



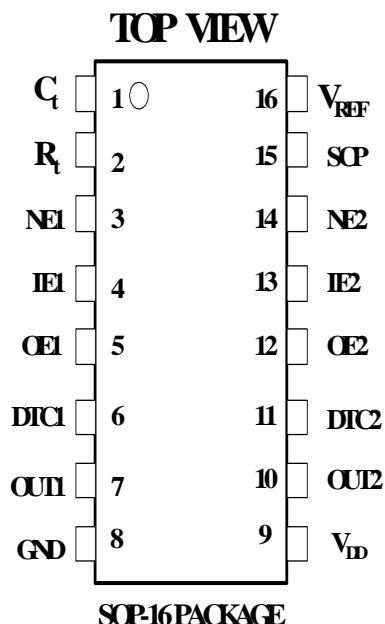
Details are subject to change without notice

2-CHANNEL SWITCHING REGULATOR

FEATURES

- Complete PWM Power Control Circuitry
- Under-Voltage Lockout (UVLO) Protection
- Open Drain Output
- Output Short Circuit Protection
- Low Dissipation Current : 1.6mA
- Dead-Time Control : 0 % to 100%
- Wide Operating Frequency :
10kHz to 800kHz
- V_{DD} Range : 4.0V to 14.0V

PIN CONFIGURATION



GENERAL DESCRIPTION

The AAT1341 provides an integrated two-channel pulse-width-modulation (PWM) solution for the power supply of DC-DC system; this device offers system engineers the flexibility to tailor-make the power supply circuitry for specific applications. Each channel contains its own error amplifier, PWM comparator, dead-time control (DTC), and output driver. The under-voltage protection, oscillator, short circuit protection and voltage reference circuit are the common features of the two channels.

Both channels of AAT1341 can be used for DC-DC converter operations including step-up, step-down, and inverting. Dead-time control can be set to provide 0% to 100% dead-time through a resistive divider network. Soft-start can be implemented by paralleling the DTC resistor with a capacitor. Two dead-time control inputs are assigned for CH1 and CH2 individually, and dead-time control inputs can be used to control on / off operation.

With a minimal number of external components, the AAT1341 offers a simple and cost effective solution.



PIN DESCRIPTION

| PIN NO | NAME | I/O | DESCRIPTION |
|---------------|-------------|------------|---|
| 1 | C_t | I | External Timing Capacitance |
| 2 | R_t | I | External Timing Resistance |
| 3 | NE1 | I | Noninverting Input of Error Amplifier 1 |
| 4 | IE1 | I | Inverting Input of Error Amplifier 1 |
| 5 | OE1 | I | Output of Error Amplifier 1 |
| 6 | DTC1 | I | Output 1 Dead-Time / Soft-Start Setting |
| 7 | OUT1 | O | Output 1 |
| 8 | GND | | Ground |
| 9 | V_{DD} | I | Power Supply |
| 10 | OUT2 | O | Output 2 |
| 11 | DTC2 | I | Output 2 Dead-Time / Soft-Start Setting |
| 12 | OE2 | I | Output of Error Amplifier 2 |
| 13 | IE2 | I | Inverting Input of Error Amplifier 2 |
| 14 | NE2 | I | Noninverting Input of Error Amplifier 2 |
| 15 | SCP | I | Timer Latch Setting |
| 16 | V_{REF} | O | Reference Voltage (2.5V) Output |

**ABSOLUTE MAXIMUM RATINGS**

| CHARACTERISTICS | SYMBOL | VALUE | UNIT |
|--------------------------------------|---------------|---------------|------|
| Supply Voltage | V_{DD} | 14.0 | V |
| Input Voltage (IE -, DTC) | V_I | V_{DD} | V |
| Output Voltage | V_O | $V_{DD}+0.3$ | V |
| Output Current | I_O | 120 | mA |
| Operating Free-Air Temperature Range | T_C | - 20 to + 85 | °C |
| Storage Temperature Range | $T_{storage}$ | - 45 to + 125 | °C |
| Power Dissipation | P_d | 500 | mW |

