

## Self-oscillating Half-bridge Driver

### Features

- Floating channel designed for bootstrap operation to +600V
- Noise immunity of transient voltage
- Under-voltage lockout
- Programmable oscillator frequency
- Matched propagation delay for both channels
- Ultra low startup current of 75uA
- Shutdown function turns off both channels
- Low side output in phase with  $R_T$

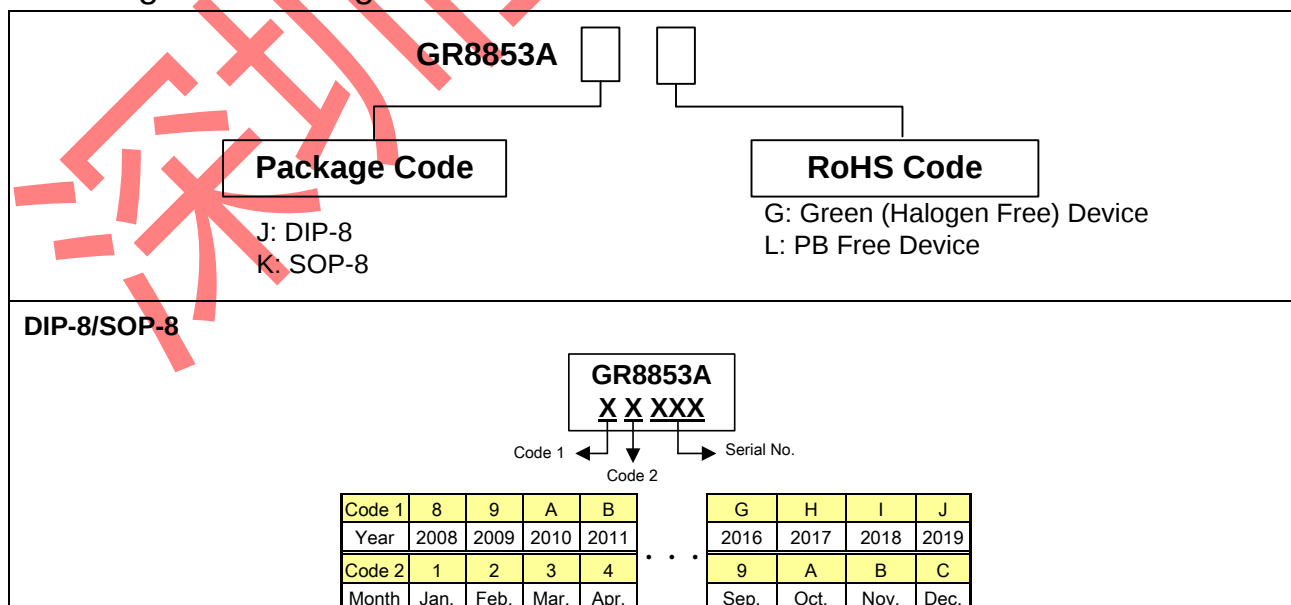
### Applications

- HID lamp ballast
- PDP sustain driver
- Motor driver
- SMPS

### Description

GR8853A is a high voltage, high speed, self-oscillating power MOSFET and IGBT driver with both high and low side referenced output channels. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. The front end features a programmable oscillator which is similar to the 555 timer. The output drivers feature a high pulse current buffer stage and an internal dead time designed for minimum driver cross-conduction. Propagation delays for the two channels are matched to simplify use in 50% duty cycle applications. The floating channel can be used to drive an N-MOSFET or IGBT in the high side configuration that operates off a high voltage rail up to 600 volts.

