Low Dropout Voltage Regulator with Reset

■ GENERAL DISCRIPTION

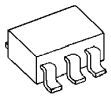
The NJU7276 is a low drop out voltage regulator with input-monitor reset function with internal fixed delay.

Advanced CMOS technology achieves ultra low current consumption and high accuracy.

It delivers up to 5V/100mA output power with the maximum input voltage of 9V.

The NJU7276 suitable for MPU applications.

■ PACKAGE OUTLINE

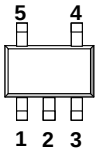


NJU7276F

■ FEATURES

- Ultra Low Quiescent Current Iq=3.5μA typ. (Io=0mA)
- Output Voltage Accuracy Vo = ±1.0%
- Reset Voltage Accuracy V_{RT} = ±1.0%
- Input Voltage Monitor type
- Delay Time(Built-in Fixed Type) 50ms /100ms /200ms
- Output Current Io(max.)=100mA
- Output capacitor with 0.1uF ceramic capacitor
- Nch Open Drain Output
- Internal Short Circuit Current Limit
- CMOS Technology
- Package Outline SOT-23-5

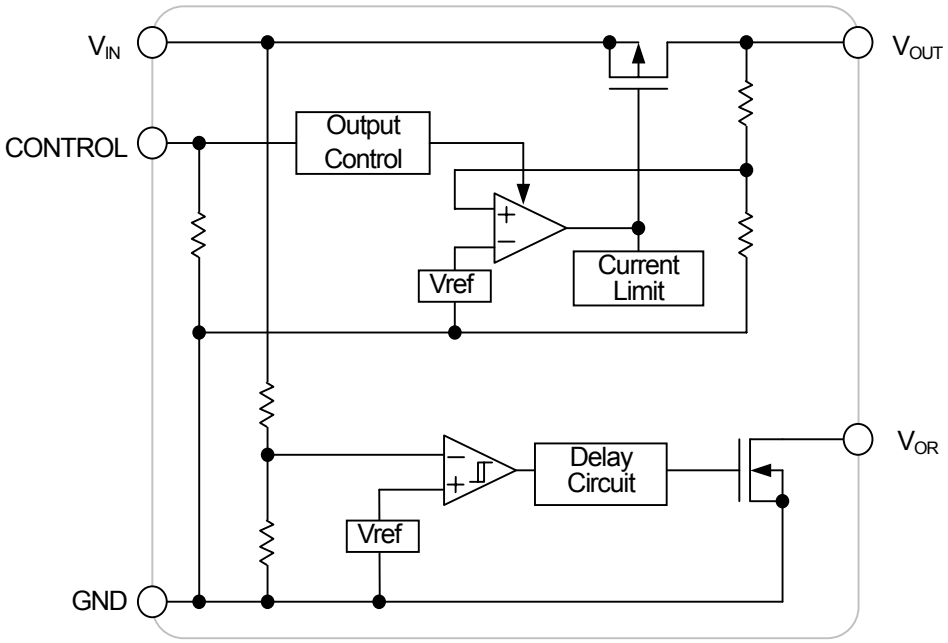
■ PIN CONFIGURATION



1.V_{IN}
2.GND
3.CONT
4.V_{OR}
5.V_{OUT}

NJU7276F

■ EQUIVALENT CIRCUIT



■ OUTPUT VOLTAGE/ DETECTION VOLTAGE

Device Name	Output	Detection	Delay Time
NJU7276F1502A2	1.5V	2.0V	100ms
NJU7276F3342A2	3.3V	4.2V	100ms
NJU7276F0555A2	5.0V	5.5V	100ms

Output voltage options available : 1.5 ~ 5.0V (0.1V step)
Detection voltage options available : 2.0 ~ 6.0V (0.1V step)

■ ABSOLUTE MAXIMUM RATINGS (Ta=25˚C)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	+11	V
Control Voltage	V_{CONT}	+11	V
V_{OR} Pin Output Voltage	V_{OR}	GND -0.3 ~ +11	V
V_{OR} Pin Output Current	I_{OR}	50	mA
Power Dissipation	P_D	200(*1) 350(*2)	mW
Operating Temperature Range	Topr	-40 ~ +85	˚C
Storage Temperature	Tstg	-40 ~ +125	˚C

