



## 81CXX/81NXX

CMOS IC

### VOLTAGE DETECTORS WITH BUILT-IN DELAY TIME

#### DESCRIPTION

The UTC **81CXX** and **81NXX** series are good performance voltage detector and manufactured by CMOS technologies with highly accurate, low power consumption. A delay circuit is built-in to each detector, therefore, peripherals are unnecessary and high density mounting is possible. Detect voltage is extremely accurate with minimal temperature drift. Both CMOS and N-channel open drain output configurations are available.

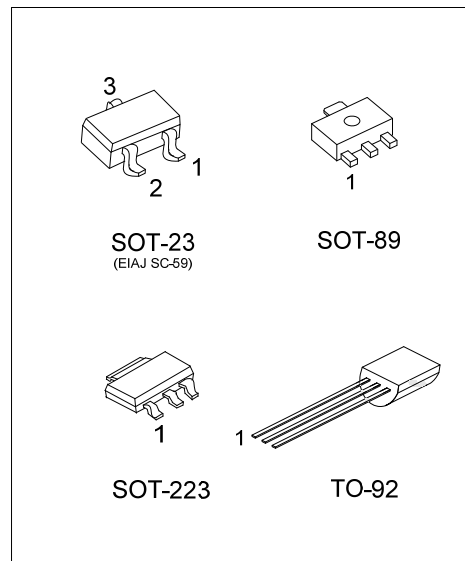
#### FEATURES

- \* Highly Accurate: Detect voltage  $\pm 2\%$
- \* Built-In Delay time : 1ms ~ 50ms  
50ms ~ 200ms  
200ms ~ 400ms
- \* Detect Voltage Temperature Characteristics: TYP  $\pm 100\text{ppm}/^\circ\text{C}$
- \* Wide Operating Voltage Range : 0.7V ~ 10.0V
- \* Low Current Consumption : TYP 1.0 $\mu\text{A}$  ( $V_{\text{IN}}=2.0\text{V}$ )

#### ORDERING INFORMATION

##### CMOS:

Ordering Number		①:Delay Time			Package	Pin Assignment			Packing
Lead Free	Halogen Free	Duration		Code		1	2	3	
-	81CXXG-①-AA3-B-R	1~50 50~200 200~400	ms ms ms	P Q R	SOT-223	O	G	I	Tape Reel
-	81CXXG-①-AB3-E-R				SOT-89	O	I	G	Tape Reel
-	81CXXG-①-AE3-3-R				SOT-23	O	G	I	Tape Reel
-	81CXXG-①-AE3-5-R				SOT-23	G	O	I	Tape Reel
-	81CXXG-①-AE3-2-R				SOT-23	I	O	G	Tape Reel
81CXXL-①-T92-D-B	81CXXG-①-T92-D-B				TO-92	I	G	O	Tape Box
81CXXL-①-T92-E-B	81CXXG-①-T92-E-B				TO-92	O	I	G	Tape Box
81CXXL-①-T92-D-K	81CXXG-①-T92-D-K				TO-92	I	G	O	Bulk
81CXXL-①-T92-E-K	81CXXG-①-T92-E-K				TO-92	O	I	G	Bulk



■ ORDERING INFORMATION(Cont.)

**N-Channel:**

Ordering Number		①:Delay Time			Package	Pin Assignment			Packing
Lead Free	Halogen Free	Duration		Code		1	2	3	
-	81NXXG-①-AA3-B-R	1~50 50~200 200~400	ms ms ms	H J K	SOT-223	O	G	I	Tape Reel
-	81NXXG-①-AB3-E-R				SOT-89	O	I	G	Tape Reel
-	81NXXG-①-AE3-3-R				SOT-23	O	G	I	Tape Reel
-	81NXXG-①-AE3-5-R				SOT-23	G	O	I	Tape Reel
-	81NXXG-①-AE3-2-R				SOT-23	I	O	G	Tape Reel
81NXXL-①-T92-D-B	81NXXG-①-T92-D-B				TO-92	I	G	O	Tape Box
81NXXL-①-T92-E-B	81NXXG-①-T92-E-B				TO-92	O	I	G	Tape Box
81NXXL-①-T92-D-K	81NXXG-①-T92-D-K				TO-92	I	G	O	Bulk
81NXXL-①-T92-E-K	81NXXG-①-T92-E-K				TO-92	O	I	G	Bulk

Note: 1. Pin assignment: I:V<sub>IN</sub> O:V<sub>OUT</sub> G:V<sub>SS</sub>

2. XX: Output Voltage, refer to Marking Information.

<p>81CXXG-①-AA3-x-R</p>	<ul style="list-style-type: none"> <li>(1)Packing Type</li> <li>(2)Pin Code</li> <li>(3)Package Type</li> <li>(4)Delay Time</li> <li>(5)Green Package</li> <li>(6)Output Voltage Code</li> <li>(7)Output Configuration</li> </ul>	<ul style="list-style-type: none"> <li>(1) R: Tape Reel, B: Tape Box, K: Bulk</li> <li>(2) refer to Pin Assignment</li> <li>(3) AA3: SOT-223, AB3: SOT-89, AE3: SOT-23, T92: TO-92</li> <li>(4) ① : refer to Delay Time</li> <li>(5) G: Halogen Free and Lead Free, L: Lead Free</li> <li>(6) XX: refer to Marking Information</li> <li>(7) C: CMOS, N: N-Channel</li> </ul>
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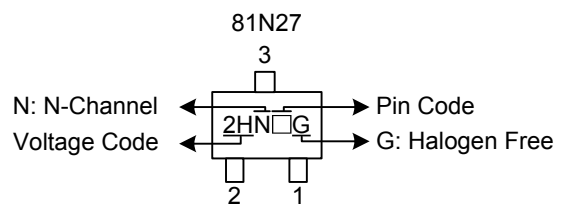
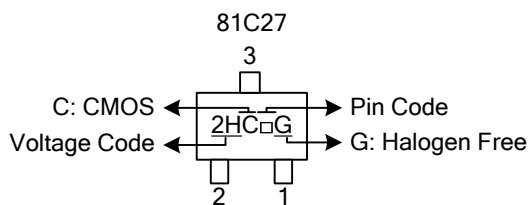
## MARKING INFORMATION