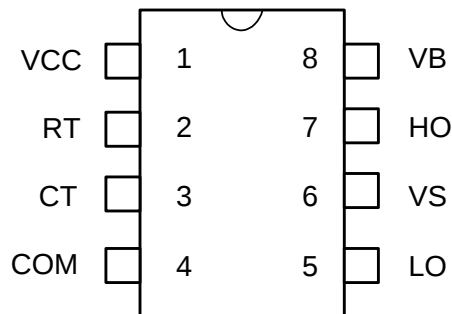
### Ordering and Marking Information



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## Pin Configuration

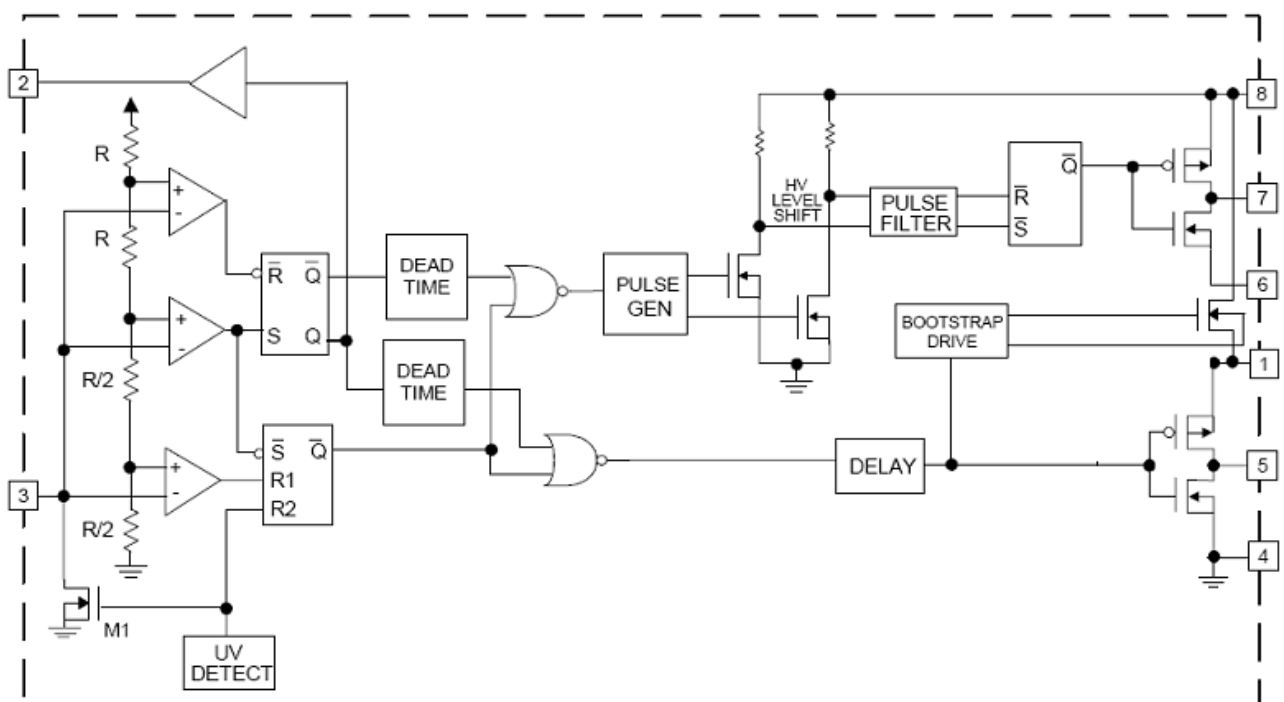
**TOP VIEW**



## Pin Description

| Pin No. | Name | Function                                                                                                                       |
|---------|------|--------------------------------------------------------------------------------------------------------------------------------|
| 1       | VCC  | Low side and logic fixed supply                                                                                                |
| 2       | RT   | Oscillator timing resistor input, in phase with HO for normal IC operation                                                     |
| 3       | CT   | Oscillator timing capacitor input, the oscillator frequency according to the following equation: $f = 0.7213 / (RT \times CT)$ |
| 4       | COM  | Low side return                                                                                                                |
| 5       | LO   | Low side gate drive output                                                                                                     |
| 6       | VS   | High side floating supply return                                                                                               |
| 7       | HO   | High side gate drive output                                                                                                    |
| 8       | VB   | High side floating supply                                                                                                      |

## Block Diagram



## Absolute Maximum Ratings

|                                                           |       |                   |   |   |
|-----------------------------------------------------------|-------|-------------------|---|---|
| Supply voltage VCC                                        | ----- | 19V               |   |   |
| VB                                                        | ----- | - 0.3V ~ 625V     |   |   |
| VS                                                        | ----- | VB-25V ~ VB+0.3V  |   |   |
| HO                                                        | ----- | VS-0.3V ~ VB+0.3V |   |   |
| LO, RT, CT                                                | ----- | - 0.3V ~ VCC+0.3V |   |   |
| Junction temperature                                      | ----- | 150°C             |   |   |
| Operating ambient temperature                             | ----- | - 20°C ~ 85°C     |   |   |
| Storage temperature range                                 | ----- | - 65°C ~ 150°C    |   |   |
| SOP-8 package thermal resistance                          | ----- | 160°C/W           |   |   |
| DIP-8 package thermal resistance                          | ----- | 100°C/W           |   |   |
| Power dissipation (SOP-8, at ambient temperature = 85°C)  | ----- | 400mW             |   |   |
| Power dissipation (DIP-8, at ambient temperature = 85°C)  | ----- |                   |   |   |
| 6                                                         | 5     | 0                 | m | W |
| Lead temperature (All Pb free packages, soldering, 10sec) | ----- | 260°C             |   |   |
| ESD voltage protection, human body model                  | ----- | 3KV               |   |   |
| ESD voltage protection, machine model                     | ----- | 200V              |   |   |