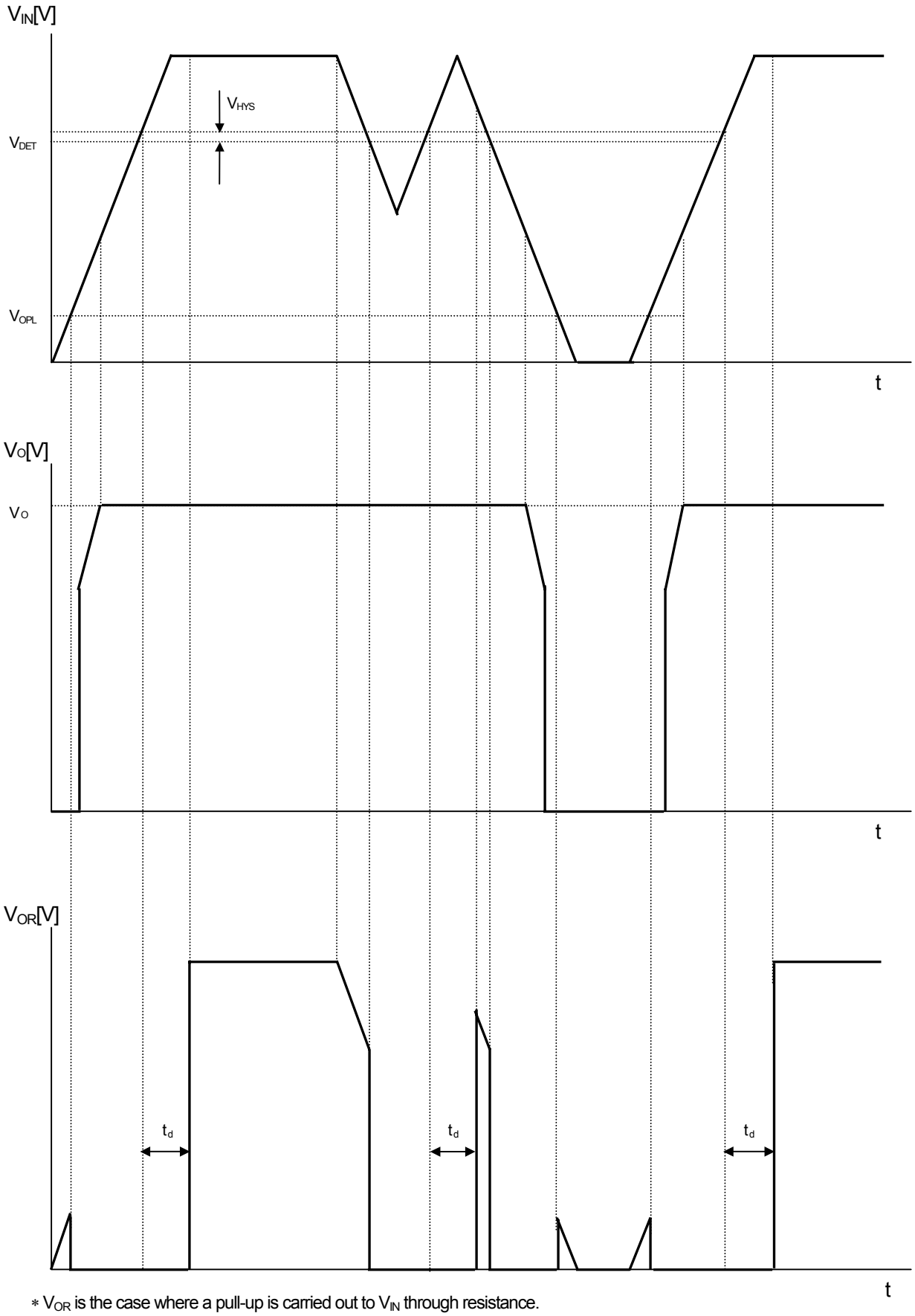
(*1): Device itself
(*2): Mounted on glass epoxy board based on EIA/JEDEC. (114.3x76.2x1.6mm: 2Layers)

■ ELECTRICAL CHARACTERISTICS (V_{IN}=Vo+1V, C_{IN}=0.1µF, C_O=0.1µF, Ta=25˚C)

PARAMETER	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
General Characteristics							
Quiescent Current	I_Q	V_{IN}=Vo+2V, V_{CONT}=V_{IN}, I_O=0mA		-	3.5	8.2	µA
Quiescent Current at Control OFF	$I_{Q(OFF)}$	V_{IN}=Vo+2V, V_{CONT}=0V, I_O=0mA		-	1.3	2.2	µA
Regulator Block							
Output Voltage	V_O	I_O=30mA		-1.0%	-	+1.0%	V
Output Current	I_O	V_O - 0.3V		100	-	-	mA
Line Regulation	$\Delta V_O/\Delta V_{IN}$	V_{IN}=V_O+1V ~ V_O+6V(V_O<3.0V) V_{IN}=V_O+1V ~ 9V(V_O≥3.0V) I_O=30mA		-	-	0.3	%/V
Load Regulation	$\Delta V_O/\Delta I_O$	I_O=0 ~ 100mA		-	-	0.15	%/mA
Output Voltage Temperature Coefficient	$\Delta V_O/\Delta Ta$	Ta=0 ~ 85˚C, I_O=10mA		-	±100	-	ppm/˚C
Control Voltage for ON-State	$V_{CONT(ON)}$			1.6	-	V_{IN}	V
Control Voltage for OFF-State	$V_{CONT(OFF)}$			0	-	0.3	V
Pull-down Resistance	R_{CONT}			2	5	10	MΩ
Short Circuit Limit	I_{LIM}	V_O=0V		-	25	-	mA
Input Voltage	V_{IN}			-	-	9	V
Dropout Voltage	ΔV_{I-O}	I_O=40mA	1.5V≤V_O≤2.0V	-	0.19	0.60	V
		I_O=60mA	2.1V≤V_O≤2.4V	-	0.19	0.29	V
			2.5V≤V_O≤2.7V	-	0.18	0.27	V
			2.8V≤V_O≤3.3V	-	0.17	0.26	V
			3.4V≤V_O≤5.0V	-	0.16	0.24	V
			5.1V≤V_O≤6.0V	-	0.15	0.22	V
Reset Block							
Detection Voltage	V_{DET}			-1.0%	-	+1.0%	V
Hysteresis Voltage	V_{HYS}			70	90	130	mV
V_{OR} Pin Output Current	I_{OR}	Nch, V_{DS}=0.5V, V_{CONT}=0V	V_{IN}=1.2V	0.75	2.00	-	mA
			V_{IN}=2.4V (V_{DET}≥2.7V)	4.50	7.00	-	mA
Output Leak Current	I_{LEAK}	V_{IN}=V_{OR}=V_{CONT}=9V		-	-	0.1	µA
Detection Voltage Temperature Coefficient	$\Delta V_{DET}/\Delta Ta$	Ta=0 ~ 85˚C		-	±100	-	ppm/˚C
Delay Time	td	V_{IN}= V_{DET} +1V	NJU7276xxxxx1	42.5	50.0	57.5	ms
			NJU7276xxxxx2	85	100	115	ms
			NJU7276xxxxx3	170	200	230	ms
Operating Voltage(*3)	V_{OPL}	R_L=100kΩ		-	-	0.8	V

(*3): The value condition that V_{OR} become 10% or less of the input voltage(V_{IN}).

