Switching Regulator IC for Buck Converter

with 40V/1A MOSFET

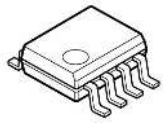
■ GENERAL DESCRIPTION

The **NJW4152** is a buck converter with **40V/1A** MOSFET. It corresponds to high oscillating frequency, and Low ESR Output Capacitor (MLCC) within wide input range from 4.6V to 40V. Therefore, the **NJW4152** can realize downsizing of an application with a few external parts.

Also, it has a soft start function, an over current protection and a thermal shutdown circuit. Moreover there is an automotive for extended operating temperature range version.

It is suitable for logic voltage generation from high voltage that Car Accessory, Office Automation Equipment, Industrial Instrument and so on.

■ PACKAGE OUTLINE



NJW4152GM1-A
(HSOP8)

■ FEATURES

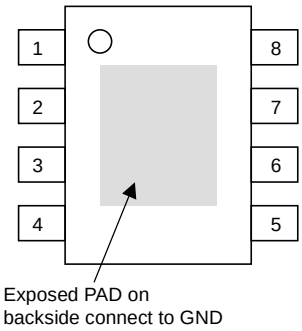
- Maximum Rating Input Voltage 45V
- Wide Operating Voltage Range 4.6V to 40V
- Switching Current 1.4A(min.)
- PWM Control
- Wide Oscillating Frequency 300kHz to 1MHz
- Soft Start Function 4ms typ.
- UVLO (Under Voltage Lockout)
- Over Current Protection / Thermal Shutdown Protection
- Standby Function
- Package Outline NJW4152GM1: HSOP8
- AEC-Q100 This product meets the reliability level required by AEC-Q100.

■ PRODUCT CLASSIFICATION

Status	Part Number	Version	Output Current	Switching Current Limit (MIN.)	Operating Voltage	Package	Operating Temperature Range
MP	NJW4152GM1-A	A	1.0A	1.4A	4.6 to 40V	HSOP8	General Spec. -40 to +85°C
MP	NJW4152GM1-A-T	A	1.0A	1.4A	4.6 to 40V	HSOP8	Automotive T Spec. -40 to +105°C
MP	NJW4152GM1-A-T1	A	1.0A	1.4A	4.6 to 40V	HSOP8	Automotive T1 Spec. -40 to +125°C
MP	NJW4152GM1-AB	AB	1.0A	1.4A	3.6 to 40V	HSOP8	General Spec. -40 to +85°C
MP	NJW4152GM1-AB-T1	AB	1.0A	1.4A	3.6 to 40V	HSOP8	Automotive T1 Spec. -40 to +125°C
MP	NJW4152R-B	B	600mA	0.8A	4.6 to 40V	MSOP8 (VSP8)	General Spec. -40 to +85°C
U.D.	NJW4152R-BA-Z	BA	600mA	0.8A	4.4 to 40V	MSOP8 (VSP8)	Automotive Z Spec. -40 to +125°C

This data sheet is applied to "NJW4152GM1-A-T1,.
Please refer to each data sheet for other versions.

