GENERAL DESCRIPTION

The N3860 is a low cost, low start-up current, low operating current, current mode PWM controller, specifically designed for the lower stand-by power consumption. The device allows the implementation of complete off-line AC/DC adapters, DC/DC converters, battery chargers or stand-by power supplies.

The N3860 features a burst mode function, when output power works at very light load and the duty of gate driver is under 900nS, the N3860 will enter the burst mode condition to reduce operating frequency and switching loss, this special function helps decrease power consumption to be Green Mode Requirement.

The N3860 features a protective circuitry which in presence of an over load condition or an over voltage condition, the device controls a delayed time to disable the output pulses and pull down the VCC voltage to 4V, then trying to restart, once the default has gone, the power device auto-recovers.

FEATURES

- Low Start-up Current (typ.=10uA)
- Low Operating Supply Current
- Current Mode Control
- 10V~26V Range For VCC Voltage
- Adjustable Operating Frequency
- Over Load Protection
- Over Voltage Protection
- Pulse Output For Driving MOSFET
- Green Mode Requirement
- Burst Mode at Light Load Condition
- Very Low Cost Solution
- Built -in Resistor of Gate Connection
- SOP-8 and DIP-8 Package

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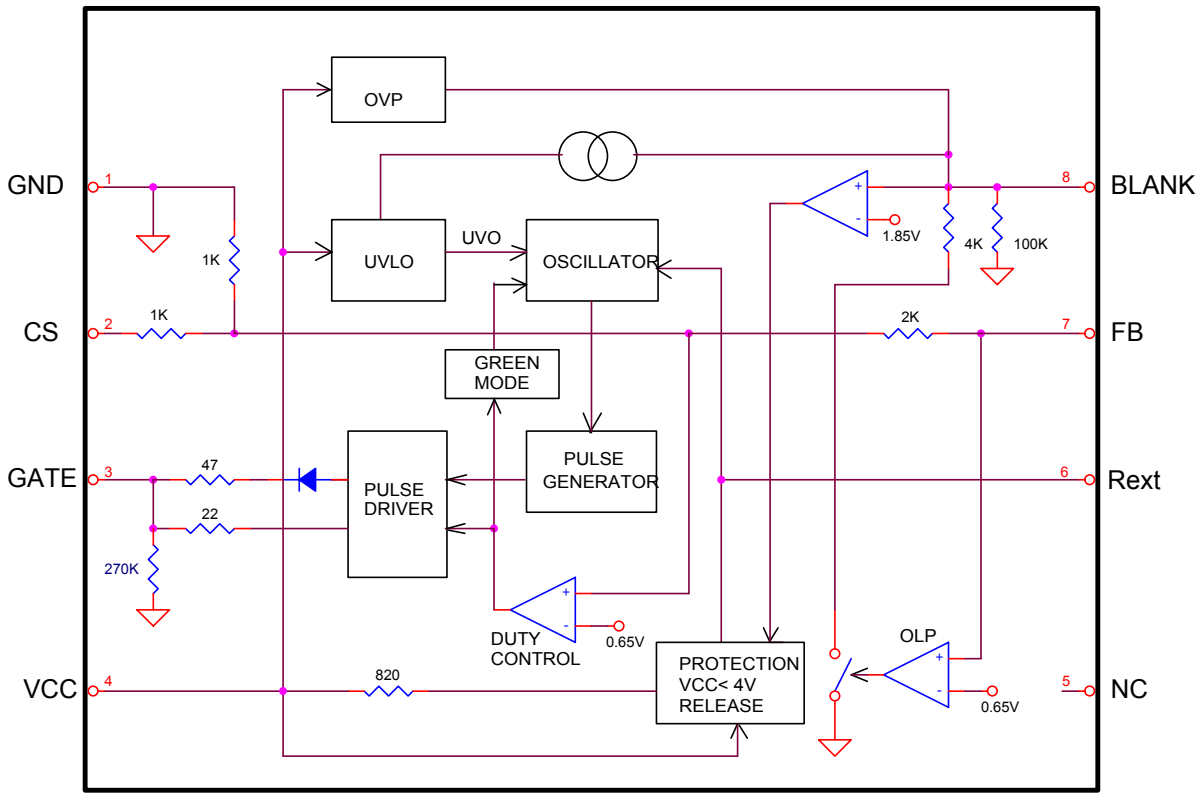
DEVICE SELECTION GUIDE

