



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.

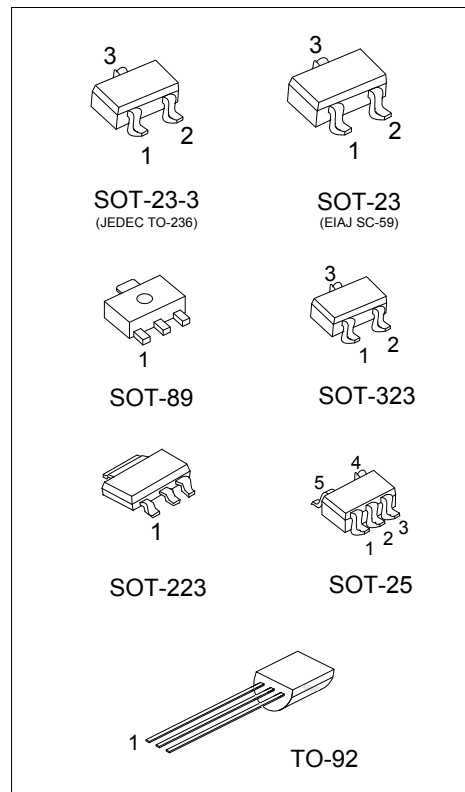
FEATURES

- * Highly Accurate: Detect voltage $\pm 2\%$
- * Built-In Delay time : 1ms ~ 50ms
50ms ~ 200ms
120ms ~ 280ms
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 μA ($V_{\text{IN}}=2.0\text{V}$)

ORDERING INFORMATION

CMOS:

Ordering Number		①:Delay Time			Package	Pin Assignment					Packing
Lead Free	Halogen Free	Duration	Code	1		2	3	4	5		
81CXXL-①-AA3-B-R	81CXXG-①-AA3-B-R	1~50 50~200 120~280 200~400	ms ms ms ms	P Q G R	SOT-223	O	G	I	-	-	Tape Reel
81CXXL-①-AB3-E-R	81CXXG-①-AB3-E-R				SOT-89	O	I	G	-	-	Tape Reel
81CXXL-①-AE2-3-R	81CXXG-①-AE2-3-R				SOT-23-3	G	O	I	-	-	Tape Reel
81CXXL-①-AE2-5-R	81CXXG-①-AE2-5-R				SOT-23-3	O	G	I	-	-	Tape Reel
81CXXL-①-AE2-2-R	81CXXG-①-AE2-2-R				SOT-23-3	O	I	G	-	-	Tape Reel
81CXXL-①-AE3-3-R	81CXXG-①-AE3-3-R				SOT-23	G	O	I	-	-	Tape Reel
81CXXL-①-AE3-5-R	81CXXG-①-AE3-5-R				SOT-23	O	G	I	-	-	Tape Reel
81CXXL-①-AE3-2-R	81CXXG-①-AE3-2-R				SOT-23	O	I	G	-	-	Tape Reel
81CXXL-①-AF5-Y-R	81CXXG-①-AF5-Y-R				SOT-25	N	G	N	O	I	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	
81NXXL-①-AA3-B-R	81NXXG-①-AA3-B-R	1~50 50~200 120~280 200~400	ms	H J F K	SOT-223	O	G	I	Tape Reel
81NXXL-①-AB3-E-R	81NXXG-①-AB3-E-R				SOT-89	O	I	G	Tape Reel
81NXXL-①-AE2-3-R	81NXXG-①-AE2-3-R				SOT-23-3	G	O	I	Tape Reel
81NXXL-①-AE2-5-R	81NXXG-①-AE2-5-R				SOT-23-3	O	G	I	Tape Reel
81NXXL-①-AE2-2-R	81NXXG-①-AE2-2-R				SOT-23-3	O	I	G	Tape Reel
81NXXL-①-AE3-3-R	81NXXG-①-AE3-3-R				SOT-23	G	O	I	Tape Reel
81NXXL-①-AE3-5-R	81NXXG-①-AE3-5-R				SOT-23	O	G	I	Tape Reel
81NXXL-①-AE3-2-R	81NXXG-①-AE3-2-R				SOT-23	O	I	G	Tape Reel
81NXXL-①-AL3-3-R	81NXXG-①-AL3-3-R				SOT-323	G	O	I	Tape Reel
81NXXL-①-AL3-5-R	81NXXG-①-AL3-5-R				SOT-323	O	G	I	Tape Reel
81NXXL-①-AL3-2-R	81NXXG-①-AL3-2-R				SOT-323	O	I	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: O:V_{OUT} G:V_{SS} I:V_{IN}

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

<p>81CXXG-①-AA3-x-R</p> <p>(1)Packing Type (2)Pin Code (3)Package Type (4)Delay Time (5)Green Package (6)Output Voltage Code (7)Output Configuration</p>	<p>(1) R: Tape Reel, B: Tape Box, K: Bulk (2) refer to Pin Assignment (3) AA3: SOT-223, AB3: SOT-89, AE2: SOT-23-3, AE3: SOT-23, AL3: SOT-323, T92: TO-92 (4)①: refer to Delay Time (5) G: Halogen Free and Lead Free, L: Lead Free (6) XX: refer to Marking Information (7) C: CMOS, N: N-Channel</p>
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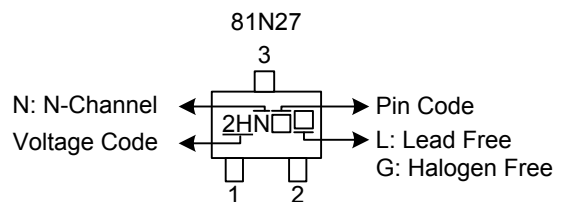
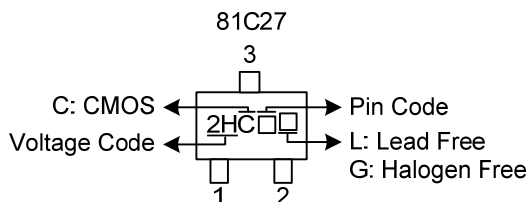
MARKING INFORMATION

