



## 82NXX

CMOS IC

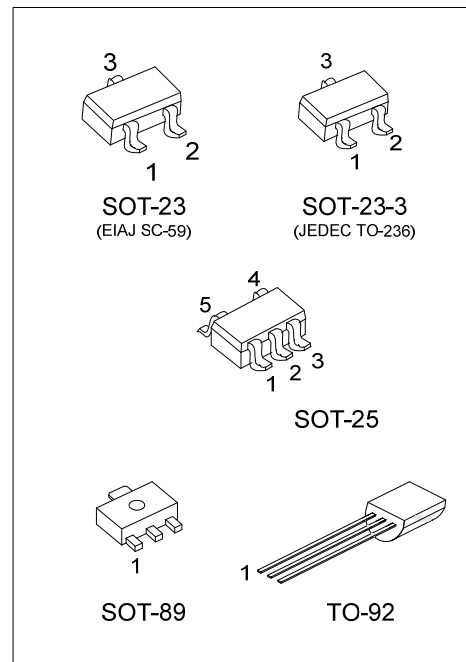
### VOLTAGE DETECTORS

#### DESCRIPTION

The UTC **82NXX** series are highly precise, low power consumption voltage detectors. Detect voltage is extremely accurate with minimal temperature drift. N-channel open drain output configurations are available.

#### FEATURES

- \* High-accuracy detection voltage :  $\pm 2\%$
- \* Detect voltage range : 1.3V to 6.0V in 0.1V increments
- \* Detect voltage temperature characteristics: TYP.  $\pm 100\text{ppm}/^\circ\text{C}$ .
- \* Wide operating voltage range : 0.7V to 10.0V
- \* Low current consumption : TYP 0.7 $\mu\text{A}$  (at  $V_{\text{IN}}=1.5\text{V}$ )



#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment					Packing
Lead Free	Halogen Free		1	2	3	4	5	
82NXXL-AB3-E-R	82NXXG-AB3-E-R	SOT-89	O	I	G	-	-	Tape Reel
82NXXL-AE2-5-R	82NXXG-AE2-5-R	SOT-23-3	O	G	I	-	-	Tape Reel
82NXXL-AE3-5-R	82NXXG-AE3-5-R	SOT-23	O	G	I	-	-	Tape Reel
82NXXL-AF5-B-R	82NXXG-AF5-B-R	SOT-25	O	I	G	N	N	Tape Reel
82NXXL-T92-D-B	82NXXG-T92-D-B	TO-92	I	G	O	-	-	Tape Box
82NXXL-T92-D-K	82NXXG-T92-D-K	TO-92	I	G	O	-	-	Bulk
82NXXL-T92-D-R	82NXXG-T92-D-R	TO-92	I	G	O	-	-	Bulk
82NXXL-T92-E-B	82NXXG-T92-E-B	TO-92	O	I	G	-	-	Tape Box
82NXXL-T92-E-K	82NXXG-T92-E-K	TO-92	O	I	G	-	-	Bulk

Note: 1. Pin assignment: I:  $V_{\text{IN}}$  O:  $V_{\text{OUT}}$  G:  $V_{\text{SS}}$   
 2.xx: Output Voltage, refer to Marking Information

