

PC Power Supply Supervisors

SG6516

FEATURES

- Two 12V sense input pins: VS12 and VS12B
- Over-Voltage Protection (OVP) for 3.3V, 5V, and two 12V
- Over-Current Protection (OCP) for 3.3V, 5V, and two 12V
- Under-Voltage Protection (UVP) for 3.3V, 5V, and two 12V
- Open-drain output for PGO and FPO pins
- 300ms power-good delay
- 300ms turn-on delay for 3.3V, 5V, and two 12V
- 2.8ms PSON control to FPO turn-off delay
- 48ms PSON control delay
- No lockup during the fast AC power on/off
- Wide supply voltage range from 4V to 15V

DESCRIPTION

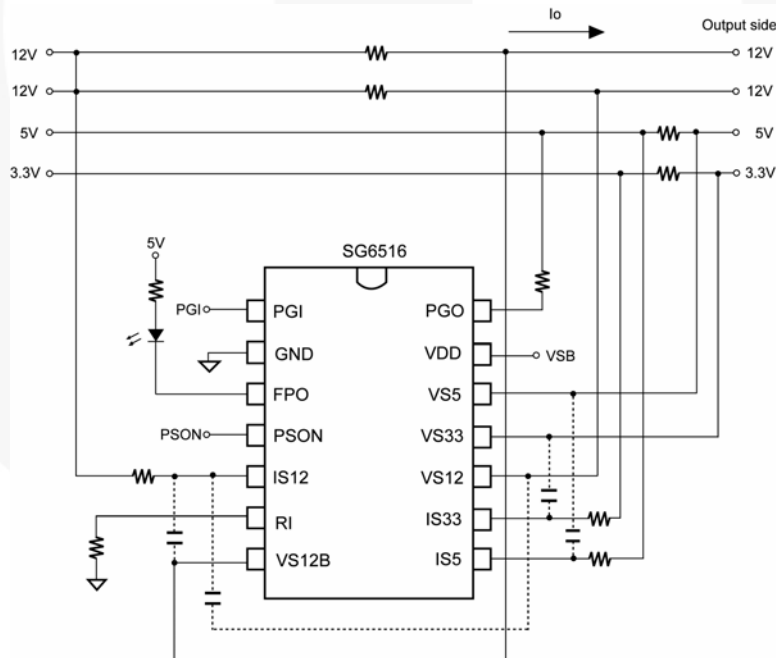
SG6516 is designed to provide the voltage and current supervisor function, remote on/off (PSON) function,

power-good (PGO) indicator function, and fault protection (FPO) function for switching power systems.

For supervisor, it provides over-voltage protection (OVP) for 3.3V, 5V, and two 12V; over-current protection (OCP) for 3.3V, 5V, and two 12V; under-voltage protection (UVP) for 3.3V, 5V, and two 12V. When 3.3V, 5V, or 12V voltage decreases to 2.3V, 3.5V, and 9V respectively, the under-voltage protection (UVP) function is enabled. FPO is set to high to turn off the PWM controller IC. The voltage difference across external current shunt is used for OCP functions. An external resistor can be used to adjust protection threshold.

The power supply is turned on after a 48ms delay time when PSON signal is set from high to low. To turn off the power supply, the PSON signal is set from low to high with the delay time 48ms. The PGI circuitry provides a power-down warning signal for PGO. When PGI input is lower than the internal 1.25V reference voltage, the PGO signal is pulled low.

TYPICAL APPLICATION

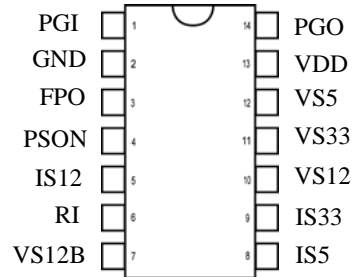


MARKING INFORMATION



T: D = DIP, S = SOP
 P: Z = Lead Free
 Null=regular package
 XXXXXXXX: Wafer Lot
 Y: Year; WW: Week
 V: Assembly Location