PACKAGE	VOLTAGE CODE			MARKING
SOT-223	10:1.0V 11:1.1V 12:1.2V 13:1.3V 14:1.4V	26:2.6V 27:2.7V 28:2.8V 29:2.9V		<p>C: CMOS N: N-Channel</p> <p>L: Lead Free G: Halogen Free</p>
SOT-89	15:1.5V 16:1.6V 17:1.7V 18:1.8V 19:1.9V 20:2.0V	30:3.0V 31:3.1V 32:3.2V 33:3.3V 34:3.4V 35:3.5V	42:4.2V 43:4.3V 44:4.4V 45:4.5V 46:4.6V 47:4.7V	<p>C: CMOS N: N-Channel</p>
TO-92	21:2.1V 22:2.2V 2C: 2.25V 23:2.3V 24:2.4V 25:2.5V	36:3.6V 37:3.7V 38:3.8V 39:3.9V 40:4.0V 41:4.1V	48:4.8V 49:4.9V 50:5.0V	<p>C: CMOS N: N-Channel</p> <p>L: Lead Free G: Halogen Free</p>

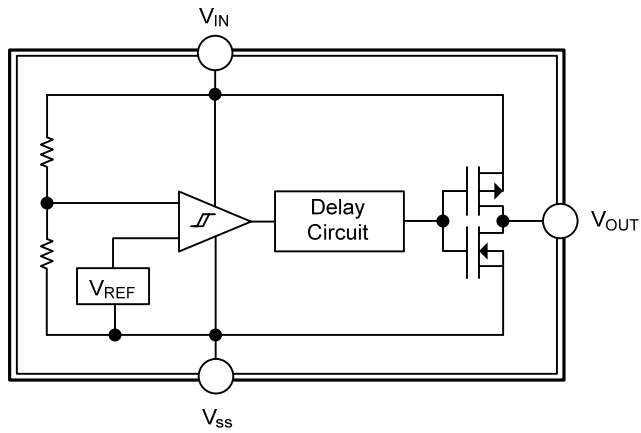
PACKAGE	INTEGER (Note 1)	CODE	DECIMAL (Note 2)	CODE	MARKING
SOT-23-3	1.	1	.0	A	<p>C: CMOS N: N-Channel</p> <p>L: Lead Free G: Halogen Free</p>
SOT-23	2.	2	.1	B	
SOT-323	3.	3	.2	C	
	4.	4	.3	D	
	5.	5	.4	E	
	6.	6	.5	F	
SOT-25			.6	G	<p>C: CMOS</p> <p>L: Lead Free G: Halogen Free</p>
			.7	H	
			.8	J	
			.9	K	

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

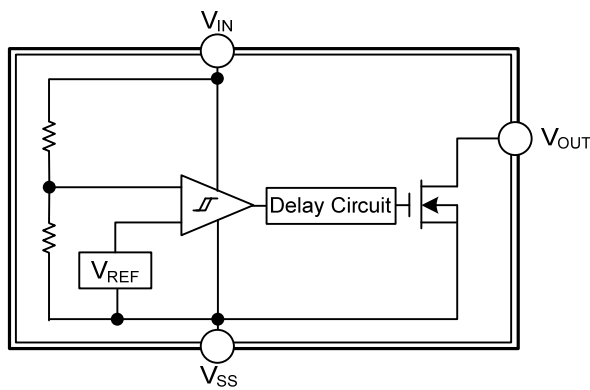
EXAMPLE:



■ BLOCK DIAGRAM



CMOS Output



N-channel Open Drain Output

■ ABSOLUTE MAXIMUM RATINGS (T_A=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V _{IN}	10	V
Output Current		I _{OUT}	50	mA
Output Voltage	CMOS	V _{OUT}	V _{SS} -0.3 ~ V _{IN} +0.3	V
	N-Ch open drain		V _{SS} -0.3 ~ 9	V
Power Dissipation	SOT-223	P _D	800	mW
	SOT-23/SOT-23-3		150	mW
	SOT-25/SOT-323		500	mW
	SOT-89		300	mW
	TO-92			
Operating Temperature		T _{OPR}	-30 ~ +85	°C
Storage Temperature		T _{STG}	-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 _{JC}	20	°C/W
	SOT-23/SOT-23-3		200	°C/W
	SOT-25/SOT-323		45	°C/W
	SOT-89		100	°C/W
	TO-92			

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

Detection voltage (1.0V ~ 1.9V)

PARAMETER	SYMBOL	CIRCUIT	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Detect Voltage	V _{DF}	1		V _{DF} (T) ×0.98	V _{DF} (T)	V _{DF} (T) ×1.02	V
Hysteresis Range	V _{HYS}	1		V _{DF} ×0.02	V _{DF} ×0.05	V _{DF} ×0.08	V
Operating Voltage	V _{IN}	1	V _{DF} =1.6V ~ 6.0V	0.7		10.0	V
Supply Current	I _{SS}	2	V _{IN} =1.5V		0.9	2.6	μA
			V _{IN} =5.0		2.0	4.2	μA
Output Current	N-Channel	I _{OUT}	3	V _{DS} =0.5V, V _{IN} =1.0V		2.2	mA
	P- Channel						
V _{DF} Temperature Characteristics	ΔV _{DF} ΔT _{OPR} × V _{DF}				±100		ppm/°C
Transient Delay Time (V _{DR} → V _{OUT} inversion)	t _{DLY} *	5	V _{IN} changes from 0.6V ~ V _{DF} +0.5V	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	μA
				$V_{IN}=5.0V$		2.0	4.2	μA
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		$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$				± 100		ppm/ $^{\circ}C$
Transient Delay Time ($V_{DR} \rightarrow V_{OUT}$ inversion)		t_{DLY}^*	5	V_{IN} changes from $0.6V \sim V_{DF}+0.5V$	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	μA
				$V_{IN}=5.0V$		2.0	4.2	μA
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		$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$				± 100		ppm/ $^{\circ}C$
Transient Delay Time ($V_{DR} \rightarrow V_{OUT}$ inversion)		t_{DLY}^*	5	V_{IN} changes from $0.6V \sim V_{DF}+0.5V$	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	μA
				$V_{IN}=5.0V$		2.0	4.2	μA
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		$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$				± 100		ppm/ $^{\circ}C$
Transient Delay Time ($V_{DR} \rightarrow V_{OUT}$ inversion)		t_{DLY}^*	5	V_{IN} changes from $0.6V \sim V_{DF}+0.5V$	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	μA
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		$\frac{\Delta V_{DF}}{\Delta T_{OPR} \times V_{DF}}$			± 100		ppm/ $^{\circ}C$
Transient Delay Time ($V_{DR} \rightarrow V_{OUT}$ inversion)	t_{DLY}^*	5	V_{IN} changes from $0.6V \sim V_{DF}+0.5V$	50		200	ms

