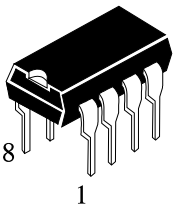
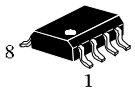
AUTOMOTIVE DIRECTION INDICATOR

The IL33193N-03, IL33193D-03 is a new generation industry standard UAA1041 “Flasher”. It has been developed for enhanced EMI sensitivity, system reliability, and improved wiring simplification. The IL33193N-03, IL33193D-03 is pin compatible with the UAA1041B.

It includes an RF filter on the Fault detection pin (Pin 07) for EMI purposes.



NSuffix
MS-001BA
(DIP-8)

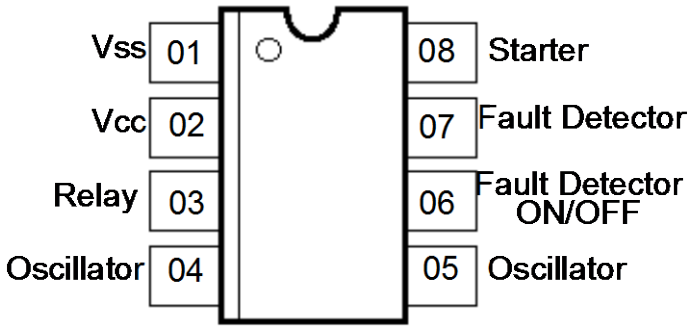


D Suffix
MS-012AA
(SO-8)

- IL33193N-03 - MS-001BA
- IL33193D-03 - MS-012AA

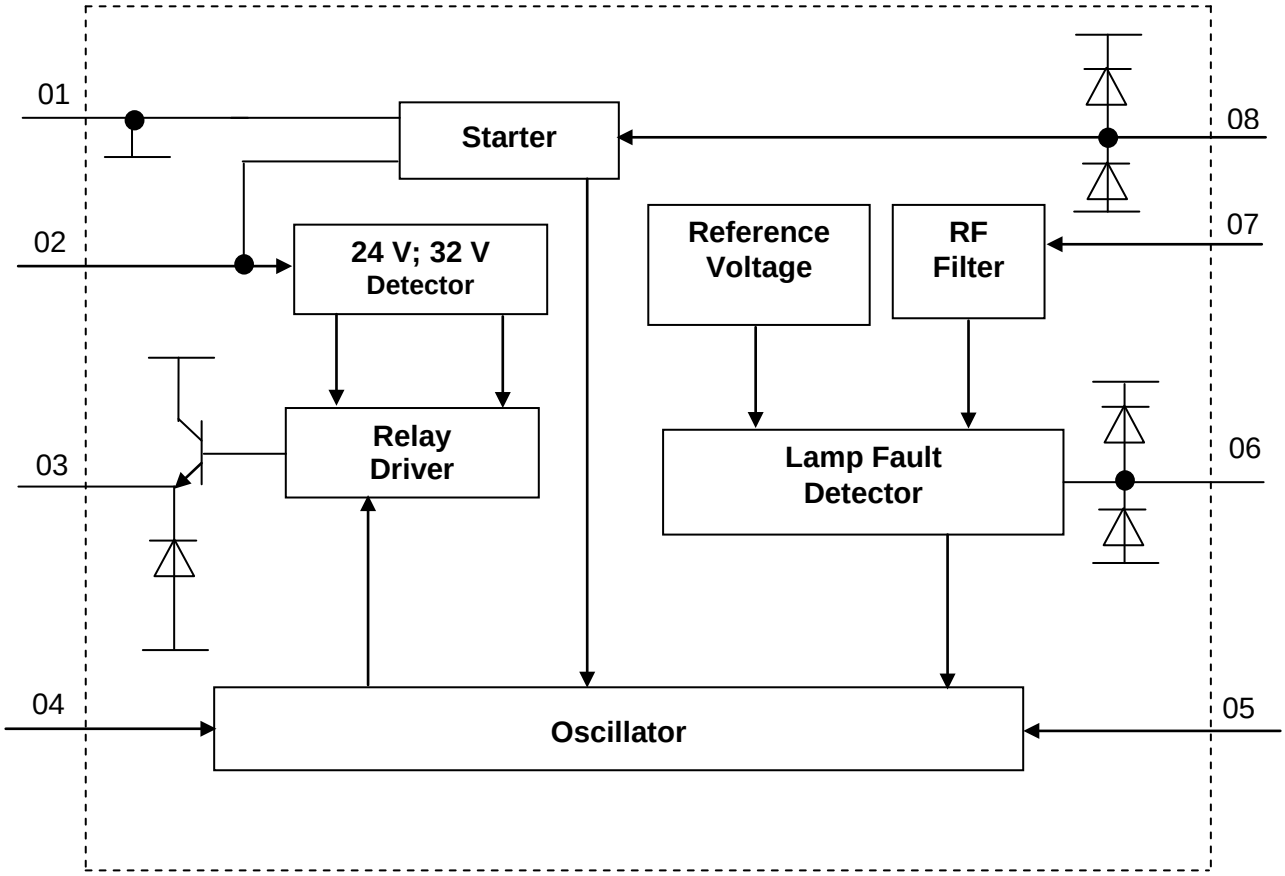
T_a=-45° to 125 °C for package MS-001BA
T_a=-45° to 105 °C for package MS-012AA