DIP-8		SOP-8	
SnPb	**Pb Free**	**SnPb**	**Pb Free**
N3860P	N3860PG	N3860V	N3860VG

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	LIMITS	UNITS
Power Supply Voltage	Vcc	30	V
FB to GND Voltage	VFB	30	V
CS to GND Voltage	Vcs	-0.3 to 5	V
Power Dissipation at Ta =50℃ , SOP/DIP	PTOT	1000/1200	mW
Junction Temperature	Tj	- 25 ~ 150	℃
Storage Temperature	TSTG	- 55 ~ 150	℃
Lead Temperature (Soldering) 10S	TLEAD	300	℃

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THERMAL DATA

PARAMETER	SYMBOL	SOP- 8	DIP-8	UNIT
Thermal Resistance Junction to Ambient	θja	53	45	℃/W
Thermal Resistance Junction to Case	θjc	23	15	℃/W

ELECTRICAL SPECIFICATIONS

(Vcc =15V ,Ta = - 25℃ to 125℃, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Turn-up Threshold	Vcc(on)		16	17	18	V
Turn-off Threshold	Vcc(off)		9.5	10	10.5	V
Operating Voltage Range	Vcc		10.5	15	26	V
Operating Supply Current	Icc	Rext=75K ,No load		0.5		mA
Operating Supply Current	Icc	Rext=75K and 1.0nF output load		1		mA
Start-up Current	Istart			10	15	uA
Frequency Range	fs	Rext =75K	47	52	57	KHz
Rise Time	tr	1.0nF output load on pin3		300		nS
Fall Time	tf	1.0nF output load on pin3		200		nS
Max.Current Sense Voltage	Vcs(max)	Tc = 25℃	1.2	1.3	1.4	V
		Tc = 100℃	1.1	1.2	1.3	V
Over Voltage Protection Threshold	V(OVP)		26	28	30	V
Minimum Turn-on Time	Ton(min)			900		nS

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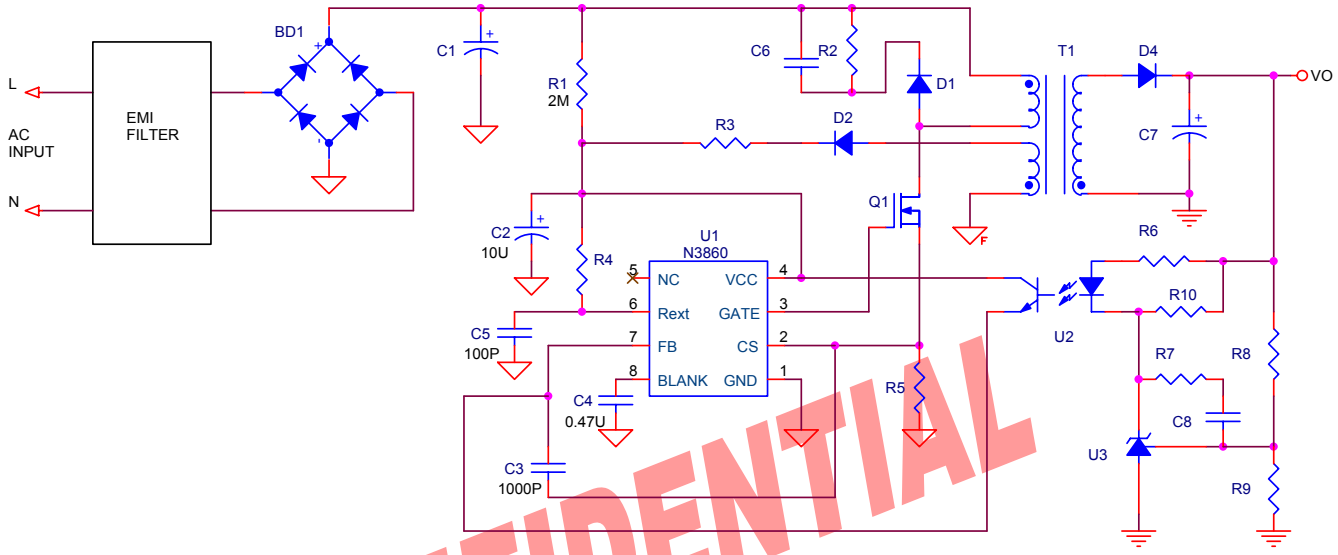
TYPICAL APPLICATION