## Recommended Operating Conditions

| Item               | Min.    | Max. | Unit |
|--------------------|---------|------|------|
| Supply voltage VCC | 10      | 18   | V    |
| Supply voltage VBS | VCC-0.7 | 18   | V    |

## Electrical Characteristics

VBIAS (VCC, VBS) = 12V, CL = 1000 pF, CT = 1 nF and TA = 25°C unless otherwise specified. The VIN, VTH and IIN parameters are referenced to COM. The VO and IO parameters are referenced to COM and are applicable to the respective output leads: HO or LO.

| Parameter | Conditions | Symbol | Min. | Typ. | Max. | Unit |
|-----------|------------|--------|------|------|------|------|
|-----------|------------|--------|------|------|------|------|

### Low Voltage Supply Characteristics

|                                             |                                     |                    |     |     |     |    |
|---------------------------------------------|-------------------------------------|--------------------|-----|-----|-----|----|
| Rising VCC under-voltage lockout threshold  |                                     | V <sub>CCUV+</sub> | 8.1 | 9.0 | 9.9 | V  |
| Falling VCC under-voltage lockout threshold |                                     | V <sub>CCUV-</sub> | 7.2 | 8.0 | 8.8 | V  |
| VCC under-voltage lockout Hysteresis        |                                     | V <sub>CCUVH</sub> | 0.5 | 1.0 | 1.5 | V  |
| Micropower startup VCC supply current       | V <sub>CC</sub> ≤ V <sub>CCUV</sub> | I <sub>QCCUV</sub> | —   | 50  | 100 | μA |
| Quiescent VCC supply current                |                                     | I <sub>QCC</sub>   | —   | 160 | 300 | μA |
| VCC operating voltage                       |                                     | V <sub>op</sub>    | 10  | 12  | 18  | V  |

### Floating Supply Characteristics

|                                       |                                     |                    |   |    |    |    |
|---------------------------------------|-------------------------------------|--------------------|---|----|----|----|
| Micropower startup VBS supply current | V <sub>CC</sub> ≤ V <sub>CCUV</sub> | I <sub>QBSUV</sub> | — | 0  | 10 | μA |
| Quiescent VBS supply current          |                                     | I <sub>QBS</sub>   | — | 30 | 50 | μA |
| Offset supply leakage current         | VB=VS=600V                          | I <sub>LK</sub>    | — | —  | 50 | μA |

### Oscillator I/O Characteristics

|                                         |                                     |                   |      |       |      |     |
|-----------------------------------------|-------------------------------------|-------------------|------|-------|------|-----|
| Oscillator frequency (CT=1008pF)        | RT = 14.71k                         | f <sub>osc</sub>  | 47.2 | 48.2  | 49.2 | kHz |
| RT pin duty cycle                       | f <sub>osc</sub> < 100kHz           | d                 | 48   | 50    | 52   | %   |
| CT pin current                          |                                     | I <sub>CT</sub>   | —    | 0.001 | 1.0  | μA  |
| UV-mode CT pin pulldown current         | V <sub>CC</sub> = 7V                | I <sub>CTUV</sub> | 0.25 | 0.30  | 0.5  | mA  |
| Upper CT ramp voltage threshold         |                                     | V <sub>CT+</sub>  | —    | 8.0   | —    | V   |
| Lower CT ramp voltage threshold         |                                     | V <sub>CT-</sub>  | —    | 4.0   | —    | V   |
| CT voltage shutdown threshold           |                                     | V <sub>CTSD</sub> | 3.8  | 4.1   | 4.2  | V   |
| High-level RT output voltage, VCC - VRT | I <sub>RT</sub> = 100μA             | V <sub>RT+</sub>  | —    | 10    | 50   | mV  |
|                                         | I <sub>RT</sub> = 1mA               |                   | —    | 100   | 300  | mV  |
| Low-level RT output voltage             | I <sub>RT</sub> = 100μA             | V <sub>RT-</sub>  | —    | 10    | 50   | mV  |
|                                         | I <sub>RT</sub> = 1mA               |                   | —    | 100   | 300  | mV  |
| UV-mode RT output voltage               | V <sub>CC</sub> ≤ V <sub>CCUV</sub> | V <sub>RTUV</sub> | —    | 0     | 100  | mV  |
| SD-Mode RT output voltage, VCC - VRT    | I <sub>RT</sub> = 100μA             | V <sub>RTSD</sub> | —    | 10    | 50   | mV  |
|                                         | V <sub>CT</sub> = 0V                |                   |      |       |      | mV  |
|                                         | I <sub>RT</sub> = 1mA               |                   | —    | 100   | 300  | mV  |
|                                         | V <sub>CT</sub> = 0V                |                   |      |       |      | mV  |