- Pin Compatible with the UAA1041B
- Defective Lamp Detection Threshold
- Short Circuit Detection and Relay Shutdown
- RF Filter for EMI Purposes
- Load Dump Protection
- Double Battery Capability for Jump Start Protection
- Internal Free Wheeling Diode Protection



(Top View)

Figure 1. Pin connections



This device contains 60 active transistors.

Figure 2. Simplified Block Diagram

Maximum Ratings

Rating	Symbol	Value		Unit
		Min	Max	
Pin 1 Positive Current (Continuous/Pulse)	I1+	-	150/500	mA
Pin 1 Negative Current (Continuous/Pulse)	I1–	-	–35/–500	mA
Pin 2 Current (Continuous/Pulse)	I2	-	±350/±1900	mA
Pin 3 Current (Continuous/Pulse)	I3	-	±300/±1400	mA
Pin 8 Current (Continuous/Pulse)	I8	-	±25/±50	mA
ESD (All Pins Except Pin 4)	V_{ESD}	-	1000	V
ESD (Pin 4)	V_{ESD4}	-	500	V
Junction Temperature	T_J	-	150	°C
Operation Ambient Temperature Range For IL33193N-03	T_A	–45	125	°C
For IL33193D-03		–45	105	°C
Storage Temperature Range	T_{stg}	–65	150	°C

Electrical Characteristics

(8.0 V ≤ V_{CC}=V_{bat} ≤ 18 V, –45°C ≤T_A ≤125°C (for IL33193N-03) and –45°C ≤ T_A ≤ 105°C (for IL33193D-03), unless otherwise noted)

Characteristic	**Symbol**	**Limits**		**Unit**
		Min	**Max**	
Battery Voltage Range (Normal Operation)	V_{bat}	8.0	18	V
Overvoltage Detector Threshold (VPin2 – VPin1)	V_{ih}	19	22	V
Clamping Voltage (R_{SS} = 220 Ω)	V_{cl}	27	32	V
Short Circuit Detector Threshold (VPin2-VPin7) T_A = 25 °C	$V_{Dth(sc)}$	0.63	0.77	V
T_A = –45; +125 °C (–45; +105 °C for IL33193D-03)		0.47	0.93	
Output Voltage [I = –250 mA (VPin2 – VPin3)]	V_{sat}	–	1.5	V
Oscillator Constant (T_A = 25 °C)	K_n	1.30	1.75	–
T_A = –45; +125 °C (–45; +105 °C for IL33193D-03)		1.25	1.85	–
Duty Cycle (Normal Operation)	Q_n	45	55	%
Oscillator Constant (One 21 W Lamp Defect, T_A=25°C)	K_f	0.45	0.75	–
T_A = –45; +125 °C (–45; +105 °C for IL33193D-03)		0.41	0.83	–
Duty Cycle (One 21 W Lamp Defect)	Q_f	35	45	%
Oscillator Constant (T_A = 25°C)	K3	0.12	0.20	–
Current Consumption (Relay “Off,” Enable Pin 6 High) V_{CC} = V_{bat} = 13.5 V, R_{SS} = 220 Ω	I_{CCL}	–	5.3	mA
Current Consumption (Relay “On”) V_{CC} = V_{bat} = 13.5 V, R_{SS} = 220 Ω	I_{CCH}	–	8.0	mA
Defect Lamp Detector Threshold [R3 = 220 Ω, (V_{Pin2} – V_{Pin7})] V_{CC} = V_{bat} = 13.5 V	V_S	75	95	mV
Note: R_{SS} Resistor between the Pin 01 and «Ground»				

