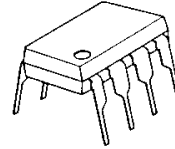


Step-Down PWM DC/DC Converter IC

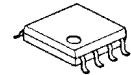
■GENERAL DESCRIPTION

The NJM2393 is a step down PWM DC/DC converter IC. An internal 1.5A power transistor, a pulse-by-pulse current limit circuit and a 1% precision reference make the NJM2393 suitable for a wide range of step down applications. The NJM2393 features 100% maximum duty cycle for low voltage drop operation.

■PACKAGE OUTLINE



NJM2393D

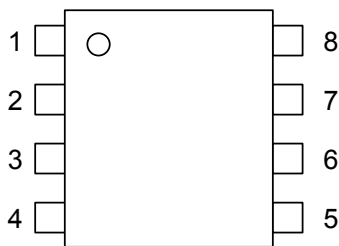


NJM2393M

■FEATURES

- Operating Voltage 3.0V~40V
- Wide Oscillator Frequency 1kHz~150kHz
- Precision Reference Voltage $V_{th}=1.25V \pm 1\%$
- Internal High Power Transistor 1.5A max.
- Maximum duty ratio 100%
- Internal Over Current Limit Circuit
- PWM switching control
- Bipolar Technology
- Package Outline NJM2393D : DIP8
NJM2393M : DMP8

