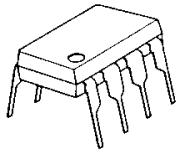
Step-Down PWM DC/DC Converter IC

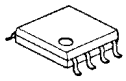
■GENERAL DESCRIPTION

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

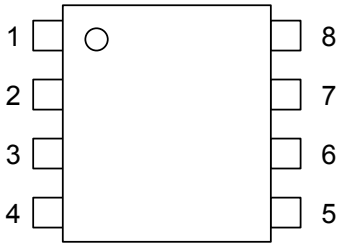


NJM2393M

■FEATURES

- Operating Voltage 3.0V~40V
- Wide Oscillator Frequency 1kHz~150kHz
- Precision Reference Voltage V_{th}=1.25V ± 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

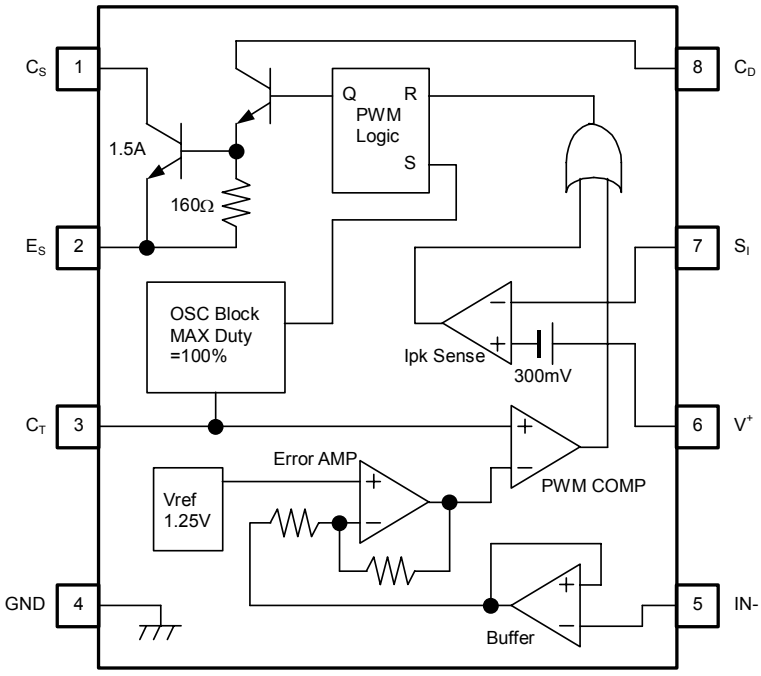
■PIN CONFIGURATION



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

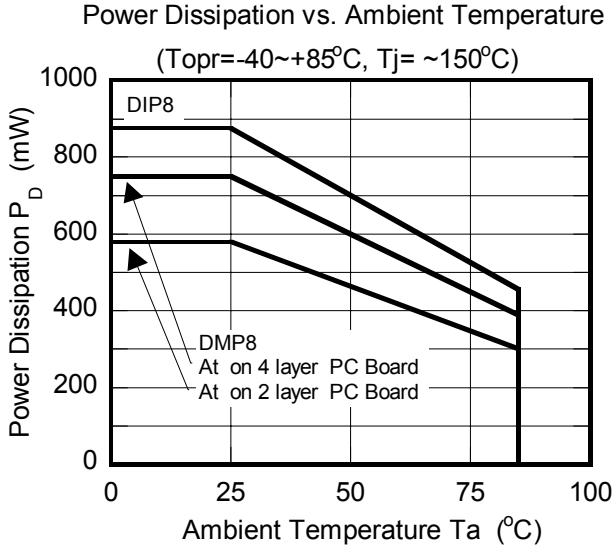


■ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

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

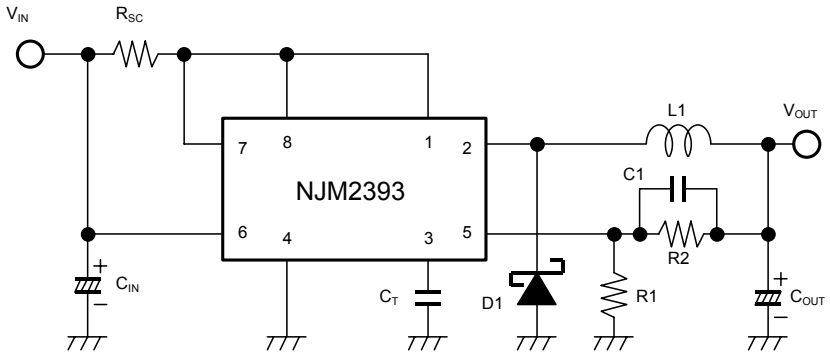
DC Characteristics (V^+=5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
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
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 β≈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->V_{th}, E_S=GND	-	2.8	4.0	mA