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

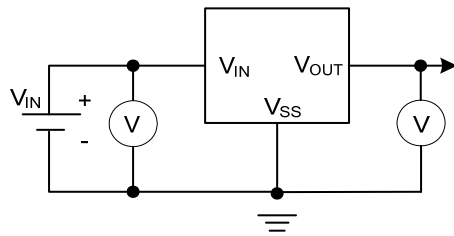
Release Voltage: $V_{DR} = V_{DF} + V_{HYS}$

* 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.

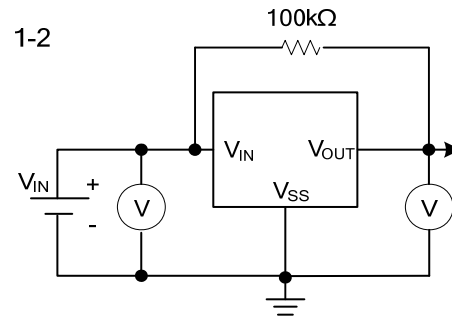
■ TEST CIRCUITS

1-1



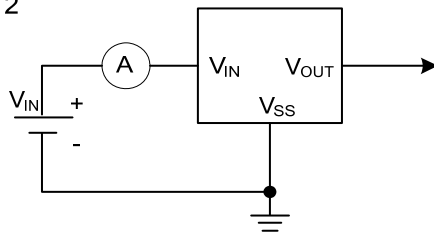
Cmos Output

1-2

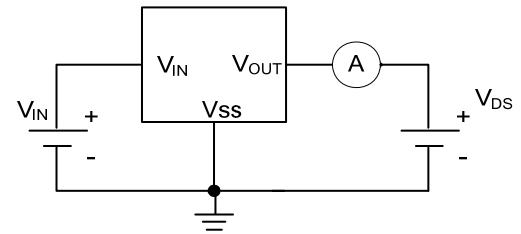


N-channel Open Drain Output

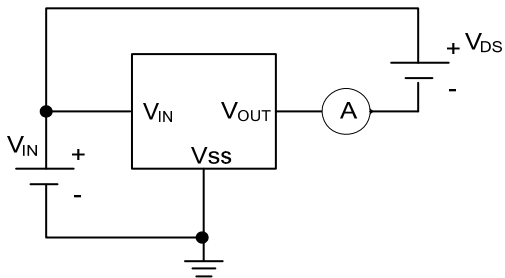
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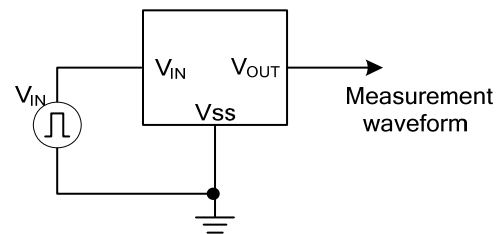
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4

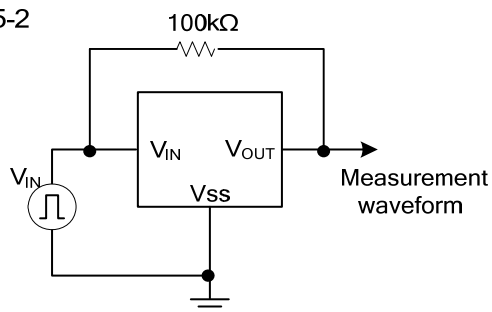


5-1



Cmos Output

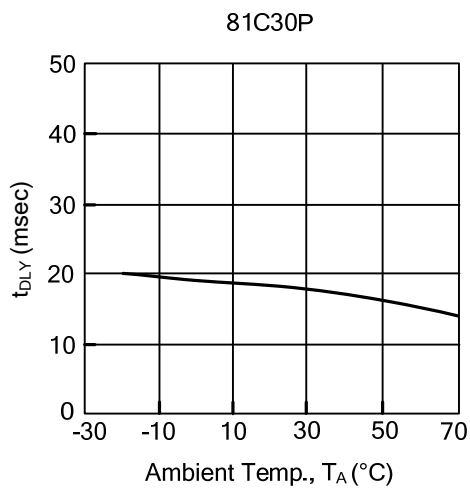
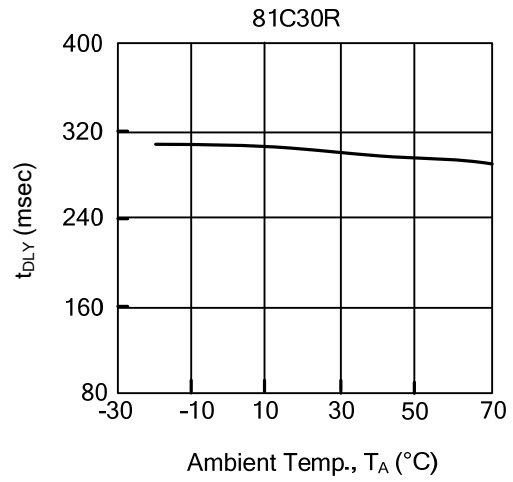
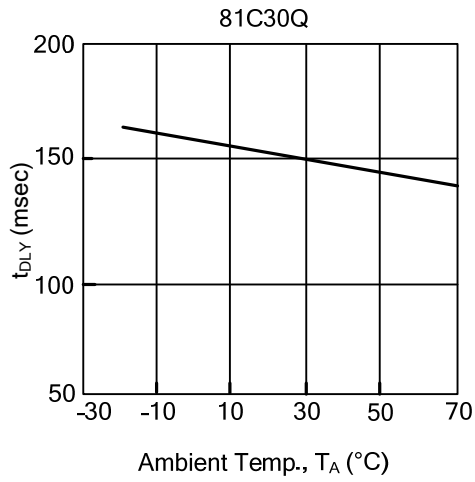
5-2