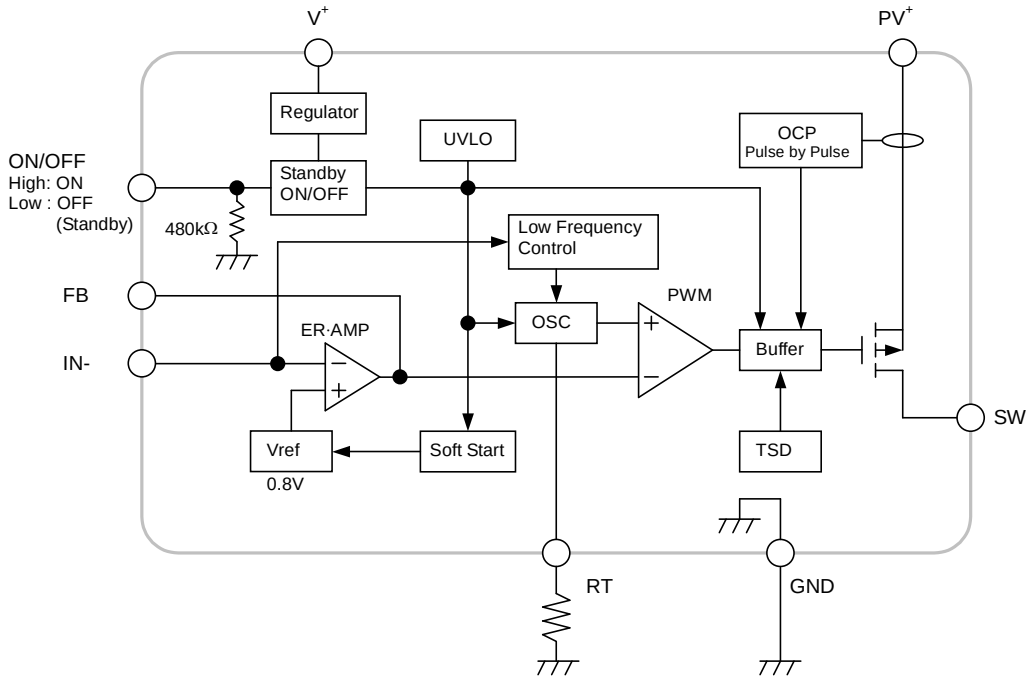
■ PIN CONFIGURATION



NJW4152GM1-A

PIN FUNCTION
1. PV^+
2. V^+
3. ON/OFF
4. RT
5. IN-
6. FB
7. GND
8. SW

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	MAXIMUM RATINGS	UNIT
Supply Voltage (V^+ pin, PV^+ pin)	V^+	+45	V
PV^+- SW pin Voltage	V_{PV-SW}	+45	V
IN- pin Voltage	V_{IN-}	-0.3 to +6	V
ON/OFF pin Voltage	$V_{ON/OFF}$	+45	V
Power Dissipation	P_D	HSOP8 790 (*1) 2,500 (*2)	mW
Junction Temperature Range	Tj	-40 to +150	°C
Operating Temperature Range	T_{opr}	-40 to +125	°C
Storage Temperature Range	T_{stg}	-40 to +150	°C

(*1): Mounted on glass epoxy board. (76.2×114.3×1.6mm:EIA/JDEC standard size, 2Layers)

(*2): Mounted on glass epoxy board. (76.2×114.3×1.6mm:EIA/JDEC standard size, 4Layers), internal Cu area: 74.2×74.2mm

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V^+	4.6	–	40	V
Output Current (*3)	I_{OUT}	–	–	1.0	A
Timing Resistor	R_T	18	27	68	kΩ
Oscillating Frequency	fosc	300	700	1,000	kHz