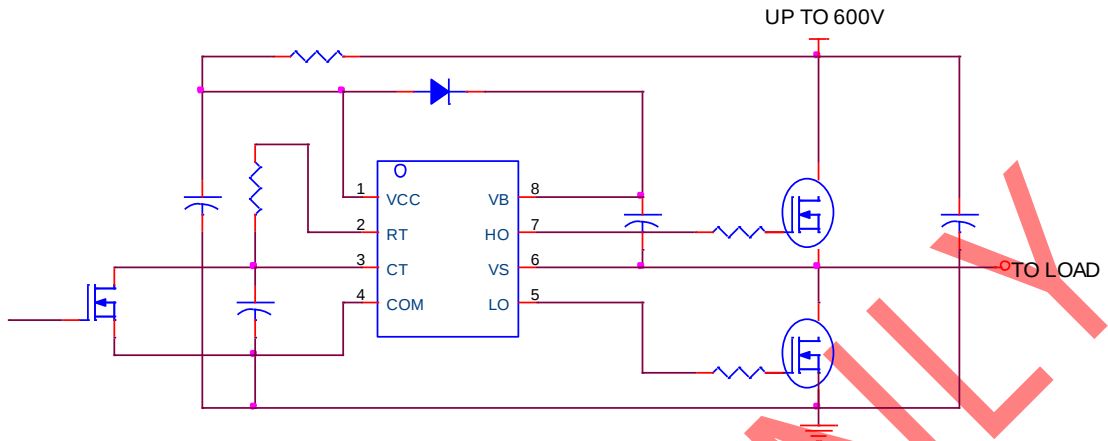
### Gate Driver Output Characteristics

|                            |                                     |     |   |     |     |      |
|----------------------------|-------------------------------------|-----|---|-----|-----|------|
| Output rise time (CL=1nF)  | V <sub>CC</sub> ≤ V <sub>CCUV</sub> | tr  | — | 80  | 150 | nsec |
| Output fall time (CL=1nF)  |                                     | tf  | — | 30  | 100 | nsec |
| Shutdown propagation delay |                                     | tsd | — | 660 | —   | nsec |