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The maximum peak switch current is:

I PK = 1.1 / R5 (Tc = 100℃)

The frequency set by R4

fs = 4.1E9 / R4

OPERATION DESCRIPTION

Under Voltage Lockout (UVLO)

The turn-on/turn-off threshold are fixed at 17V/10V, The hold-up capacitor must be charged to 17V through the start-up resistor, then the device starts to work, if the hold-up capacitor be discharged to 10V, the device stops to work.

The hold-up capacitor should be enough to supply VCC before energy can be delivered from the auxiliary winding of the main transformer. VCC must not drop below 10V during start-up process. The UVLO function ensures the hold-up capacitor can adequately supply VCC.

Start-Up Current

The typical start-up current is only 10uA, This allows to use a high resistance of start-up resistor for minimizing power loss, therefore, a 2 MΩ start-up resistor and a 10uF VCC hold-up capacitor would be sufficient for the typical application.

Internal Over-Voltage Protection

The N3860 has built in a internal OVP function to prevent damage due to over-voltage of VCC, When the voltage of VCC exceeds 28V, to disable the output pulses and pull down the VCC voltage to 4V, then trying to restart, once the default has gone, the power device auto-recovers.

External Over-Voltage Protection

The N3860 is also provided an external OVP function to set lower over voltage threshold than internal OVP. The external over-voltage protection with an external zener diode ZD1 is showing on the bellowing application circuit.

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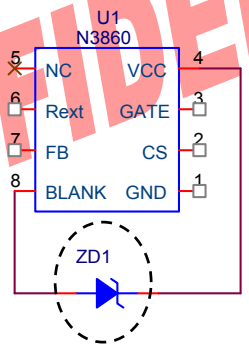
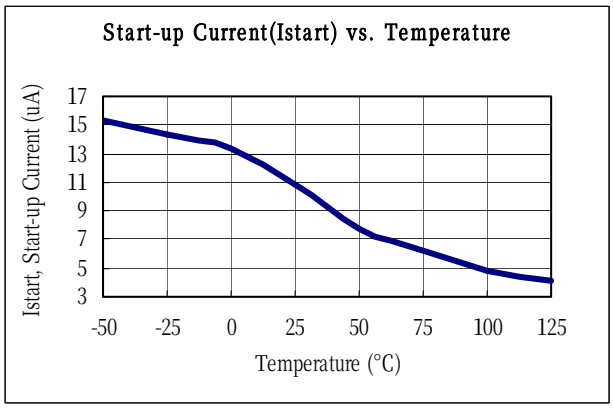
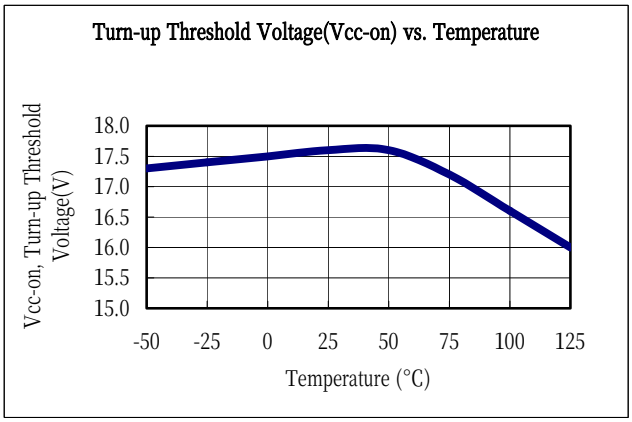