(*3): At Static Status

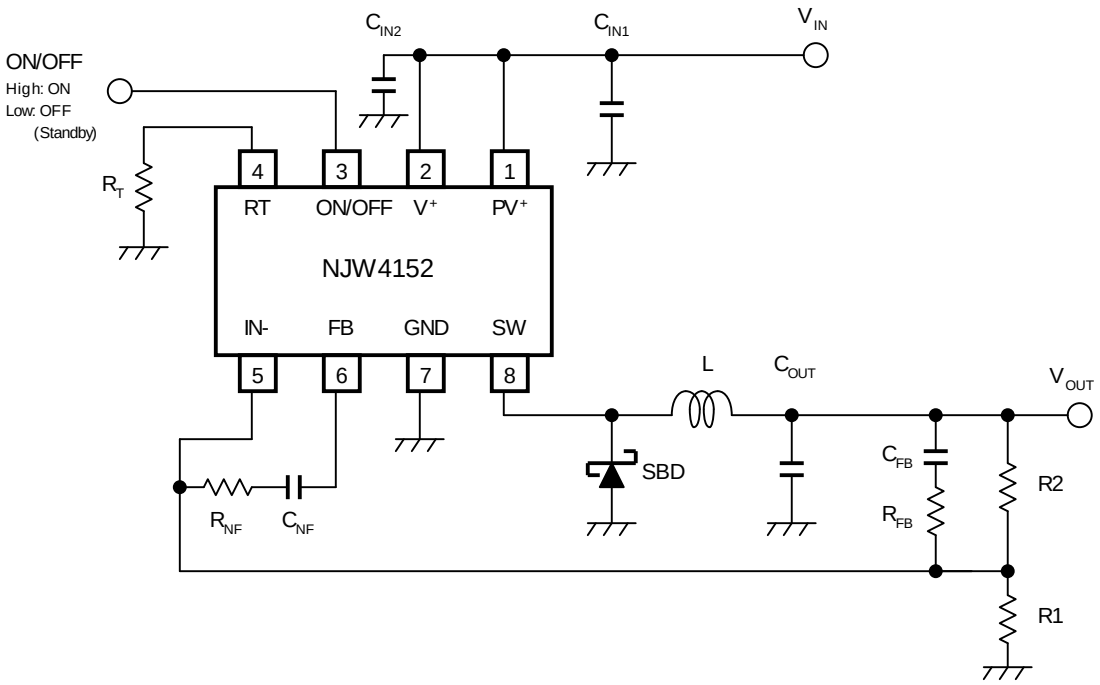
■ ELECTRICAL CHARACTERISTICS (Unless otherwise noted, $V^+=V_{ON/OFF}$=12V, R_T=27kΩ, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Under Voltage Lockout Block						
ON Threshold Voltage	V_{T_ON}	V^+= L → H	4.3	4.5	4.6	V
		V^+= L → H, Ta= -40ºC to +125ºC	4.3	–	4.7	
OFF Threshold Voltage	V_{T_OFF}	V^+= H → L	4.2	4.4	4.54	V
		V^+= H → L, Ta= -40ºC to +125ºC	4.2	–	4.60	
Hysteresis Voltage	V_{HYS}		60	100	–	mV
		Ta= -40ºC to +125ºC	60	–	–	
Soft Start Block						
Soft Start Time	T_{SS}	V_B=0.75V	2	4	8	ms
		V_B=0.75V, Ta= -40ºC to +125ºC	2	–	8	
Oscillator Block						
Oscillation Frequency	f_{OSC}		630	700	770	kHz
		Ta= -40ºC to +125ºC	630	–	770	
Oscillation Frequency (Low Frequency Control)	f_{OSC_LOW}	V_{IN-}=0.4V, V_{FB}=0.55V	–	270	–	kHz
RT pin Voltage	V_{RT}		0.24	0.275	0.31	V
		Ta= -40ºC to +125ºC	0.24	–	0.31	
Oscillation Frequency deviation (Supply voltage)	f_{DV}	V^+=4.6 to 40V	–	1	–	%
Error Amplifier Block						
Reference Voltage	V_B		-1.0%	0.8	+1.0%	V
		Ta= -40ºC to +125ºC	-2.0%	–	+2.0%	
Input Bias Current	I_B		-0.1	–	+0.1	μA
		Ta= -40ºC to +125ºC	-0.1	–	+0.1	
Open Loop Gain	A_V		–	80	–	dB
Gain Bandwidth	G_B		–	0.6	–	MHz
Output Source Current	I_{OM+}	V_{FB}=1V, V_{IN-}=0.7V	8	16	24	μA
		V_{FB}=1V, V_{IN-}=0.7V, Ta= -40ºC to +125ºC	8	–	24	
Output Sink Current	I_{OM-}	V_{FB}=1V, V_{IN-}=0.9V	1	2	4	mA
		V_{FB}=1V, V_{IN-}=0.9V, Ta= -40ºC to +125ºC	0.5	–	4.5	
PWM Comparate Block						
Maximum Duty Cycle	$M_{AX}D_{UTY}$	V_{IN-}=0.7V	100	–	–	%
		V_{IN-}=0.7V, Ta= -40ºC to +125ºC	100	–	–	