PACKAGE	VOLTAGE CODE			MARKING
SOT-223	10:1.0V	26:2.6V	42:4.2V	
	11:1.1V	27:2.7V		
	12:1.2V	28:2.8V		
	13:1.3V	29:2.9V		
	14:1.4V	30:3.0V		
SOT-89	15:1.5V	31:3.1V	43:4.3V	
	16:1.6V	32:3.2V		
	17:1.7V	33:3.3V		
	18:1.8V	34:3.4V		
	19:1.9V	35:3.5V		
TO-92	20:2.0V	36:3.6V	44:4.4V	
	21:2.1V	37:3.7V		
	22:2.2V	38:3.8V		
	23:2.3V	39:3.9V		
	24:2.4V	40:4.0V		
	25:2.5V	41:4.1V		
		50:5.0V		

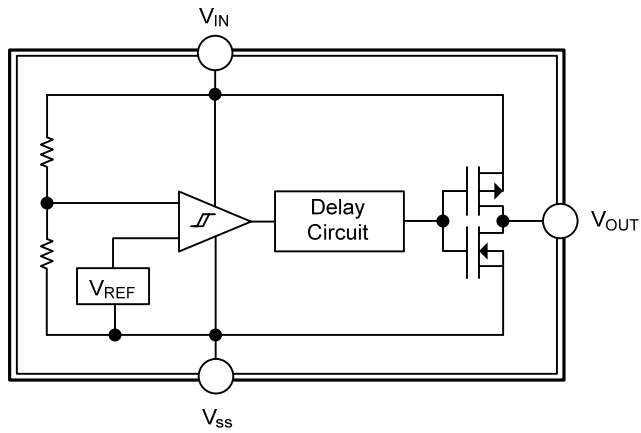
PACKAGE	INTEGER (Note 1)	CODE	DECIMAL (Note 2)	CODE	MARKING
SOT-23	1.	1	.0	A	
	2.	2	.1	B	
	3.	3	.2	C	
	4.	4	.3	D	
	5.	5	.4	E	
	6.	6	.5	F	
			.6	G	
			.7	H	
			.8	J	
			.9	K	

Notes: 1. Represents the integer of the Detect Voltage  
 2. Represents the decimal number of the Detect Voltage

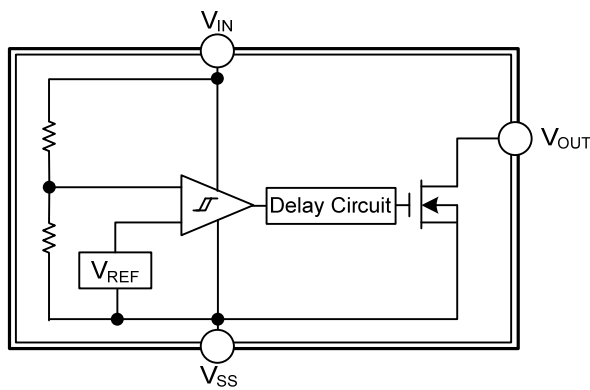
## EXAMPLE:



■ BLOCK DIAGRAM



CMOS Output



N-channel Open Drain Output

### ■ ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C)

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V <sub>IN</sub>	10	V
Output Current		I <sub>OUT</sub>	50	mA
Output Voltage	CMOS	V <sub>OUT</sub>	V <sub>SS</sub> -0.3 ~ V <sub>IN</sub> +0.3	V
	N-Ch open drain		V <sub>SS</sub> -0.3 ~ 9	V
Power Dissipation	SOT-223	P <sub>D</sub>	800	mW
	SOT-23		150	
	SOT-89		500	
	TO-92		300	
Operating Temperature		T <sub>OPR</sub>	-30 ~ +85	°C
Storage Temperature		T <sub>STG</sub>	-40 ~ +125	°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.

### ■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Case	SOT-223	θ <sub>JC</sub>	20	°C/W
	SOT-23		200	
	SOT-89		45	
	TO-92		100	

### ■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

#### Detection voltage (1.0V ~ 1.9V)

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Detect Voltage	V <sub>DF</sub>	1		V <sub>DF</sub> (T) ×0.98	V <sub>DF</sub> (T)	V <sub>DF</sub> (T) ×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
Operating Voltage	V <sub>IN</sub>	1	V <sub>DF</sub> =1.6V ~ 6.0V	0.7		10.0	V
Supply Current	I <sub>SS</sub>	2	V <sub>IN</sub> =1.5V		0.9	2.6	μA
			V <sub>IN</sub> =5.0		2.0	4.2	μA
Output Current	N-Channel	I <sub>OUT</sub>	3	V <sub>DS</sub> =0.5V, V <sub>IN</sub> =1.0V		2.2	mA
	P- Channel						
V <sub>DF</sub> Temperature Characteristics	ΔV <sub>DF</sub> ΔT <sub>OPR</sub> × V <sub>DF</sub>				±100		ppm/°C
Transient Delay Time (V <sub>DR</sub> → V <sub>OUT</sub> inversion)	t <sub>DLY</sub> *	5	V <sub>IN</sub> changes from 0.6V ~ 10V	50		200	ms

■ ELECTRICAL CHARACTERISTICS(Cont.)

**Detection voltage (2.0V ~ 2.9V)**

PARAMETER		SYMBOL	CIRCUIT	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Detect Voltage		$V_{DF}$	1		$V_{DF} (T) \times 0.98$	$V_{DF} (T)$	$V_{DF} (T) \times 1.02$	V
Hysteresis Range		$V_{HYS}$	1		$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V
Operating Voltage		$V_{IN}$	1	$V_{DF}=1.6V \sim 6.0V$	0.7		10.0	V
Supply Current		$I_{SS}$	2	$V_{IN}=2.0V$		1.0	3.0	$\mu A$
				$V_{IN}=5.0V$		2.0	4.2	$\mu A$
Output Current	N-Channel	$I_{OUT}$	3	$V_{DS}=0.5V, V_{IN}=2.0V$		7.9		mA
	P- Channel		4	$V_{DS}=2.1V, V_{IN}=8.0V$ (CMOS output)		-15.4		mA
$V_{DF}$ Temperature Characteristics		$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$				$\pm 100$		ppm/ $^{\circ}C$
Transient Delay Time ( $V_{DR} \rightarrow V_{OUT}$ inversion)		$t_{DLY}^*$	5	$V_{IN}$ changes from 0.6V ~ 10V	50		200	ms