PIN CONFIGURATION



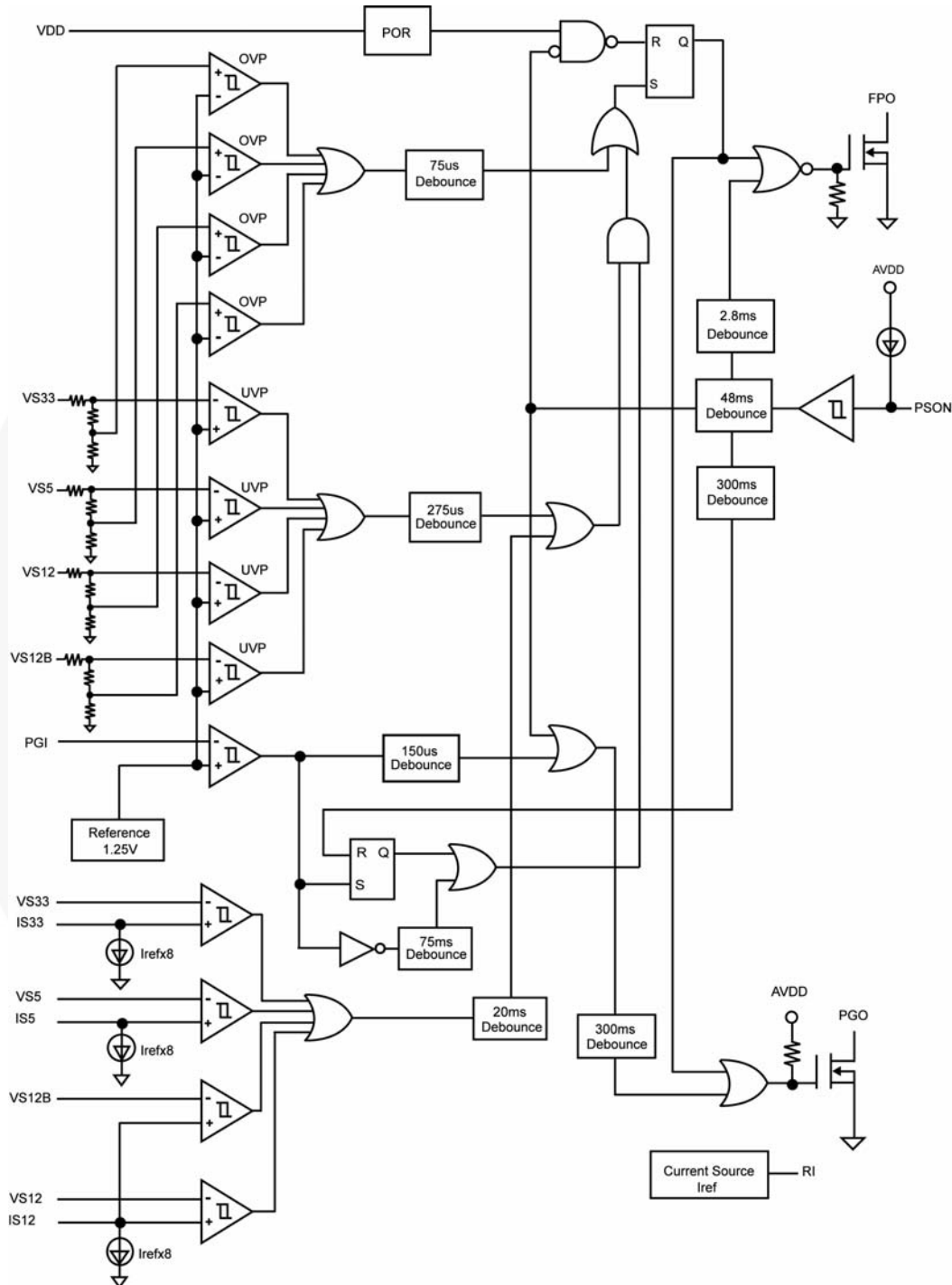
ORDERING INFORMATION

Part Number	Pb-Free	Package Type
SG6516DZ		14 pin DIP Plastic
SG6516SZ		14 pin SOP Plastic