■ ELECTRICAL CHARACTERISTICS (Unless otherwise noted, $V^+=V_{ON/OFF}=12V$, $R_T=27k\Omega$, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Block						
Output ON Resistance	R_{ON}	I_{SW}=1A	–	0.3	0.5	Ω
Switching Current Limit	I_{LIM}		1.4	1.7	2.0	A
Switching Leak Current	I_{LEAK}	$V_{ON/OFF}$=0V, V^+=45V, V_{SW}=0V	–	–	1	μA
		$V_{ON/OFF}$=0V, V^+=45V, V_{SW}=0V Ta= -40ºC to +125ºC	–	–	2	
ON/OFF Block						
ON Control Voltage	V_{ON}	$V_{ON/OFF}$= L → H	1.6	–	V^+	V
		$V_{ON/OFF}$= L → H, Ta= -40ºC to +125ºC	1.6	–	V^+	
OFF Control Voltage	V_{OFF}	$V_{ON/OFF}$= H → L	0	–	0.5	V
		$V_{ON/OFF}$= H → L, Ta= -40ºC to +125ºC	0	–	0.5	
Pull-down Resistance	R_{PD}		–	480	–	kΩ
General Characteristics						
Quiescent Current	I_{DD}	R_L=no load, V_{IN-}=0.7V, V_{FB}=0.55V	–	2.5	2.8	mA
		R_L=no load, V_{IN-}=0.7V, V_{FB}=0.55V Ta= -40ºC to +125ºC	–	–	3.5	
Standby Current	I_{DD_STB}	$V_{ON/OFF}$=0V	–	–	1	μA
		$V_{ON/OFF}$=0V, Ta= -40ºC to +125ºC	–	–	1	

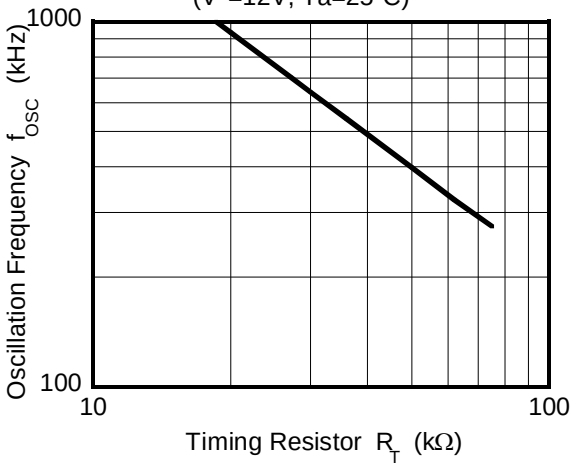
■ TYPICAL APPLICATIONS



■ CHARACTERISTICS

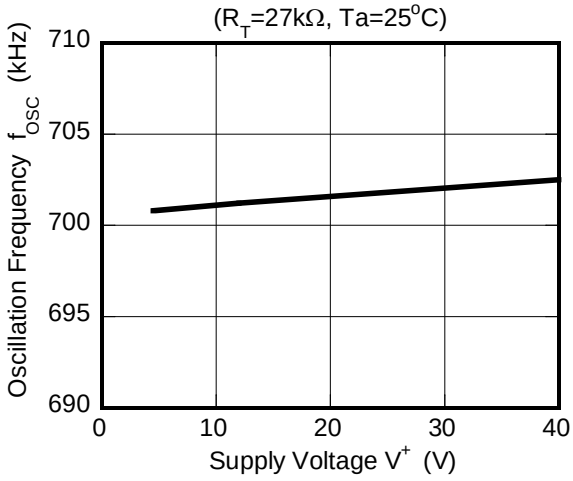
Timing Resistor vs.Oscillation Frequency