N-channel Open Drain Output

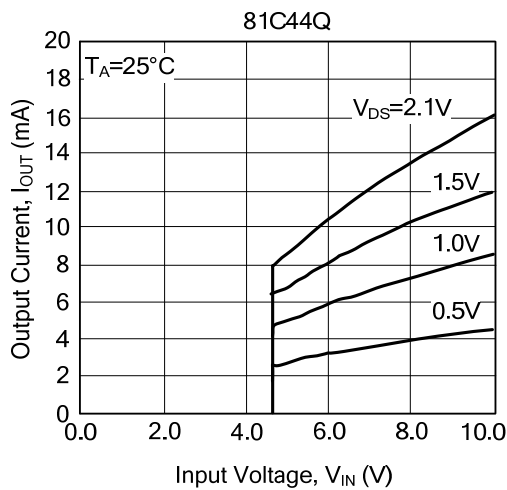
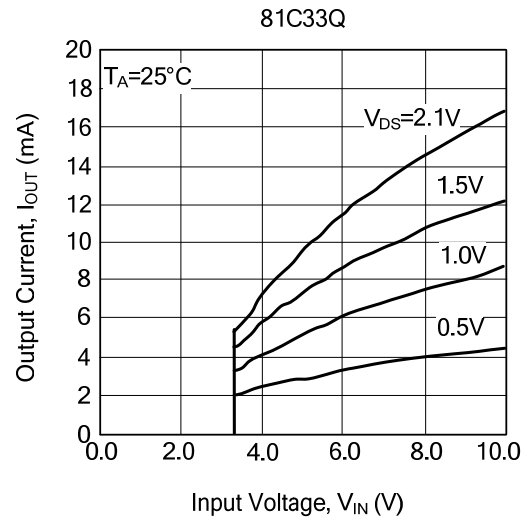
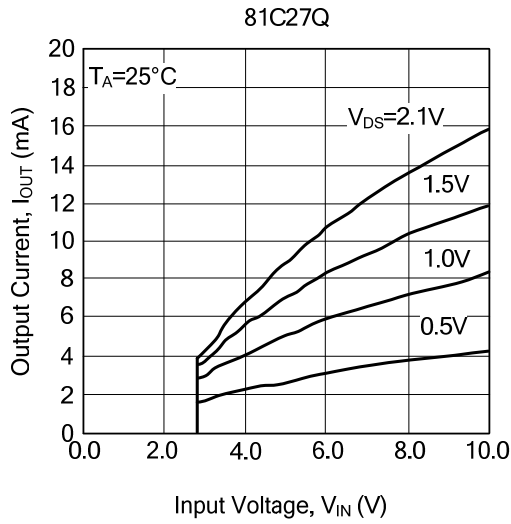
■ TYPICAL PERFORMANCE CHARACTERISTICS

(1) Ambient Temperature vs. Transient Delay Time

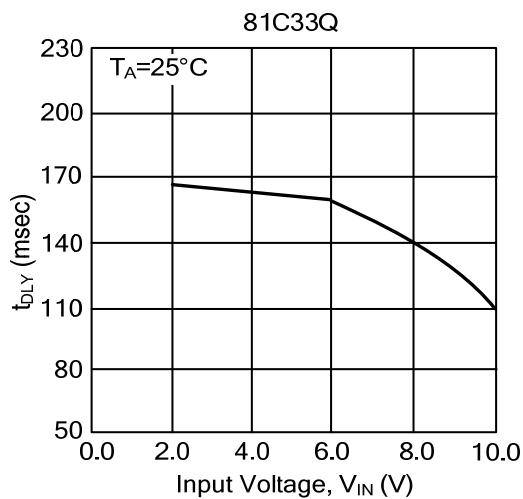


■ TYPICAL PERFORMANCE CHARACTERISTICS (Cont.)