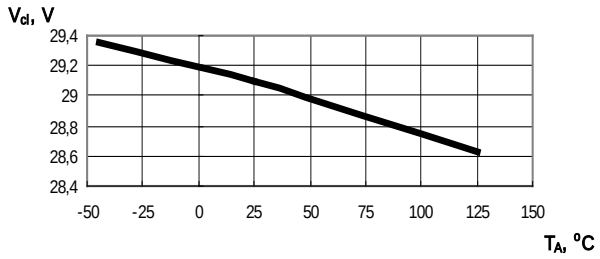


Figure 3. Clamping Voltage versus Ambient Temperature

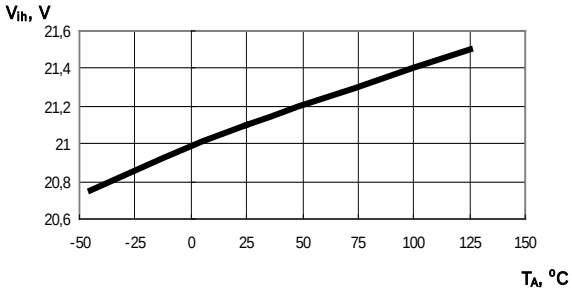


Figure 4. Overvoltage Detector Threshold versus Ambient Temperature

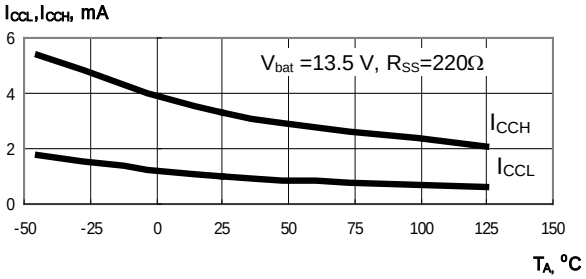


Figure 5. Supply Current versus Ambient Temperature

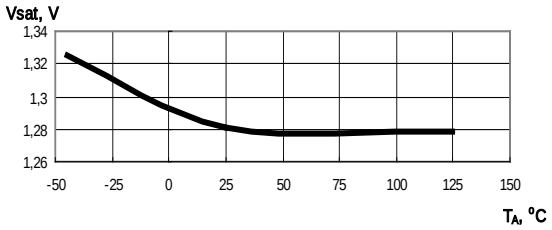


Figure 6. Output Voltage versus Ambient Temperature

Function Description

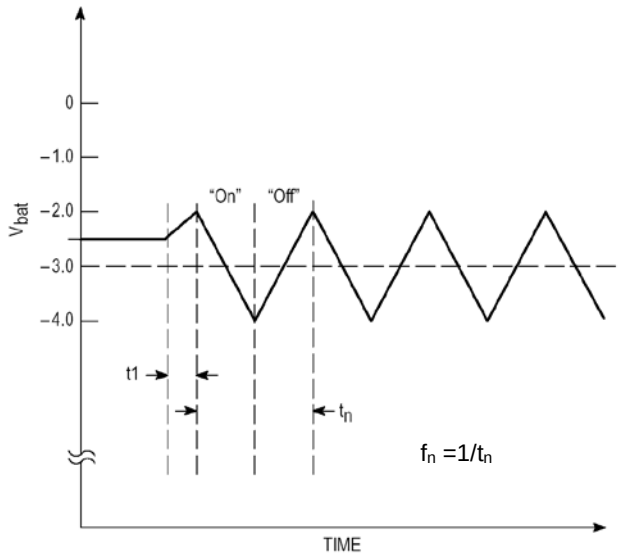


Figure 7. Normal Operation Oscillator Timing Diagram

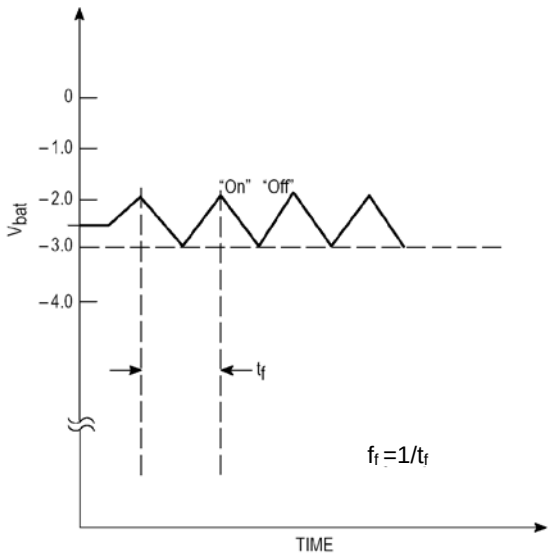


Figure 8. One Defective Lamp Oscillator Timing Diagram

Supply and Protection Systems

Pin 01 is connected to ground via resistor R1 which limits the current in the event of any high voltage transients. Pin 02 (V_{CC}) is the positive supply and may be connected directly to the vehicle's battery voltage.

Overvoltage and Double Battery Protection: When the applied V_{CC} to V_{SS} voltage is greater than 22 V, the overvoltage detector circuit turns the relay driver off. Both the device and the lamps are protected if two 12 V batteries are connected in series and used to jump start the vehicle.

Load Dump Overvoltage Protection: A 29 V overvoltage detector protects the circuits against high voltage transients due to load dumps and other low energy spikes. The relay driver is automatically turned on whenever the V_{CC} to V_{SS} voltage is greater than 32 V.

Overvoltage Protection, High Voltage Transients: The Fault Detector ON/OFF and the Starter pins are protected against positive and negative transients by internal on–chip diodes.

On–Chip Relay Driver

The device directly drives the flasher relay. The output structure is an Emitter of an NPN transistor. It contains the free wheeling diode circuitry necessary to protect the device whenever the relay is switched off.

Oscillator

The device uses a sawtooth oscillator (Figure 7, 8).

The frequency is determined by the external components C2 and R2. In the normal operating mode (Figure 7), the flashing frequency is: $f_n = 1/R2*C2*K_n$. With a defective (open) 21 W lamp (Figure 8), the flashing frequency changes to: $f_n = 2.5*f_f$.

Short circuit detection delay $t_3 = K3*R2*C2$.

Starter

Pin 08 is connected through a 3.3 kΩ resistor to the flashing lamp. Pin 08 is the input to the Starter function and senses the use of SA1 by sensing ground through the lamp (Figure 9).

Lamp Fault Detector with Internal RF Filter

A Lamp defect is sensed by the lamp fault detector's monitoring of the voltage developed across the external shunt resistor R4 (Figure 9) via the RF filter. The R4 voltage drop is compared to a V_{bat} dependent internal reference voltage (V_{ref}) to validate the comparison over the full battery voltage range. A detected fault causes the oscillator to change frequency (Figure 8).