**Detection voltage (3.0V ~ 3.9V)**

PARAMETER		SYMBOL	CIRCUIT	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Detect Voltage		$V_{DF}$	1		$V_{DF} (T) \times 0.98$	$V_{DF} (T)$	$V_{DF} (T) \times 1.02$	V
Hysteresis Range		$V_{HYS}$	1		$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V
Operating Voltage		$V_{IN}$	1	$V_{DF}=1.6V \sim 6.0V$	0.7		10.0	V
Supply Current		$I_{SS}$	2	$V_{IN}=3.0V$		1.3	3.4	$\mu A$
				$V_{IN}=5.0V$		2.0	4.2	$\mu A$
Output Current	N-Channel	$I_{OUT}$	3	$V_{DS}=0.5V, V_{IN}=3.0V$		10.1		mA
	P- Channel		4	$V_{DS}=2.1V, V_{IN}=8.0V$ (CMOS output)		-15.4		mA
$V_{DF}$ Temperature Characteristics		$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$				$\pm 100$		ppm/ $^{\circ}C$
Transient Delay Time ( $V_{DR} \rightarrow V_{OUT}$ inversion)		$t_{DLY}^*$	5	$V_{IN}$ changes from 0.6V ~ 10V	50		200	ms

**Detection voltage (4.0V ~ 4.9V)**

PARAMETER		SYMBOL	CIRCUIT	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Detect Voltage		$V_{DF}$	1		$V_{DF} (T) \times 0.98$	$V_{DF} (T)$	$V_{DF} (T) \times 1.02$	V
Hysteresis Range		$V_{HYS}$	1		$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V
Operating Voltage		$V_{IN}$	1	$V_{DF}=1.6V \sim 6.0V$	0.7		10.0	V
Supply Current		$I_{SS}$	2	$V_{IN}=4.0V$		1.5	3.8	$\mu A$
				$V_{IN}=5.0V$		2.0	4.2	$\mu A$
Output Current	N-Channel	$I_{OUT}$	3	$V_{DS}=0.5V, V_{IN}=4.0V$		11.5		mA
	P- Channel		4	$V_{DS}=2.1V, V_{IN}=8.0V$ (CMOS output)		-15.4		mA
$V_{DF}$ Temperature Characteristics		$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$				$\pm 100$		ppm/ $^{\circ}C$
Transient Delay Time ( $V_{DR} \rightarrow V_{OUT}$ inversion)		$t_{DLY}^*$	5	$V_{IN}$ changes from 0.6V ~ 10V	50		200	ms

■ ELECTRICAL CHARACTERISTICS(Cont.)

**Detection voltage (5.0V)**

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Detect Voltage	$V_{DF}$	1		$V_{DF}(T) \times 0.98$	$V_{DF}(T)$	$V_{DF}(T) \times 1.02$	V
Hysteresis Range	$V_{HYS}$	1		$V_{DF} \times 0.02$	$V_{DF} \times 0.05$	$V_{DF} \times 0.08$	V
Operating Voltage	$V_{IN}$	1	$V_{DF}=1.6V \sim 6.0V$	0.7		10.0	V
Supply Current	$I_{SS}$	2	$V_{IN}=5.0V$		2.0	4.2	$\mu A$
Output Current	N-Channel	$I_{OUT}$	3	$V_{DS}=0.5V, V_{IN}=5.0V$		13.0	mA
	P- Channel		4	$V_{DS}=2.1V, V_{IN}=8.0V$ (CMOS output)		-15.4	mA
$V_{DF}$ Temperature Characteristics		$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$			$\pm 100$		ppm/ $^{\circ}C$
Transient Delay Time ( $V_{DR} \rightarrow V_{OUT}$ inversion)	$t_{DLY}^*$	5	$V_{IN}$ changes from 0.6V ~ 10V	50		200	ms

$V_{DF}(T)$ : established detect voltage value

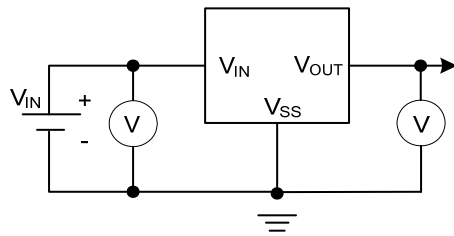
Release Voltage:  $V_{DR} = V_{DF} + V_{HYS}$

\* Transient Delay Time: 1ms ~ 50ms & 200ms ~ 400ms versions are also available.

Note: The power consumption during power-start to output being stable (release operation) is 2 $\mu A$  greater than it is after that period (completion of release operation) because of delay circuit through current.

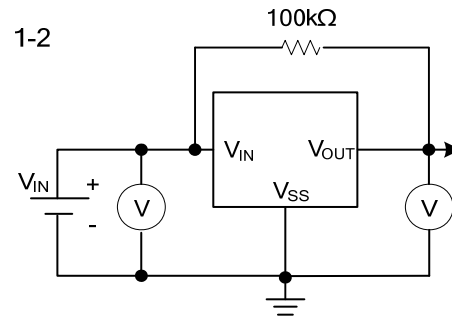
## ■ TEST CIRCUITS

1-1



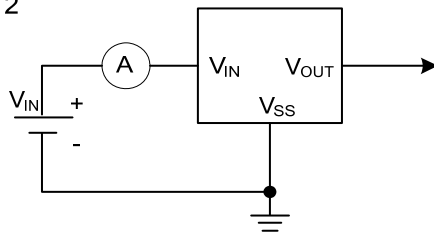
Cmos Output

1-2

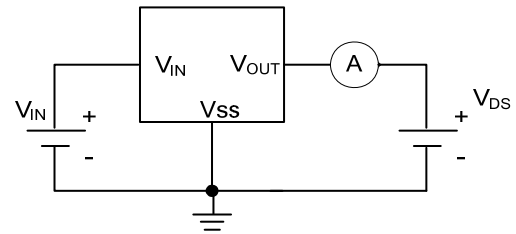


N-channel Open Drain Output

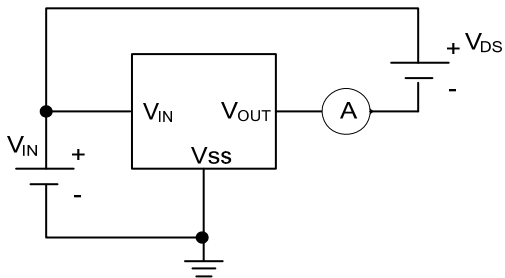
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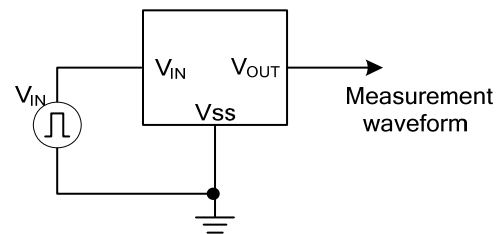
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4