RECOMMENDED OPERATING CONDITION

| CHARACTERISTICS | SYMBOL | MIN | MAX | UNIT |
|---|-----------|------|----------|------------|
| Supply Voltage, V_{DD} | V_{DD} | 4.0 | 14.0 | V |
| Input Voltage, IE1, IE2 | V_{cm} | 0.5 | 1.6 | V |
| Output Voltage | V_O | 0 | V_{DD} | V |
| Oscillation (OSC) Capacitance | C_{OSC} | 100 | 15,000 | pF |
| Oscillation (OSC) Resistance | R_{OSC} | 5.1 | 50.0 | k Ω |
| Oscillation (OSC) Frequency | f_{OSC} | 10 | 800 | kHz |
| Output Current, I_{OUT1} , I_{OUT2} | I_O | - | 100 | mA |
| Operating Free-Air Temperature | T_C | - 20 | 85 | °C |

**ELECTRICAL CHARACTERISTICS, $V_{DD} = 6.0V$ (UNLESS OTHERWISE SPECIFIED) (SEE NOTE 1)****OSCILLATOR**

| PARAMETER | | TEST CONDITION | MIN | TYP | MAX | UNIT |
|---------------------------------|----------------|--|-----|-----|-----|------|
| Frequency | f_{OSC} | $C_{OSC} = 220pF,$ $R_{OSC} = 10k$ | 320 | 400 | 480 | kHz |
| Frequency Changes with V_{DD} | $f_{\Delta V}$ | $V_{DD} = 4.0V$ to $14.0V,$ $T_C = 25^\circ C$ $C_{OSC} = 220pF,$ $R_{OSC} = 10k\Omega$ | - | 1 | - | % |

UNDER VOLTAGE PROTECTION

| PARAMETER | | TEST CONDITION | MIN | TYP | MAX | UNIT |
|------------------------------------|-----------|--------------------|-----|------|-----|------|
| Upper Threshold Voltage | V_{UPH} | $T_C = 25^\circ C$ | - | 2.90 | - | V |
| Lower Threshold Voltage | V_{UPL} | $T_C = 25^\circ C$ | - | 2.53 | - | V |
| Hysteresis ($V_{UPH} - V_{UPL}$) | V_{HYS} | $T_C = 25^\circ C$ | - | 0.37 | - | V |

SHORT CIRCUIT PROTECTION CONTROL

| PARAMETER | | TEST CONDITION | MIN | TYP | MAX | UNIT |
|--|-----------|----------------|------|------|------|---------|
| Input Threshold Voltage | V_{r1} | CH1, CH2 | 0.90 | 1.05 | 1.20 | V |
| Short-Circuit Detect Threshold Voltage | V_{r2} | | 1.48 | 1.64 | 1.80 | V |
| SCP Terminal Source Current | I_{SCP} | | -3.5 | -2.5 | -1.5 | μA |
| Stand-by Voltage | V_{STB} | | - | 50 | 100 | mV |
| Latch Voltage | V_{LT} | | - | 30 | 100 | mV |

Note1: Typical values of all parameters are specified at $T_C = 25^\circ C$.



ELECTRICAL CHARACTERISTICS, $V_{DD} = 6.0V$ (UNLESS OTHERWISE SPECIFIED) (SEE NOTE 1) (CONT.)

REFERENCE VOLTAGE

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|--------------------------|-----------|--|-----|-----|-----|------|
| Reference Voltage | V_{REF} | $I_{REF} = -1mA$, $T_C = 25^\circ C$ | 2.4 | 2.5 | 2.6 | V |
| Input Voltage Regulation | V_{RI} | $I_{REF} = -1mA$, $V_{DD} = 4.0V$ to $14.0V$ | - | 1 | 5 | mV |
| Output Regulation | V_{RO} | $I_{REF} = -0.1mA$ to $-3.0mA$ | - | 1 | 10 | mV |

EA (ERROR AMPLIFIER)

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|-----------------------------|-----------|----------------------|-----|----------|-----------|---------|
| Input Offset Voltage | V_{IO} | CH1, CH2, Unity Gain | - | - | 6 | mV |
| Input Bias Current | I_{IB} | CH1, CH2 | - | ± 15 | ± 100 | nA |
| Input Voltage Range | V_{IR} | CH1, CH2 | 0.5 | - | 1.6 | V |
| Open-Loop Voltage Gain | A_{VO} | | 70 | 85 | - | dB |
| Output Voltage Swing | V_{OS+} | | 2.3 | 2.5 | - | V |
| | V_{OS-} | | - | 0.7 | 0.9 | |
| Output Sink Current | I_{OS+} | OE=1.25V | 3 | 20 | - | mA |
| Output Source Current | I_{OS-} | OE=1.25V | -75 | -45 | - | μA |
| Common-Mode Rejection Ratio | CMRR | | 60 | 80 | - | dB |