Short Circuit Detector

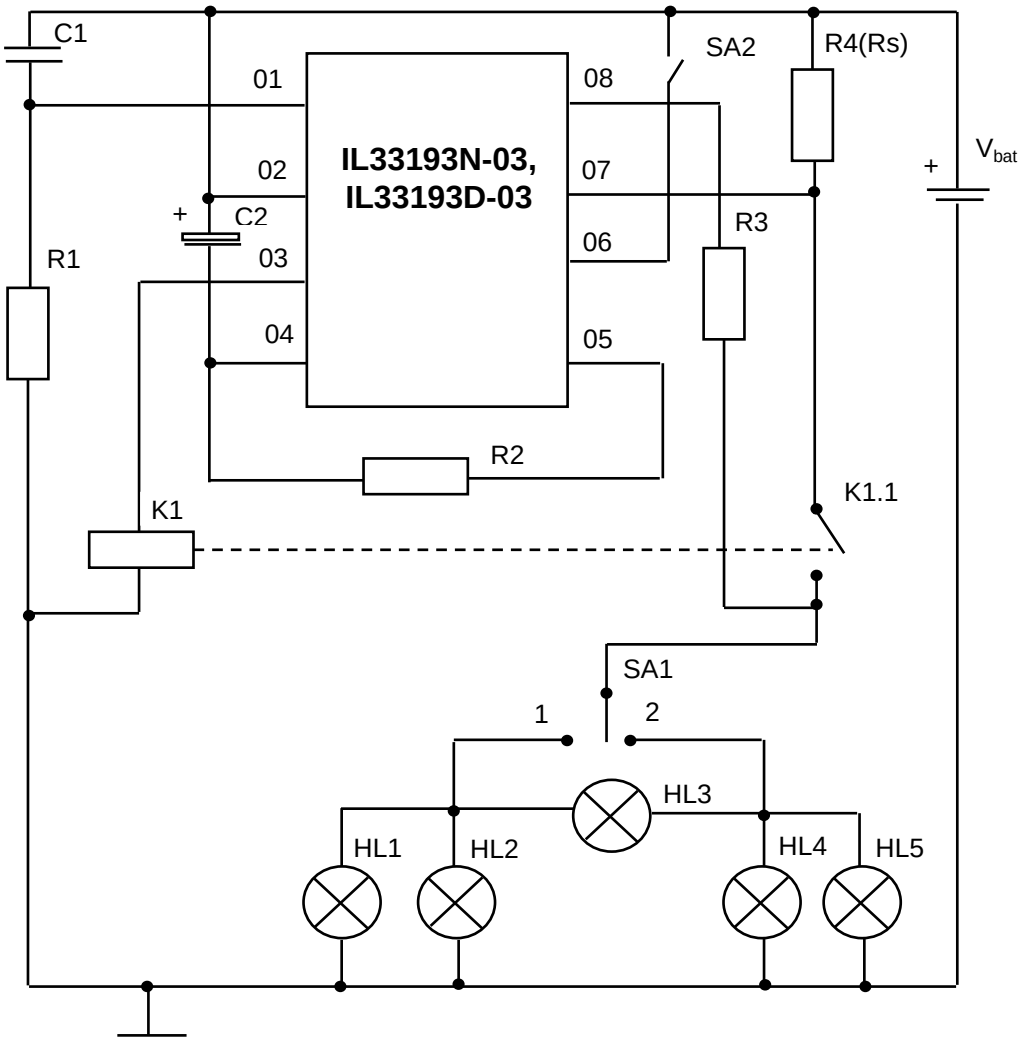
Detects excessive current (Ish > 25 A) flowing in the shunt resistor R4 (Figure 9). The detection takes place after a time delay of t_3 (t_3 = 55 ms). In this case, the relay will be turned off. The circuit