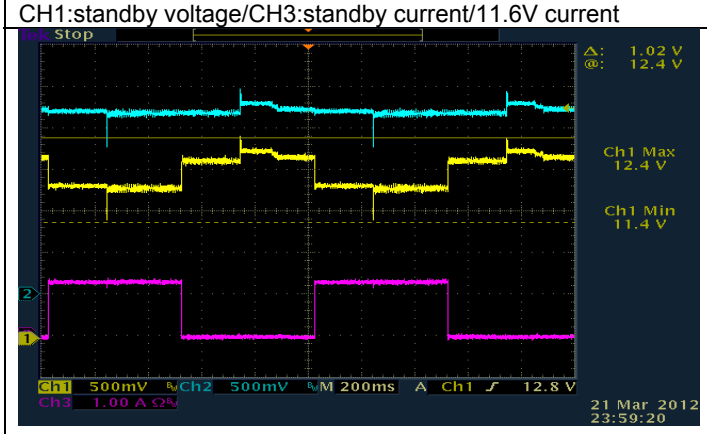


FIGURE9.

Main:0A-15A dynamic/standby voltage=main voltage dynamic

CH1:standby voltage/CH2:Mian voltage

CH3:standby current/11.6V current

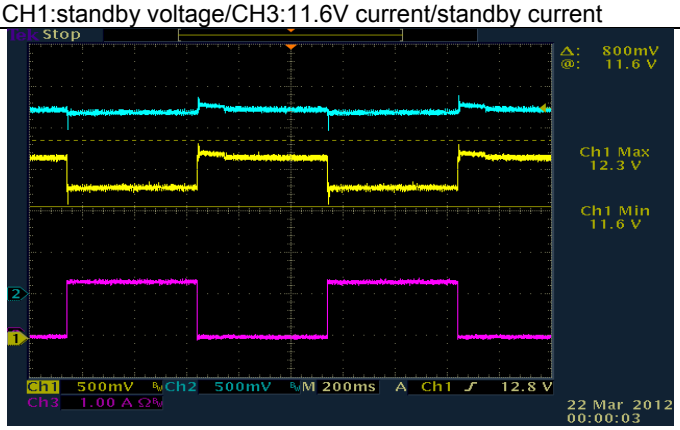


FIGURE 10.

Main:0A-7A dynamic/standby voltage=main voltage dynamic

CH1:standby voltage/CH2:Mian voltage

CH3:standby current/11.6V current

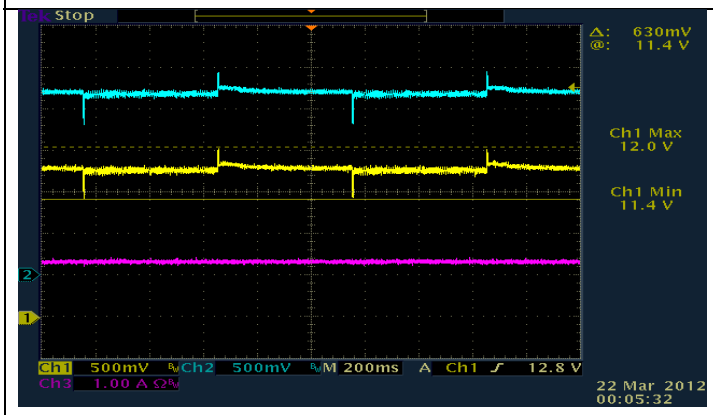


FIGURE11.

Main:0A-15A/500ms/500ms dynamic and

standby=0-1.5A 500ms/500ms dynamic

/standby voltage=main voltage dynamic(11.6V always on)

CH1:standby voltage/CH2:Mian voltage

CH3:11.6V current

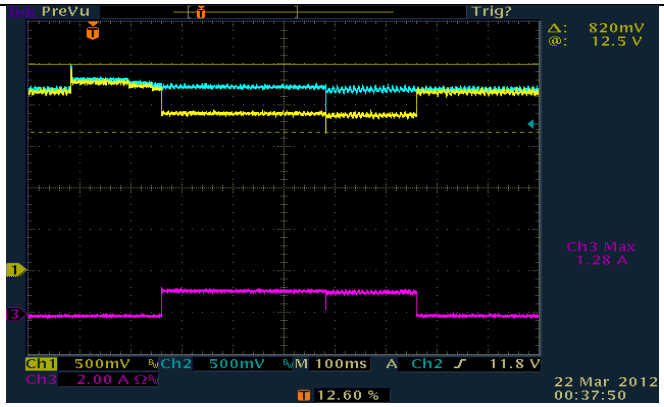


FIGURE 12.