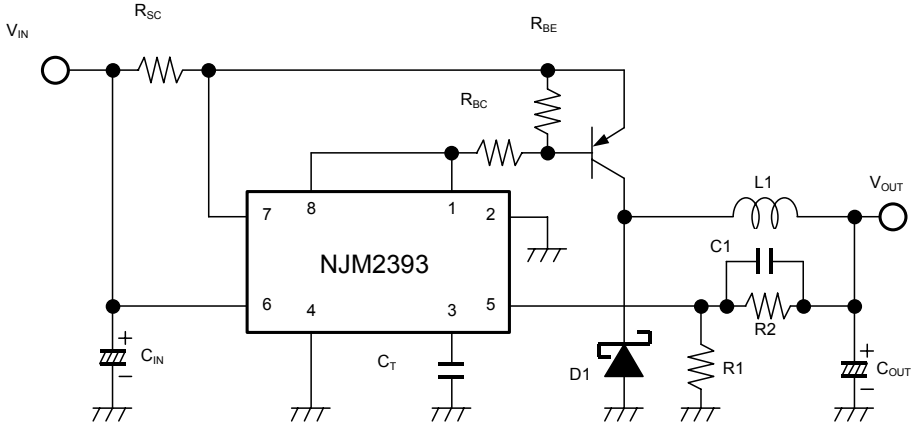
(note) Output switch tests are performed under pulsed conditions to minimize power dissipation.

■TYPICAL APPLICATIONS

Step-Down Converter

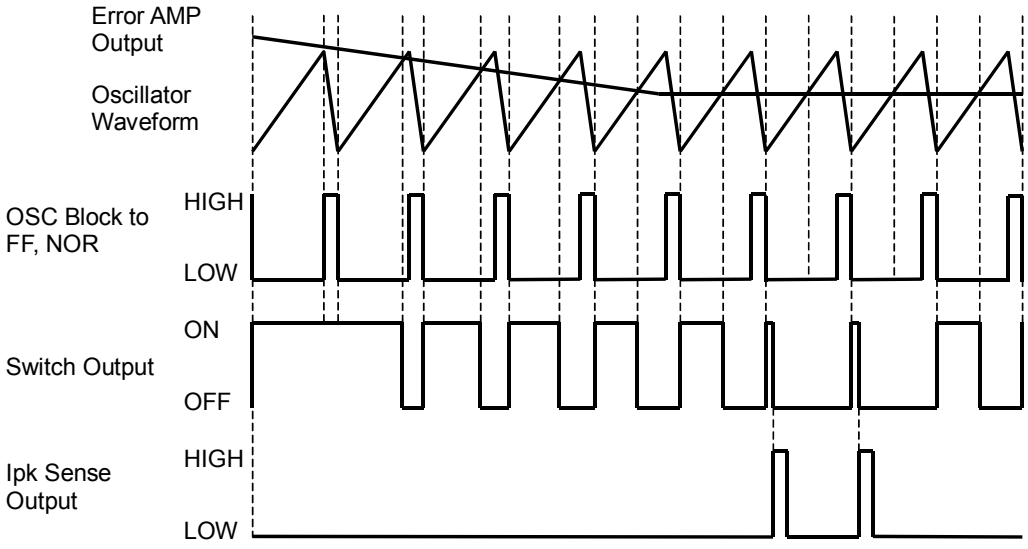


Step-Down Converter (High Current)



D1 use to schottky diode.