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

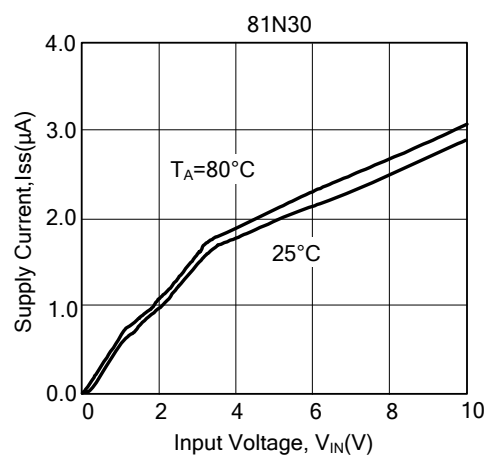
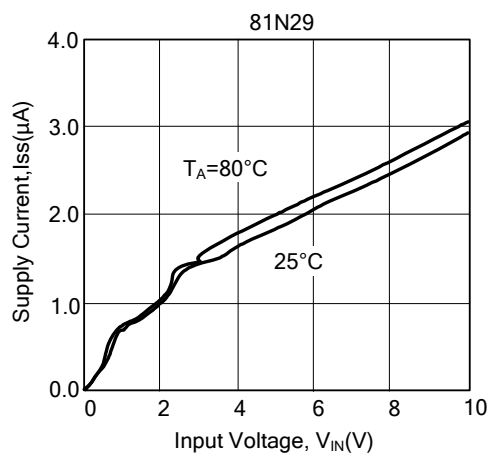
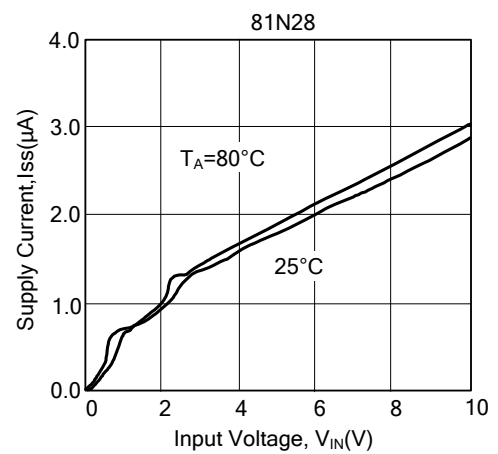
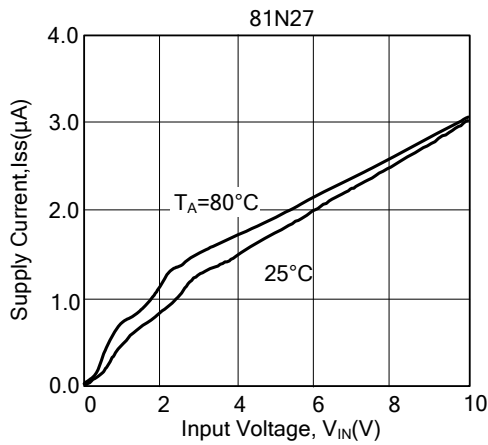
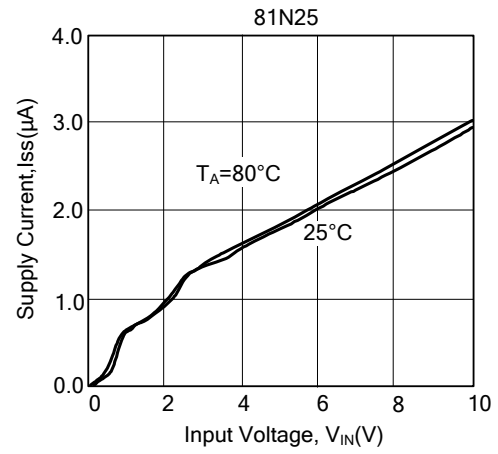
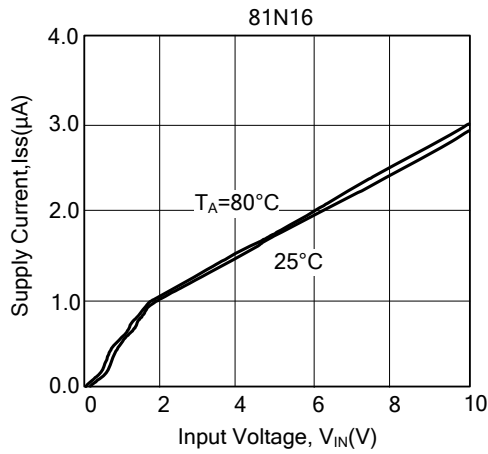


(2) Transient Delay Time vs. Input Voltage

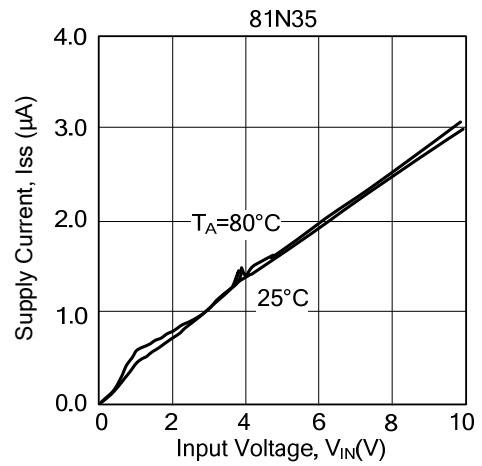
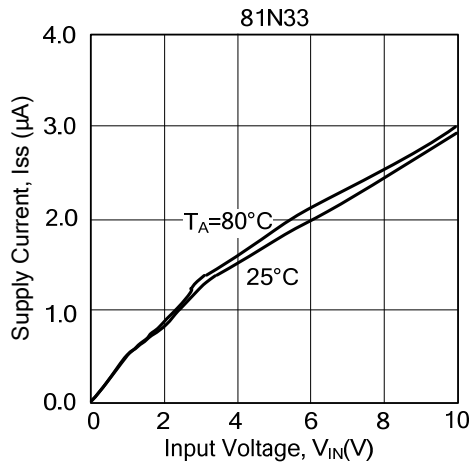


■ TYPICAL PERFORMANCE CHARACTERISTICS (Cont.)