<p>82NXXG-AB3-5-R</p>	<p>(1) Packing Type          (2) Pin Assignment          (3) Package Type          (4) Green Package          (5) Output Voltage Code</p>	<p>(1) B: Tape Box, K: Bulk, R: Tape Reel          (2) refer to Pin Assignment          (3) AB3: SOT-89, AE2: SOT-23-3, AE3: SOT-23, AF5: SOT-25, T92: TO-92          (4) G: Halogen Free and Lead Free, L: Lead Free          (5) XX: refer to Marking Information</p>
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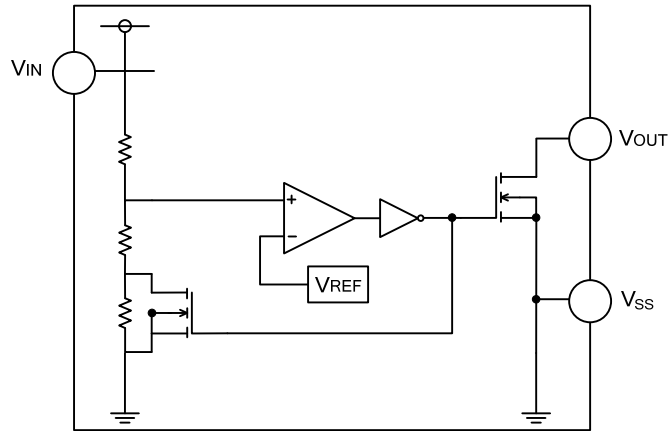
■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE		MARKING		
SOT-89	13:1.3V	37:3.7V			
	14:1.4V	38:3.8V			
	15:1.5V	39:3.9V			
	16:1.6V	40:4.0V			
	17:1.7V	41:4.1V			
TO-92	18:1.8V	42:4.2V			
	19:1.9V	43:4.3V			
	20:2.0V	44:4.4V			
	21:2.1V	45:4.5V			
	22:2.2V	46:4.6V			
	23:2.3V	47:4.7V			
	24:2.4V	48:4.8V			
	25:2.5V	49:4.9V			
	SOT-23 SOT-23-3	26:2.6V		50:5.0V	
		27:2.7V		51:5.1V	
28:2.8V		52:5.2V			
29:2.9V		53:5.3V			
30:3.0V		54:5.4V			
SOT-25	31:3.1V	55:5.5V			
	32:3.2V	56:5.6V			
	33:3.3V	57:5.7V			
	34:3.4V	58:5.8V			
	35:3.5V	59:5.9V			
	36:3.6V	60:6.0V			

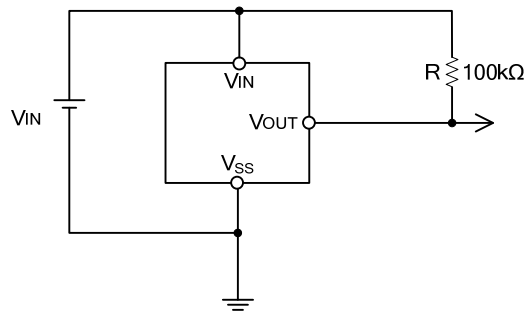
■ MARKING CODE FOR SOT-23/SOT-25

PART NUMBER	DETECT VOLATGE		MARKING CODE	PART NUMBER	DETECT VOLATGE		MARKING CODE
	VOLTAGE	CODE			VOLTAGE	CODE	
82N13	1.3V	13	N13	82N37	3.7V	37	N37
82N14	1.4V	14	N14	82N38	3.8V	38	N38
82N15	1.5V	15	N15	82N39	3.9V	39	N39
82N16	1.6V	16	N16	82N40	4.0V	40	N40
82N17	1.7V	17	N17	82N41	4.1V	41	N41
82N18	1.8V	18	N18	82N42	4.2V	42	N42
82N19	1.9V	19	N19	82N43	4.3V	43	N43
82N20	2.0V	20	N20	82N44	4.4V	44	N44
82N21	2.1V	21	N21	82N45	4.5V	45	N45
82N22	2.2V	22	N22	82N46	4.6V	46	N46
82N23	2.3V	23	N23	82N47	4.7V	47	N47
82N24	2.4V	24	N24	82N48	4.8V	48	N48
82N25	2.5V	25	N25	82N49	4.9V	49	N49
82N26	2.6V	26	N26	82N50	5.0V	50	N50
82N27	2.7V	27	N27	82N51	5.1V	51	N51
82N28	2.8V	28	N28	82N52	5.2V	52	N52
82N29	2.9V	29	N29	82N53	5.3V	53	N53
82N30	3.0V	30	N30	82N54	5.4V	54	N54
82N31	3.1V	31	N31	82N55	5.5V	55	N55
82N32	3.2V	32	N32	82N56	5.6V	56	N56
82N33	3.3V	33	N33	82N57	5.7V	57	N57
82N34	3.4V	34	N34	82N58	5.8V	58	N58
82N35	3.5V	35	N35	82N59	5.9V	59	N59
82N36	3.6V	36	N36	82N60	6.0V	60	N60

■ BLOCK DIAGRAM



■ TYPICAL APPLICATION CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V <sub>IN</sub>	12	V
Output Current		I <sub>OUT</sub>	50	mA
Output Voltage		V <sub>OUT</sub>	V <sub>SS</sub> -0.3 ~12	V
Power Dissipation	SOT-23-3/SOT-23	P <sub>D</sub>	150	mW
	SOT-25		500	mW
	SOT-89		300	mW
	TO-92			
Operating Temperature		T <sub>OPR</sub>	-40 ~ +105	°C
Storage Temperature		T <sub>STG</sub>	-40 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C, unless otherwise specified.)