**ELECTRICAL CHARACTERISTICS, $V_{DD} = 6.0V$
(UNLESS OTHERWISE SPECIFIED) (SEE NOTE 1) (CONT.)**

DEAD-TIME CONTROL & PWM

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|-------------------------------|------------|--------------------------------|------|------|------|---------|
| Input Bias Current | I_{IB} | $V_{DTC} = 2.0V$ | - | 0.1 | 1.0 | μA |
| Input Threshold Voltage (DTC) | V_{d0} | Duty = 0%, $f_{OSC} = 10kHz$ | 1.79 | 1.97 | 2.15 | V |
| | V_{d100} | Duty = 100%, $f_{OSC} = 10kHz$ | 1.32 | 1.48 | 1.64 | |
| Latch Input Voltage | V_{DTC} | $I_{DTC} = 40\mu A$ | 2.28 | 2.48 | - | V |
| Latch Mode Source Current | I_{DTC} | DTC1, DTC2=0V | -560 | -200 | - | μA |

OUTPUT STAGE

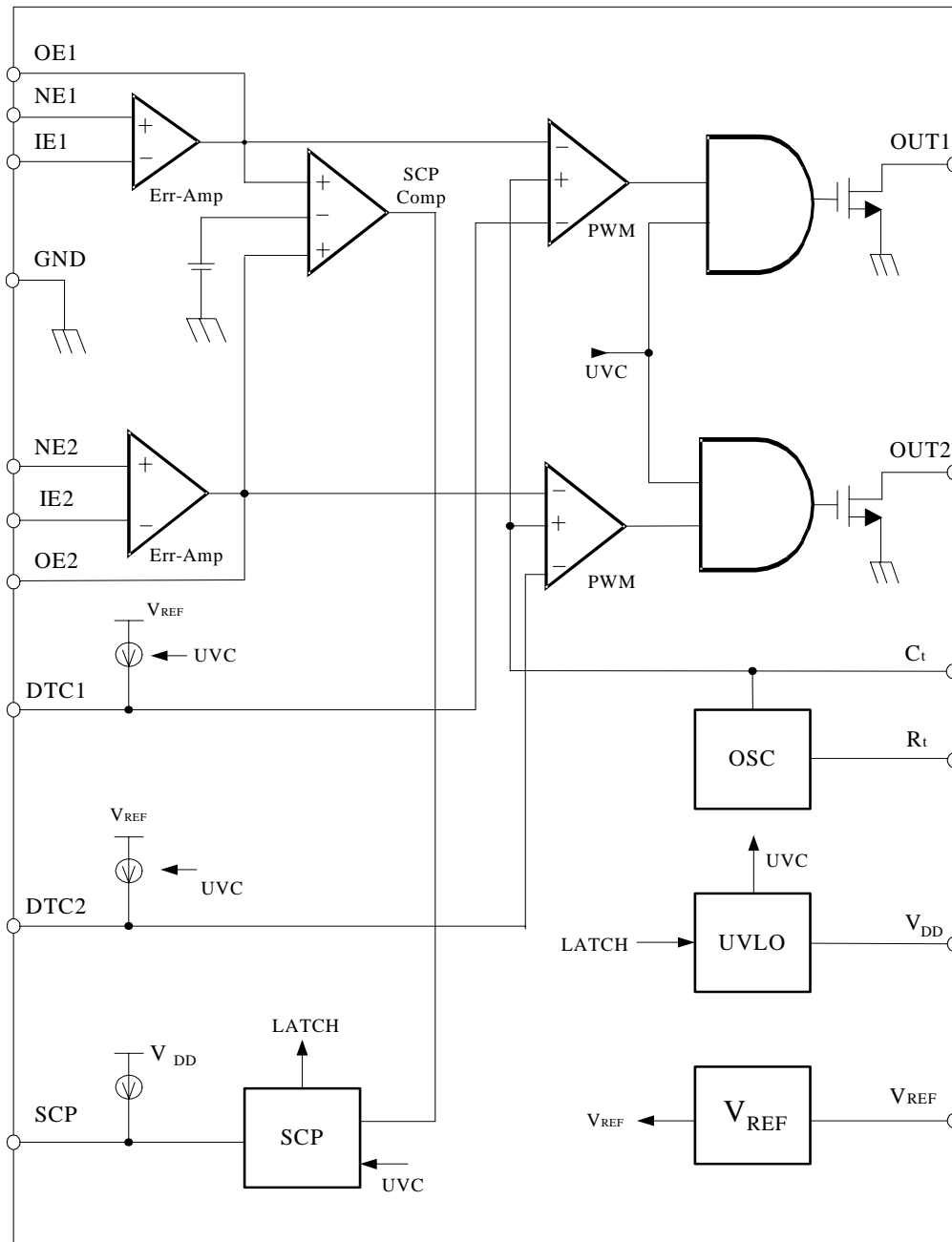
| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|--------------------|------------|---------------------------|-----|-----|-----|---------|
| Saturation Voltage | V_{SAT} | $I_O = 75mA$ (CH1, CH2) | - | 0.8 | 1.2 | V |
| Leakage Current | I_{LEAK} | $V_O = 14.0V$ | - | - | 5.0 | μA |