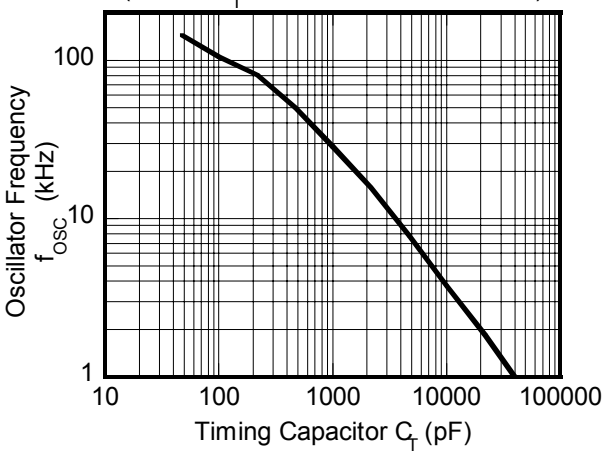
■TIMING CHART



■TYPICAL CHARACTERISTICS

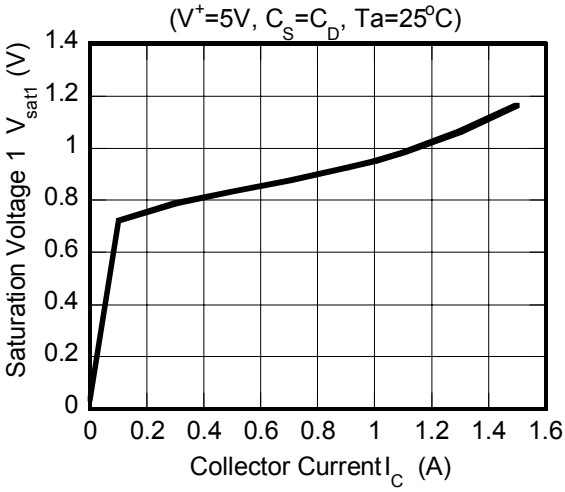
Oscillator Frequency vs. Timing Capacitor

(V^+=5V, S_I=V^+, Pin 5=GND, Ta=25°C)



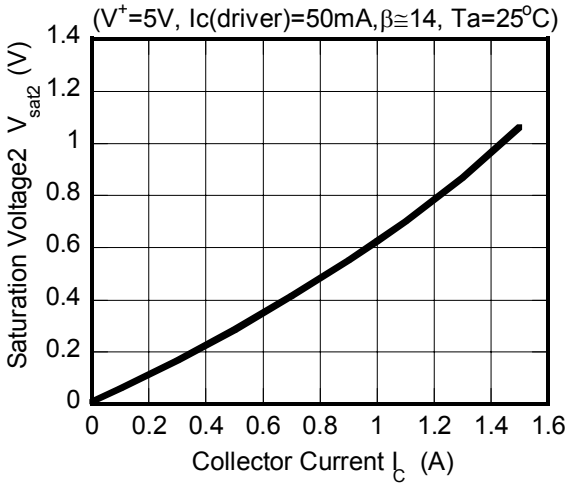
Saturation Voltage 1 vs. Collector Current

(V^+=5V, C_S=C_D, Ta=25°C)



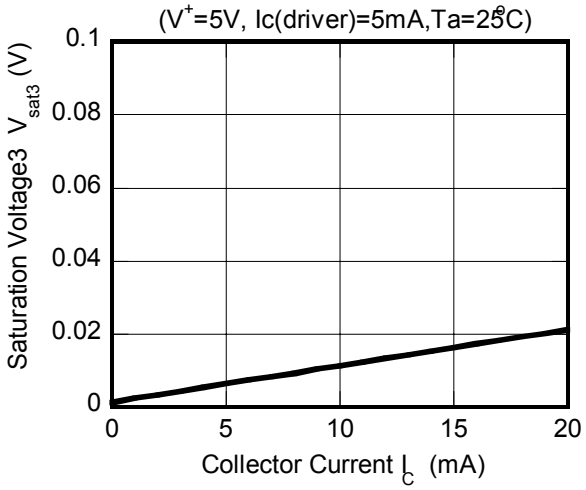
Saturation Voltage 2 vs. Collector Current

(V^+=5V, Ic(driver)=50mA,β≅14, Ta=25°C)