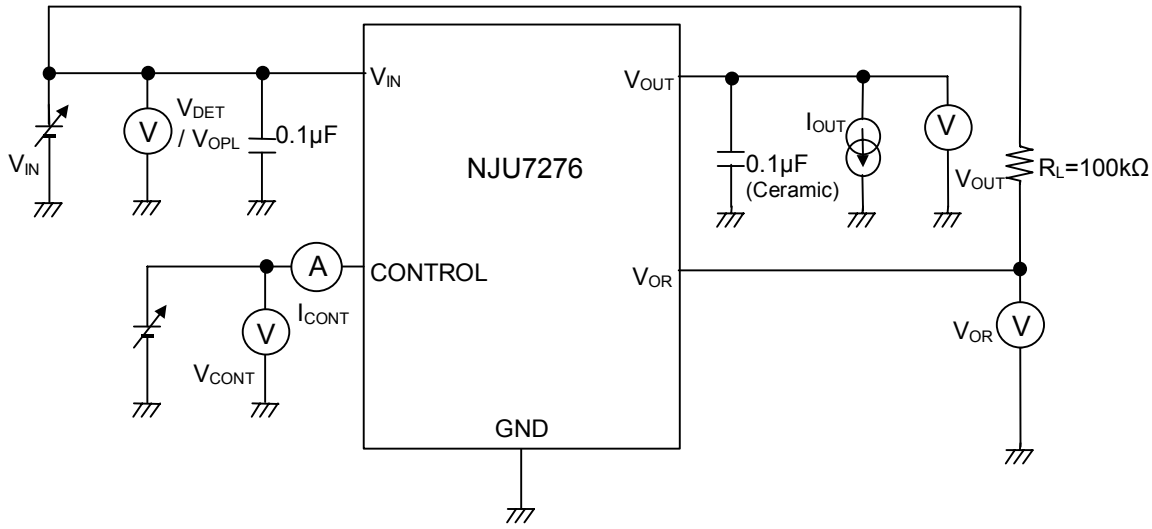
■ TIMING CHART



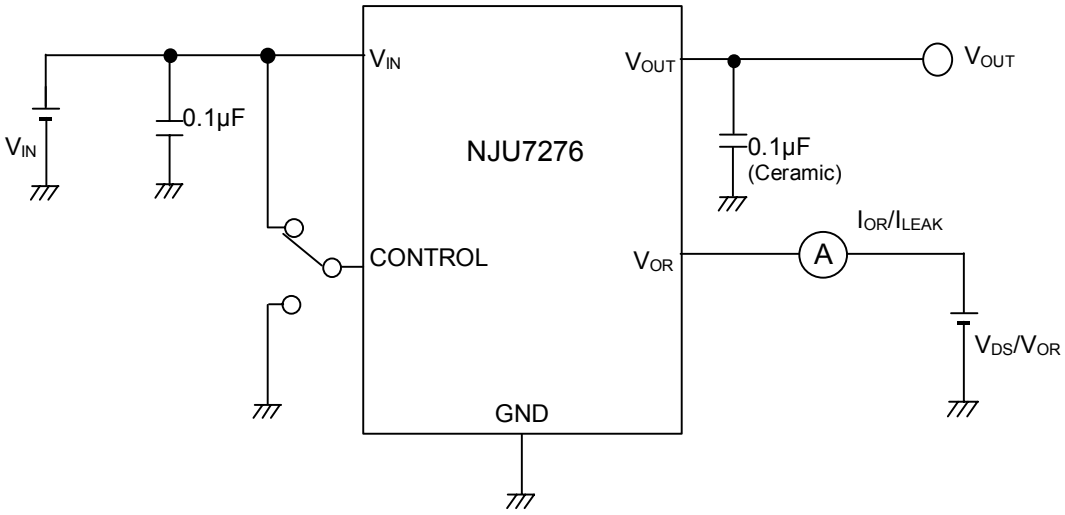
∗ V_{OR} is the case where a pull-up is carried out to V_{IN} through resistance.