In case: adjust standby voltage=11.6 than dynamic

Main:0A-15A/500ms/500ms dynamic and

standby=0-1.5A 500ms/500msdynamic

/standby voltage=12.5~11.68(11.6V on/off)

CH1:standby voltage/CH2:Mian voltage

CH3:11.6V current

O.C.P. Current

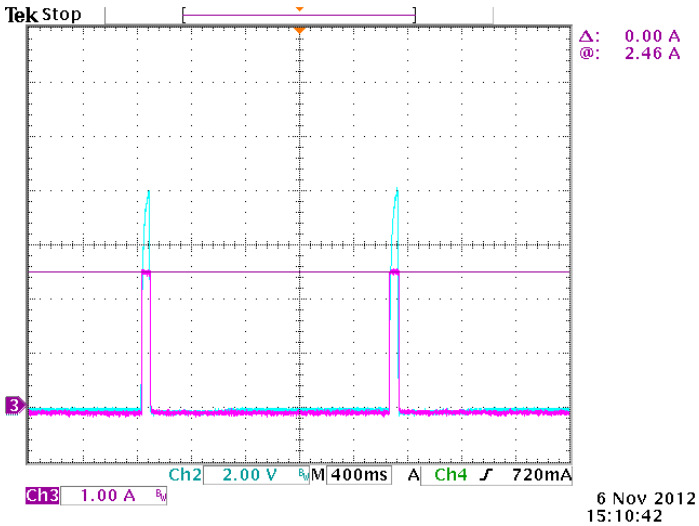


FIGURE13.

Remote off stand by OCP

O.C.P current=2.46A

CH1:standby voltage/CH3:standby current

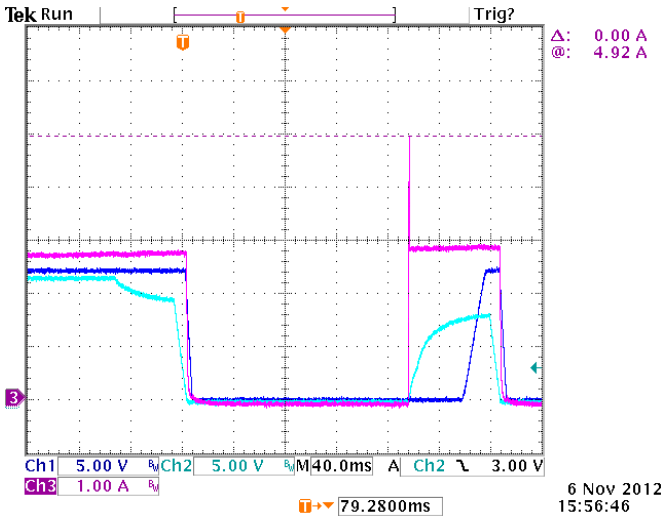


FIGURE 14.

Remote on 11.6V turn on stand by OCP current=

11.6V internal O.C.P current +standby O.C.P

current=2.46A+2.46A=4.92A

CH1:standby voltage/CH2:Main voltage/CH3:standby current

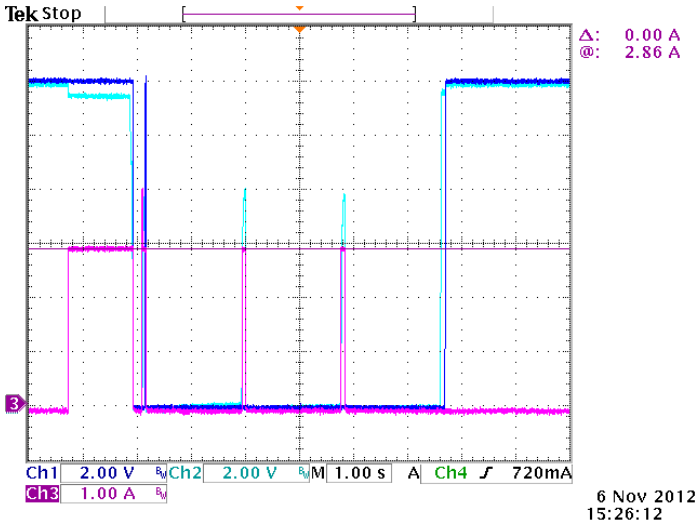


FIGURE15.