(V^+=12V, Ta=25°C)



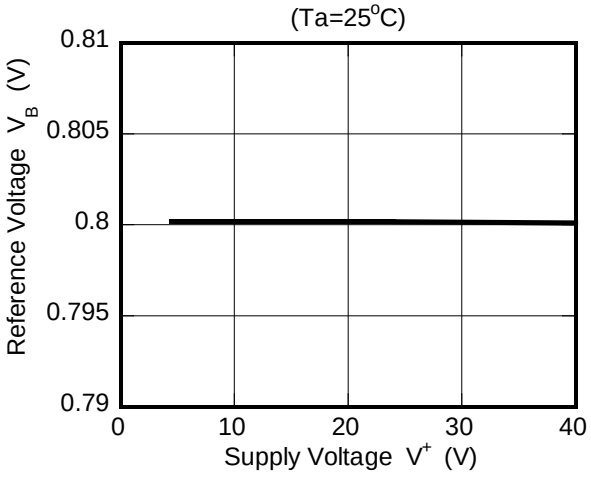
Oscillation Frequency vs. Supply Voltage

(R_T=27kΩ, Ta=25°C)



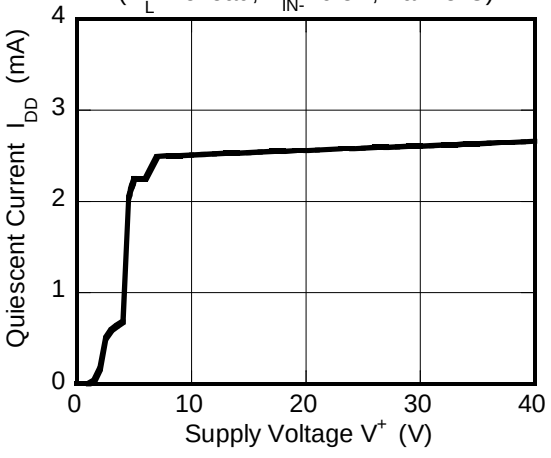
Reference Voltage vs. Supply Voltage

(Ta=25°C)



Quiescent Current vs. Supply Voltage

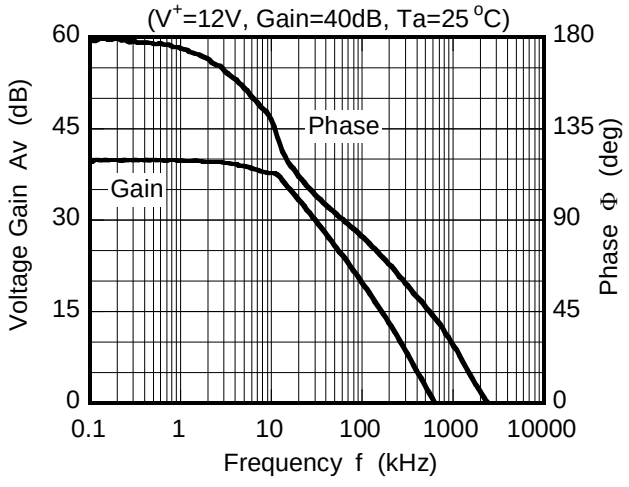
(R_L=no load, V_{IN-}=0.5V, Ta=25°C)



Error Amplifier Block

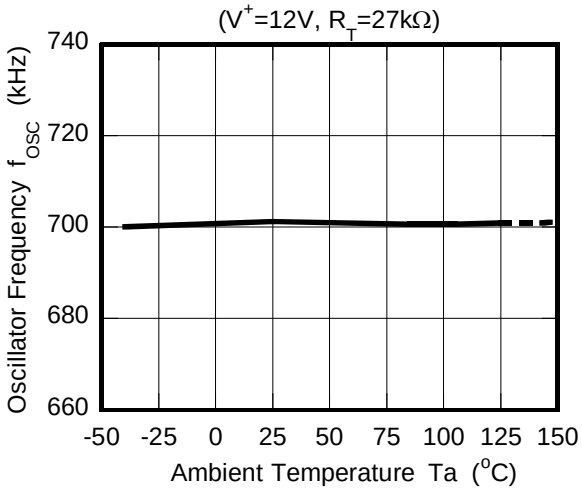
Voltage Gain, Phase vs. Frequency

(V^+=12V, Gain=40dB, Ta=25 °C)