is reset by switching SA1 to the off position.

Operation with Short Circuit Detection

Pin 06 has to be left open and a capacitor C1 has to be connected between Pin 01 and Pin 02.

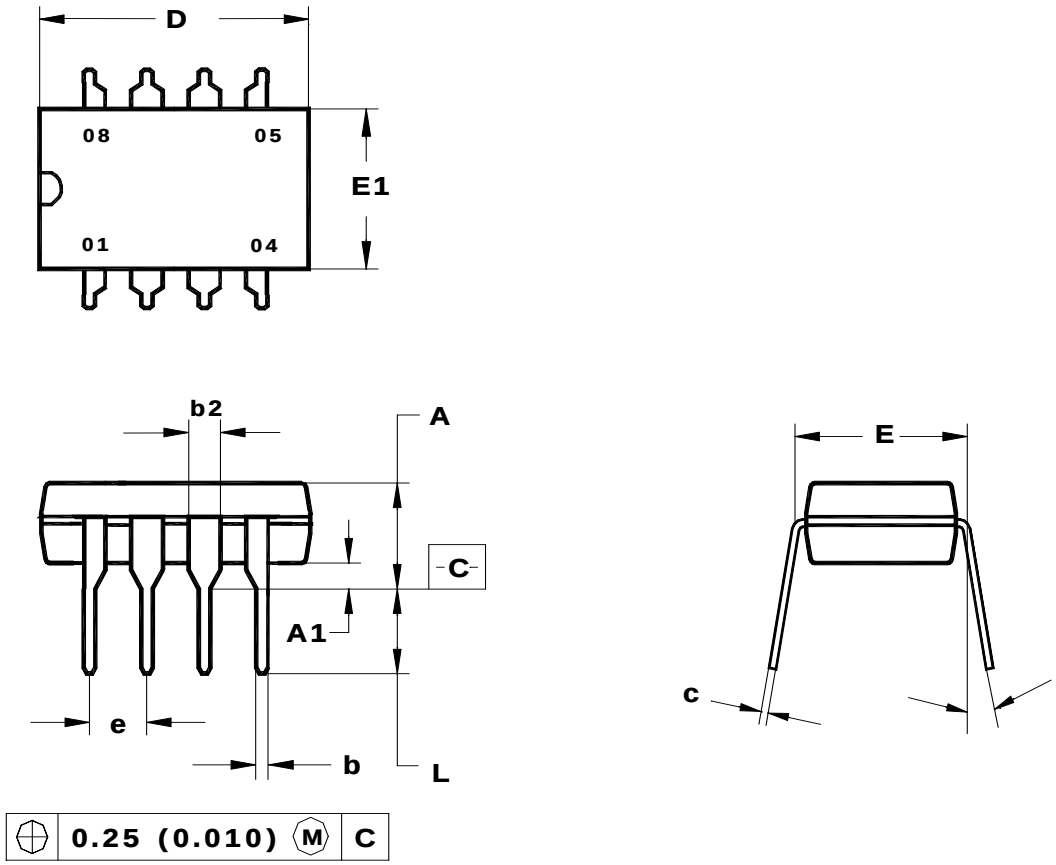
Operation without Short Circuit Detection