Remote on->11.6V turn on stand by OCP current =

11.6V internal O.C.P current +standby O.C.P

current=2.86A+2.46A=5.32A than 11.6V off standby OCP take

over--◊If O.C.P release-◊11.6V turn on

CH1:standby voltage/CH2:Main voltage/CH3:standby current

O.V.P. Current

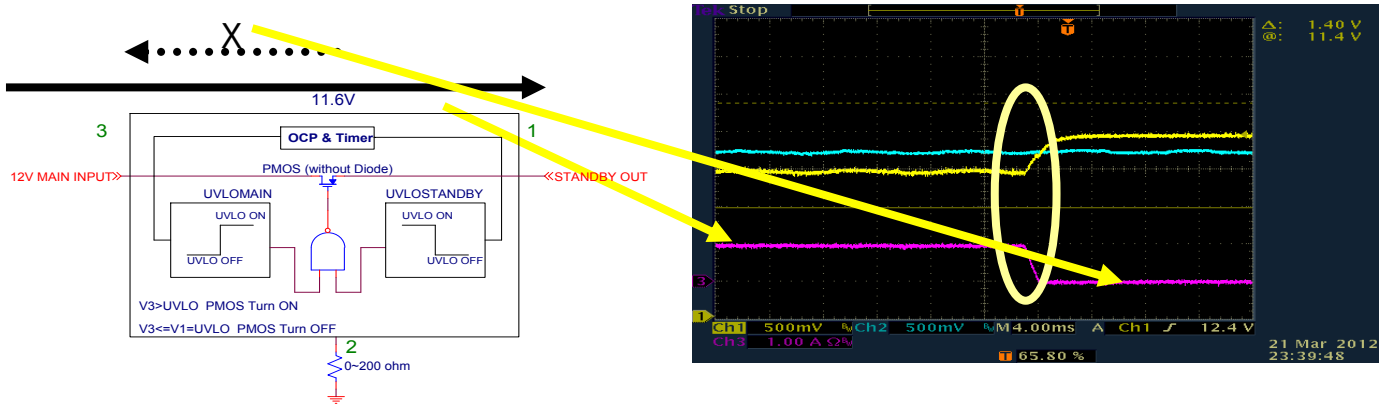


FIGURE 16.

Remote on◊11.6V turn on◊ standby current from main◊

If standby O.V.P--◊11.6V off

CH1:standby voltage/CH2:Main voltage/CH3:11.6S current

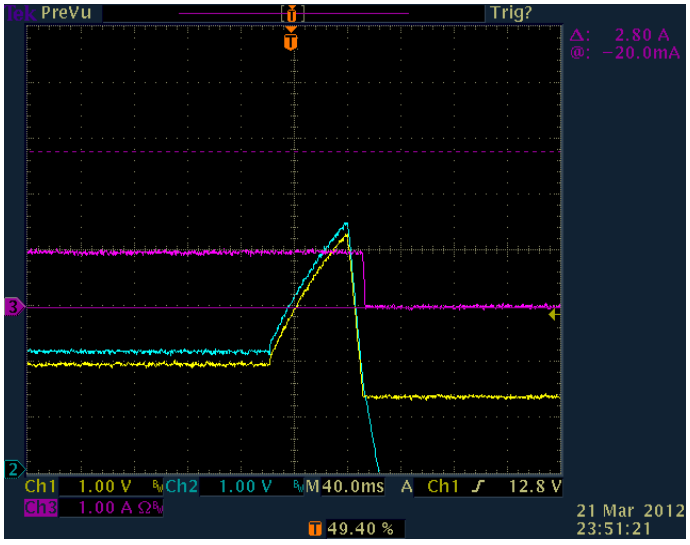


FIGURE 17.