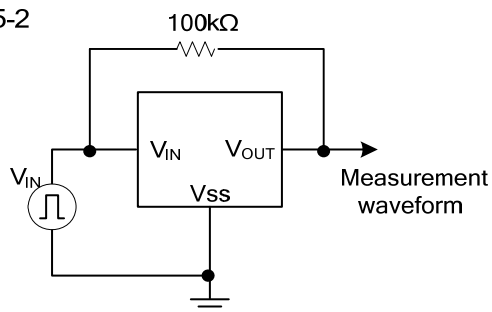


5-1



Cmos Output

5-2

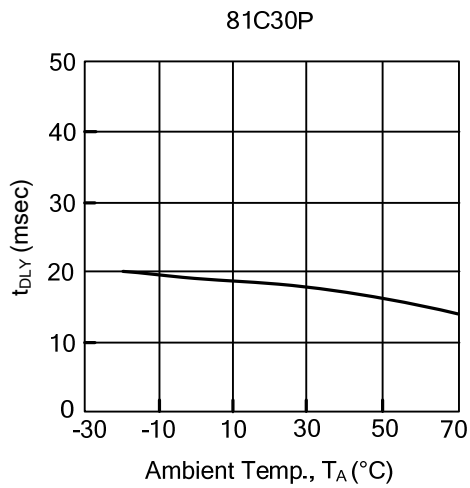
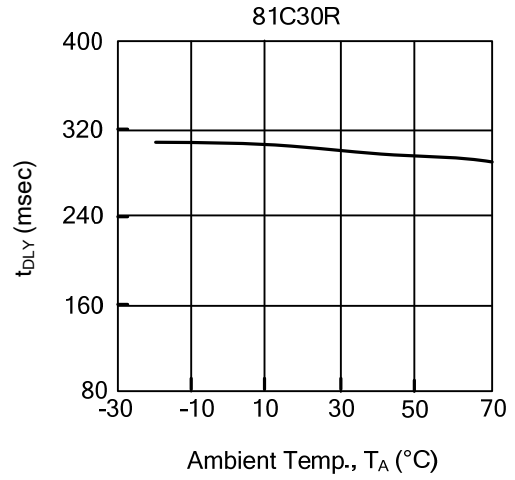
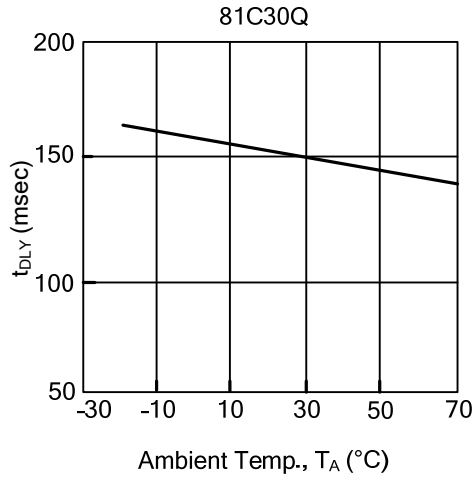


N-channel Open Drain Output



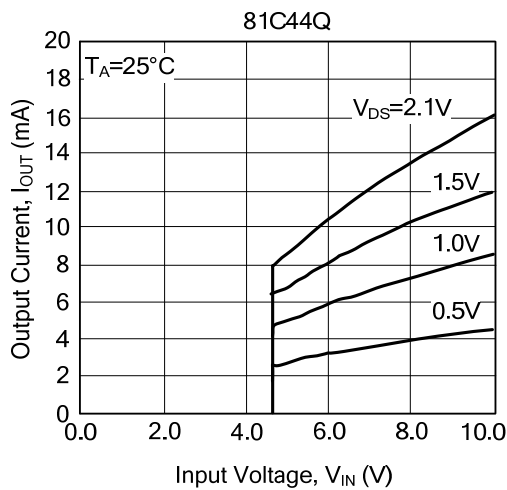
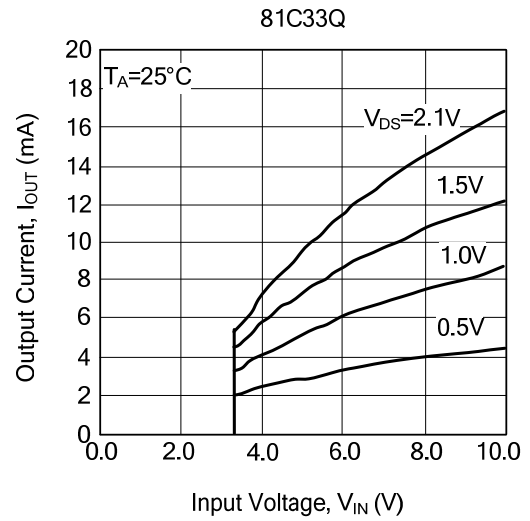
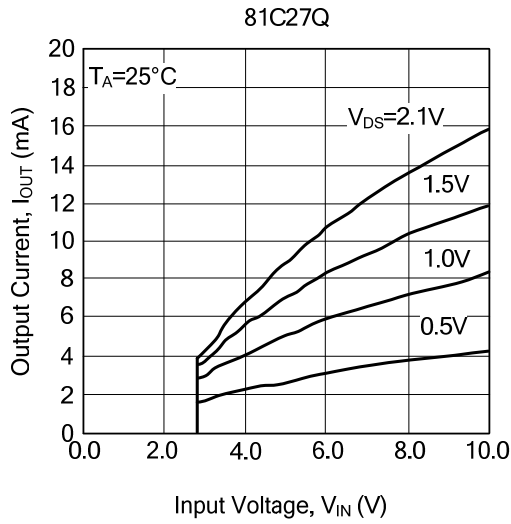
## ■ TYPICAL PERFORMANCE CHARACTERISTICS