OPERATING CURRENT

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|----------------|--------------|-----------------------|-----|-----|-----|------|
| Supply Current | I_{DD-OFF} | Output "OFF" State | - | 1.3 | 1.8 | mA |
| | I_{DD-ON} | $R_{OSC} = 10k\Omega$ | - | 1.6 | 2.3 | mA |

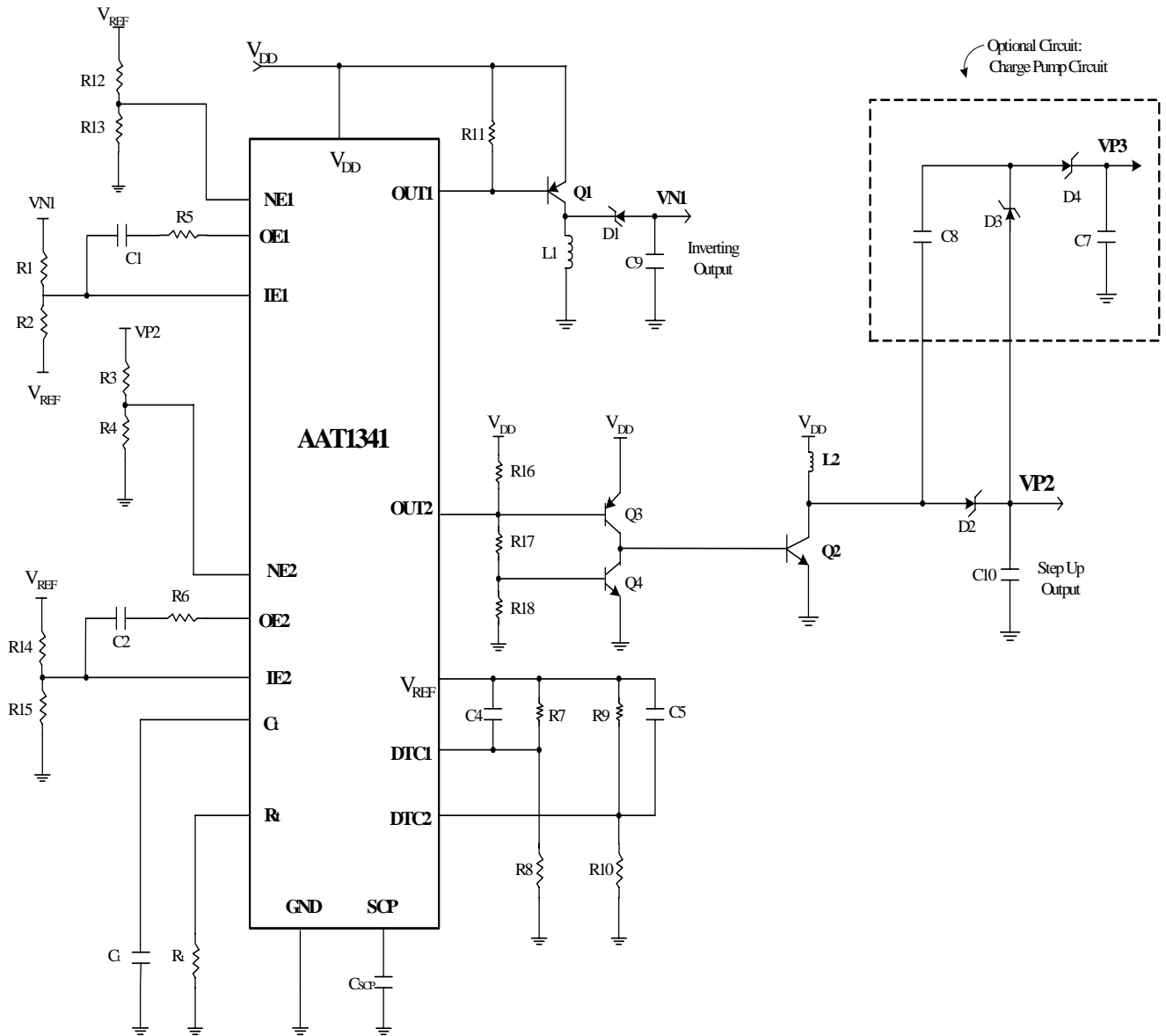


BLOCK DIAGRAM



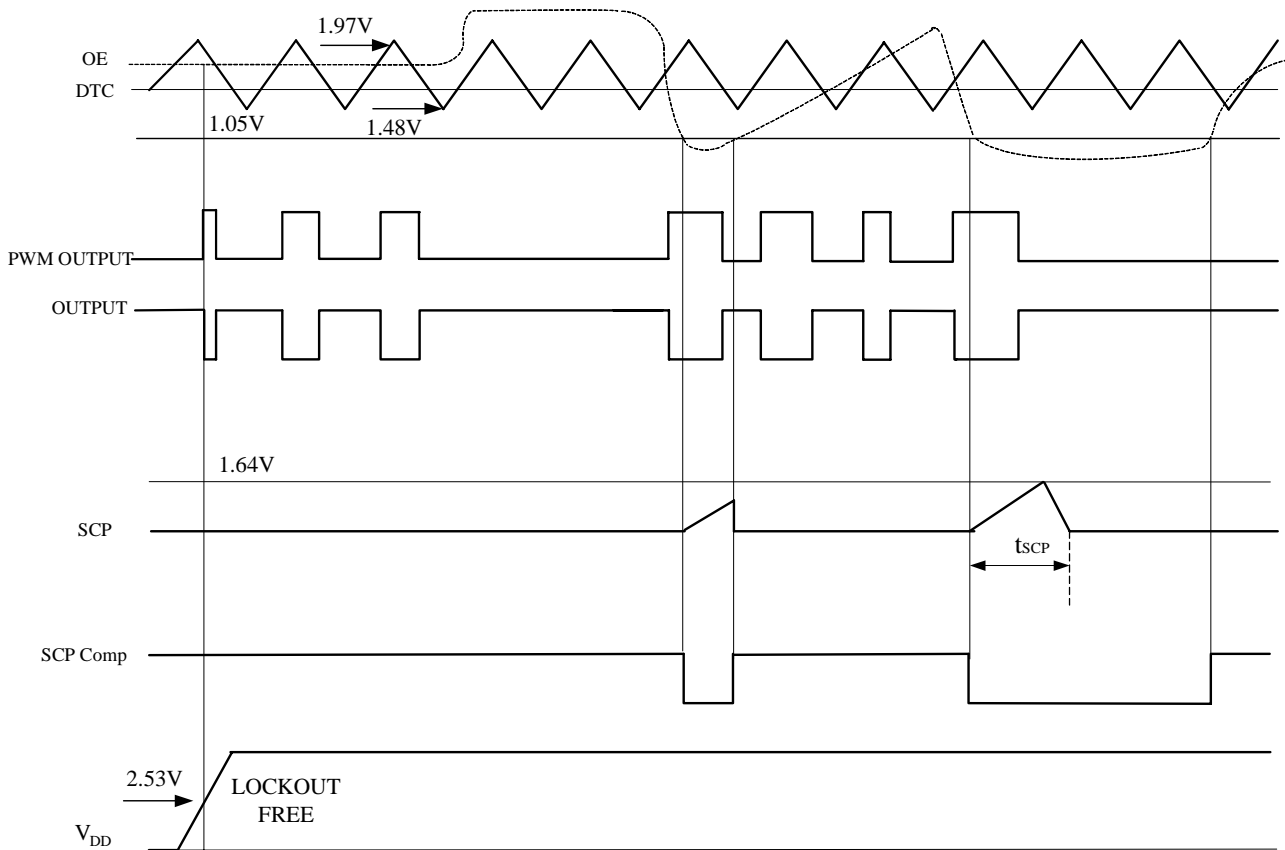


APPLICATION CIRCUIT





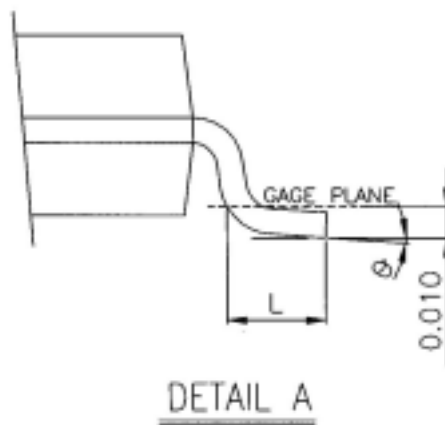
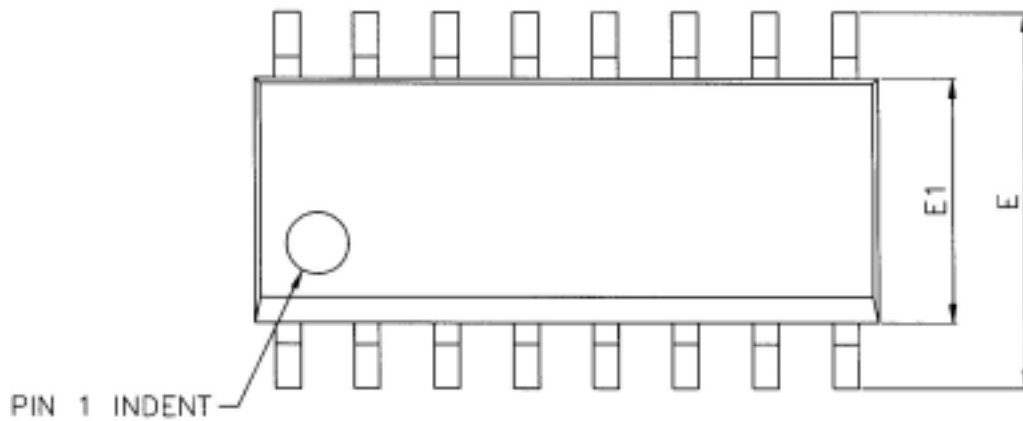