Main O.V.P◊11.6S turn off◊ Power latch mode◊

CH1:standby voltage/CH2:Main voltage/CH3:11.6Scurrent

Output Short Circuit

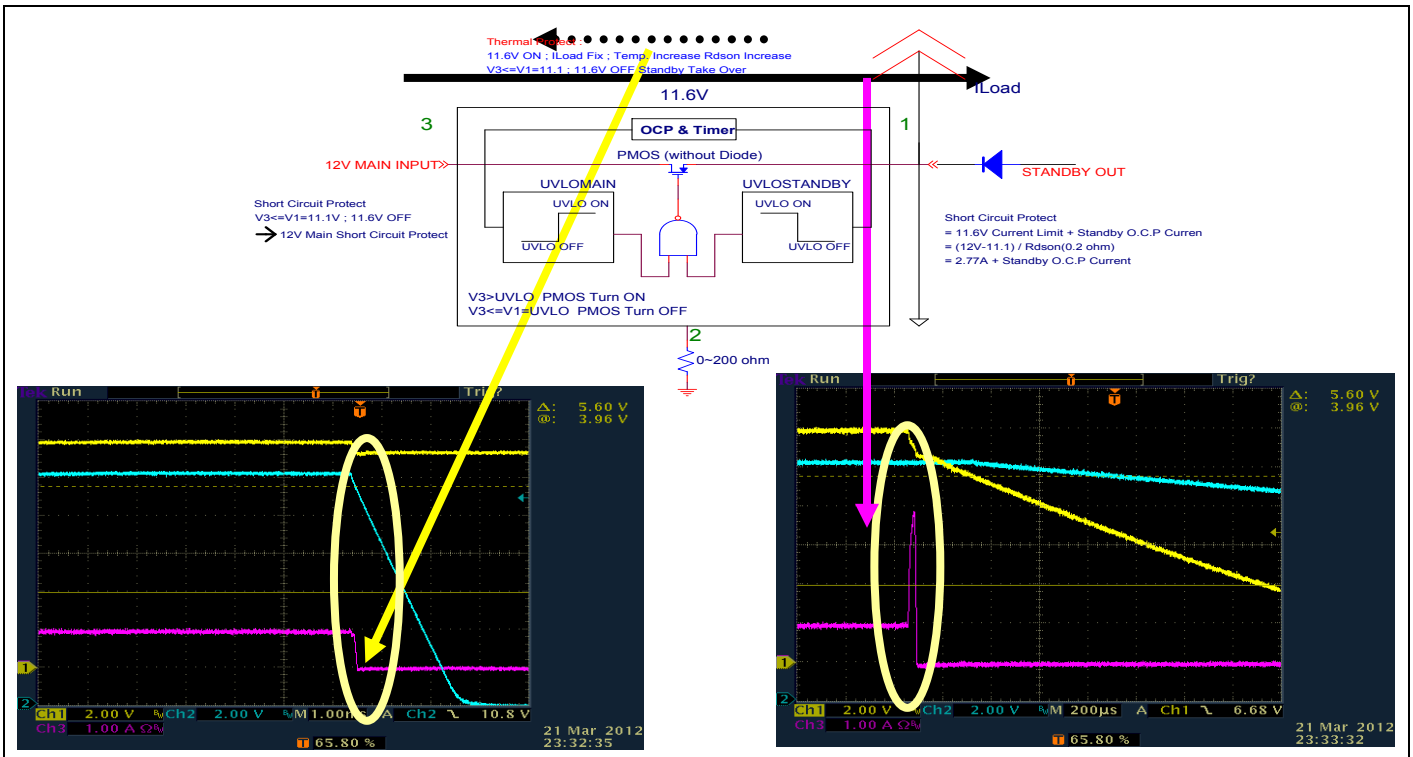


FIGURE 18.
Main short→11.6V turn off→
CH1:standby voltage/CH2:Main voltage/CH3:11.6V current

FIGURE 19.
Standby short→11.6V turn off→
CH1:standby voltage/CH2:Main voltage/CH3:11.6V current