Pin 06 has to be connected to Pin 02, and the use of capacitor C1 is not necessary.



C1
C2 – 5.6 µF
K1, K1.1 – Relay
HL1, HL2, HL4, HL5 - 21 W Turn Signal Lamps
R1 - 220 Ω
R2 - 75 kΩ
R3 – 3.3 kΩ
R4 (Rs) - 30 mΩ

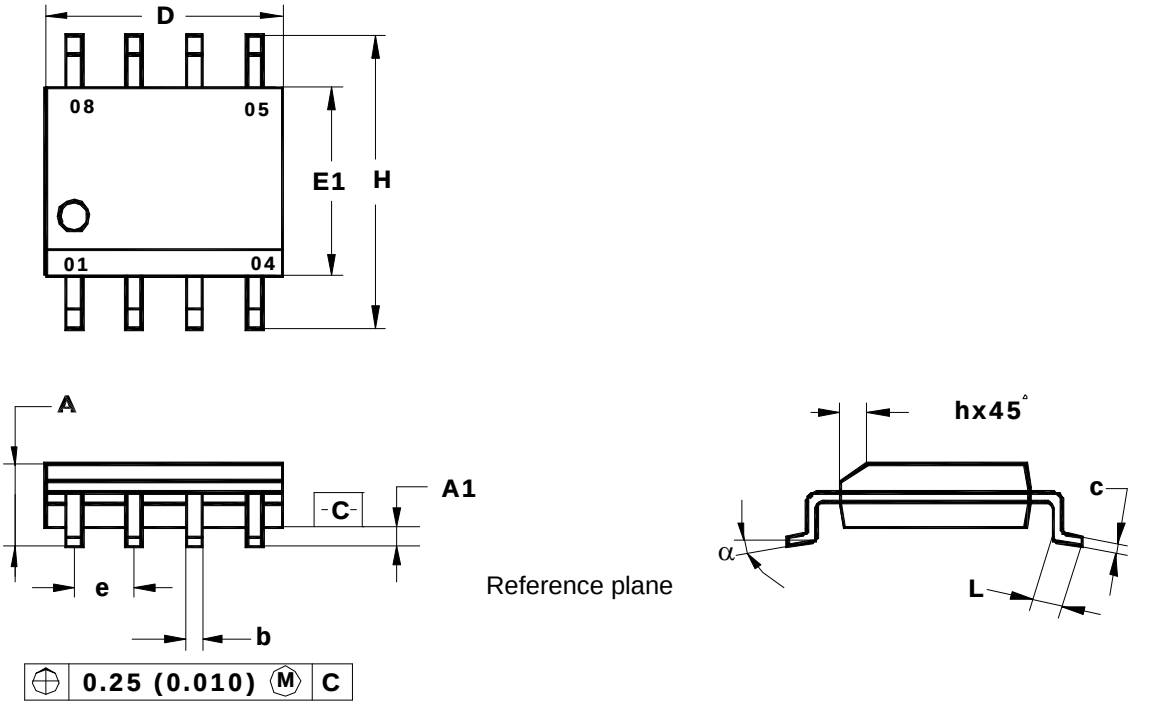
Figure 9. Typical Application



Note – The sizes D, E1 do not include size of the spew which should not be more 0,25 (0,010) on the side.