TIMING CHART



Note: $t_{SCP} \cong \frac{C_{SCP} V_{r2}}{I_{SCP}}$

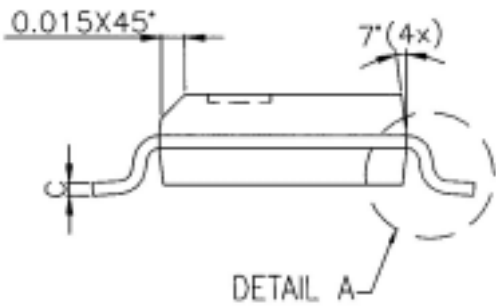
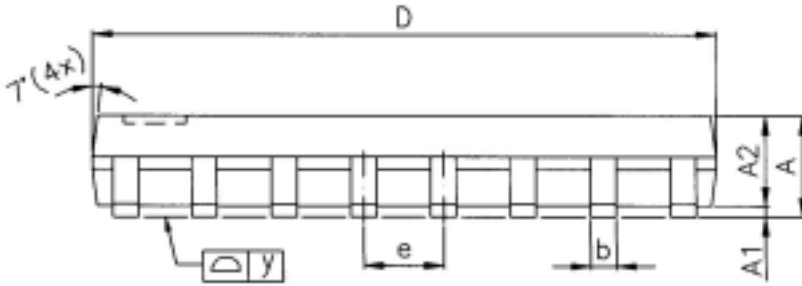


PACKAGE DIMENSION
16-PIN SOP





PACKAGE DIMENSION (CONT.)





PACKAGE DIMENSION (CONT.)