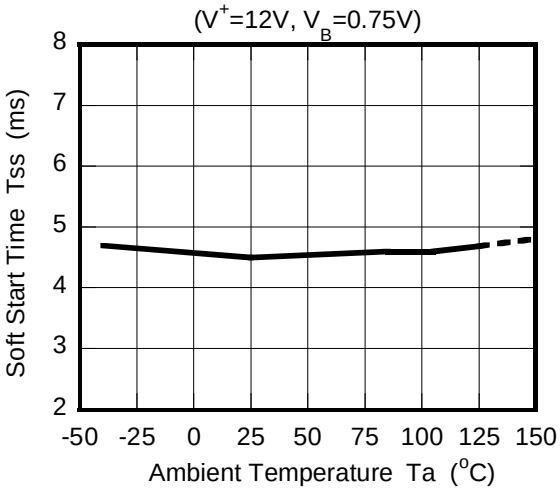


■ CHARACTERISTICS

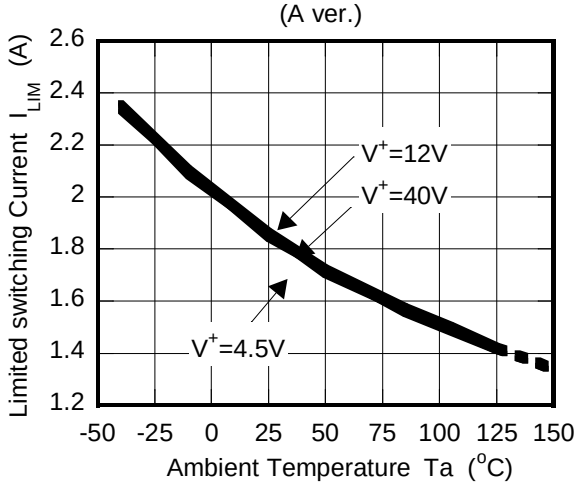
Oscillator Frequency vs. Temperature
(V^+=12V, R_T=27kΩ)



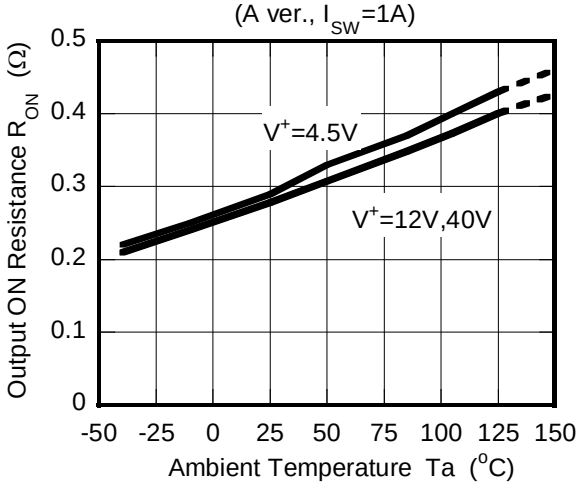
Soft Start Time vs. Temperature
(V^+=12V, V_B=0.75V)



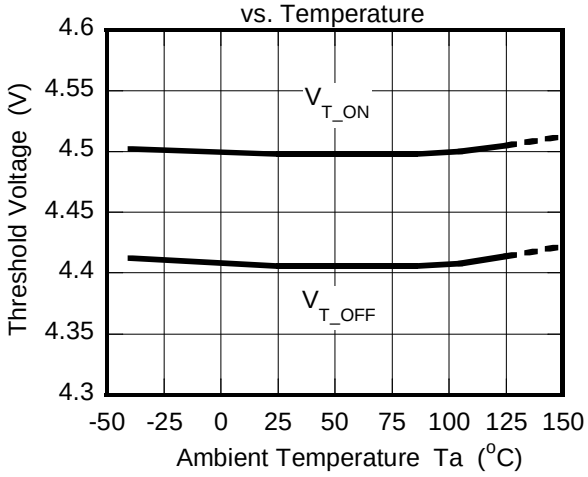
Limited Switching Current vs. Temperature
(A ver.)