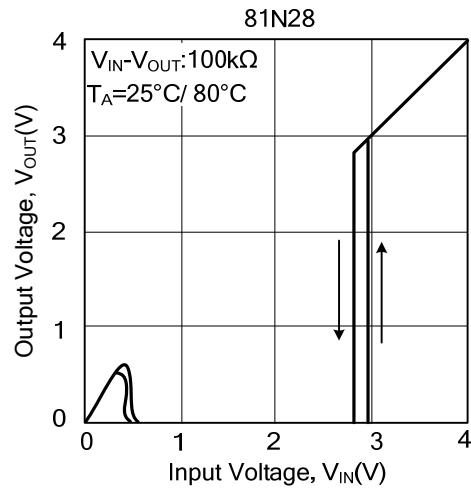
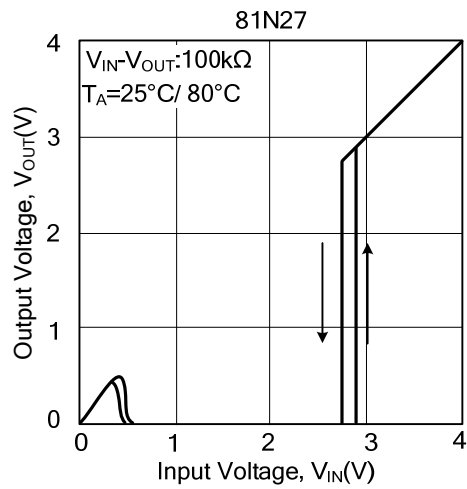
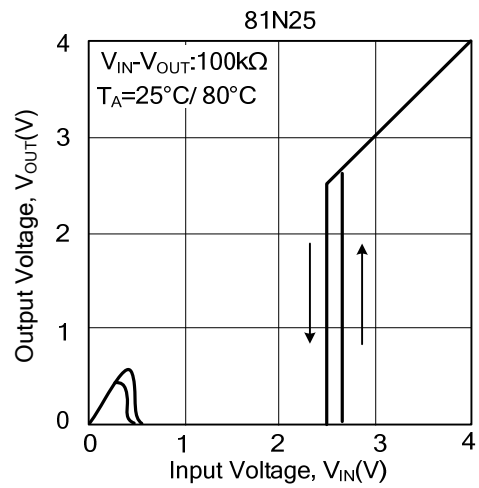
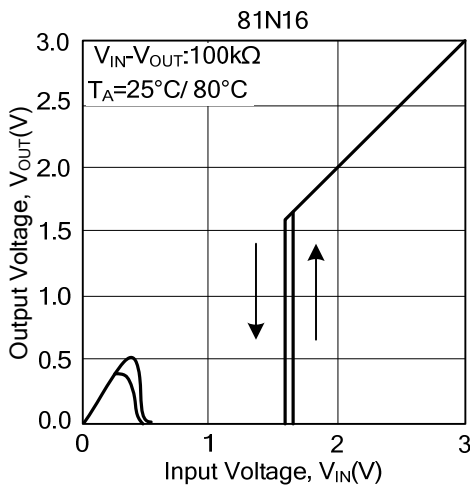
(3) Supply Current vs. Input Voltage



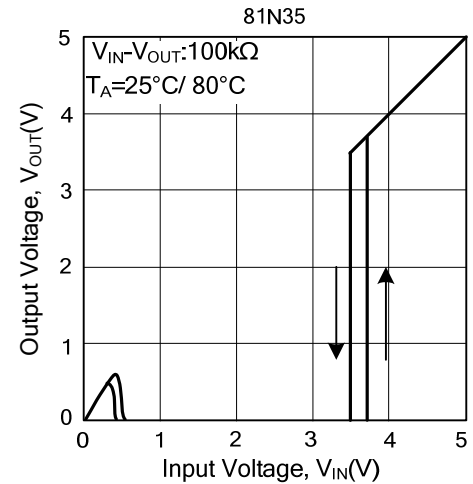
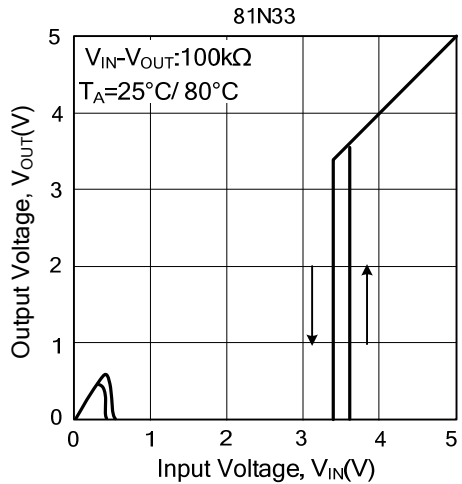
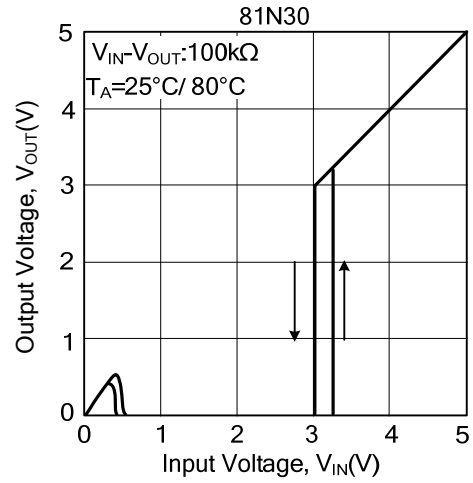
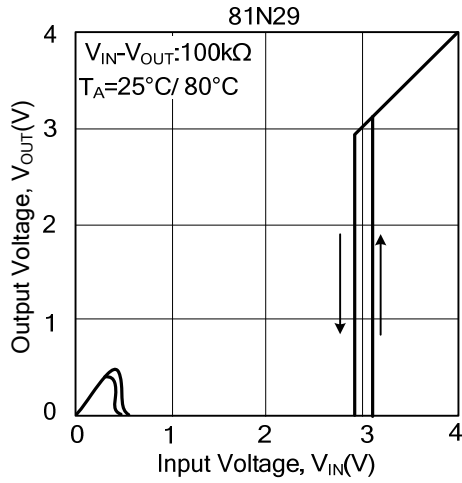
■ TYPICAL PERFORMANCE CHARACTERISTICS (Cont.)



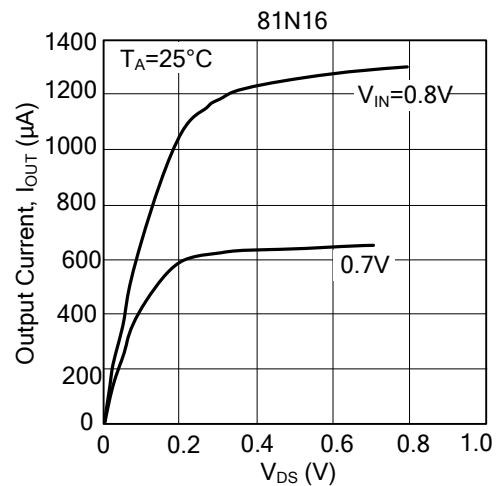
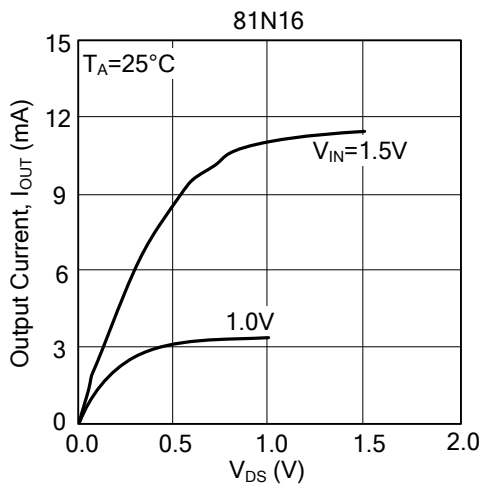
(4) Output Voltage vs. Input Voltage