**Detection voltage (1.3V ~ 1.5V)**

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITONS	MIN	TYP	MAX.	UNIT
Detect Voltage (Note1)	V <sub>DF</sub>	1		V <sub>DF</sub> ×0.98	V <sub>DF</sub> (Note2)	V <sub>DF</sub> ×1.02	V
Hysteresis Range	V <sub>HYS</sub>	1		V <sub>DF</sub> ×0.02	V <sub>DF</sub> ×0.05	V <sub>DF</sub> ×0.08	V
Supply Current	I <sub>SS</sub>	2	V <sub>IN</sub> =1.5V		0.7	2.3	μA
			V <sub>IN</sub> =5V		1.1	3.6	μA
Operating Voltage	V <sub>IN</sub>	1		0.7		6.0	V
Output Current	I <sub>OUT</sub>	3	V <sub>DS</sub> =0.5V, V <sub>IN</sub> =1.0V	0.85	2.7		mA
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$		T <sub>OPR</sub> = -40 ~ 105°C		± 100		ppm/°C
Transient Delay Time	t <sub>DLY</sub>	4				0.2	ms

**Detection voltage (1.6V ~ 1.9V)**

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITONS	MIN	TYP	MAX.	UNIT
Detect Voltage(Note1)	V <sub>DF</sub>	1		V <sub>DF</sub> ×0.98	V <sub>DF</sub> (Note2)	V <sub>DF</sub> ×1.02	V
Hysteresis Range	V <sub>HYS</sub>	1		V <sub>DF</sub> ×0.02	V <sub>DF</sub> ×0.05	V <sub>DF</sub> ×0.08	V
Supply Current	I <sub>SS</sub>	2	V <sub>IN</sub> =1.5V		0.7	2.3	μA
			V <sub>IN</sub> =5V		1.1	3.6	μA
Operating Voltage	V <sub>IN</sub>	1		0.7		10	V
Output Current	I <sub>OUT</sub>	3	V <sub>DS</sub> =0.5V, V <sub>IN</sub> =1.0V	1.0	2.2		mA
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$		T <sub>OPR</sub> = -40 ~ 105°C		± 100		ppm/°C
Transient Delay Time	t <sub>DLY</sub>	4				0.2	ms

**Detection voltage (2.0V ~ 2.4V)**

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITONS	MIN	TYP	MAX.	UNIT
Detect Voltage(Note1)	V <sub>DF</sub>	1		V <sub>DF</sub> ×0.98	V <sub>DF</sub> (Note2)	V <sub>DF</sub> ×1.02	V
Hysteresis Range	V <sub>HYS</sub>	1		V <sub>DF</sub> ×0.02	V <sub>DF</sub> ×0.05	V <sub>DF</sub> ×0.08	V
Supply Current	I <sub>SS</sub>	2	V <sub>IN</sub> =2.0V		0.8	2.7	μA
			V <sub>IN</sub> =5.0V		1.1	3.6	μA
Operating Voltage	V <sub>IN</sub>	1		0.7		10	V
Output Current	I <sub>OUT</sub>	3	V <sub>DS</sub> =0.5V, V <sub>IN</sub> =2.0V	3.0	7.7		mA
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$		T <sub>OPR</sub> = -40 ~ 105°C		± 100		ppm/°C
Transient Delay Time	t <sub>DLY</sub>	4				0.2	ms

■ ELECTRICAL CHARACTERISTICS(Cont.)

**Detection voltage (2.5V ~ 2.9V)**

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITONS	MIN	TYP	MAX.	UNIT
Detect Voltage(Note1)	$V_{DF}$	1		$V_{DF} \times 0.98$	$V_{DF}$ (Note2)	$V_{DF} \times 1.02$	V
Hysteresis Range	$V_{HYS}$	1		$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V
Supply Current	$I_{SS}$	2	$V_{IN} = 2.0V$		0.8	2.7	$\mu A$
			$V_{IN} = 5.0V$		1.1	3.6	$\mu A$
Operating Voltage	$V_{IN}$	1		0.7		10	V
Output Current	$I_{OUT}$	3	$V_{DS} = 0.5V, V_{IN} = 2.0V$	3.0	7.7		mA
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$		$T_{OPR} = -40 \sim 105^{\circ}C$		$\pm 100$		ppm/ $^{\circ}C$
Transient Delay Time	$t_{DLY}$	4				0.2	ms