PIN DESCRIPTIONS

Pin No.	Pin Name	Type	Description
1	PGI	Analog input	Power-good input. For ATX SMPS, it detects AC line voltage through the main transformer.
2	GND	Supply	Ground.
3	FPO	Logic output	Fault protection output. Output signal to control the primary PWM IC through an opto-coupler. When FPO is low, the PWM IC is enabled.
4	PSON	Logic input	Remote on/off logic input from CPU or main board. The power supply is turned on/off after a 48ms delay.
5	IS12	Analog input	12V over-current protection sense input. For typical application, this pin is connected to the positive end of a current shunt through one resistor. When the voltage on IS12 is higher than that of VS12 by 5mV, OCP is enabled.
6	RI	Analog input	Reference setting. One external resistor, R_i , connected between the RI and GND pins determines a reference current, $I_{REF} = 1.25/R_i$, for OCP programming.
7	VS12B	Analog input	Second 12V over/under-voltage control sense input.
8	IS5	Analog input	5V over-current protection sense input.
9	IS33	Analog input	3.3V over-current protection sense input.
10	VS12	Analog input	12V over/under-voltage control sense input.
11	VS33	Analog input	3.3V over/under-voltage control sense input.
12	VS5	Analog input	5V over/under-voltage control sense input.
13	VDD	Supply	Supply voltage. 4V ~ 15V. For ATX SMPS, it is connected to 5V-standby and 12V through diodes respectively.
14	PGO	Logic output	Power-good logic output, 0 or 1(open-drain). Power good=1, the power supply is good for operation. The power-good delay is 300ms.

BLOCK DIAGRAM



FUNCTION TABLE

PGI	PSON	UVP 12V & OCP	OVP	FPO	PGO
PGI<1.25V	L	No	No	L	L
PGI<1.25V	L	No	Yes	H	L
PGI<1.25V	L	Yes	No	L	L
PGI<1.25V	L	Yes	Yes	H	L
PGI>1.25V	L	No	No	L	H
PGI>1.25V	L	No	Yes	H	L
PGI>1.25V	L	Yes	No	H	L
PGI>1.25V	L	Yes	Yes	H	L
X	H	X	X	H	L