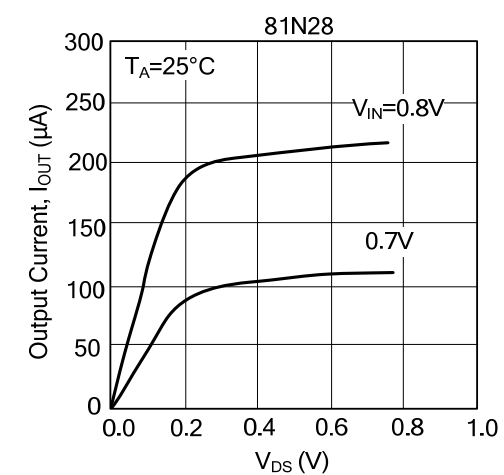
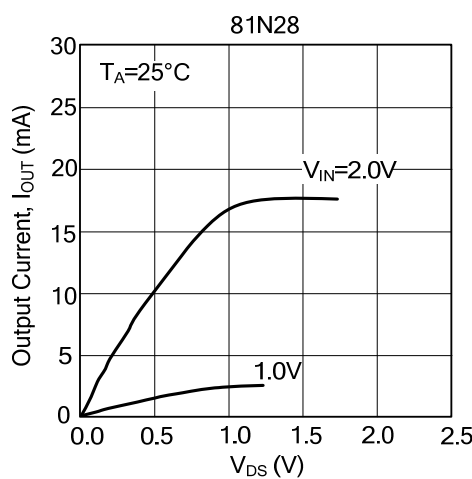
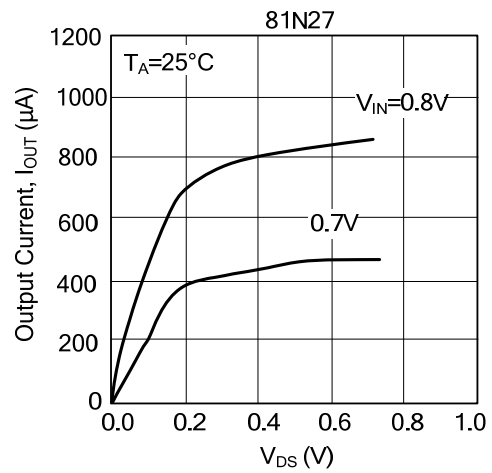
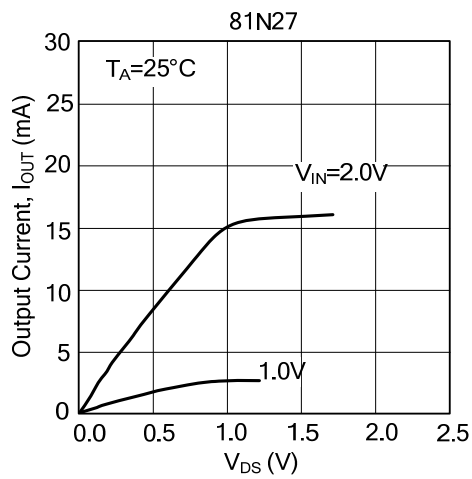
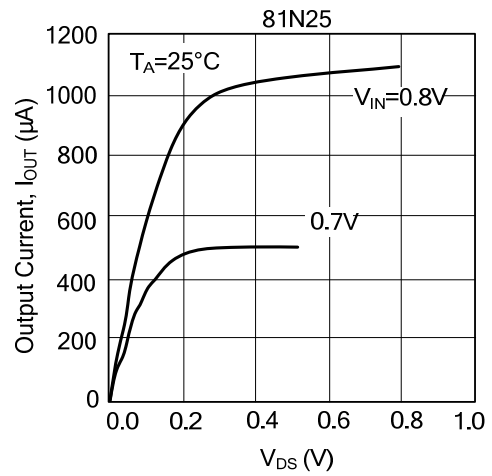
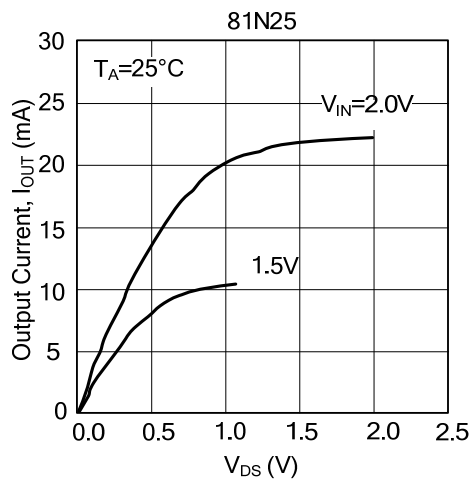
■ TYPICAL PERFORMANCE CHARACTERISTICS (Cont.)