### (1) Ambient Temperature vs. Transient Delay Time

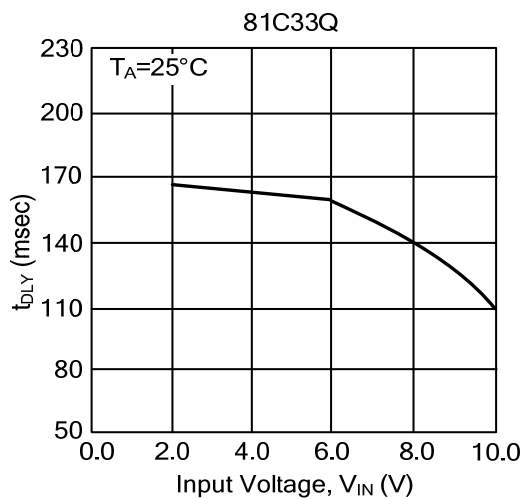


## ■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)

### (2) P-Channel Driver Output Current vs. Input Voltage

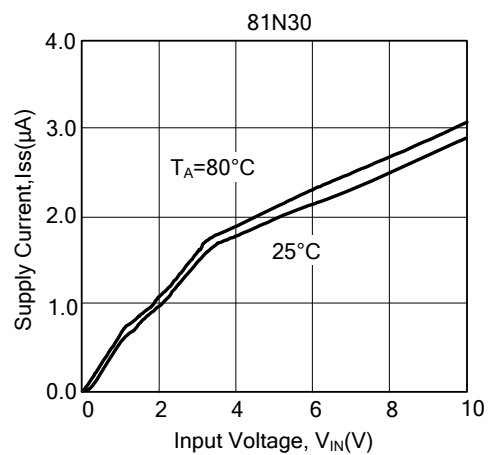
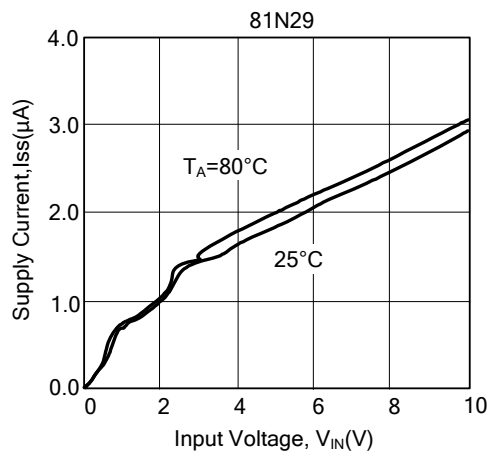
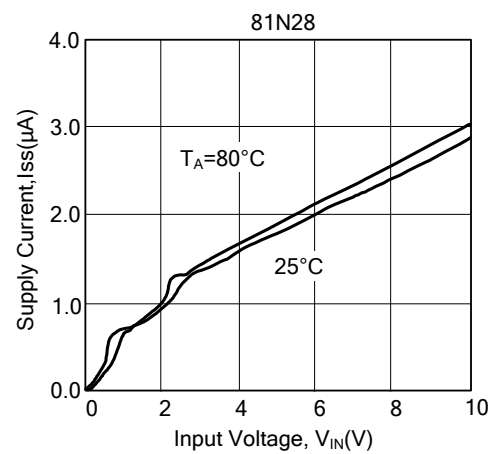
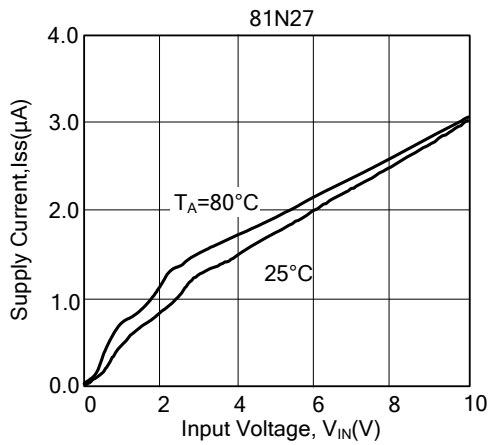
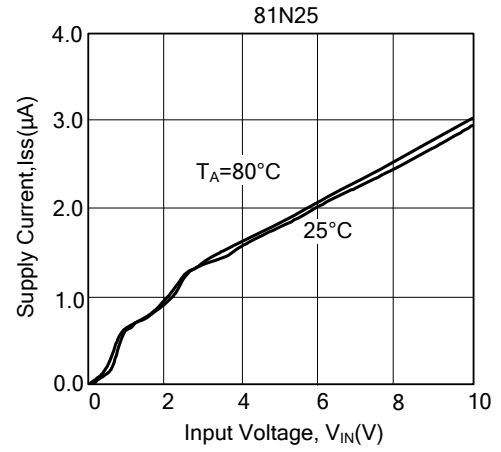
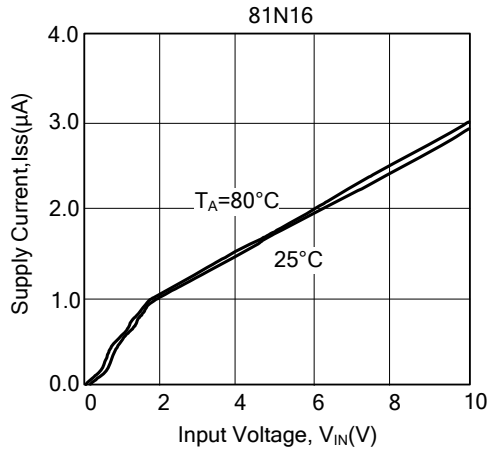


### (2) Transient Delay Time vs. Input Voltage

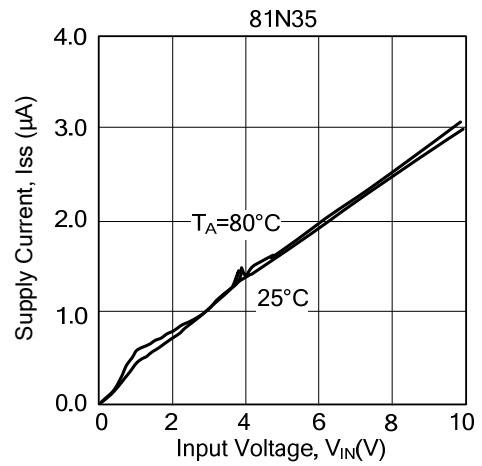
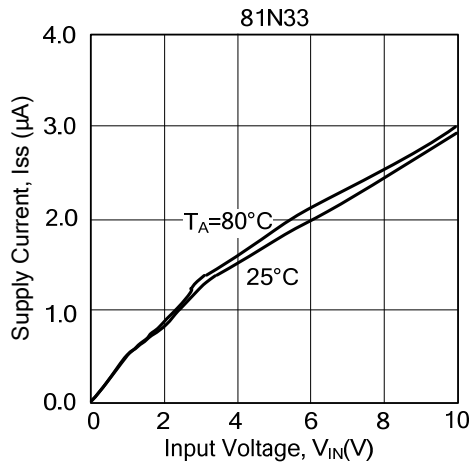


