

SWITCHING REGULATOR CONTROL IC FOR FLYBACK

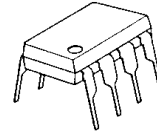
■GENERAL DESCRIPTION

The **NJM2369** is a high speed switching regulator control IC which can operate at low voltage.

It uses a totempole output circuit, so that it can drive an external power MOS-FET directly.

It is suitable for applications of flyback type switching regulation of up to 10W.

■PACKAGE OUTLINE



NJM2369D
(DIP8)



NJM2369M
(DMP8)



NJM2369E
(SOP8)

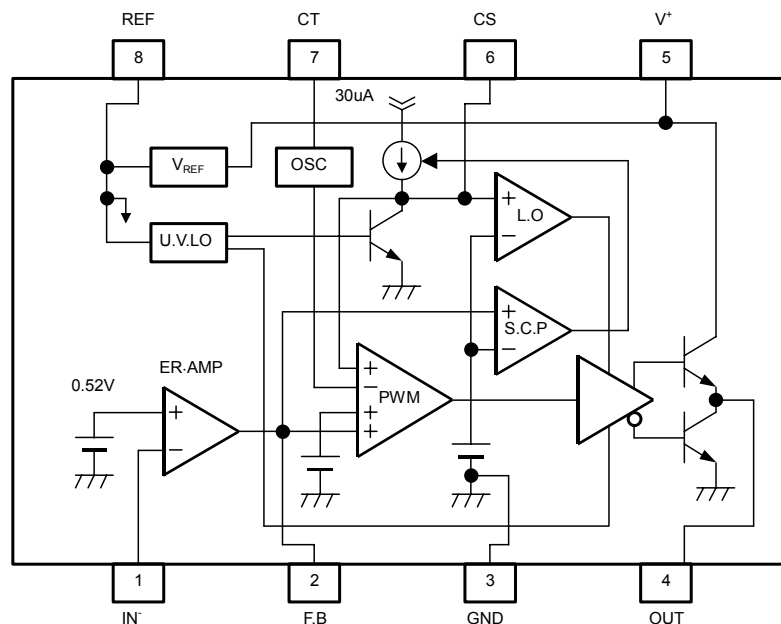


NJM2369V
(SSOP8)

■FEATURES

- Operating Voltage (3.6V ~ 32V)
- Wide Oscillator Range (5kHz ~ 350 kHz)
- Soft-Start function.
- Under Voltage Lockouts (U.V.L.O.)
- Bipolar Technology
- Package Outline DIP8, DMP8, SOP8 JEDEC 150mil, SSOP8

■BLOCK DIAGRAM



PIN FUNCTION

1. IN⁻
2. F.B
3. GND
4. OUT
5. V⁺
6. CS
7. CT
8. REF

NJM2369

■ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

| PARAMETER | SYMBOL | MAXIMUM RATINGS | UNIT |
|-----------------------------|------------------|---|------|
| Input Voltage | V ⁺ | 36 | V |
| Reference Output Current | I _{OR} | 10 | mA |
| Power Dissipation | P _D | (DIP 8) 700 (DMP 8) 300 (SOP 8) 300 (SSOP 8) 250 | mW |
| Operating Temperature Range | T _{OPR} | -40 ~ +85 | °C |
| Storage Temperature Range | T _{STG} | -50 ~ 125 | °C |

■RECOMMENDED OPERATING CONDITIONS (V⁺=6V, Ta=25°C)

| PARAMETER | SYMBOL | RATINGS | MIN. | MAX. | UNIT |
|-----------------------------|------------------|---------|------|--------|------|
| Operating Voltage | V ⁺ | | 3.6 | 32 | V |
| Feed Back Resistor | R _{NF} | | 100 | — | kΩ |
| Oscillator Timing Capacitor | C _T | | 220 | 22,000 | pF |
| Oscillator Timing Resistor | R _T | | 22 | 100 | kΩ |
| Oscillate | f _{OSC} | | 5 | 350 | kHz |

■ELECTRICAL CHARACTERISTICS (V⁺=6V, R_T=33kΩ, C_T=1,000pF, Ta=25°C)

REFERENCE VOLTAGE BLOCK

| PARAMETER | SYMBOL | RATINGS | MIN. | TYP. | MAX. | UNIT |
|-----------------|-------------------|--|------|------|------|------|
| Output Voltage | V _{REF} | I _{OR} =1mA | 2.45 | 2.50 | 2.55 | V |
| Line Regulation | L _{LINE} | V ⁺ =3.6V ~ 32V, I _{OR} =1mA | — | 6.8 | 20.7 | mV |
| Load Regulation | L _{LOAD} | I _{OR} =0.1mA ~ 5.0mA | — | 5 | 30 | mV |