x = Don't care

FPO = L: Fault IS NOT latched

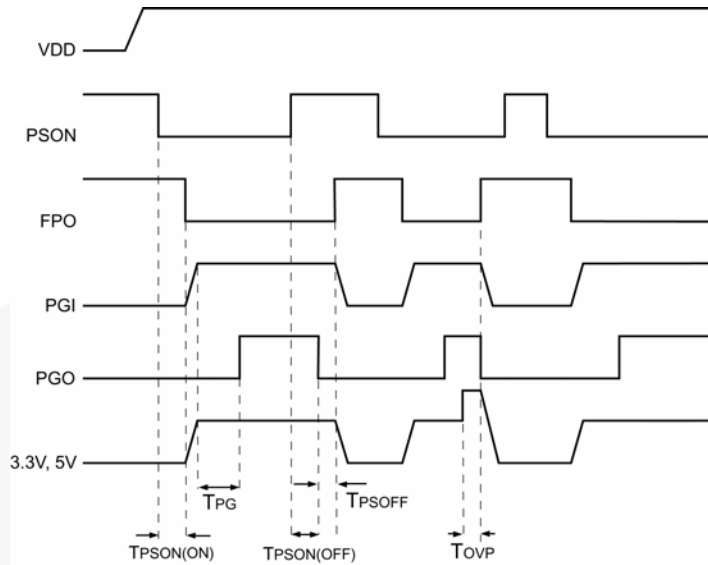
FPO = H: Fault IS latched

PGO = L: Fault

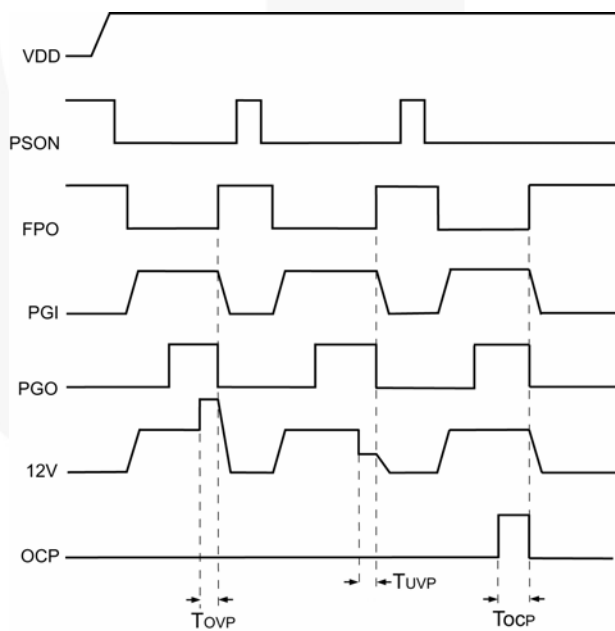
PGO = H: No fault

TIMING DIAGRAM

PSON On/Off and 3.3V, 5V OVP Function



12V OVP/UVP and OCP Function



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ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DD}	DC Supply Voltage	16	V
V _{IN}	Input Voltage	PSON, VS33, VS5, PGI, IS33, IS5	-0.3 to 7.0
		VS12, VS12B, IS12	-0.3 to 15.0
V _{OUT}	Output Voltage	FPO, PGO	8
P _D	Power Dissipation	400	mW
T _J	Operating Free Junction Temperature Range	-40 to +125	°C
T _{STG}	Storage Temperature Range	-55 to +150	°C
T _L	Lead Temperature (Wave Soldering, 10 Seconds)	260	°C
ESD	Electrostatic Discharge Capability, Human Body Model	4.5	KV
	Electrostatic Discharge Capability, Machine Model	200	V

* All voltage values, except differential voltages, are given with respect to GND pin.

*Stresses above those listed may cause permanent damage to the device.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Test Conditions	Value	Unit
V _{DD}	DC Supply Voltage		4 to 15	V
T _{OPER}	Operating Ambient Temperature Range		-25 to +85	°C

ELECTRICAL CHARACTERISTICS

V_{DD}=12V, T_A=25°C, unless otherwise noted.

V_{DD} Section

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I _{DD1}	Supply Current	PSON = Low		1.7	2.6	mA
I _{DD2}	Supply Current	PSON = High		1.0	1.5	mA
T _R	Supply Voltage Rising Time		1			ms
V _{ST}	V _{DD} Start Threshold Voltage				4.0	V

Over-Voltage and Over-Current Protection

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{OVP}	Over-Voltage Protection VS33		3.7	3.9	4.1	V
	Over-Voltage Protection VS5		5.7	6.1	6.5	
	Over-Voltage Protection VS12, VS12B		13.2	13.8	14.4	
I _{REF}	Ratio of Current Sense Sink Current to Current Sense Setting Pin (RI) Source Current	R _I = 30KΩ, 0.1% Resistor	7.6	8.0	8.4	
V _{OFFSET}	OCP Comparator Input Offset Voltage		-5		5	mV
I _{LKG}	Leakage Current (FPO)	V(FPO) = 5V			5	μA
V _{OLFPO}	Low-Level Output Voltage (FPO)	I _{SINK} 20mA			0.4	V
T _{OVP}	OVP Delay Time		33	75	110	μs
T _{OCP}	OCP Delay Time			20		ms
V _{RI}	RI Pin Voltage		1.237	1.250	1.262	V
I _{RI}	Output Current RI		12.5		62.5	μA
I _{LKG12}	Leakage Current VS12,VS12B			93		μA
T _{ST-OCP}	Start-up OCP / UVP Protection Time	PGI < 1.25V, FPO=Low	200	300	450	ms