**Detection voltage (3.0V ~ 3.4V)**

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITONS	MIN	TYP	MAX.	UNIT
Detect Voltage(Note1)	$V_{DF}$	1		$V_{DF} \times 0.98$	$V_{DF}$ (Note2)	$V_{DF} \times 1.02$	V
Hysteresis Range	$V_{HYS}$	1		$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V
Supply Current	$I_{SS}$	2	$V_{IN} = 3.0V$		0.9	3.0	$\mu A$
			$V_{IN} = 5.0V$		1.1	3.6	$\mu A$
Operating Voltage	$V_{IN}$	1		0.7		10	V
Output Current	$I_{OUT}$	3	$V_{DS} = 0.5V, V_{IN} = 3.0V$	5.0	10.1		mA
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$		$T_{OPR} = -40 \sim 105^{\circ}C$		$\pm 100$		ppm/ $^{\circ}C$
Transient Delay Time	$t_{DLY}$	4				0.2	ms

**Detection voltage (3.5V ~ 3.9V)**

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITONS	MIN	TYP	MAX.	UNIT
Detect Voltage(Note1)	$V_{DF}$	1		$V_{DF} \times 0.98$	$V_{DF}$ (Note2)	$V_{DF} \times 1.02$	V
Hysteresis Range	$V_{HYS}$	1		$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V
Supply Current	$I_{SS}$	2	$V_{IN} = 3.0V$		0.9	3.0	$\mu A$
			$V_{IN} = 5.0V$		1.1	3.6	$\mu A$
Operating Voltage	$V_{IN}$	1		0.7		10	V
Output Current	$I_{OUT}$	3	$V_{DS} = 0.5V, V_{IN} = 3.0V$	5.0	10.1		mA
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$		$T_{OPR} = -40 \sim 105^{\circ}C$		$\pm 100$		ppm/ $^{\circ}C$
Transient Delay Time	$t_{DLY}$	4				0.2	ms

**Detection voltage (4.0V ~ 4.5V)**

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITONS	MIN	TYP	MAX.	UNIT
Detect Voltage(Note1)	$V_{DF}$	1		$V_{DF} \times 0.98$	$V_{DF}$ (Note2)	$V_{DF} \times 1.02$	V
Hysteresis Range	$V_{HYS}$	1		$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V
Supply Current	$I_{SS}$	2	$V_{IN} = 4.0V$		1.0	3.2	$\mu A$
			$V_{IN} = 5.0V$		1.1	3.6	$\mu A$
Operating Voltage	$V_{IN}$	1		0.7		10	V
Output Current	$I_{OUT}$	3	$V_{DS} = 0.5V, V_{IN} = 4.0V$	6.0	11.5		mA
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$		$T_{OPR} = -40 \sim 105^{\circ}C$		$\pm 100$		ppm/ $^{\circ}C$
Transient Delay Time	$t_{DLY}$	4				0.2	ms

### ■ ELECTRICAL CHARACTERISTICS (Cont.)

#### Detection voltage (4.6V ~ 4.9V)

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITONS	MIN	TYP	MAX.	UNIT
Detect Voltage(Note1)	$V_{DF}$	1		$V_{DF} \times 0.98$	$V_{DF}$ (Note2)	$V_{DF} \times 1.02$	V
Hysteresis Range	$V_{HYS}$	1		$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V
Supply Current	$I_{SS}$	2	$V_{IN} = 4.0V$		1.0	3.2	$\mu A$
			$V_{IN} = 5.0V$		1.1	3.6	$\mu A$
Operating Voltage	$V_{IN}$	1		0.7		10	V
Output Current	$I_{OUT}$	3	$V_{DS} = 0.5V, V_{IN} = 4.0V$	6.0	11.5		mA
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$		$T_{OPR} = -40 \sim 105^{\circ}C$		$\pm 100$		ppm/ $^{\circ}C$
Transient Delay Time	$t_{DLY}$	4				0.2	ms