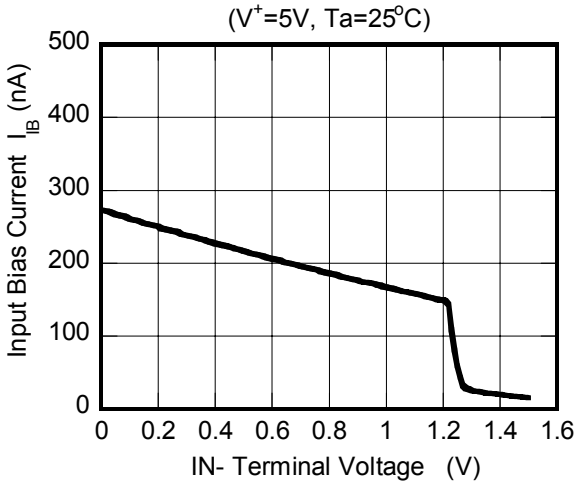
Saturation Voltage 3 vs. Collector Current

(V^+=5V, Ic(driver)=5mA,Ta=25°C)



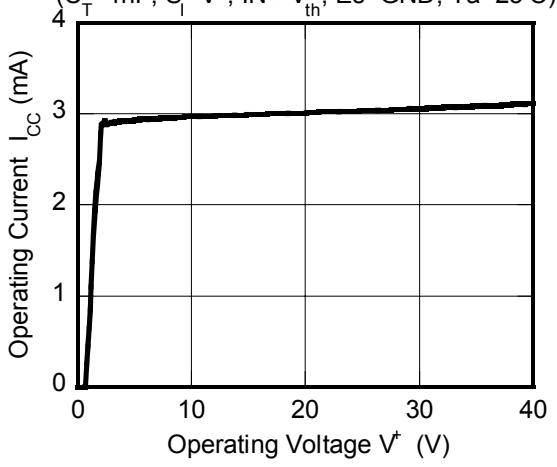
Input Bias Current vs. IN- Terminal Voltage

(V^+=5V, Ta=25°C)



Operating Current vs. Operating Voltage

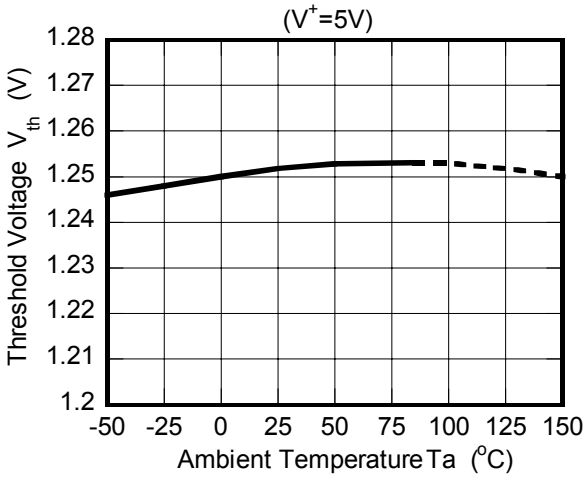
(C_T=1nF, S_I=V^+, IN->V_{th}, Es=GND, Ta=25°C)



■TYPICAL CHARACTERISTICS

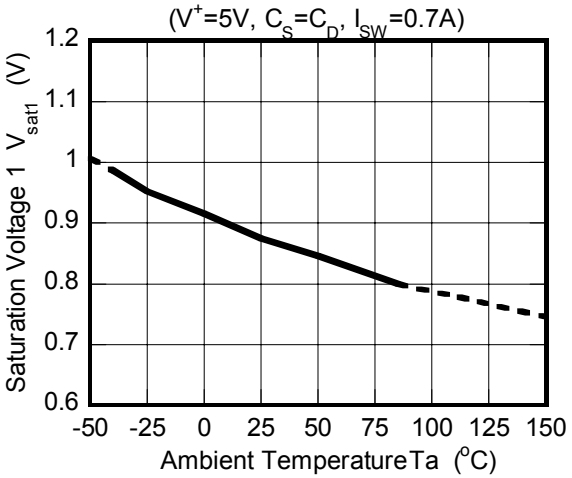
Threshold Voltage vs. Temperature

(V^+=5V)