■ TEST CIRCUIT

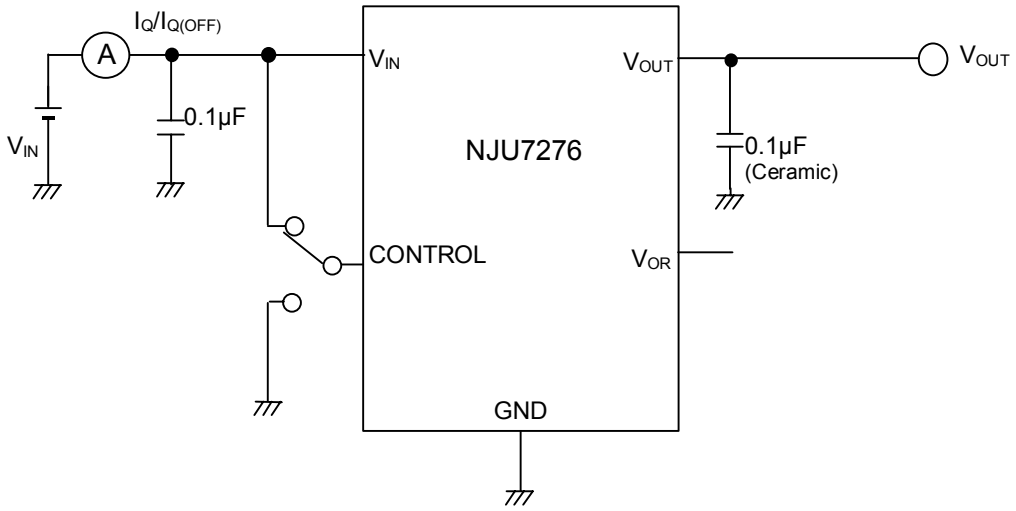
① COMMON TEST CIRCUIT



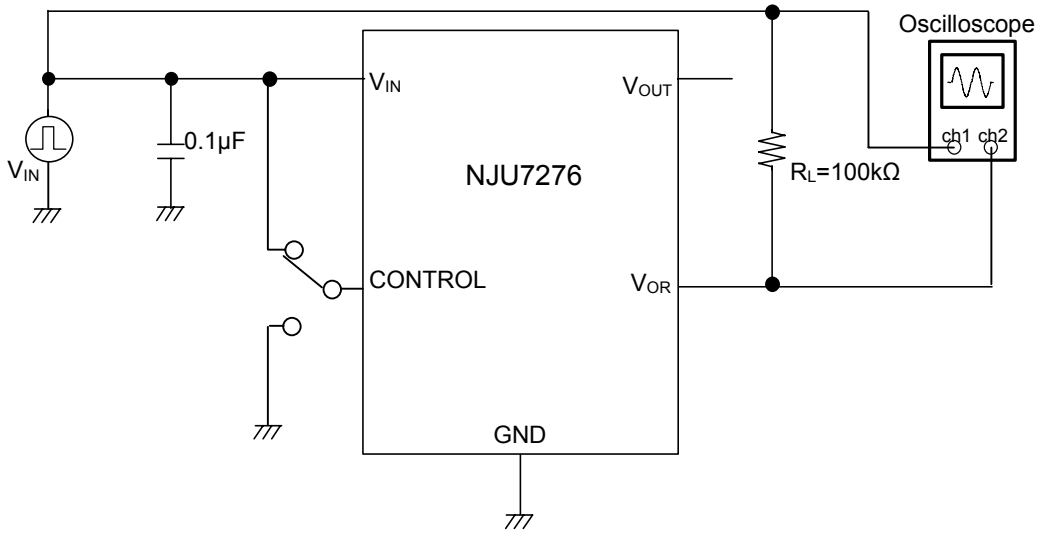
② OUTPUT CURRENT/OUTPUT LEAK CURRENT TEST CIRCUIT



③ QUIESCENT CURRENT TEST CIRCUIT

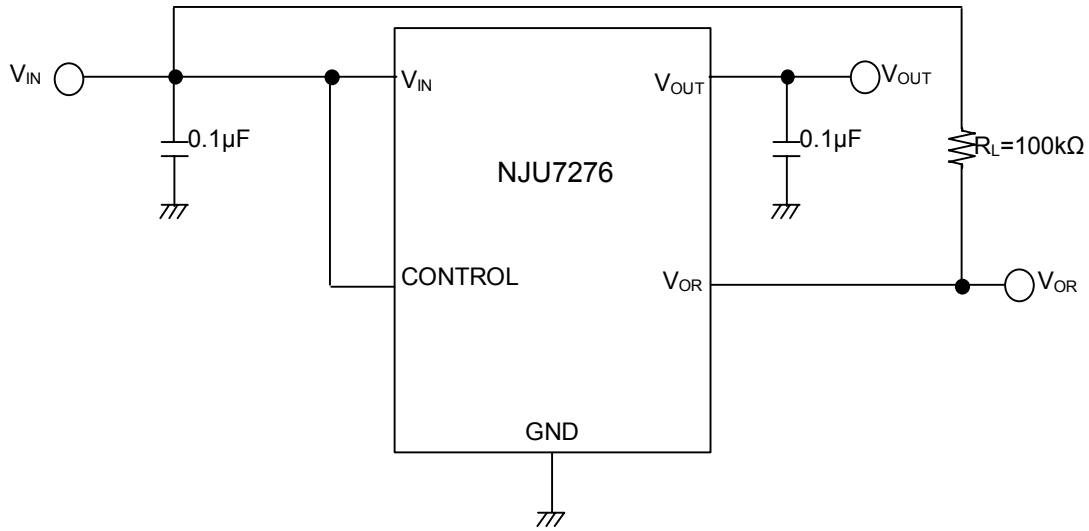


④ DELAY TIME TEST CIRCUIT



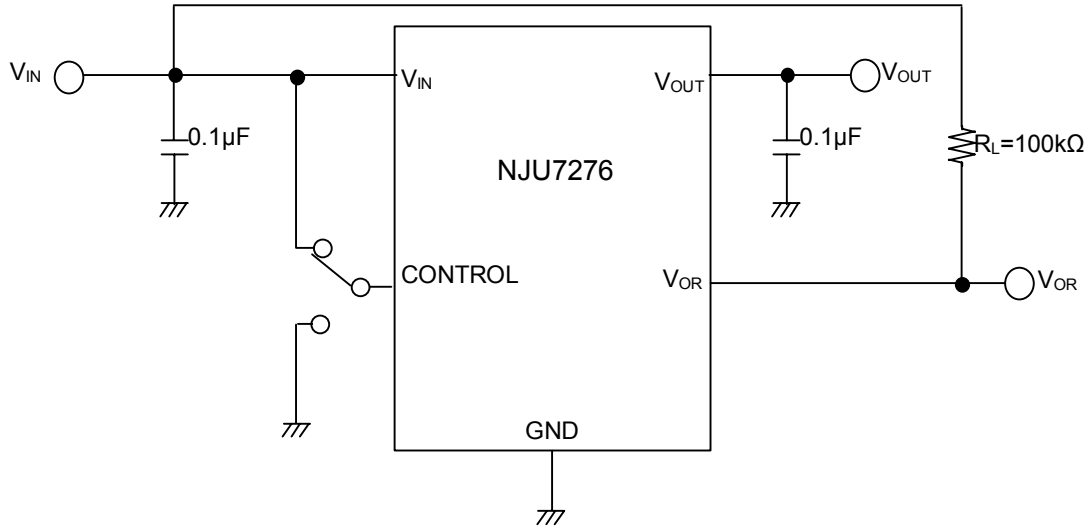
■ TYPICAL APPLICATION

① In case that ON/OFF Control is not required:



Connect control terminal to V_{IN} terminal.

② In use of ON/OFF Control:



State of control terminal:

- "H" → output is enabled.
- "L" or "open" → output is disabled.