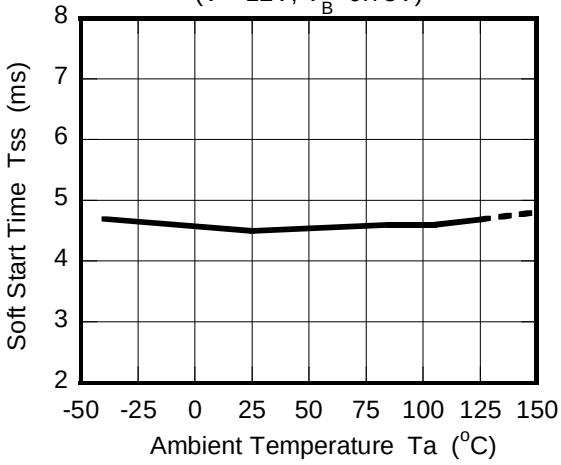
Output ON Resistance vs.Temperature
(A ver., I_{SW}=1A)



Under Voltage Lockout Voltage
vs. Temperature

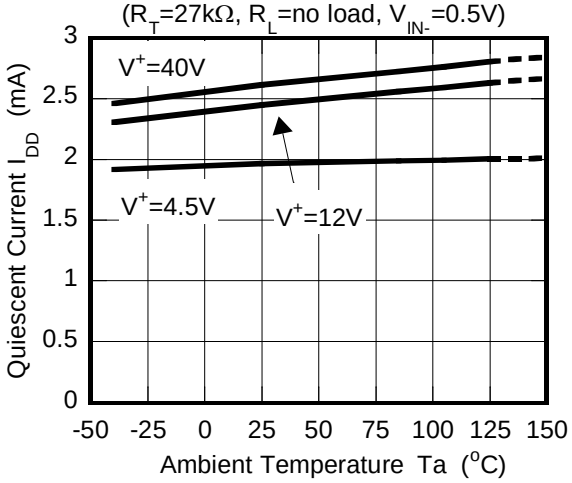


Soft Start Time vs. Temperature
(V^+=12V, V_B=0.75V)

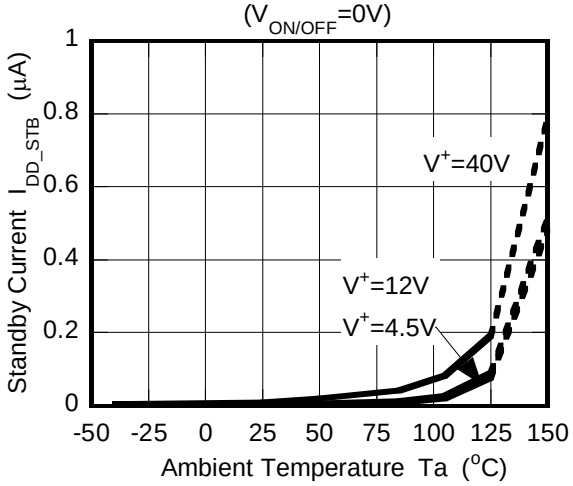


■ CHARACTERISTICS

Quiescent Current vs. Temperature
(R_T=27kΩ, R_L=no load, V_{IN-}=0.5V)



Standby Current vs. Temperature
($V_{ON/OFF}$=0V)



Switching Leak Current vs. Temperature
(V^+=45V,$V_{ON/OFF}$=0V, V_{SW}=0V)