■PIN CONFIGURATION

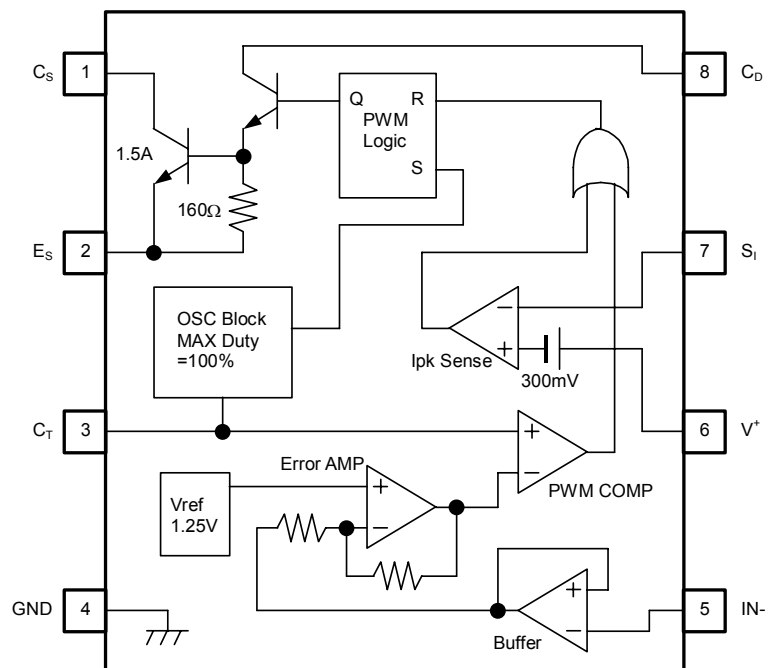


NJM2393D
NJM2393M

PIN FUNCTION

1. C_S
2. E_S
3. C_T
4. GND
5. IN-
6. V^+
7. S_I
8. C_D

■BLOCK DIAGRAM



NJM2393

■ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

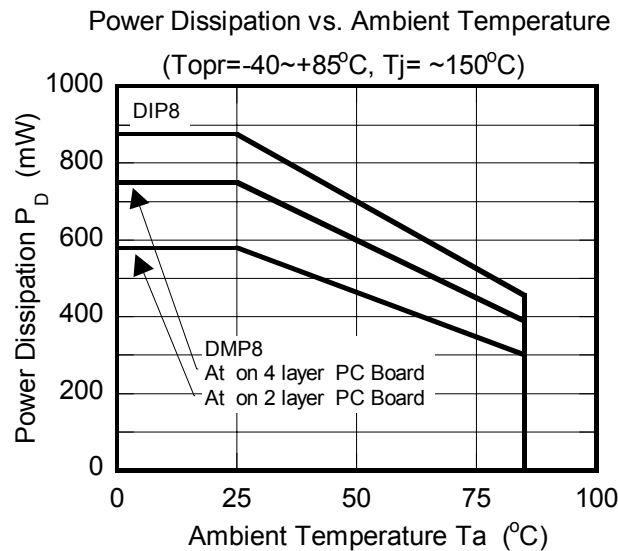
PARAMETER	SYMBOL	MAXIMUM RATINGS	UNIT
Maximum Supply Voltage	V ⁺	40	V
Comparator Input Voltage	V _{IR}	-0.3 ~ 40 (note)	V
Output Driver Voltage	V _{C(driver)}	40	V
Output Switch Voltage	V _{SW}	40	V
Output Driver Current	I _{C(driver)}	100	mA
Output Switch Current	I _{SW}	1.5	A
Power Dissipation	P _D	DIP8 875 DMP8 580 (*1) 750 (*2)	mW
Operating Temperature Range	Topr	-40 ~ +85	°C
Storage Temperature Range	Tstg	-50 ~ +150	°C

(note) When supply voltage is less than 40V, the absolute maximum input voltage is equal to the supply voltage.

(*1) At on PC board : 114.3mm × 76.2mm × 1.6mm(2 layer FR-4) : Conform to EIA/JEDEC

(*2) At on PC board :114.3mm × 76.2mm × 1.6mm(4 layer FR-4) : Conform to EIA/JEDEC

■POWER DISSIPATION vs. AMBIENT TEMPERATURE



■ ELECTRICAL CHARACTERISTICS

DC Characteristics ($V^+=5V$, $T_a=25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
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OSCILLATOR BLOCK

Oscillation Frequency	f_{OSC}	$IN=V_{th}-5mV$, $C_T=1nF$	18	27	36	kHz
Charge Current	I_{chg}		11	18	27	μA
Discharge Current	I_{dis}		110	180	300	μA
Voltage Swing	V_{OSC}	$C_T=1nF$	-	0.5	-	V_{P-P}

CURRENT LIMIT

Peak Current Sense Voltage	V_{ipk}		250	300	350	mV
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OUTPUT SWITCH

Saturation Voltage 1	V_{sat1}	Darlington Connection ($C_S=C_D$), $I_{SW}=0.7A$	-	1.0	1.3	V
Saturation Voltage 2	V_{sat2}	$I_{SW}=0.7A$, $I_C(driver)=50mA$ (Forced $\beta \approx 14$)	-	0.5	0.7	V
Saturation Voltage 3	V_{sat3}	$I_{SW}=3mA$, $I_C(driver)=5mA$	-	-	0.3	V
Output Transistor Bias Resistance	R_{bias}		-	160	-	Ω
DC Voltage Gain	h_{FE}	$I_{SW}=0.7A$, $V_{CE}=5.0V$	35	120	-	-
Collector Off-State Current	$I_{C(Off)}$	$V_{CE}=40V$	-	0.01	1	μA
Maximum duty ratio	$M_{AX}D_{UTY}$	$IN=0V$	100	-	-	%

ERROR AMPLIFIER

Threshold Voltage	V_{th}		1.2375	1.250	1.2625	V
Input Bias Current	I_{IB}	$IN=V_{th}$	-	100	200	nA

GENERAL CHARACTERISTICS

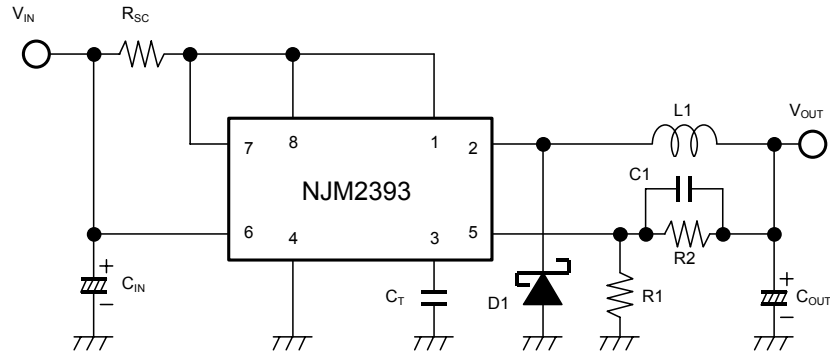
Operating Current	I_{CC}	$C_T=1nF$, $S_I=V^+$, $IN \rightarrow V_{th}$, $E_S=GND$	-	2.8	4.0	mA
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(note) Output switch tests are performed under pulsed conditions to minimize power dissipation.