■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)

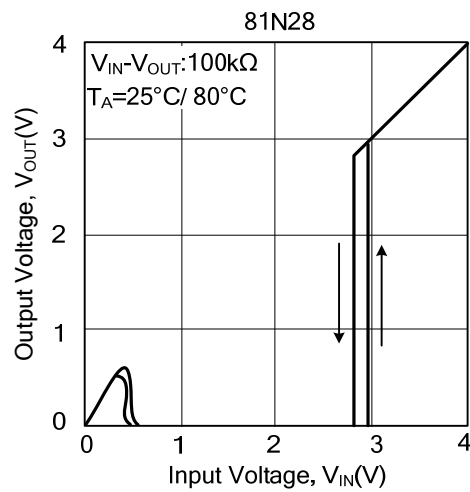
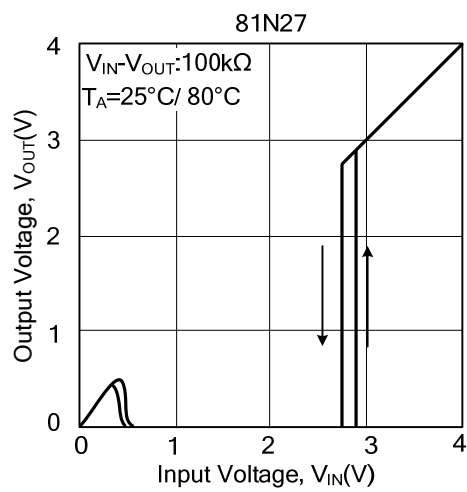
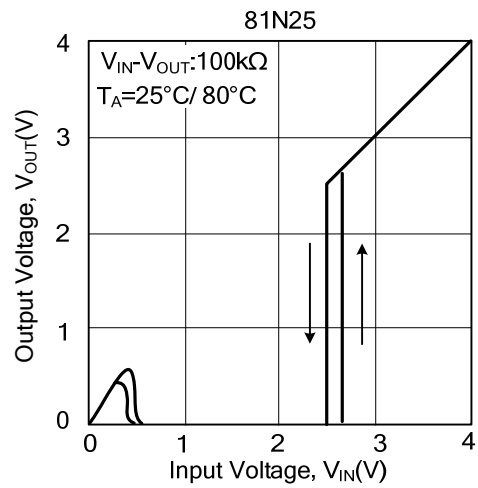
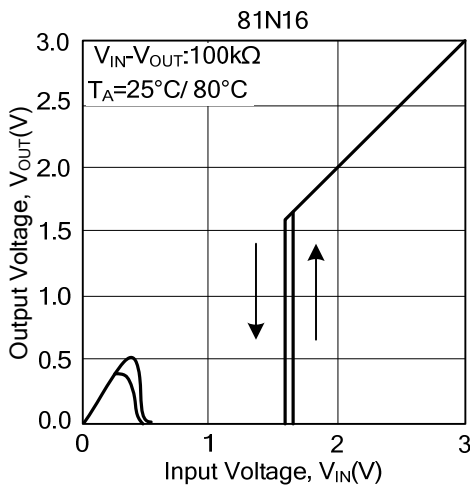
(3) Supply Current vs. Input Voltage



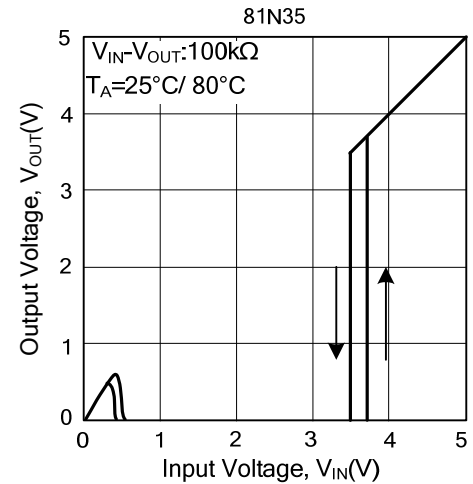
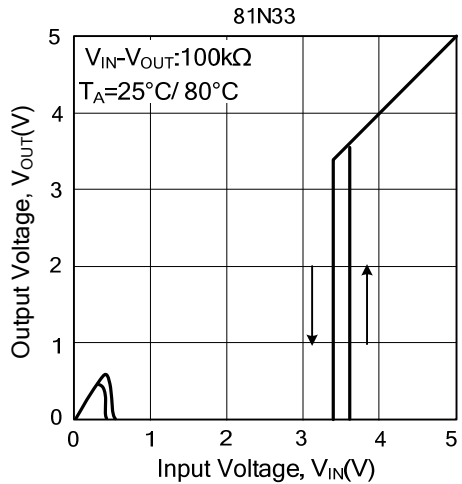
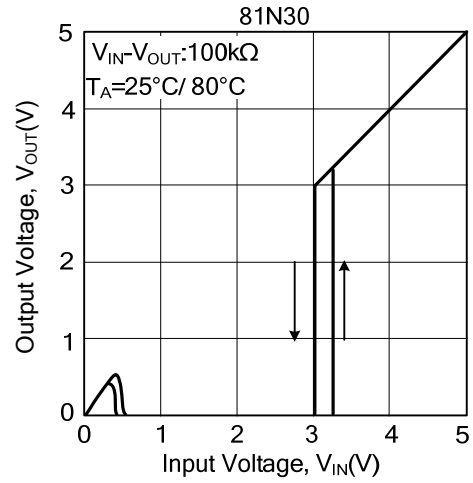
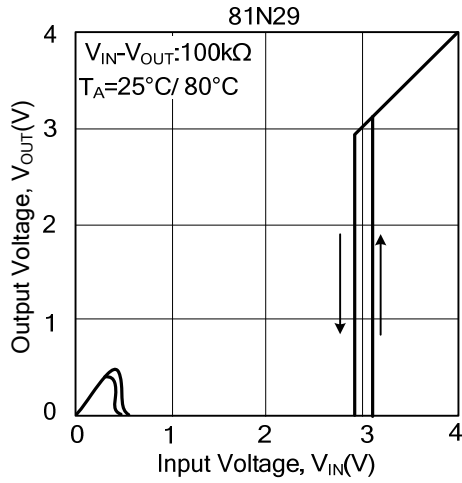
■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)