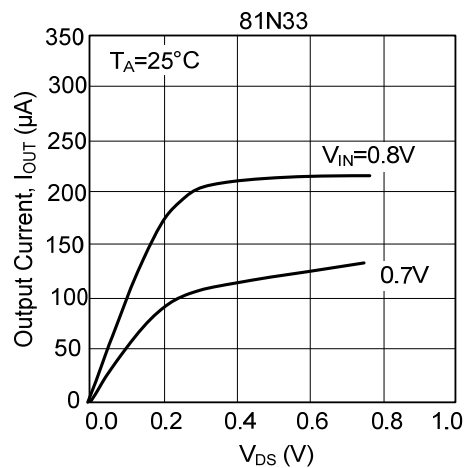
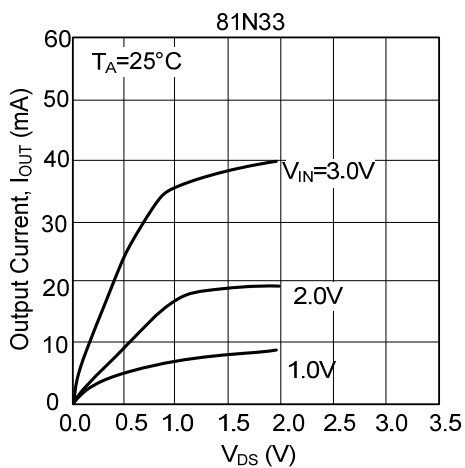
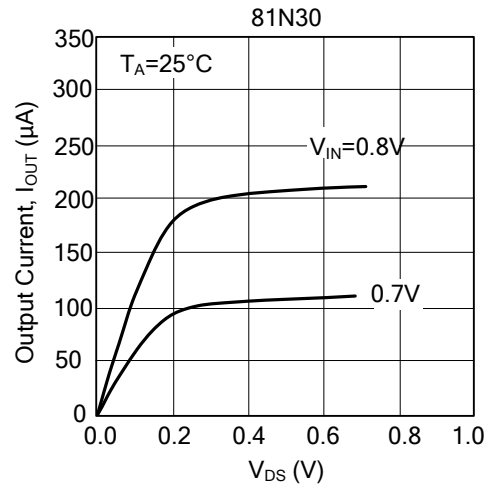
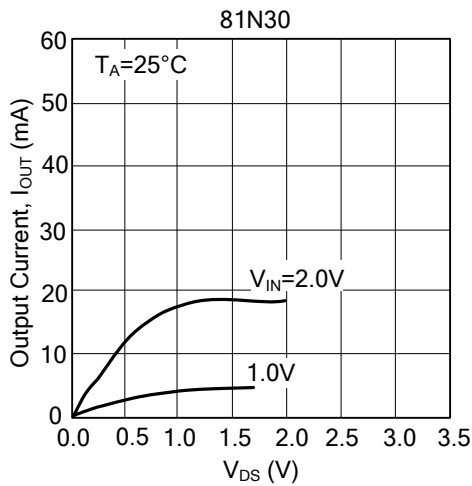
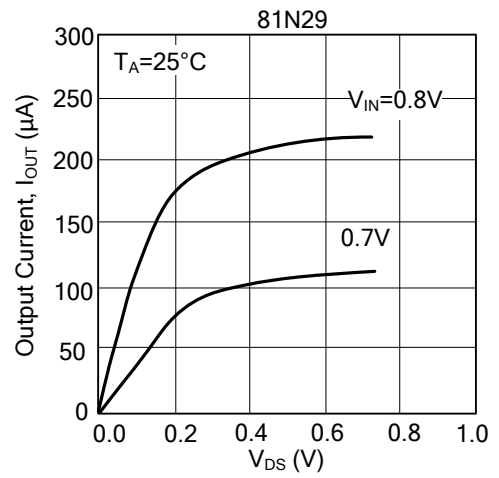
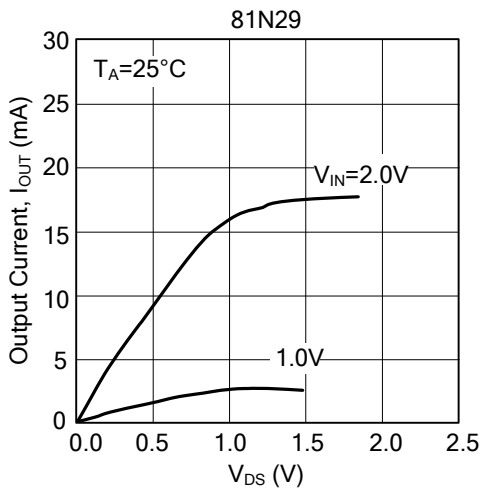
(5) N-Channel Drive Output Current vs. V_{DS}



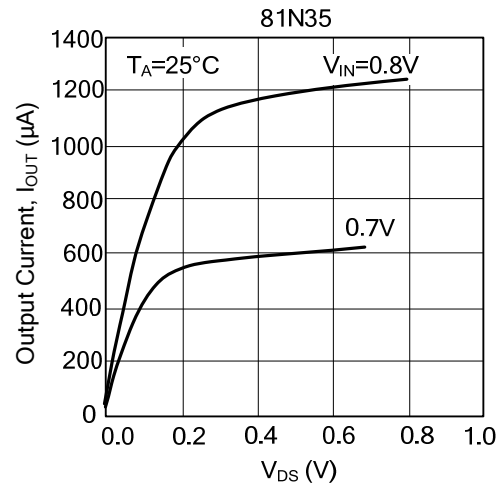
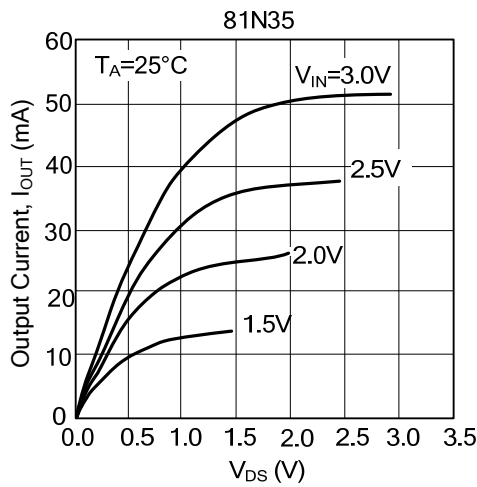
■ TYPICAL PERFORMANCE CHARACTERISTICS (Cont.)



■ TYPICAL PERFORMANCE CHARACTERISTICS (Cont.)



■ TYPICAL PERFORMANCE CHARACTERISTICS (Cont.)



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