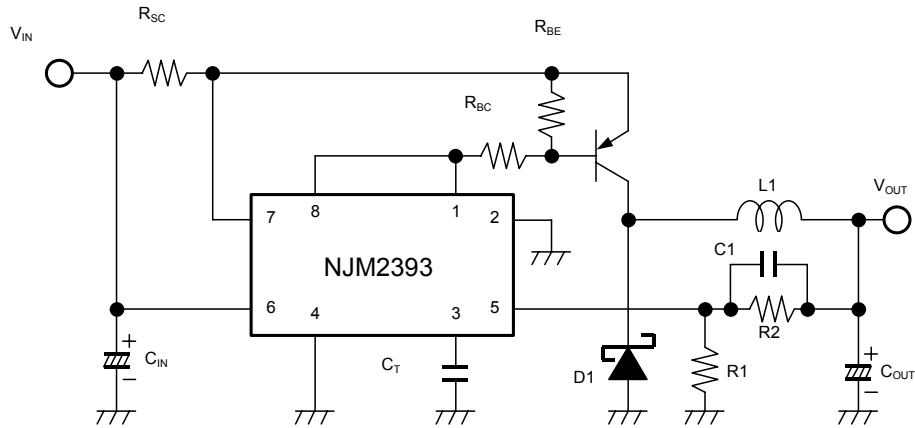
NJM2393

■TYPICAL APPLICATIONS

Step-Down Converter

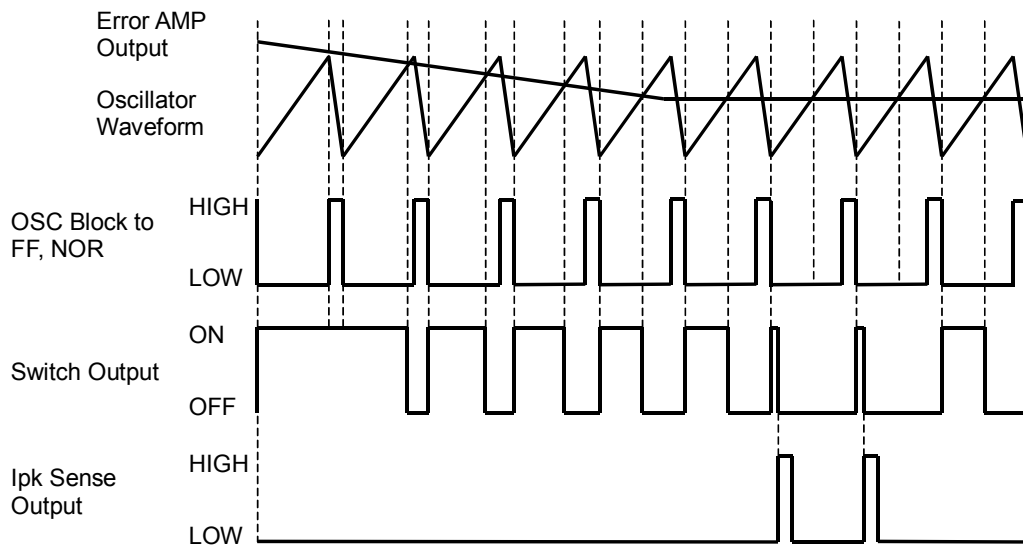


Step-Down Converter (High Current)



D1 use to schottky diode.