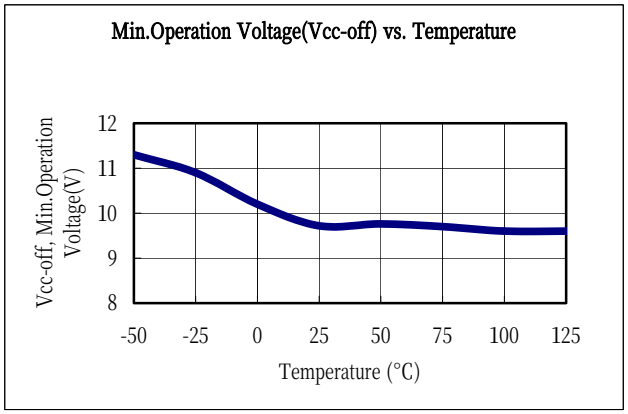
Constant Limited Power compensation

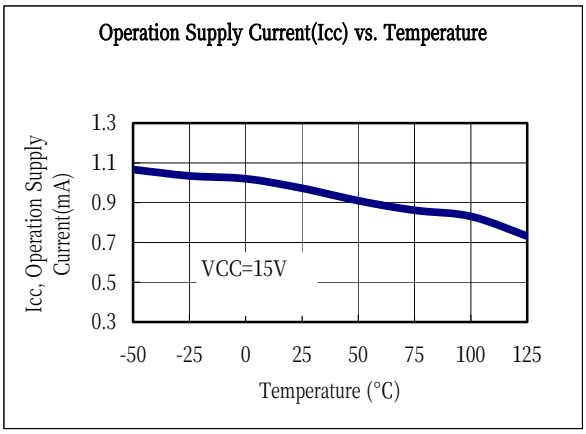
The N3860 provides a constant limited power compensation, It used a special feedback control with an external capacitor 1000pF across FB pin and CS pin to make output power equal, no mater input is low or high line condition.