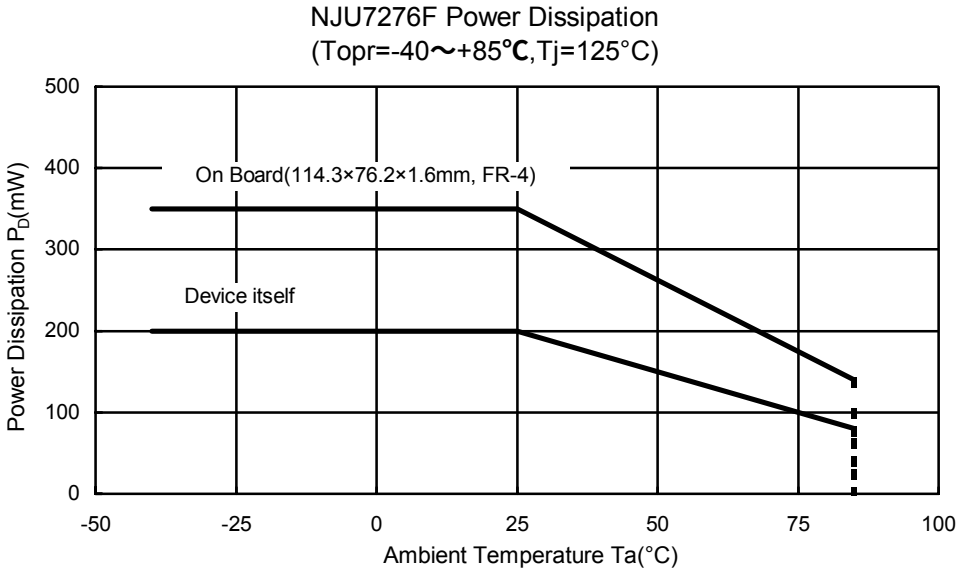
∗Input Capacitance C_{IN}

Input Capacitance C_{IN} is required to prevent oscillation and reduce power supply ripple for applications with high power supply impedance or a long power supply line.
Use the C_{IN} value of 0.1µF greater to avoid the problem.
C_{IN} should connect between GND and V_{IN} as short as possible.

∗Output Capacitance Co

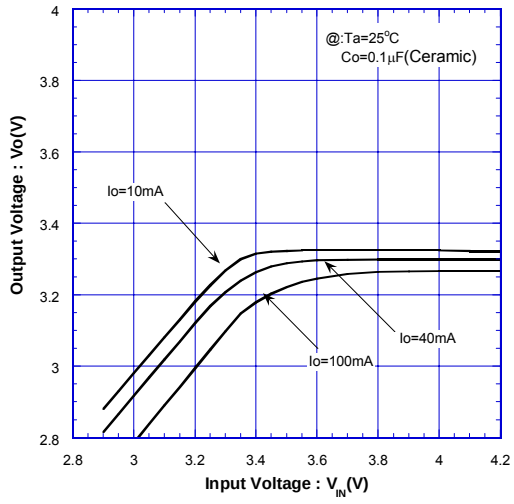
Output capacitor (Co) is required for a phase compensation of the internal error amplifier. The capacitance and the equivalent series resistance (ESR) influence stability of the regulator.
If use a smaller Co, it may cause excess output noise or oscillation of the regulator due to lack of the phase compensation. Therefore, use Co with the recommended capacitance or greater value and connect between Vo terminal and GND terminal with minimal wiring.
The recommended capacitance depends on the output voltage. Low voltage regulator requires greater value of the Co. Thus, check the recommended capacitance for each output voltage.
Use of a greater Co reduces output noise and ripple output, and also improves transient response of the output voltage against rapid load change.
This product is designed to work with any capacitor including a low ESR capacitor for the Co; however, refer "Equivalent Series Resistance vs. Output Current" and choose suitable capacitor.

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE

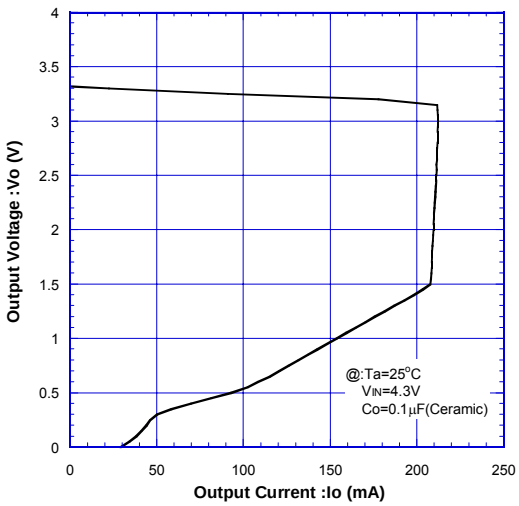


■ TYPICAL CHARACTERISTICS (LDO BLOCK)

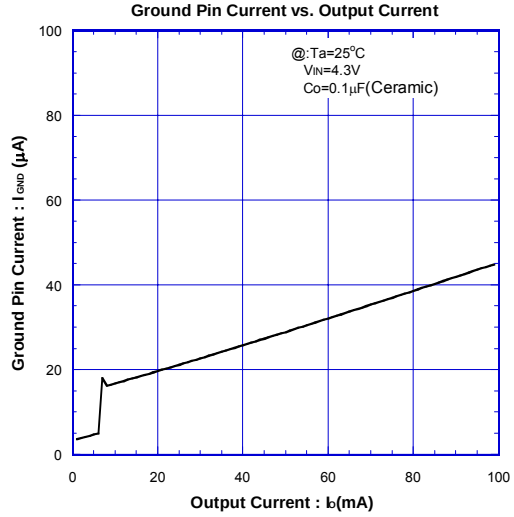
NJU7276_3.3V
Output Voltage vs. Input Voltage



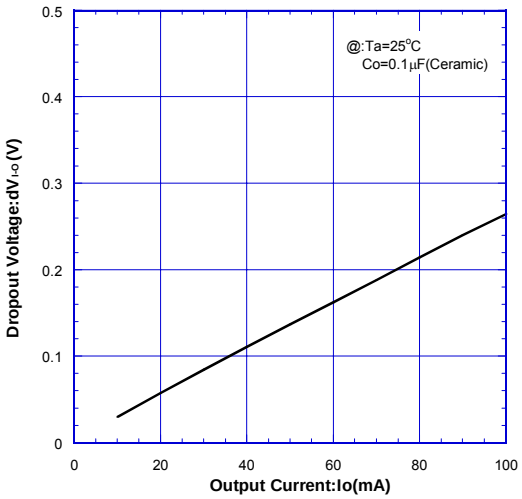
NJU7276_3.3V
Output Voltage vs. Output Current