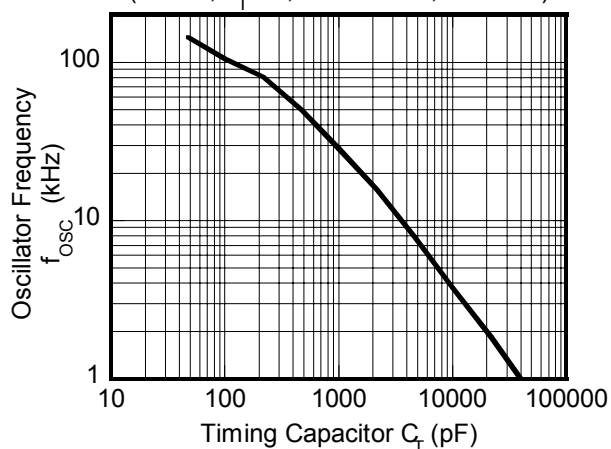
■TIMING CHART



■ TYPICAL CHARACTERISTICS

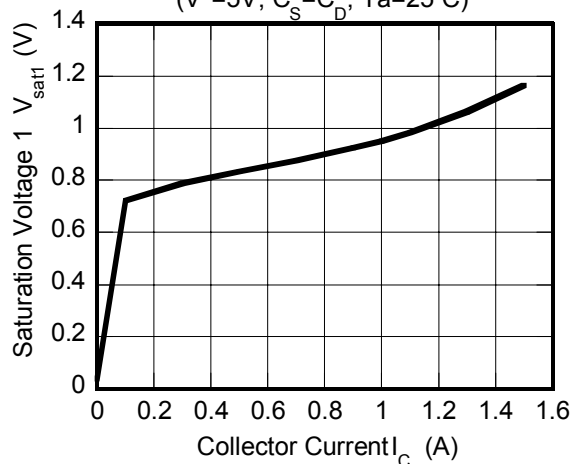
Oscillator Frequency vs. Timing Capacitor

($V^+ = 5V$, $S_I = V^+$, Pin 5=GND, $T_a = 25^\circ C$)



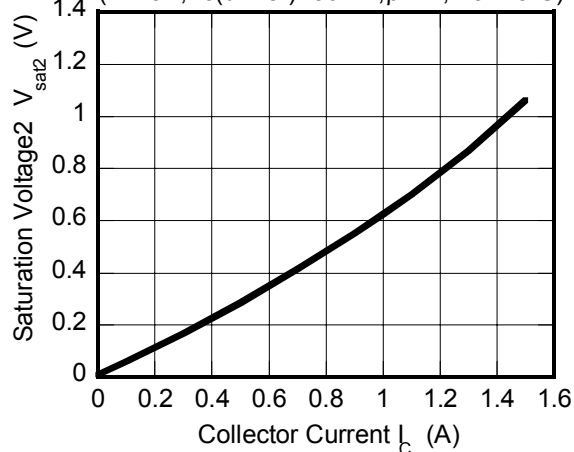
Saturation Voltage 1 vs. Collector Current

($V^+ = 5V$, $C_s = C_D$, $T_a = 25^\circ C$)



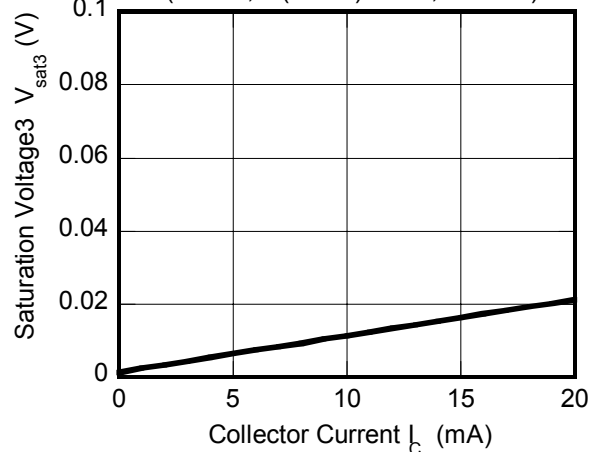
Saturation Voltage 2 vs. Collector Current

($V^+ = 5V$, $I_C(\text{driver}) = 50mA$, $\beta \approx 14$, $T_a = 25^\circ C$)