	D	E1	A	b	b2	e	α	L	E	c	A1
mm											
min	9.02	6.07	—	0.36	1.14		0°	2.93	7.62	0.20	0.38
max	10.16	7.11	5.33	0.56	1.78	2.54	15°	3.81	8.26	0.36	—
inches											
min	0.355	0.240	—	0.014	0.045		0°	0.115	0.300	0.008	0.015
max	0.400	0.280	0.210	0.022	0.070	0.1	15°	0.150	0.325	0.014	—

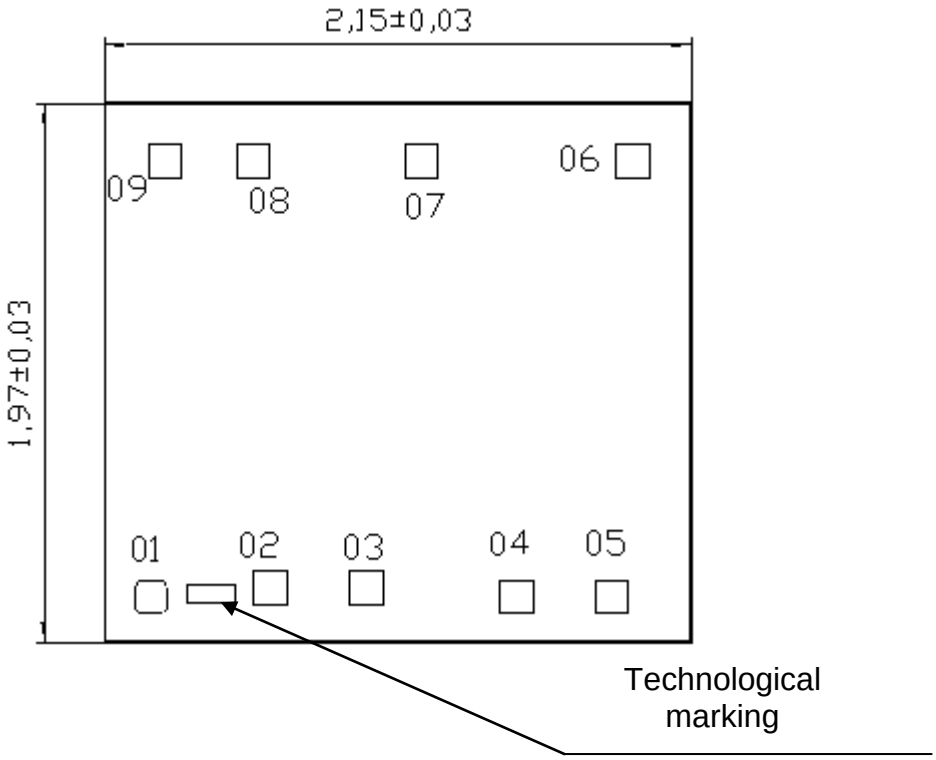
Figure 10. DIP- packade (MS-001BA) dimensions



Note - Dimensions D, E1 does not include flash value that should not exceed 0,25 mm (0.010) per side.

	D	E1	H	b	e	α	A	A1	c	L	h
Millimiters											
min	4.80	3.80	5.80	0.33		0°	1.35	0.10	0.19	0.41	0.25
max	5.00	4.00	6.20	0.51	1.27	8°	1.75	0.25	0.25	1.27	0.50
Inches											
min	0.1890	0.1497	0.2284	0.013		0°	0.0532	0.0040	0.0075	0.016	0.0099
max	0.1968	0.1574	0.2440	0.020	0.100	8°	0.0688	0.0090	0.0098	0.050	0.0196

Figure 11. Overall dimensions of package MS-012AA



Technological marking on chip «193M» with the coordinates, mm: left bottom corner x = 0.339, y = 0.147.

Chip thickness is 0.35 ± 0.02 mm.

Figure 12 - Dimensional drawing of the chip

Coordinates of the contact pads

Contact pad number	Coordinates (left bottom corner), mm	
	X	Y
01	0.110	0.110
02	0.544	0.140
03	0.898	0.140
04	1.448	0.110
05	1.797	0.110
06	1.873	1.700
07	1.098	1.700
08	0.483	1.700
09	0.159	1.700

Notes

1 Coordinates of the contact pads are provided for "passivation" layer.

2 The size of the contact pads makes 0.120x0.120 mm

Thickness and composition of the metal on the front side	Al+1%Si	1.40±0.15 µm
Thickness and composition of the metal on the back side	-	