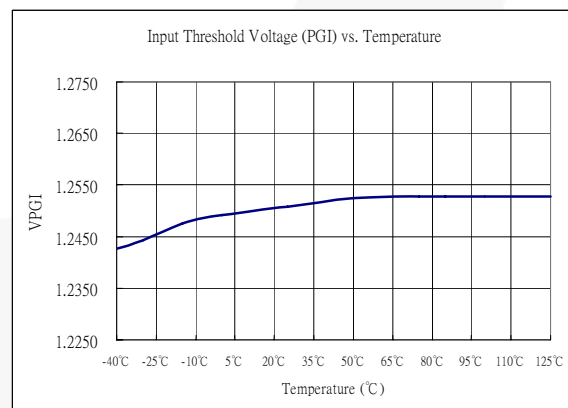
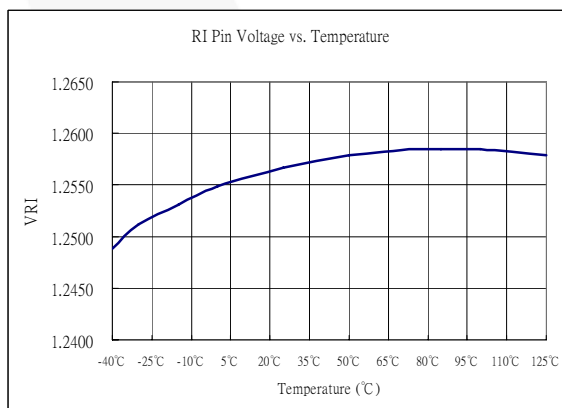
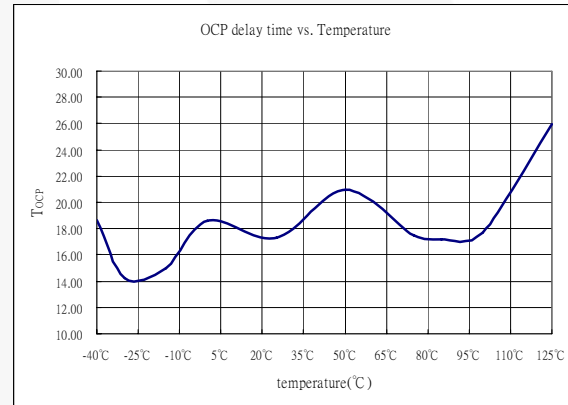
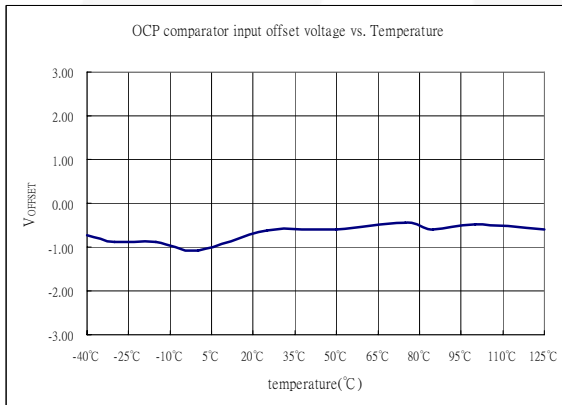
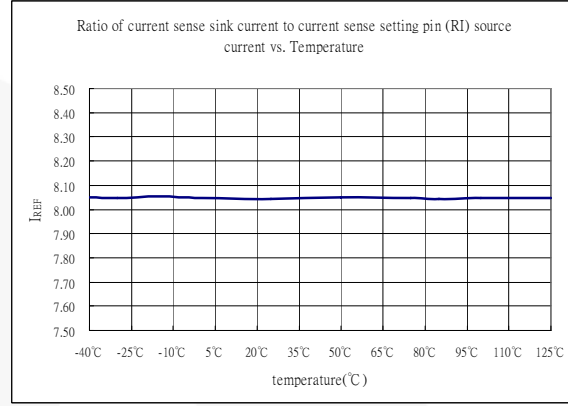
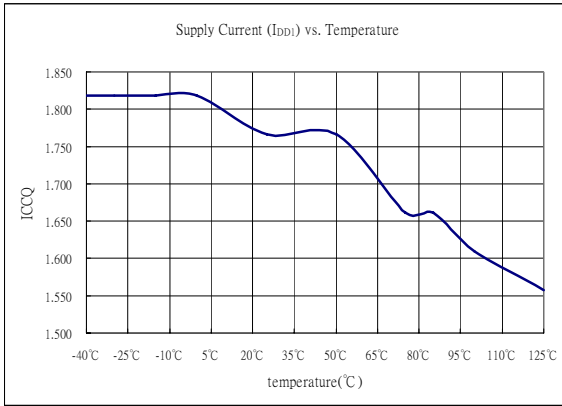
Under-Voltage Protection and PGI, PGO