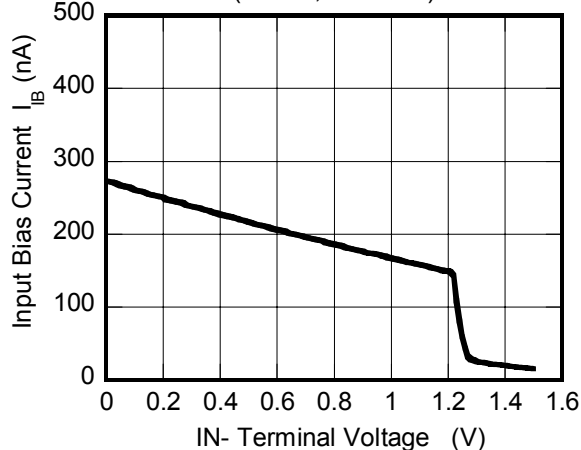
Saturation Voltage 3 vs. Collector Current

($V^+ = 5V$, $I_C(\text{driver}) = 5mA$, $T_a = 25^\circ C$)



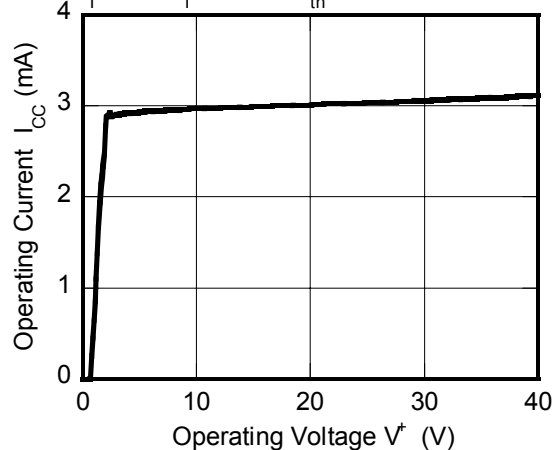
Input Bias Current vs. IN- Terminal Voltage

($V^+ = 5V$, $T_a = 25^\circ C$)