#### Detection voltage (5.0V ~ 5.5V)

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITONS	MIN	TYP	MAX.	UNIT
Detect Voltage(Note1)	$V_{DF}$	1		$V_{DF} \times 0.98$	$V_{DF}$ (Note2)	$V_{DF} \times 1.02$	V
Hysteresis Range	$V_{HYS}$	1		$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V
Supply Current	$I_{SS}$	2	$V_{IN} = 5.0V$		1.1	3.6	$\mu A$
			$V_{IN} = 6.0V$		1.2	3.8	$\mu A$
Operating Voltage	$V_{IN}$	1		0.7		10	V
Output Current	$I_{OUT}$	3	$V_{DS} = 0.5V, V_{IN} = 5.0V$	7.0	13.0		mA
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$		$T_{OPR} = -40 \sim 105^{\circ}C$		$\pm 100$		ppm/ $^{\circ}C$
Transient Delay Time	$t_{DLY}$	4				0.2	ms

#### Detection voltage (5.5V ~ 5.9V)

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITONS	MIN	TYP	MAX.	UNIT
Detect Voltage(Note1)	$V_{DF}$	1		$V_{DF} \times 0.98$	$V_{DF}$ (Note2)	$V_{DF} \times 1.02$	V
Hysteresis Range	$V_{HYS}$	1		$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V
Supply Current	$I_{SS}$	2	$V_{IN} = 5.0V$		1.1	3.6	$\mu A$
			$V_{IN} = 6.0V$		1.2	3.8	$\mu A$
Operating Voltage	$V_{IN}$	1		0.7		10	V
Output Current	$I_{OUT}$	3	$V_{DS} = 0.5V, V_{IN} = 5.0V$	7.0	13.0		mA
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$		$T_{OPR} = -40 \sim 105^{\circ}C$		$\pm 100$		ppm/ $^{\circ}C$
Transient Delay Time	$t_{DLY}$	4				0.2	ms

#### Detection voltage (6.0V)

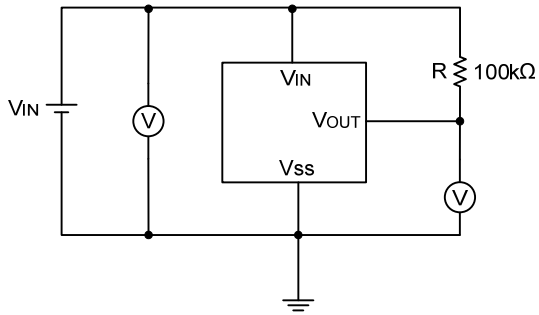
PARAMETER	SYMBOL	CIRCUIT	TEST CONDITONS	MIN	TYP	MAX.	UNIT
Detect Voltage(Note1)	$V_{DF}$	1		$V_{DF} \times 0.98$	$V_{DF}$ (Note2)	$V_{DF} \times 1.02$	V
Hysteresis Range	$V_{HYS}$	1		$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V
Supply Current	$I_{SS}$	2	$V_{IN} = 6.0V$		1.2	3.8	$\mu A$
			$V_{IN} = 7.0V$		1.3	4.0	$\mu A$
Operating Voltage	$V_{IN}$	1		0.7		10	V
Output Current	$I_{OUT}$	3	$V_{DS} = 0.5V, V_{IN} = 6.0V$	8.0	13.0		mA
Temperature Characteristics	$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$		$T_{OPR} = -40 \sim 105^{\circ}C$		$\pm 100$		ppm/ $^{\circ}C$
Transient Delay Time	$t_{DLY}$	4				0.2	ms

Notes: 1. Detect voltage of  $\pm 1\%$  tolerance is also available per customer's request.

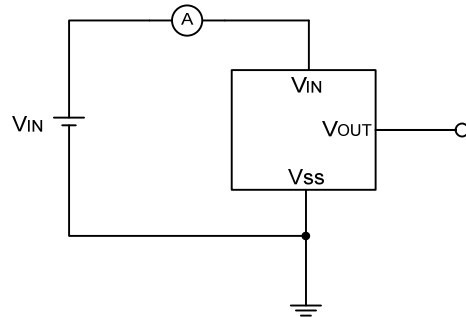
2.  $V_{DF(T)}$ : Established Detect Voltage Value