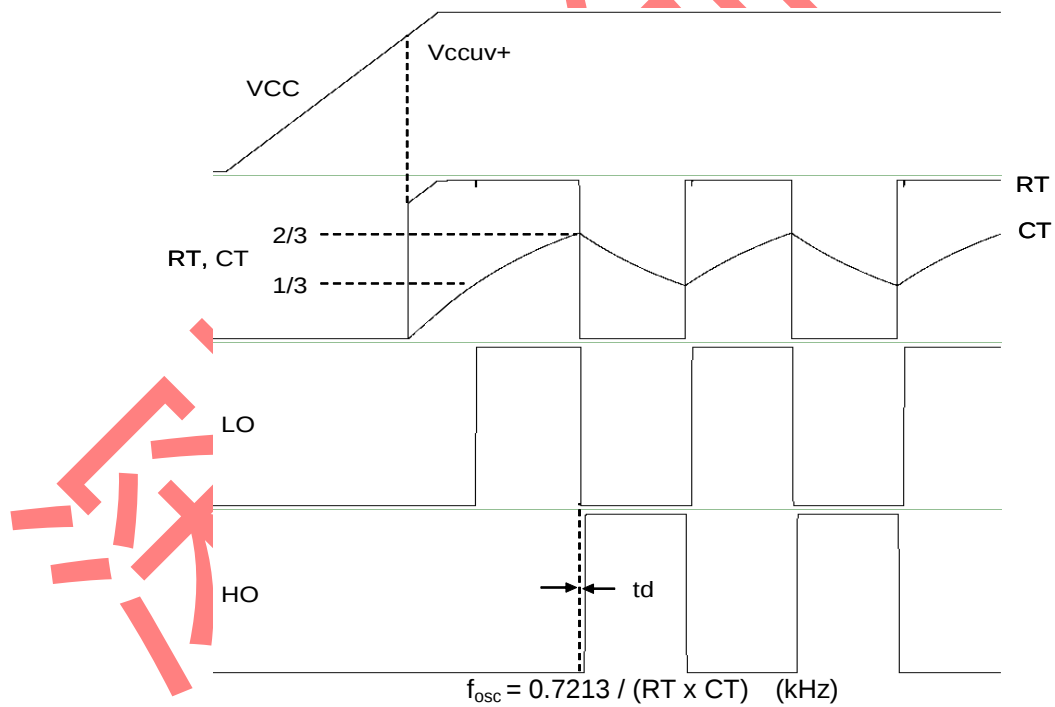


|                            |  |    |   |     |   |    |
|----------------------------|--|----|---|-----|---|----|
| Output deadtime (HO or LO) |  | td | — | 1.1 | — | μs |
|----------------------------|--|----|---|-----|---|----|