OSCILLATOR BLOCK

| PARAMETER | SYMBOL | RATINGS | MIN. | TYP. | MAX. | UNIT |
|--|------------------|---|------|------|------|------|
| Oscillate | f _{osc} | C _T =1,000pF, R _T =33kΩ | 85 | 105 | 125 | kHz |
| Oscillate Fluctuations1 (Line Fluctuations) | f _{dv} | V ⁺ =3.6V ~ 32V | — | 1 | — | % |
| Oscillate Fluctuations2 (Temp Fluctuations) | f _{dt} | Ta=-40°C ~ +85°C | — | 5 | — | % |

ERROR AMPLIFIER BLOCK

| PARAMETER | SYMBOL | RATINGS | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------|--------------------------------------|--|-----------------------|------|------|------|
| Reference Voltage | V _B | | 0.51 | 0.52 | 0.53 | V |
| Input Bias Current | I _B | | — | 5 | 100 | nA |
| Open Loop Gain | A _V | | — | 90 | — | dB |
| Gain Band width Product | G _B | | — | 0.6 | — | MHz |
| Maximum Output Voltage (F.B Pin) | V _{OM+} V _{OM-} | R _{NF} =100kΩ R _{NF} =100kΩ | V _{REF} -0.2 | — | — | V |
| Output Source Current (F.B Pin) | I _{OM+} | V _{OM} =1V | 40 | 85 | 200 | uA |

■ELECTRICAL CHARACTERISTICS ($V^+=6V$, $R_T=33k\Omega$, $C_T=1,000pF$, $T_a=25^\circ C$)

PWM COMPARATE BLOCK

| PARAMETER | SYMBOL | RATINGS | MIN. | TYP. | MAX. | UNIT |
|--------------------------------------|------------|----------------|------|------|------|------|
| Input Threshold Voltage (F.B Pin) | V_{TH0} | duty cycle=0% | – | 0.55 | 0.65 | V |
| Input Threshold Voltage (F.B Pin) | V_{TH50} | duty cycle=50% | – | 0.87 | – | V |
| Maximum Duty Cycle | αM | F.B Pin=1.2V | 55 | 64 | 85 | % |

SOFT START CIRCUIT BLOCK

| PARAMETER | SYMBOL | RATINGS | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------|--------------|----------------|------|------|------|------|
| Input Bias Current (CS Pin) | I_{BCS} | | – | 250 | 650 | nA |
| Input Threshold Voltage (CS Pin) | V_{THCS0} | duty cycle=0% | – | 0.25 | 0.35 | V |
| Input Threshold Voltage (CS Pin) | V_{THCS50} | duty cycle=50% | – | 0.52 | – | V |

SHORT CIRCUIT PROTECTION

| PARAMETER | SYMBOL | RATINGS | MIN. | TYP. | MAX. | UNIT |
|--|------------|-----------------------|------|------|------|---------|
| Input Threshold Voltage (F.B Pin) | V_{THPC} | | 1.20 | 1.50 | 1.80 | V |
| Charge Current (CS Pin) | I_{CHG} | CS Pin=0V, F.B Pin=2V | 10 | 30 | 50 | μA |
| Latch mode Threshold Voltage (CS Pin) | V_{THLA} | | 1.20 | 1.50 | 1.80 | V |

UNDER VOLTAGE LOCKOUT

| PARAMETER | SYMBOL | RATINGS | MIN. | TYP. | MAX. | UNIT |
|-----------------------|-------------|---------|------|------|------|------|
| ON Threshold Voltage | V_{THON} | | – | 2.70 | – | V |
| OFF Threshold Voltage | V_{THOFF} | | – | 2.52 | – | V |
| Hysteresis Voltage | V_{HYS} | | 60 | 180 | – | mV |

OUTPUT

| PARAMETER | SYMBOL | RATINGS | MIN. | TYP. | MAX. | UNIT |
|------------------------------------|--------------|---------------------------|------|------|------|------|
| H-Output Voltage (OUT Pin) | V_{OH} | $R_L=10k\Omega$ | 3.50 | 4.00 | – | V |
| L-Output Voltage (OUT Pin) | V_{OL} | Output Sink Current =20mA | – | 0.25 | 0.65 | V |
| Output Source Current (OUT Pin) | I_{SOURCE} | OUT Pin=0V | – | 35 | – | mA |

GENERAL CHARACTERISTIC

| PARAMETER | SYMBOL | RATINGS | MIN. | TYP. | MAX. | UNIT |
|---------------------------|------------|-------------------------------|------|------|------|------|
| Quiescent Current | I_{CCLA} | Latch Mode | – | 1.6 | 2.2 | mA |
| Average Quiescent Current | I_{CCAV} | $R_L=\infty$, duty cycle=50% | – | 5.2 | 10.0 | mA |

■ TYPICAL CHARACTERISTICS