## ■ TEST CIRCUITS

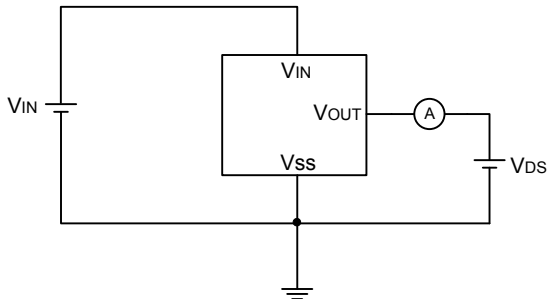
Circuit 1



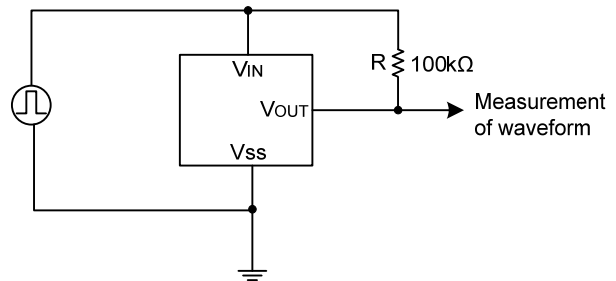
Circuit 2



Circuit 3

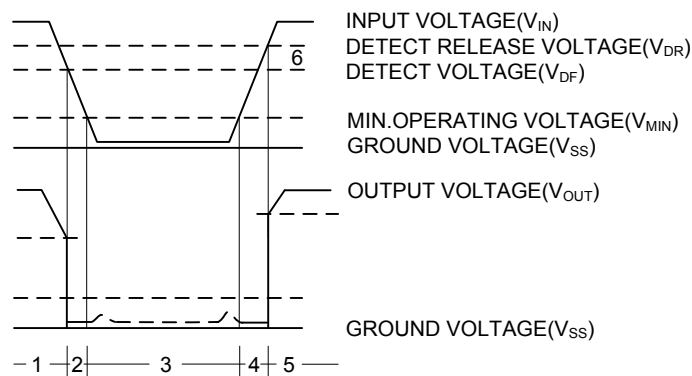


Circuit 4





■ TIMING CHART FUNCTIONAL DESCRIPTION

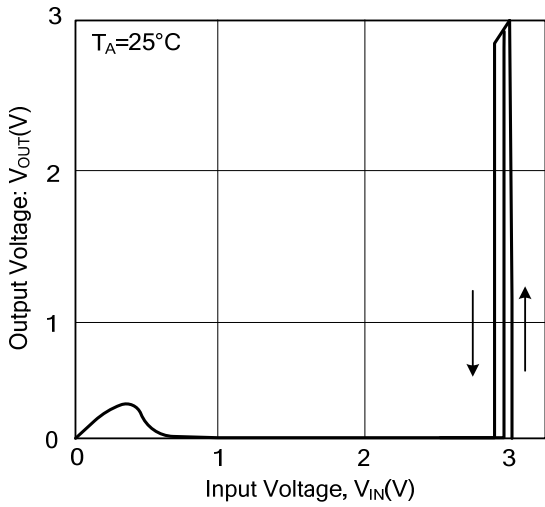


1. When input voltage ( $V_{IN}$ ) rises above detect voltage ( $V_{DF}$ ), output voltage ( $V_{OUT}$ ) will be equal to  $V_{IN}$ .
2. When input voltage ( $V_{IN}$ ) falls below detect voltage ( $V_{DF}$ ), output voltage ( $V_{OUT}$ ) will be equal to the ground voltage ( $V_{SS}$ ) level.
3. When input voltage ( $V_{IN}$ ) falls to a level below that of the minimum operating voltage ( $V_{MIN}$ ), output will become unstable. In this condition,  $V_{IN}$  will equal the pulled-up output (should output be pulled-up.)
4. When input voltage ( $V_{IN}$ ) rises above the ground voltage ( $V_{SS}$ ) level, output will be unstable at levels below the minimum operating voltage ( $V_{MIN}$ ). Between the  $V_{MIN}$  and detect release voltage ( $V_{DR}$ ) levels, the ground voltage ( $V_{SS}$ ) level will be maintained.
5. When input voltage ( $V_{IN}$ ) rises above detect release voltage ( $V_{DR}$ ), output voltage ( $V_{OUT}$ ) will be equal to  $V_{IN}$ .
6. The difference between  $V_{DR}$  and  $V_{DF}$  represents the hysteresis range.