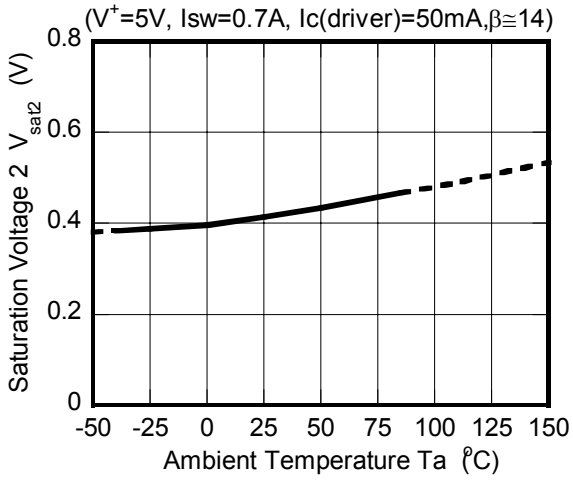
Saturation Voltage 1 vs. Temperature

(V^+=5V, C_S=C_D, I_{SW}=0.7A)



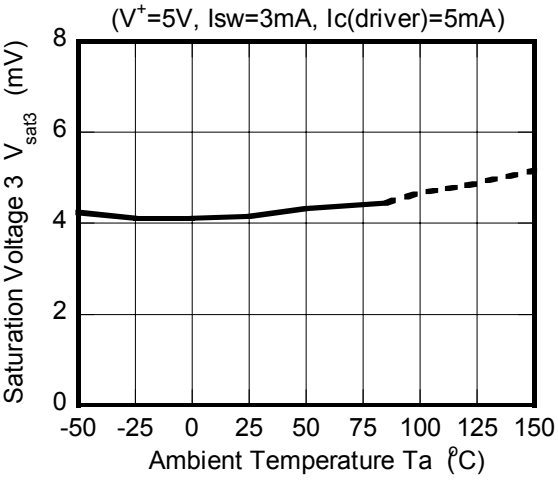
Saturation Voltage 2 vs. Temperature

(V^+=5V, Isw=0.7A, Ic(driver)=50mA,β≅14)



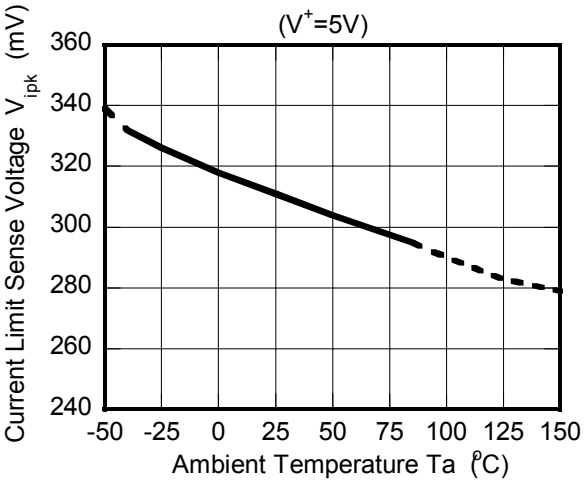
Saturation Voltage 3 vs. Temperature

(V^+=5V, Isw=3mA, Ic(driver)=5mA)



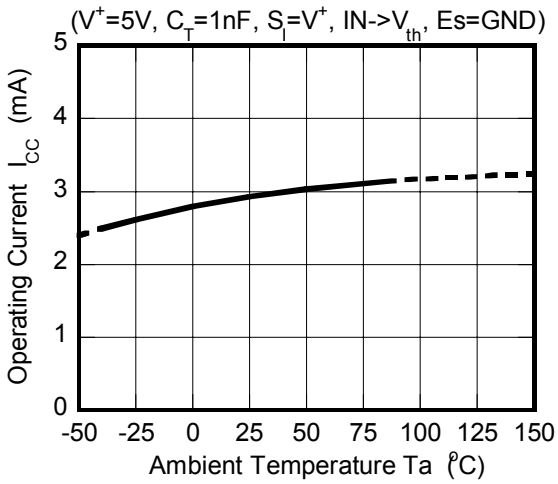
Current Limit Sense Voltage vs. Temperature

(V^+=5V)



Operating Current vs. Temperature

(V^+=5V, C_T=1nF, S_I=V^+, IN->V_{th}, Es=GND)



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