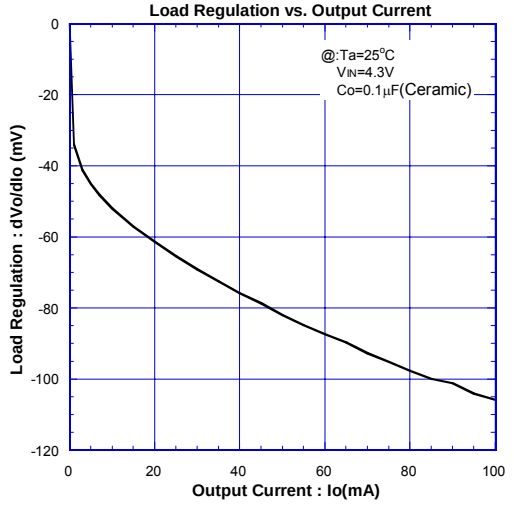
NJU7276_3.3V
Ground Pin Current vs. Output Current



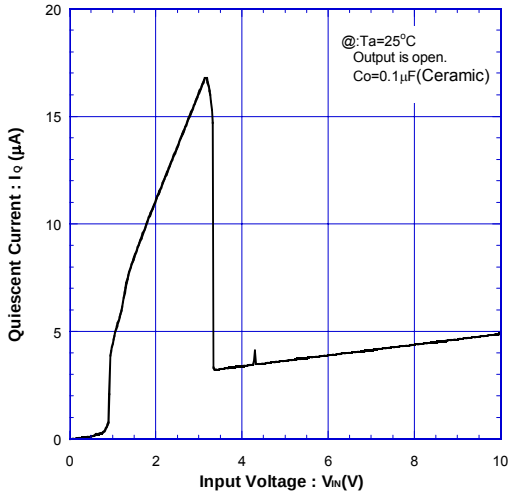
NJU7276_3.3V
Dropout Voltage vs. Output Current



NJU7276_3.3V
Load Regulation vs. Output Current

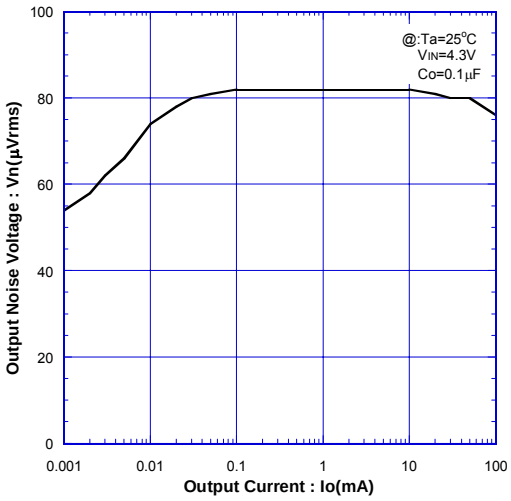


NJU7276_3.3V
Quiescent Current vs. Input Voltage

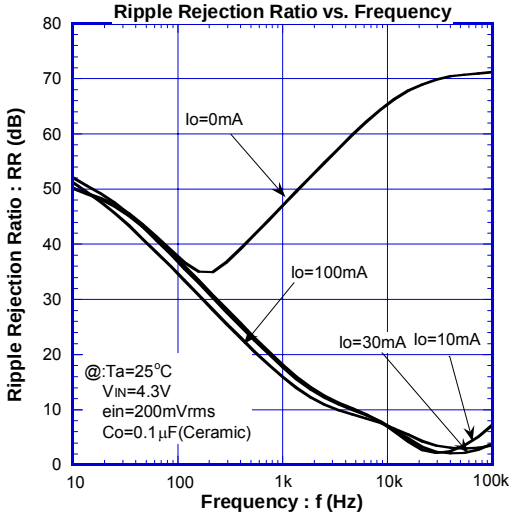


■ TYPICAL CHARACTERISTICS (LDO BLOCK)

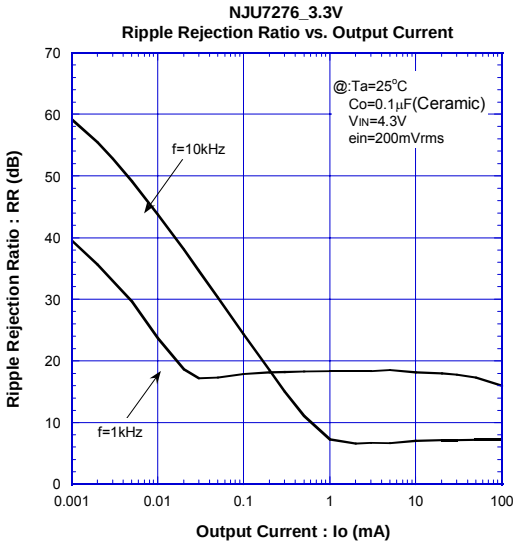
NJU7276_3.3V
Output Noise Voltage vs. Output Current



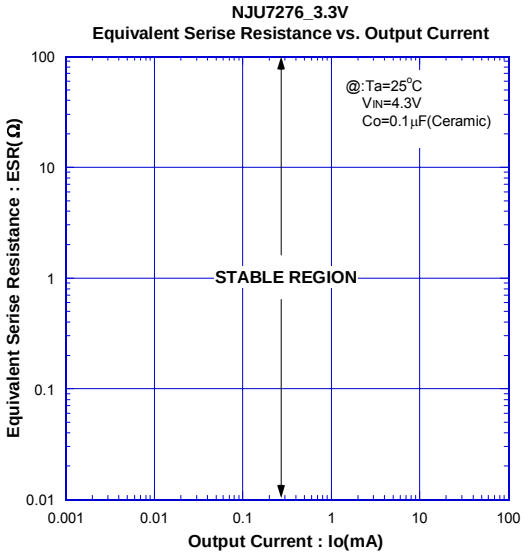
NJU7276_3.3V
Ripple Rejection Ratio vs. Frequency