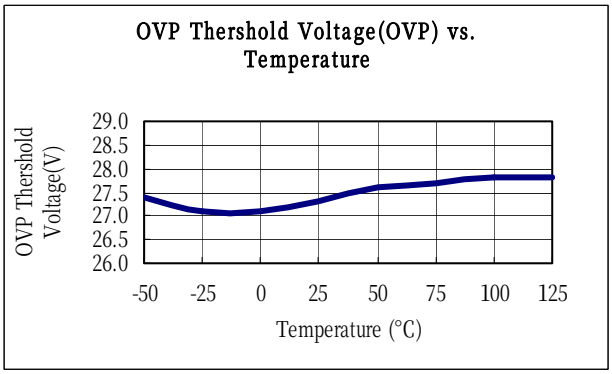
TYPICAL CHARACTERISTICS

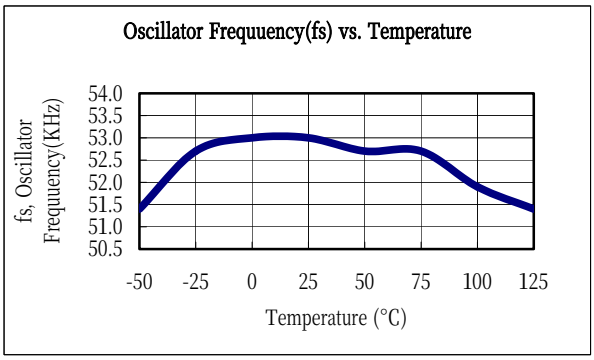


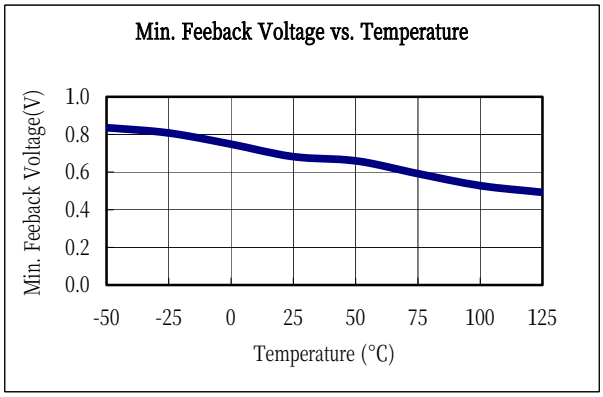


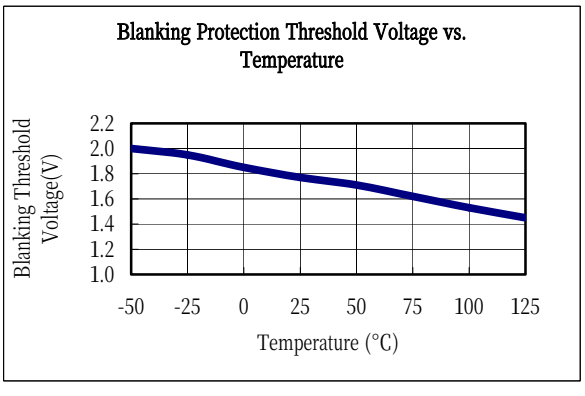

Min.Operation Voltage(Vcc-off) vs. Temperature
Vcc-off, Min.Operation Voltage(V)
12
11
10
9
8
-50 -25 0 25 50 75 100 125
Temperature (°C)


Operation Supply Current(Icc) vs. Temperature
Icc, Operation Supply Current(mA)
1.3
1.1
0.9
0.7
0.5
0.3
VCC=15V
-50 -25 0 25 50 75 100 125
Temperature (°C)

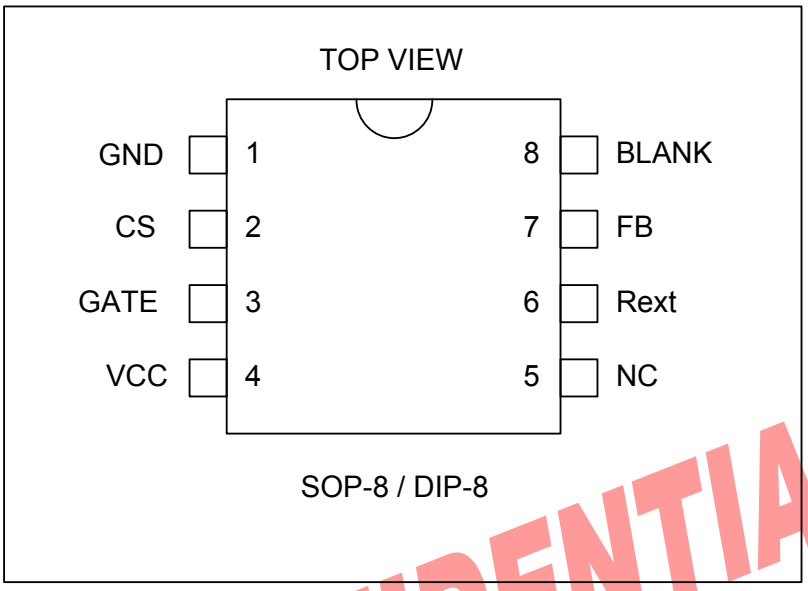

OVP Thershold Voltage(OVP) vs. Temperature
OVP Thershold Voltage(V)
29.0
28.5
28.0
27.5
27.0
26.5
26.0
-50 -25 0 25 50 75 100 125
Temperature (°C)


Oscillator Frequuency(fs) vs. Temperature
fs, Oscillator Frequuency(KHz)
54.0
53.5
53.0
52.5
52.0
51.5
51.0
50.5
-50 -25 0 25 50 75 100 125
Temperature (°C)


Min. Feeback Voltage vs. Temperature
Min. Feeback Voltage(V)
1.0
0.8
0.6
0.4
0.2
0.0
-50 -25 0 25 50 75 100 125
Temperature (°C)


Blanking Protection Threshold Voltage vs. Temperature
Blanking Threshold Voltage(V)
2.2
2.0
1.8
1.6
1.4
1.2
1.0
-50 -25 0 25 50 75 100 125
Temperature (°C)