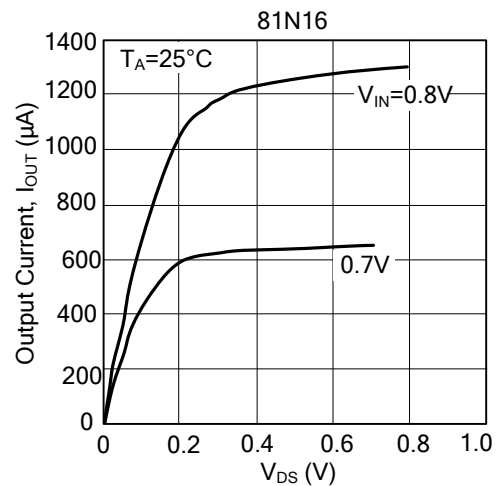
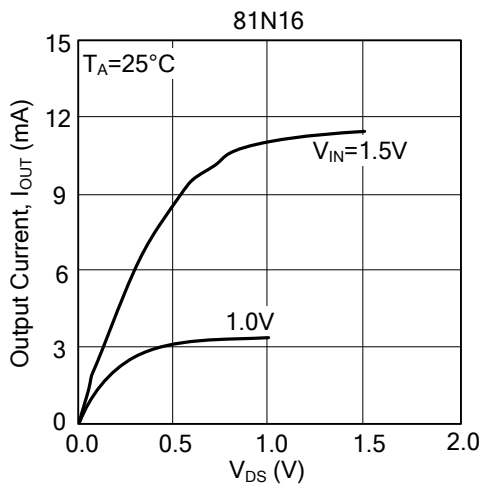
(4) Output Voltage vs. Input Voltage



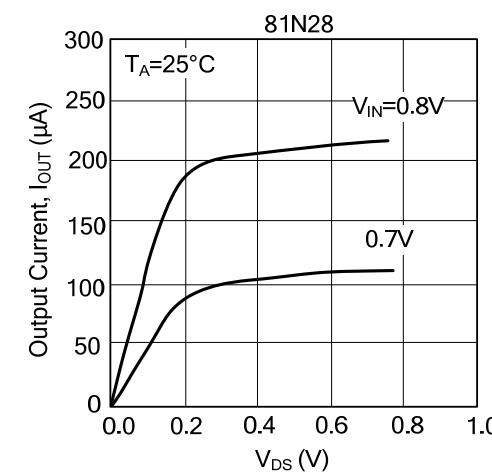
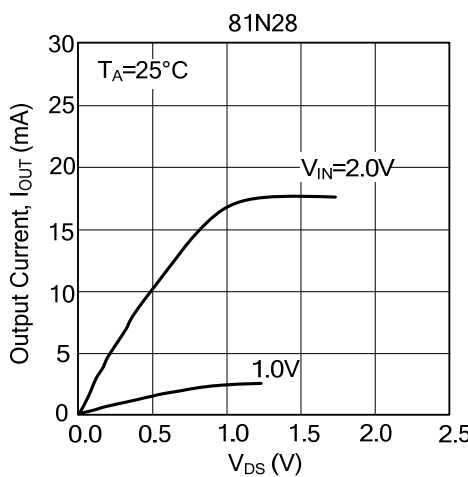
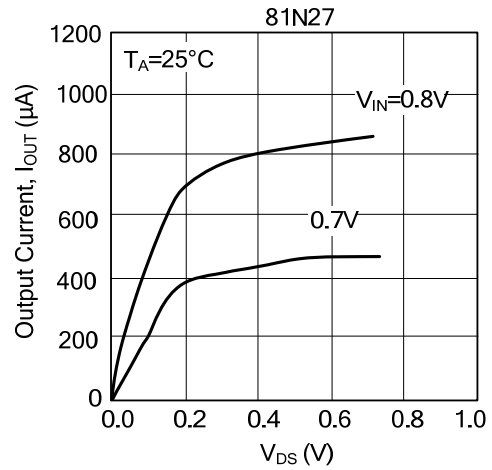
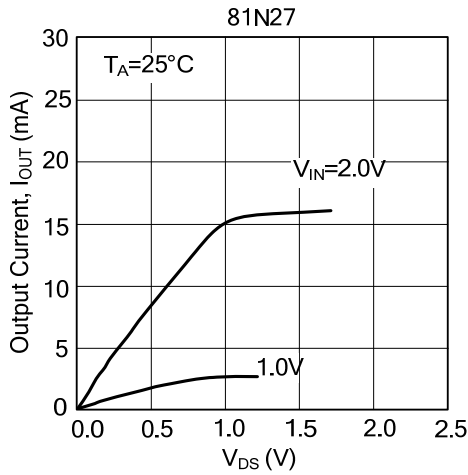
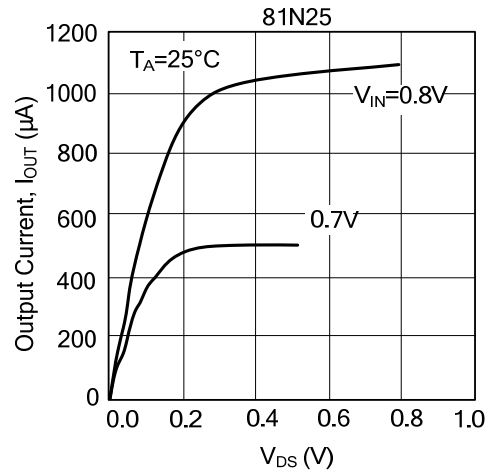
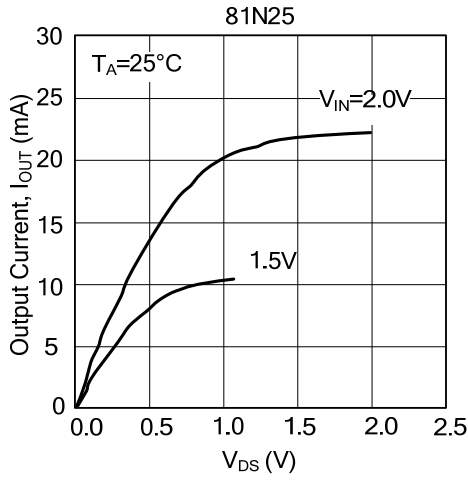
■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)