### Typical Application Circuit



### Input/Output Timing Diagram



## Typical Performance Characteristics

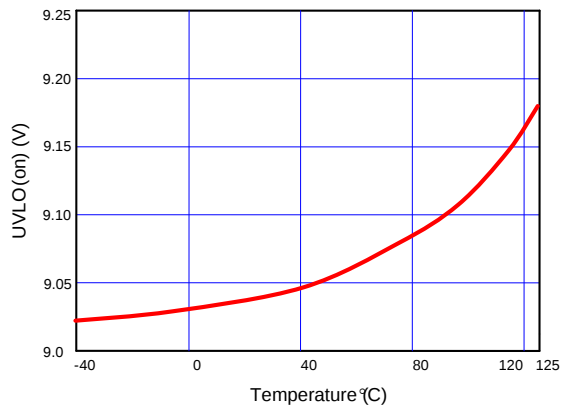


Fig. 1 UVLO(on) vs. Temperature

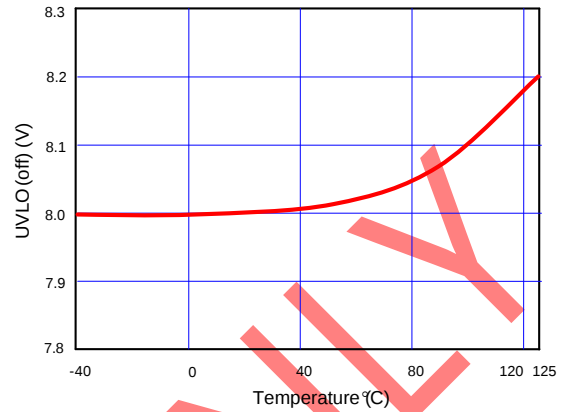


Fig. 2 UVLO(off) vs. Temperature

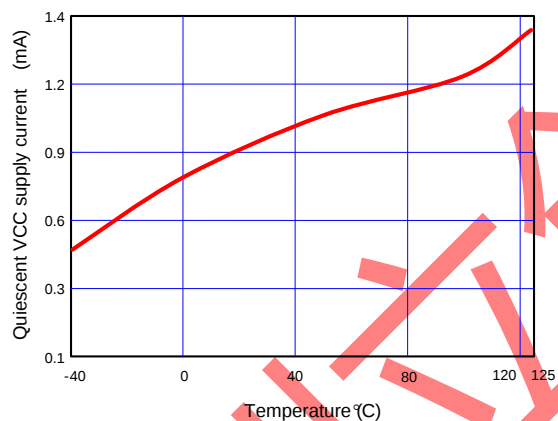


Fig. 3 Quiescent VCC supply current vs. Temperature

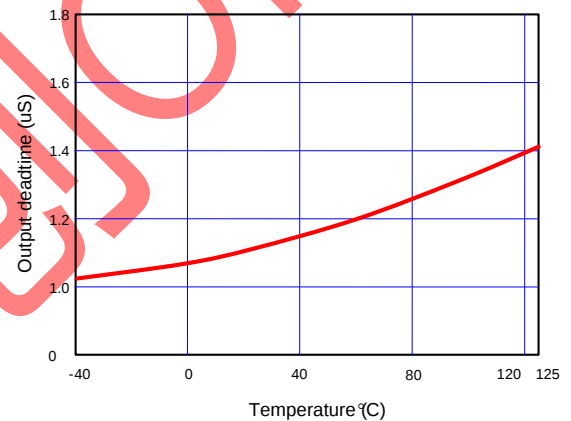


Fig. 4 Output deadtime vs. Temperature

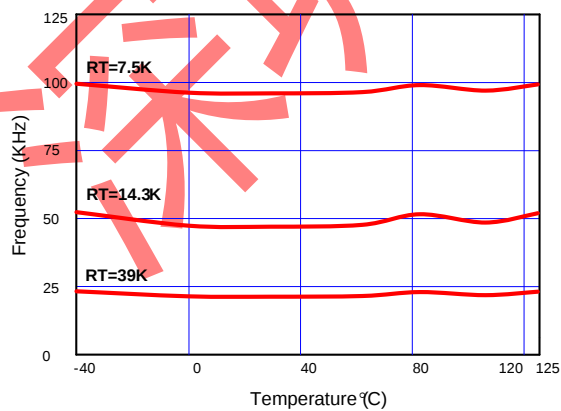
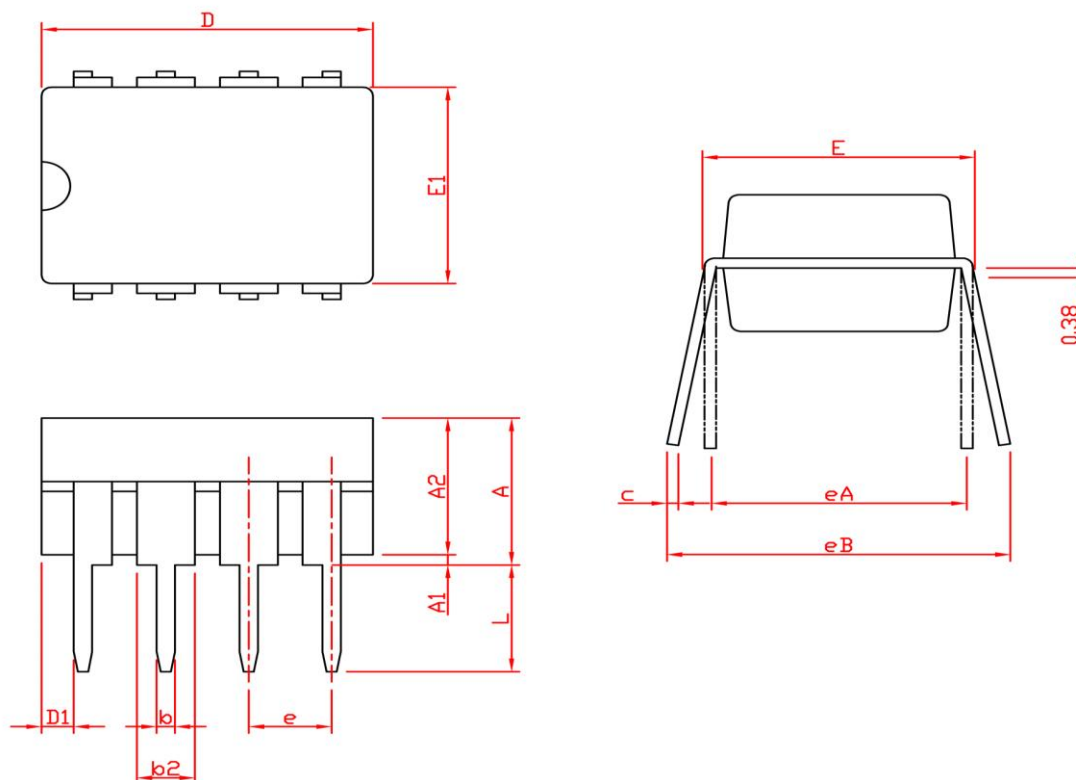