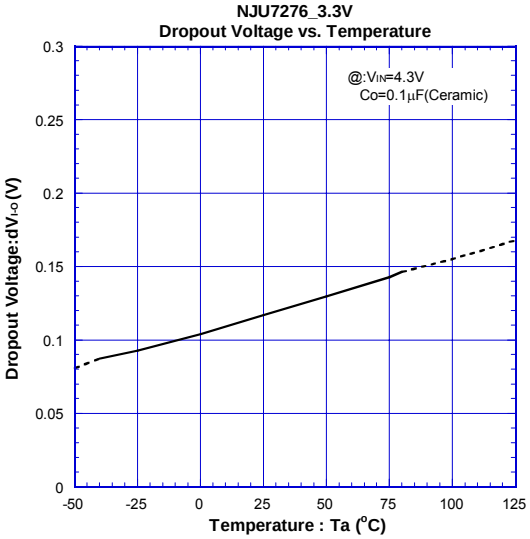
NJU7276_3.3V
Ripple Rejection Ratio vs. Output Current

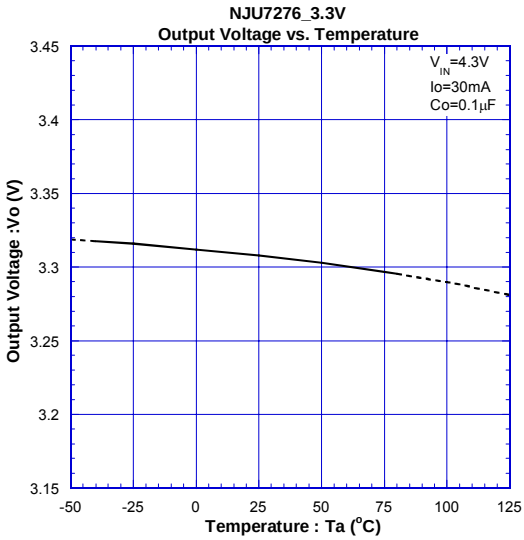


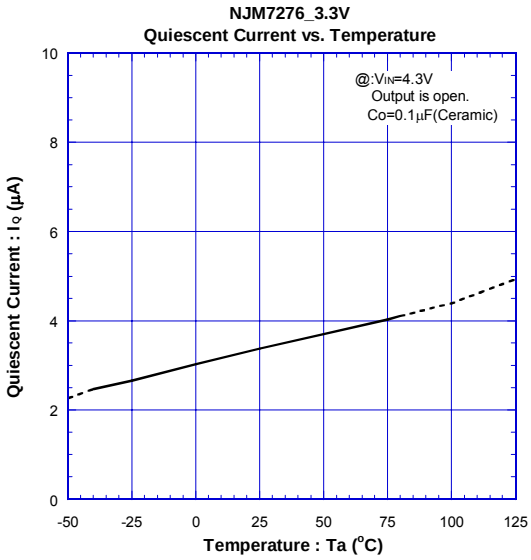
NJU7276_3.3V
Equivalent Serise Resistance vs. Output Current

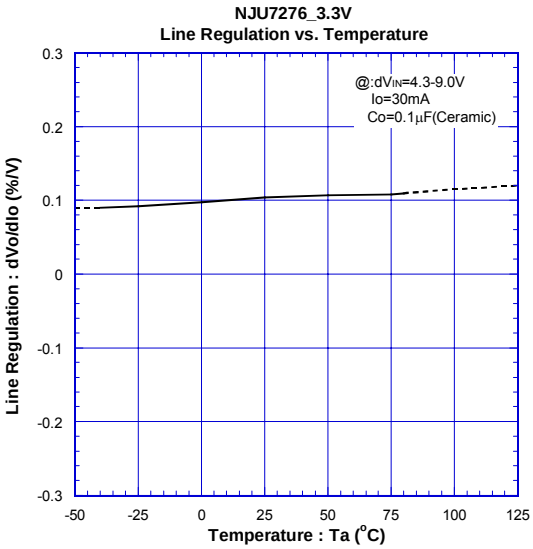


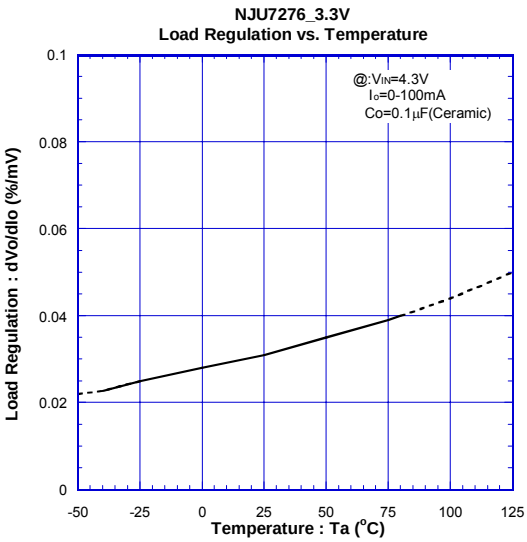
■ TYPICAL CHARACTERISTICS (LDO BLOCK)