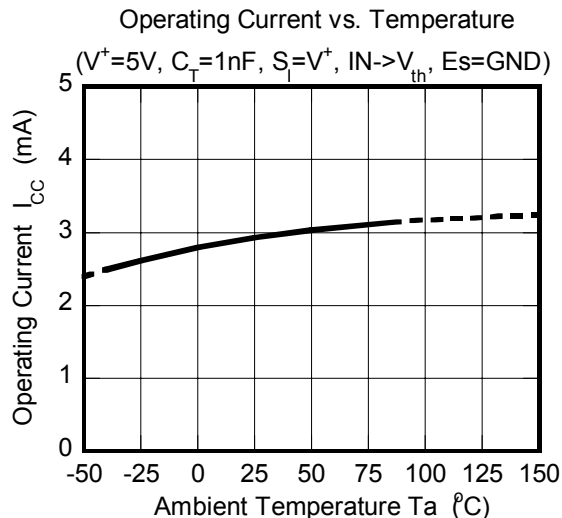
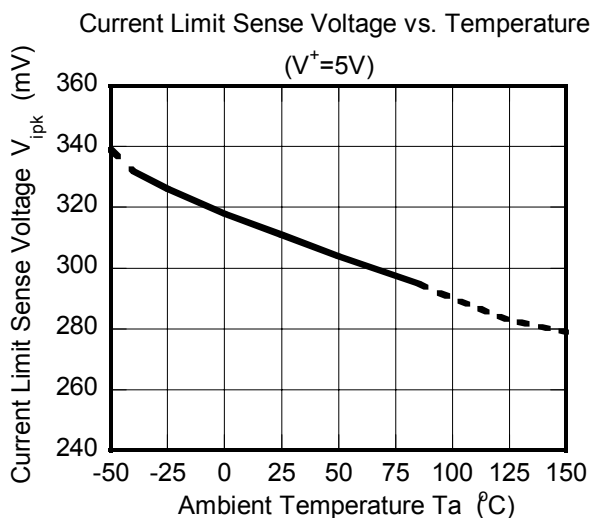
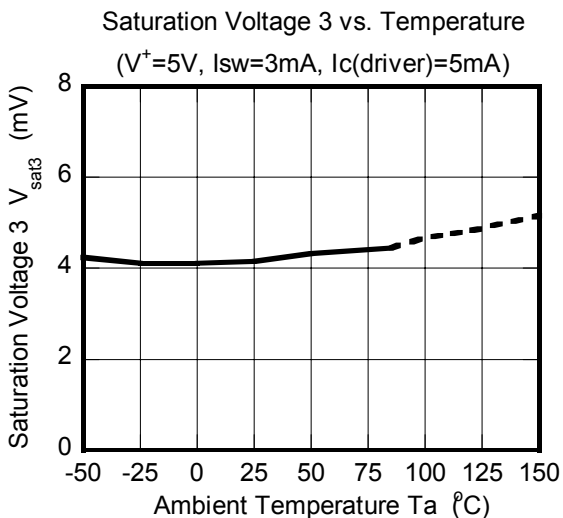
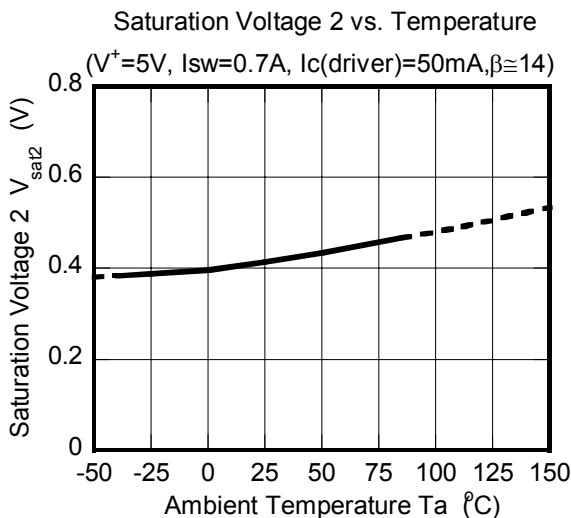
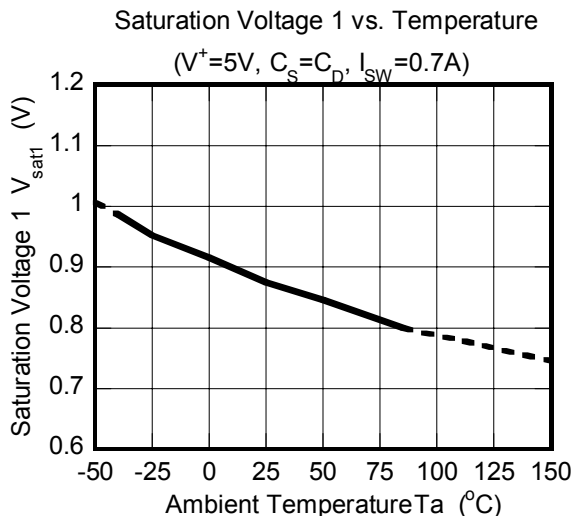
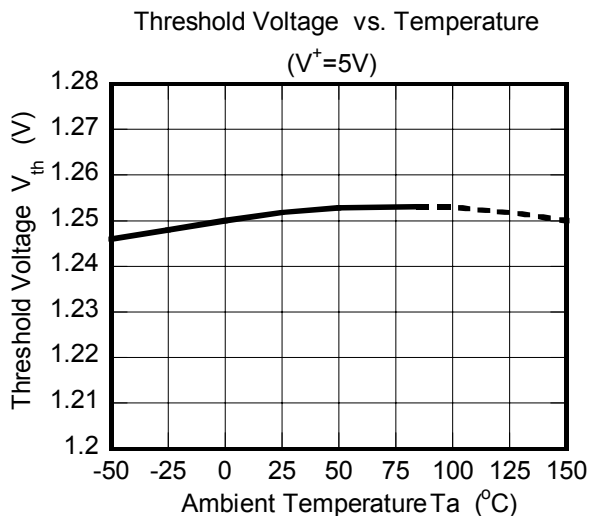


Operating Current vs. Operating Voltage

($C_T = 1nF$, $S_I = V^+$, $IN \rightarrow V_{th}$, $Es = GND$, $T_a = 25^\circ C$)



■ TYPICAL CHARACTERISTICS



MEMO

CAUTION]
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