Fig. 5 Frequency vs. Temperature

## Package Information



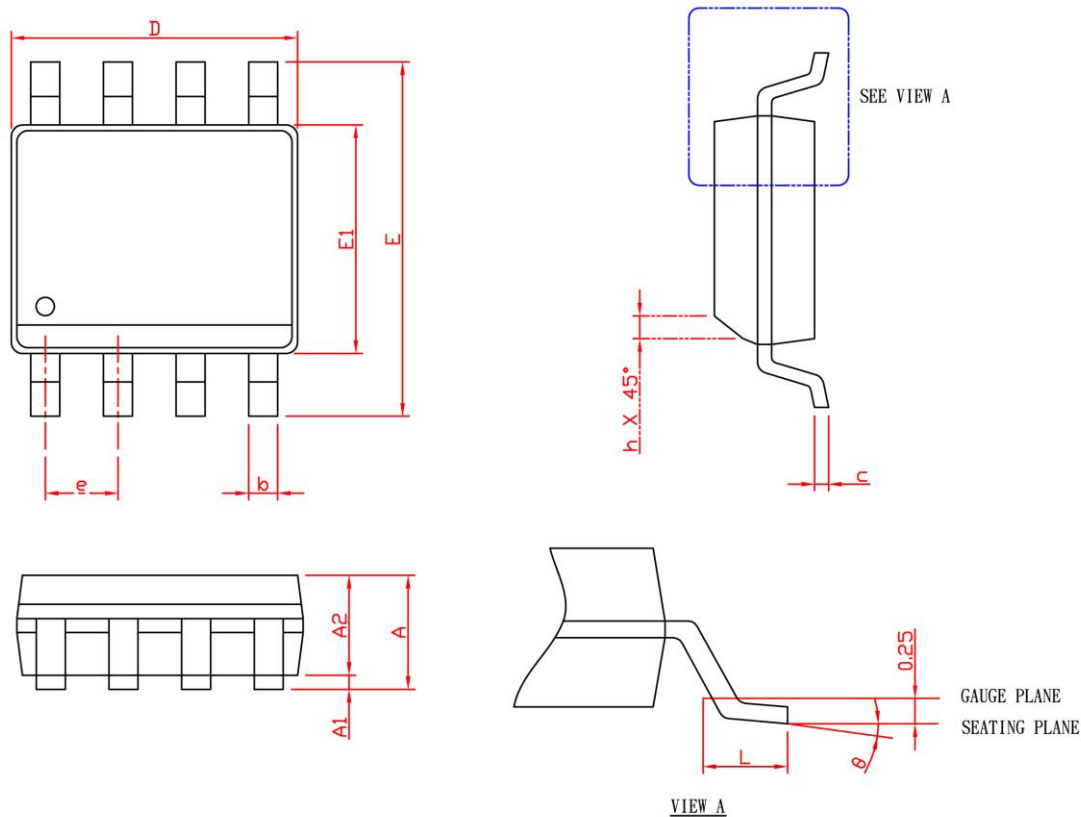
| SYMBOL | DIP-8       |       |           |       |
|--------|-------------|-------|-----------|-------|
|        | MILLIMETERS |       | INCHES    |       |
|        | MIN.        | MAX.  | MIN.      | MAX.  |
| A      |             | 5.33  |           | 0.210 |
| A1     | 0.38        |       | 0.015     |       |
| A2     | 2.92        | 4.95  | 0.115     | 0.195 |
| b      | 0.36        | 0.56  | 0.014     | 0.022 |
| b2     | 1.14        | 1.78  | 0.045     | 0.070 |
| c      | 0.20        | 0.35  | 0.008     | 0.014 |
| D      | 9.01        | 10.16 | 0.355     | 0.400 |
| D1     | 0.13        |       | 0.005     |       |
| E      | 7.62        | 8.26  | 0.300     | 0.325 |
| E1     | 6.10        | 7.11  | 0.240     | 0.280 |
| e      | 2.54 BSC    |       | 0.100 BSC |       |
| eA     | 7.62 BSC    |       | 0.300 BSC |       |
| eB     |             | 10.92 |           | 0.430 |
| L      | 2.92        | 3.81  | 0.115     | 0.150 |

Note: 1. Followed from JEDEC MS-001 BA.

2. Dimension D, D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 10 mil.



## Package Information



| SYMBOL | SOP-8       |      |           |       |
|--------|-------------|------|-----------|-------|
|        | MILLIMETERS |      | INCHES    |       |
|        | MIN.        | MAX. | MIN.      | MAX.  |
| A      |             | 1.75 |           | 0.069 |
| A1     | 0.10        | 0.25 | 0.004     | 0.010 |
| A2     | 1.25        |      | 0.049     |       |
| b      | 0.31        | 0.51 | 0.012     | 0.020 |
| c      | 0.17        | 0.25 | 0.007     | 0.010 |
| D      | 4.80        | 5.00 | 0.189     | 0.197 |
| E      | 5.80        | 6.20 | 0.228     | 0.244 |
| E1     | 3.80        | 4.00 | 0.150     | 0.157 |
| e      | 1.27 BSC    |      | 0.050 BSC |       |
| h      | 0.25        | 0.50 | 0.010     | 0.020 |
| L      | 0.40        | 1.27 | 0.016     | 0.050 |
| θ      | 0°          | 8°   | 0°        | 8°    |