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{PGI}	Input Threshold Voltage PGI		1.225	1.250	1.275	V
V _{UVP}	Under-Voltage Protection VS33		2.1	2.3	2.5	V
	Under-Voltage Protection VS5		3.3	3.5	3.7	
	Under-Voltage Protection VS12, VS12B		8.5	9.0	9.5	
T _{OND}	Under-Voltage Turn-on Delay Time		49	75	114	ms
T _{UVP}	UVP Delay Time	PGI > 1.25V	175	275	375	μs
I _{LKG-PGO}	Leakage Current (PGO)	PGO = 5V			5	μA
V _{OL-PGO}	Low-Level Output Voltage (PGO)	V _{DD} = 12V, I _{SINK} 10mA			0.4	V
T _{PG}	Timing PG Delay	PGI to PGO	200	300	450	ms
T _{ND1}	Noise Deglitch Time	PGI to PGO	90	150	210	μs

PSON Control

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I _{PSON}	Input Pull-up Current	PSON = 0V		120		μA
V _{IH}	High-Level Input Voltage		2			V
V _{IL}	Low-Level Input Voltage				0.8	V
T _{PSON}	Timing PSON to On/Off	On (PSON Low to FPO Low)	34	48	67	ms
		Off (PSON High PGO Low)	34	48	67	
T _{PSOFF}	Timing PGO Low to FPO high		1.6	2.8	4.5	ms

TYPICAL CHARACTERISTICS



APPLICATION NOTE

Over-Current Protection (OCP)

The SG6516 provides over-current protection for the 3.3V, 5V, and two 12V rails. Whenever an OCP condition occurs at any of the voltage rails, PGO is low and FPO is open. The internal OCP comparators have a

very small offset voltage ($\pm 5mV$). The sink currents of IS33, IS5, and IS12 are eight times the current at the RI pin. Below is an example demonstrating how to set OCP.

If:

$$I_1 \cdot R_1 > (I_{RI} \cdot 8) \cdot R_2, \text{ then} \tag{1}$$

OCP active.

To select an R2 resistor:

If

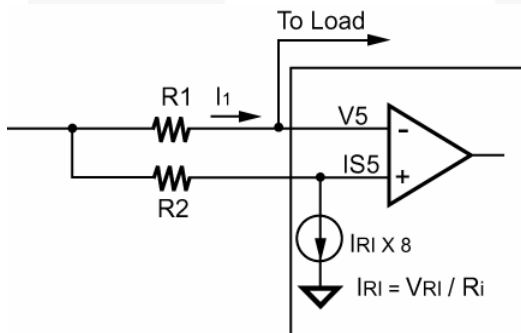
$$R_1 = 5m\Omega, R_i = 30K, \text{ and} \tag{2}$$

$$\text{OCP protection level is } 35A, \text{ then} \tag{3}$$

$$R_2 = (I_1 \cdot R_1) / (I_{RI} \cdot 8) \tag{4}$$

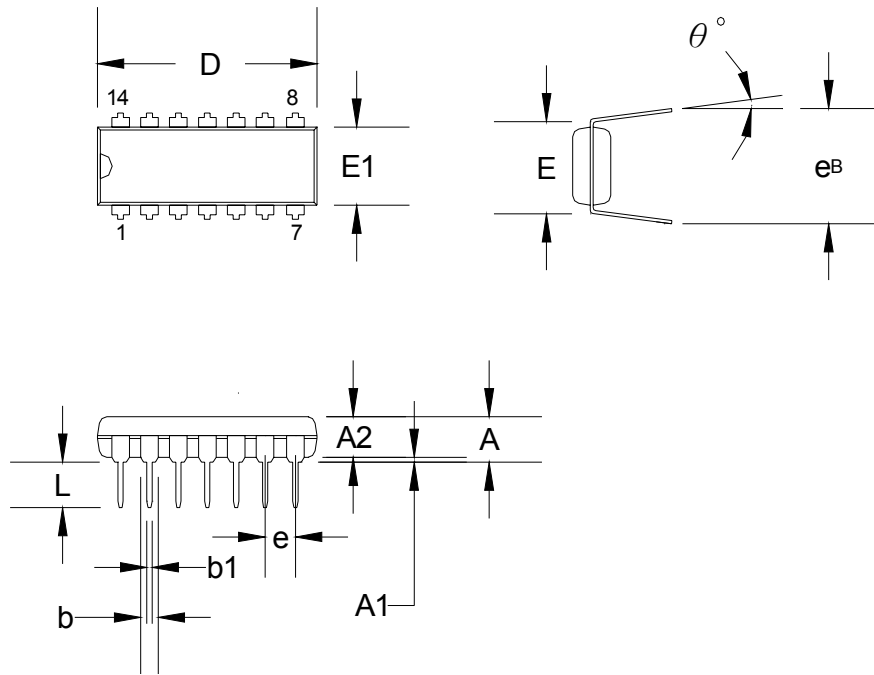
$$= (35A \cdot 5m\Omega) / \{(1.25V/30K) \cdot 8\} \tag{5}$$