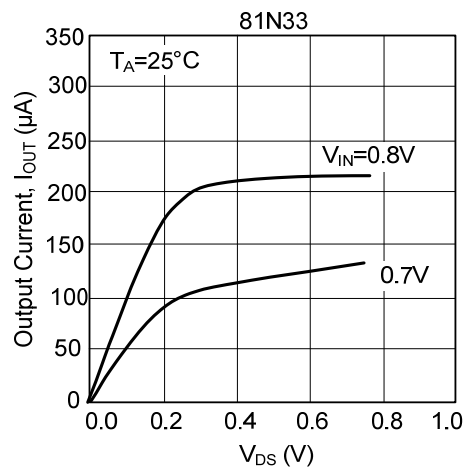
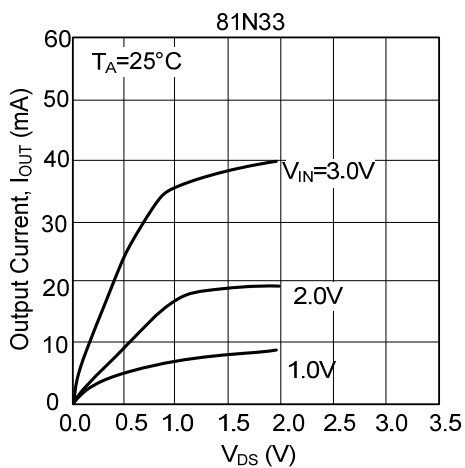
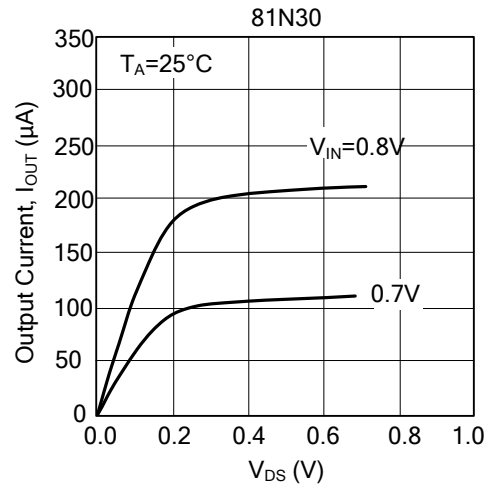
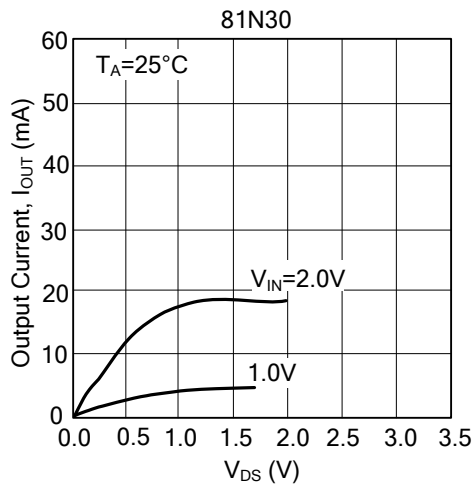
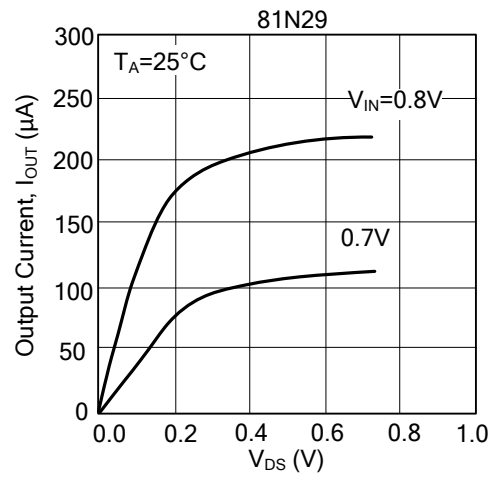
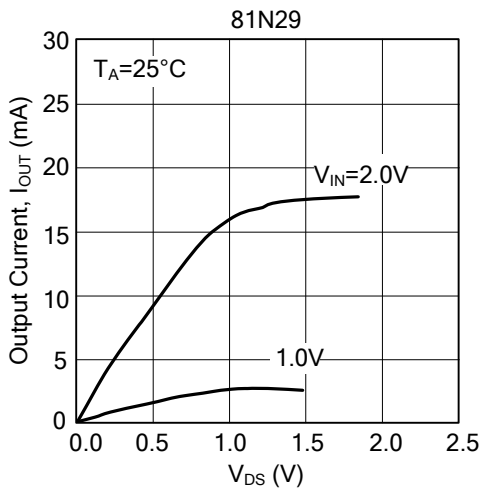
(5) N-Channel Drive Output Current vs.  $V_{DS}$



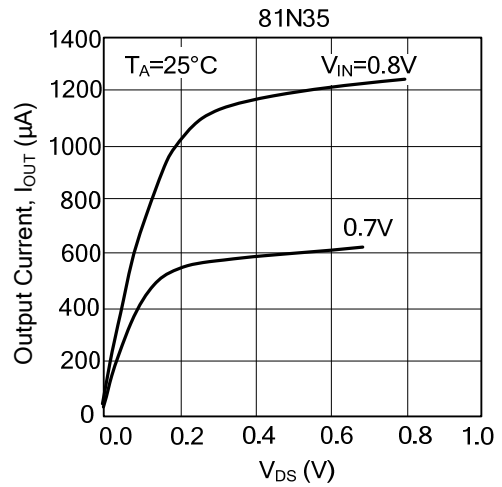
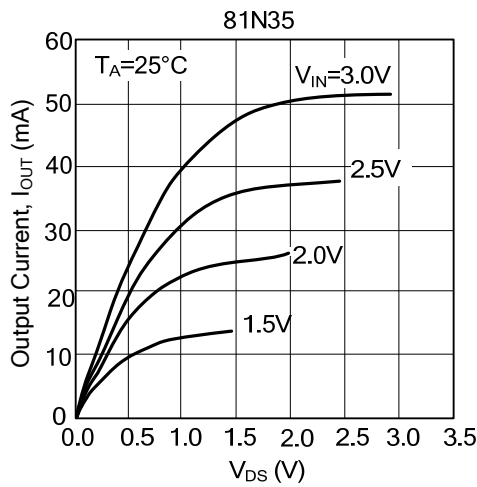
■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)



■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)



■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)



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