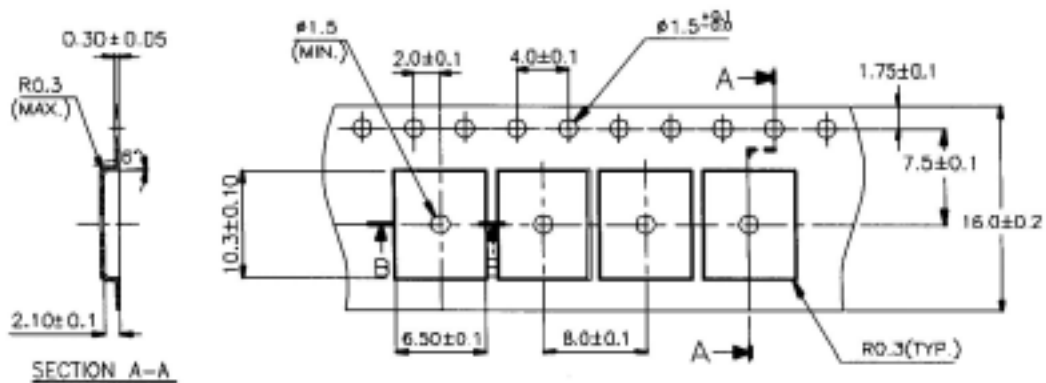
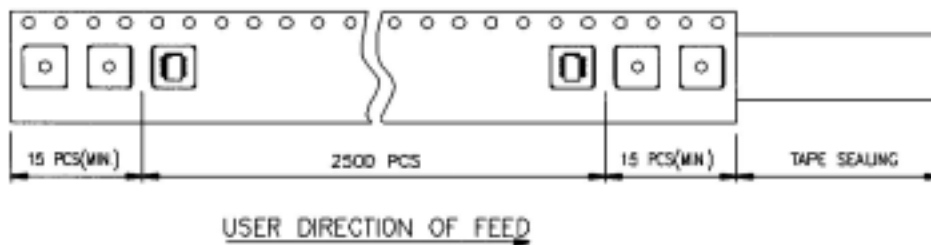
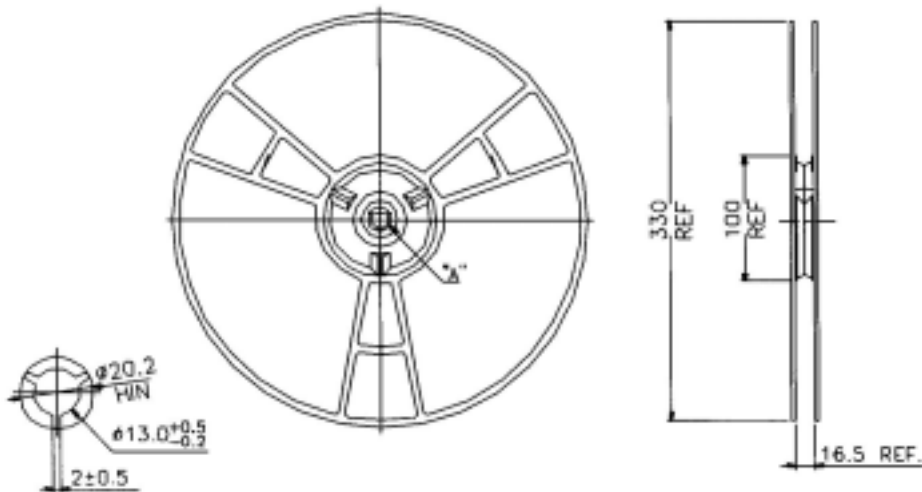
| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DEMINSIONS IN INCHES | | |
|----------|---------------------------|-------|-------|----------------------|--------|--------|
| | MIN | TYP | MAX | MIN | TYP | MAX |
| A | 1.47 | 1.60 | 1.73 | 0.058 | 0.063 | 0.068 |
| A1 | 0.10 | ----- | 0.25 | 0.004 | ----- | 0.010 |
| A2 | ----- | 1.45 | ----- | ----- | 0.057 | ----- |
| b | 0.33 | 0.41 | 0.51 | 0.013 | 0.016 | 0.020 |
| C | 0.19 | 0.20 | 0.25 | 0.0075 | 0.0080 | 0.0098 |
| D | 9.80 | 9.91 | 10.01 | 0.386 | 0.390 | 0.394 |
| E | 5.79 | 5.99 | 6.20 | 0.228 | 0.236 | 0.244 |
| E1 | 3.81 | 3.91 | 3.99 | 0.150 | 0.154 | 0.157 |
| e | ----- | 1.27 | ----- | ----- | 0.050 | ----- |
| L | 0.38 | 0.71 | 1.27 | 0.015 | 0.028 | 0.050 |
| y | ----- | ----- | 0.076 | ----- | ----- | 0.003 |
| θ | 0° | ----- | 8° | 0° | ----- | 8° |