$$= 525\Omega$$



PACKAGE INFORMATION

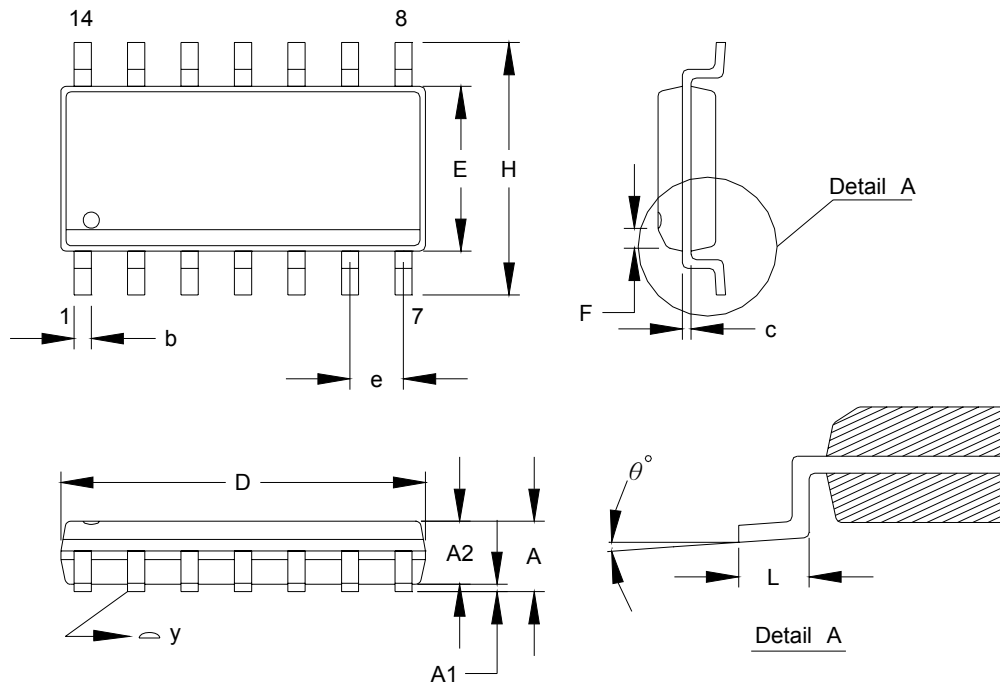
14 PINS – DIP (D)



Dimension:

Symbol	Millimeter			Inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			5.334			0.210
A1	0.381			0.015		
A2	3.175	3.302	3.429	0.125	0.130	0.135
b		1.524			0.060	
b1		0.457			0.018	
D	18.669	19.050	19.685	0.735	0.750	0.775
E		7.620			0.300	
E1	6.223	6.350	6.477	0.245	0.250	0.255
e		2.540			0.100	
L	2.921	3.302	3.810	0.115	0.130	0.150
e _B	8.509	9.017	9.525	0.335	0.355	0.375
θ°	0°	7°	15°	0°	7°	15°

14 PINS – SOP (S)



Dimension:

Symbol	Millimeter			Inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	1.473	1.626	1.727	0.058	0.064	0.068
A1	0.101		0.254	0.004		0.010
A2	1.371		1.473	0.054		0.058
b	0.330	0.406	0.508	0.013	0.016	0.020
c	0.190	0.203	0.249	0.0075	0.008	0.0098
D	8.534	8.661	8.484	0.336	0.341	0.344
E	3.810	3.912	3.988	0.150	0.154	0.157
e		1.270			0.050	
H	5.791	5.994	5.690	0.228	0.236	0.244
L	0.381	0.635	1.270	0.015	0.025	0.050
F		0.381X45°			0.015X45°	
y			0.101			0.004
θ°	0°		8°	0°		8°


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