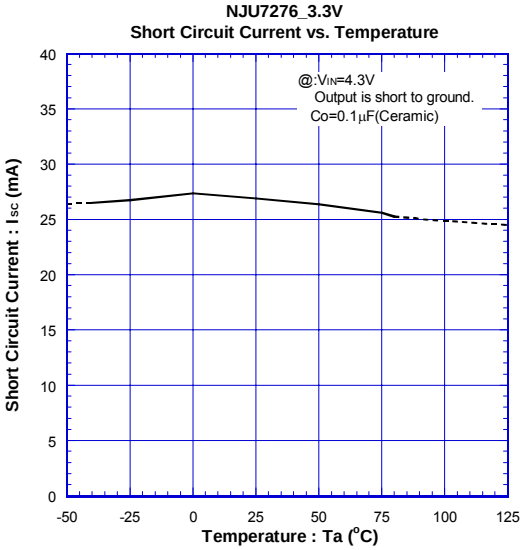






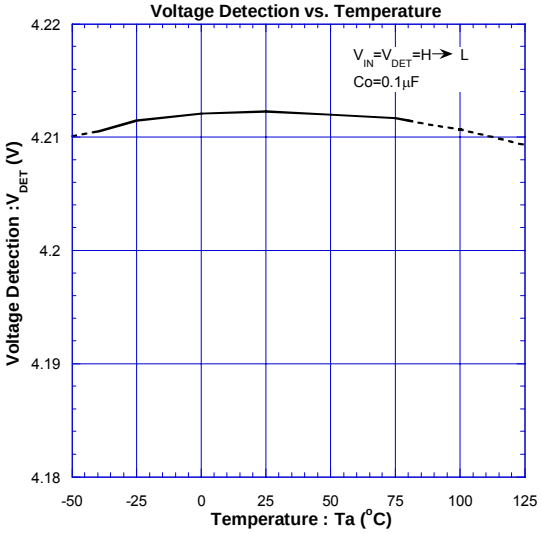




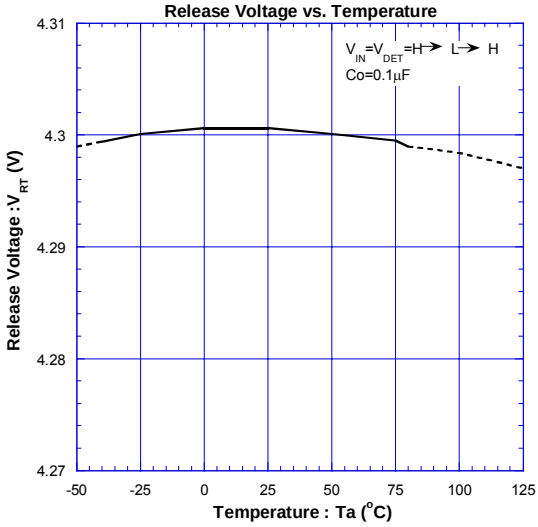


■ TYPICAL CHARACTERISTICS (RESET BLOCK)

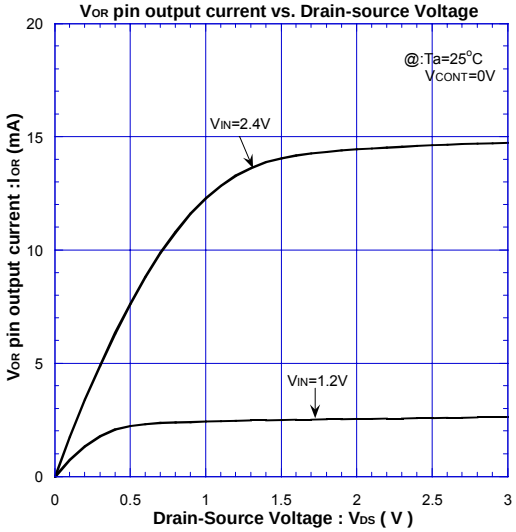
NJU7276_4.2V
Voltage Detection vs. Temperature



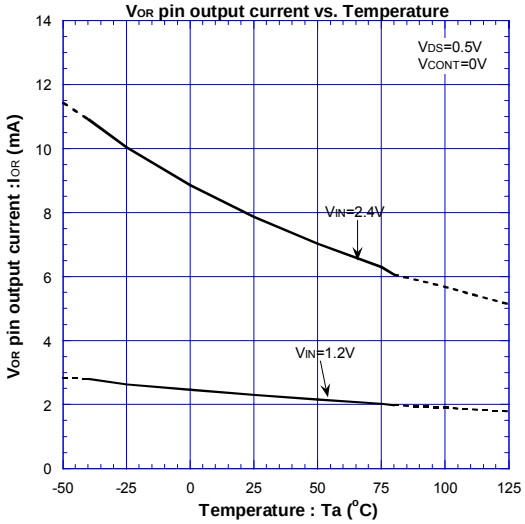
NJU7276_4.2V
Release Voltage vs. Temperature



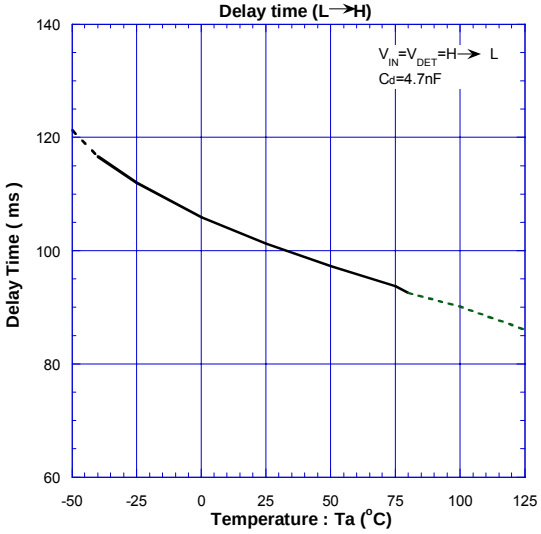
NJU7276_4.2V
V_{OR} pin output current vs. Drain-source Voltage



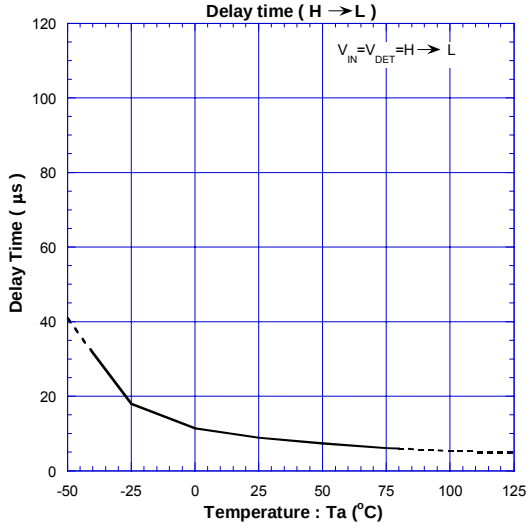
NJU7276_4.2V
V_{OR} pin output current vs. Temperature



NJU7276_4.2V
Delay time (L→H)



NJU7276_4.2V
Delay time (H →L)



[CAUTION]
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