PIN CONFIGURATIONS



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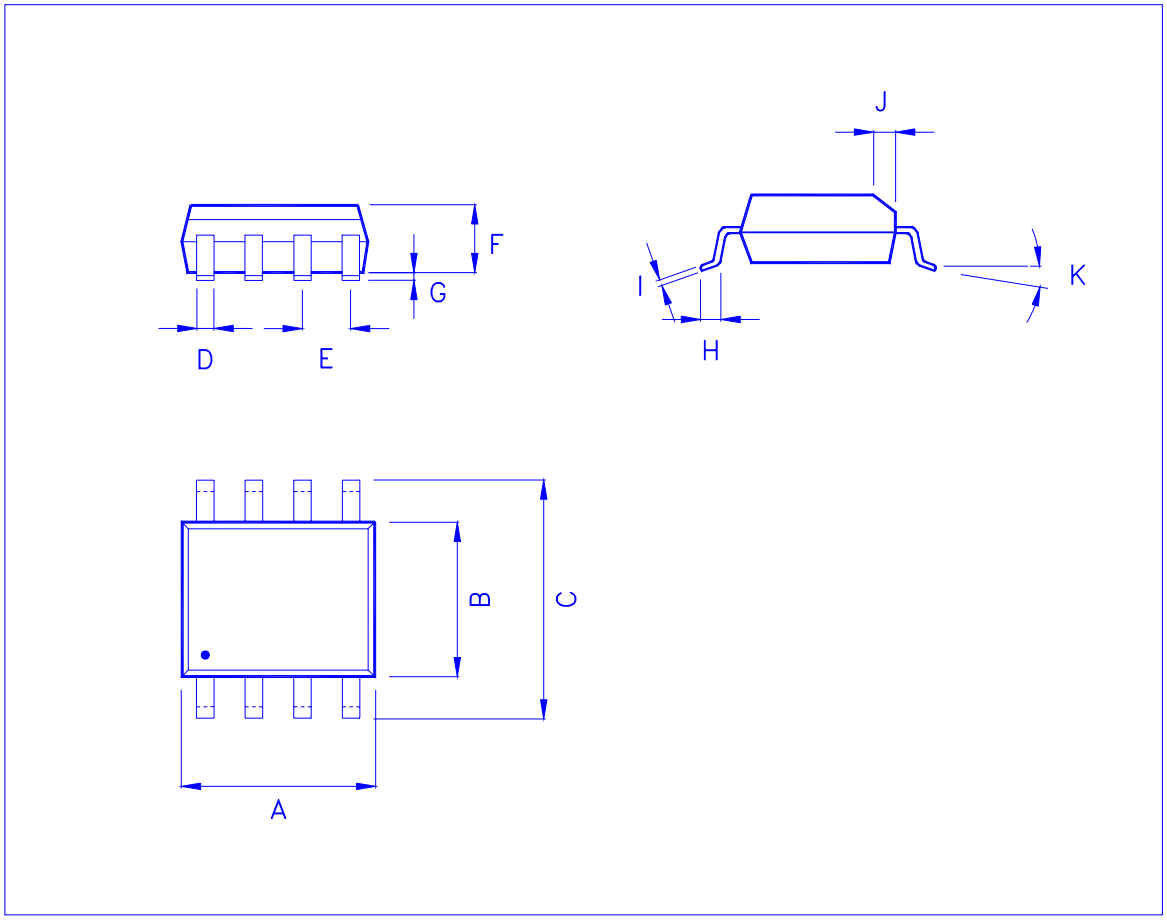
PIN FUNCTIONS

NO	FUNCTION	DESCRIPTION
1	GND	Ground, current return for both the signal and drive circuit.
2	CS	Current sense input pin, connect to the current sense resistor for power limiting.
3	GATE	Gate driver, connect to the gate of external power MOSFET.
4	VCC	Supply Voltage of this IC.
5	NC	Not connect.
6	Rext	Frequency setting resistor, connects a resistor to VCC pin and a capacitor to GND.(The capacitor is fixed to 100pF)
7	FB	Voltage feedback input.
8	BLANK	Set the blanking time to delay the protection operation.

SOP-8 (D) MECHANICAL DATA

Dimension	mm			Dimension	mm		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.8		5.0	H	0.4		1.27
B	3.8		4.0	I	0.18		0.25
C	5.8		6.2	J		0.22	
D	0.33		0.51	K	0°		8°
E		1.27		L			
F			1.75	M			
G	0.1		0.3	N			



DIP-8 MECHANICAL DATA

Dimension	mm			Dimension	mm		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	8.8		9.6	H	7.95		9.75
B	6.2		7.0	I			
C	0.35	0.45	0.55	J			
D		2.54		K			
E	0.5		0.8	L			
F	3.05	3.28	3.56	M			
G	7.48	7.62	8.13	N