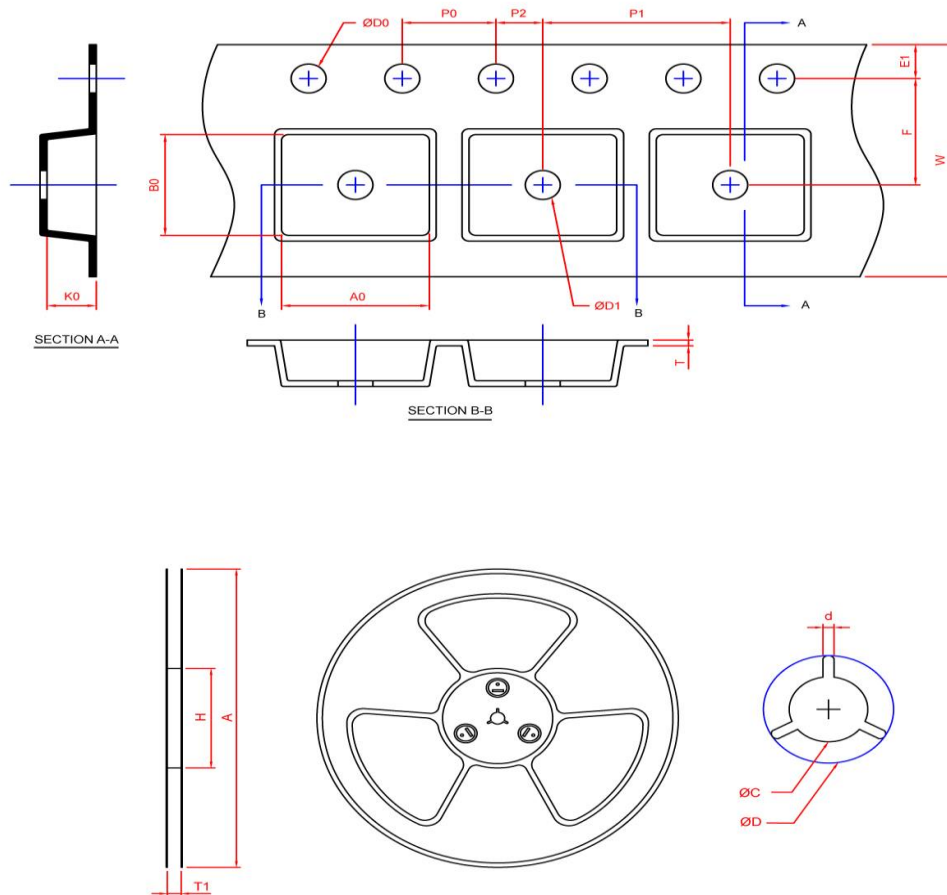
Note: 1. Followed from JEDEC MS-012 AA.

2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.

3. Dimension "E1" does not include inter-lead flash or protrusions. Inter-lead flash and protrusions shall not exceed 10 mil per side.

## Carrier Tape & Reel Dimensions

### SOP- 8



| Application | A         | H        | T1                 | C                  | d        | D                 | W         | E1        | F         |
|-------------|-----------|----------|--------------------|--------------------|----------|-------------------|-----------|-----------|-----------|
| SOP-8       | 330.0±2.0 | 50 MIN.  | 12.4+2.00<br>-0.00 | 13.0+0.50<br>-0.20 | 1.5 MIN. | 20.2 MIN.         | 12.0±0.30 | 1.75±0.10 | 5.5±0.05  |
|             | P0        | P1       | P2                 | D0                 | D1       | T                 | A0        | B0        | K0        |
|             | 4.0±0.10  | 8.0±0.10 | 2.0±0.05           | 1.5+0.10<br>-0.00  | 1.5 MIN. | 0.6+0.00<br>-0.40 | 6.40±0.20 | 5.20±0.20 | 2.10±0.20 |

(mm)

### Devices Per Unit

| Application | Carrier Width | Cover Tape Width | Devices Per Reel |
|-------------|---------------|------------------|------------------|
| SOP- 8      | 12            | -                | 2500             |

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