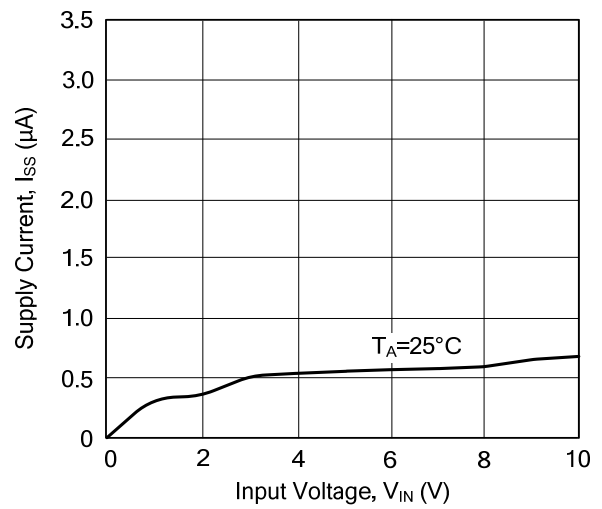
■ TYPICAL CHARACTERISTICS

82N29

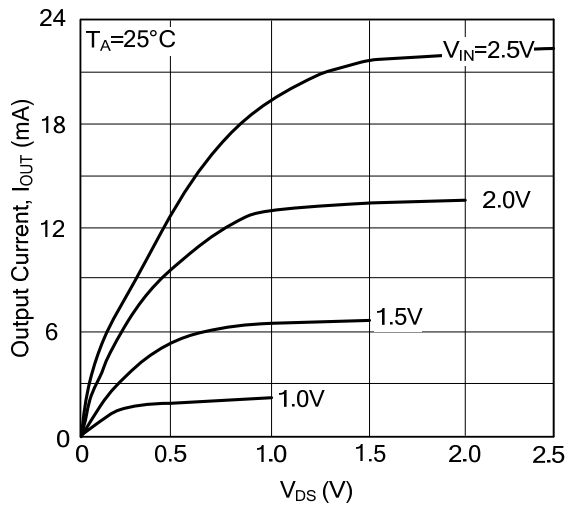
Output Voltage vs. Input Voltage



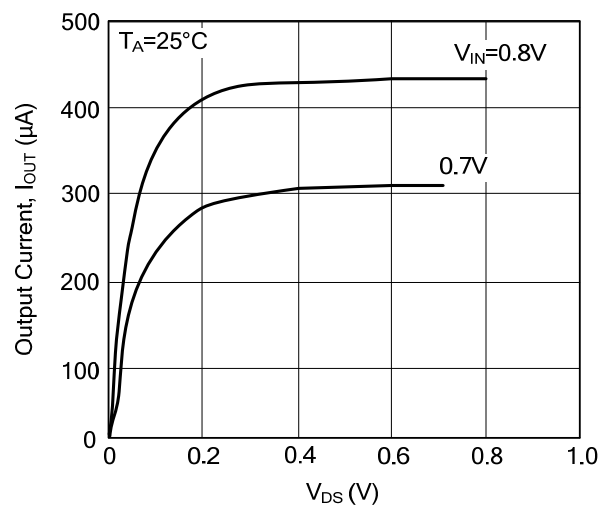
Supply Current vs. Input Voltage



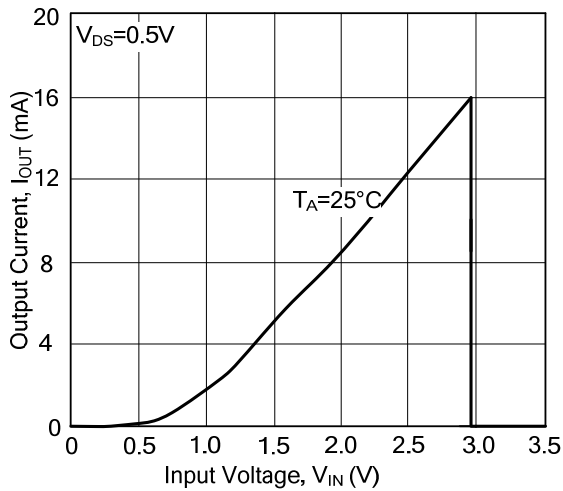
N-ch Driver Output vs. VDS



N-ch Driver Output vs. VDS