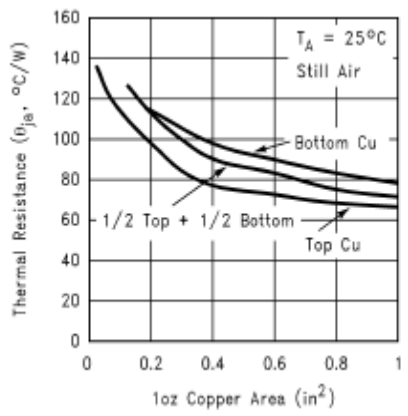


FIGURE 20. θ_{JA} vs. 1oz Copper Area for SOP8

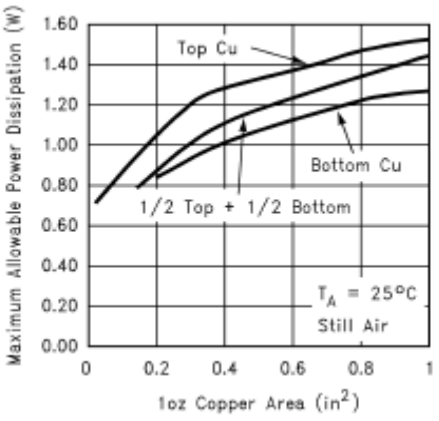


FIGURE 21. Maximum Allowable Power Dissipation vs. 1oz Copper Area for SOP8

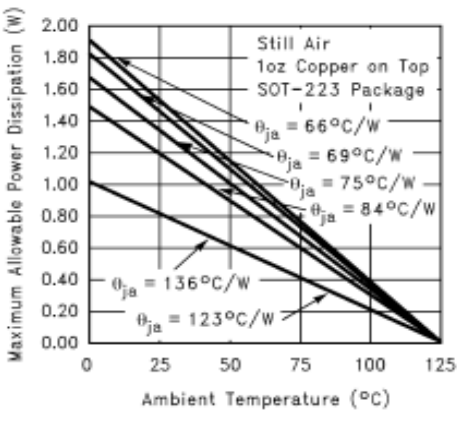
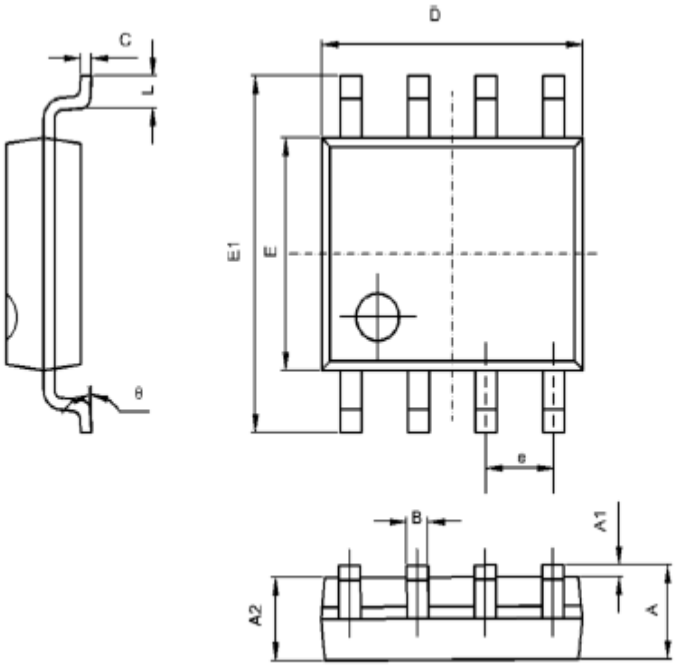


FIGURE 22. Maximum Allowable Power Dissipation vs. Ambient Temperature for Sop8

PACKAGE DIMENSION

8-PIN SOP (S8)



SYMBOL	DIMENSION IN MILLIMETERS		DIMENSION IN INCHES	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270 TYP		0.050 TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

IMPORTANT NOTICE

Champion Microelectronic Corporation (CMC) reserves the right to make changes to its products or to discontinue any integrated circuit product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

A few applications using integrated circuit products may involve potential risks of death, personal injury, or severe property or environmental damage. CMC integrated circuit products are not designed, intended, authorized, or warranted to be suitable for use in life-support applications, devices or systems or other critical applications. Use of CMC products in such applications is understood to be fully at the risk of the customer. In order to minimize risks associated with the customer's applications, the customer should provide adequate design and operating safeguards.

CMC assumes to no liability to customer product design or application support. CMC warrants the performance of its products to the specifications applicable at the time of sale.

HsinChu Headquarter
5F, No. 11, Park Avenue II,
Science-Based Industrial Park,
HsinChu City, Taiwan
TEL: +886-3-5679979
FAX: +886-3-5679909

Sales & Marketing
21F., No. 96, Sec. 1, Sintai 5th Rd., Sijhih City,
Taipei County 22102,
Taiwan, R.O.C.
TEL: +886-2-2696 3558
FAX: +886-2-2696 3559