NOTE:

1. CONTROLLING DIMENSION: INCH
2. LEAD FRAME MATERIAL: COPPER 194
3. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, TIE BAR BURRS AND GATE BURRS. MOLD FLASH, TIE BAR BURRS AND GATE BURRS SHALL NOT EXCEED 0.006" [0.15 MILLIMETERS] PER END DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SAHLL NOT EXCEED 0.010" [0.25 MILLIMETERS] PER SIDE.
4. DIMENSION "b" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.003" [0.08 MILLIMETERS] TOTAL IN EXCESS OF THE "b" DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.0028" [0.07 MILLIMETERS].
5. TOLERANCE: ± 0.010 " [0.25 MILLIMETERS] UNLESS OTHERWISE SPECIFIED.
6. OTHERWISE DIMENSION FOLLOW ACCEPTABLE SPEC.
7. REFERENCE DOCUMENT: JEDEC SPEC MS-012

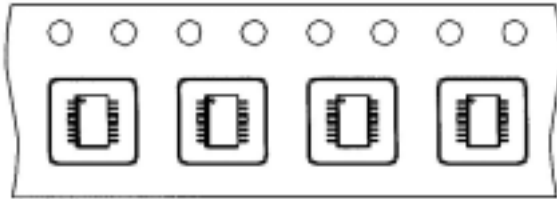


TAPE AND REEL

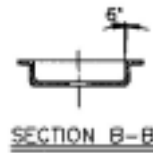




TAPE AND REEL (CONT.)



SOP 16L(150mil)



| | |
|---------|----------|
| X.XXX X | ± 0.0025 |
| X.XXX | ± 0.006 |
| X.XX | ± 0.025 |
| X.X | ± 0.10 |
| X | ± 0.25 |

UNIT: MILLIMETERS

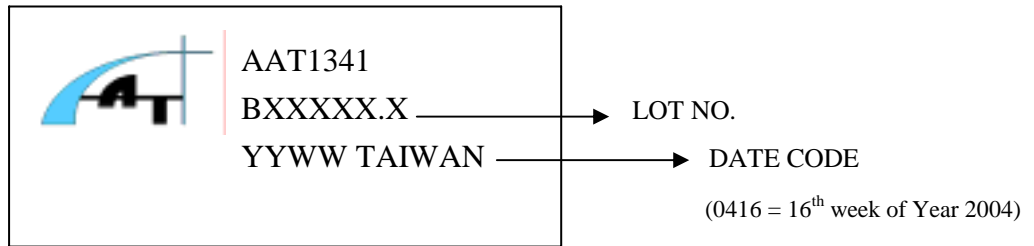
NOTE:

1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ± 0.2 .
2. CAMBER NOT TO EXCEED 1 MILLIMETER IN 100 MILLIMETERS.
3. MATERIAL: BLACK ADVANTEK POLYSTYRENE.
4. A_0 AND B_0 MEASURED ON A PLANE 0.3 MILLIMETERS ABOVE THE BOTTOM OF THE POCKET.
5. K_0 MEASURED FROM A PLANE ON THE INSIDE BOTTOM OF THE POCKET TO THE TOP SURFACE OF THE CARRIER.
6. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE.



PART MARKING

SOP16 TOP MARKING



NOTE: SOP16 HAS NO BACK MARKING.



ORDERING INFORMATION

AAT xxxxx-xx-x

AAT Part Number

Package Code 2
T=Taping Reel
Blank=Tube or Tray

Remark:
T=Taping Reel
PS.
Sop16→ 3,000pcs/reel

Blank=Tube

Package Code 1
Sop16: S1
Sop16 (Batwing): S6
Sop16 (Power Pad): S7