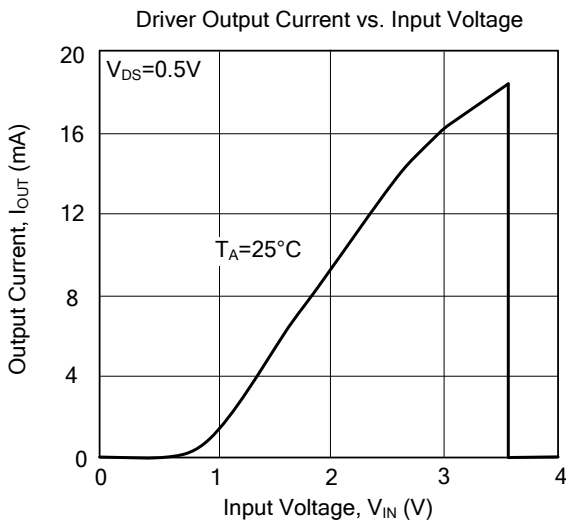
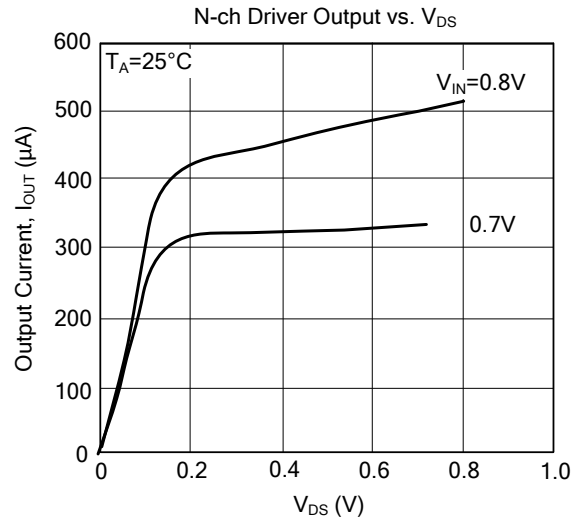
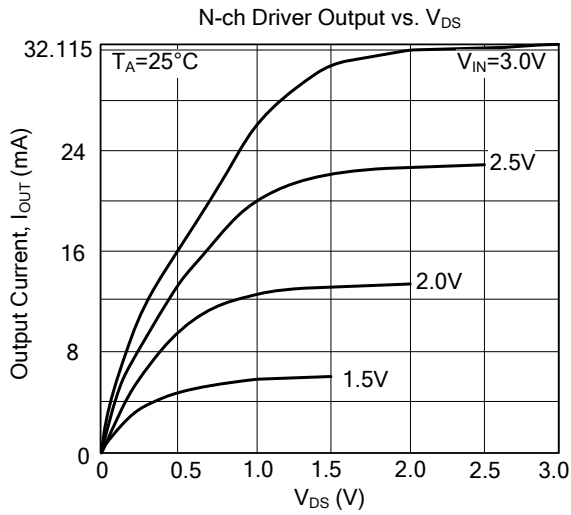
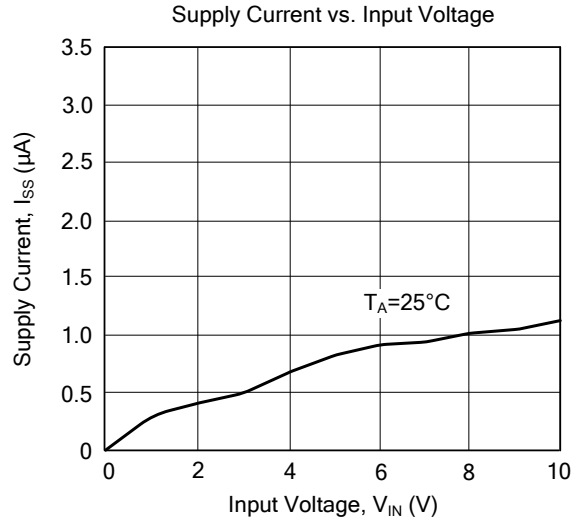
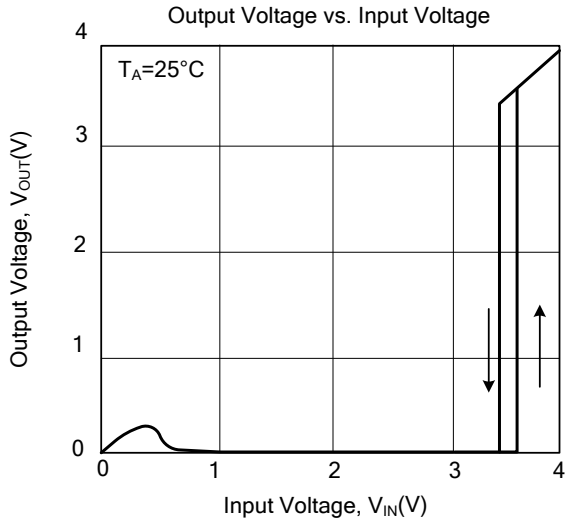


Driver Output Current vs. Input Voltage



■ TYPICAL CHARACTERISTICS

82N34



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