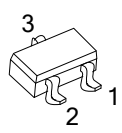
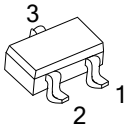
81CXXX/81NXXX

CMOS IC

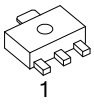
VOLTAGE DETECTORS WITH BUILT-IN DELAY TIME



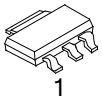
SOT-23-3
(JEDEC TO-236)



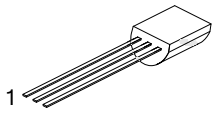
SOT-23
(EIAJ SC-59)



SOT-89



SOT-223



TO-92

■ DESCRIPTION

The UTC **81CXXX** and **81NXXX** 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 ± 2%
* Built-In Delay time : 1ms ~ 50ms
  50ms ~ 200ms
  200ms ~ 400ms
* Detect Voltage Temperature Characteristics: TYP± 100ppm/°C
* Wide Operating Voltage Range : 0.7V ~ 10.0V
* Low Current Consumption : TYP 1.0μA (V_{IN}=2.0V)

■ ORDERING INFORMATION

CMOS:

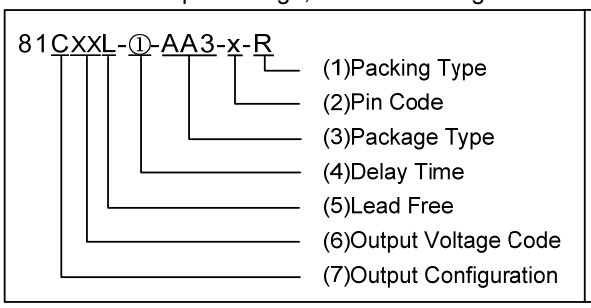
Ordering Number		①:Delay Time		Package	Pin Assignment			Packing
Lead Free	Halogen Free	Duration	Code		1	2	3	
81**C**XXL-①-AA3-B-R	81**C**XXG-①-AA3-B-R	1~50 ms 50~200 ms 200~400 ms	P Q R	SOT-223	O	G	I	Tape Reel
81**C**XXL-①-AB3-E-R	81**C**XXG-①-AB3-E-R			SOT-89	O	I	G	Tape Reel
81**C**XXL-①-AE3-3-R	81**C**XXG-①-AE3-3-R			SOT-23	O	G	I	Tape Reel
81**C**XXL-①-AE3-5-R	81**C**XXG-①-AE3-5-R			SOT-23	G	O	I	Tape Reel
81**C**XXL-①-AE3-2-R	81**C**XXG-①-AE3-2-R			SOT-23	I	O	G	Tape Reel
81**C**XXL-①-AE2-3-R	81**C**XXG-①-AE2-3-R			SOT-23-3	O	G	I	Tape Reel
81**C**XXL-①-AE2-5-R	81**C**XXG-①-AE2-5-R			SOT-23-3	G	O	I	Tape Reel
81**C**XXL-①-AE2-2-R	81**C**XXG-①-AE2-2-R			SOT-23-3	I	O	G	Tape Reel
81**C**XXL-①-T92-D-B	81**C**XXG-①-T92-D-B			TO-92	I	G	O	Tape Box
81**C**XXL-①-T92-E-B	81**C**XXG-①-T92-E-B			TO-92	O	I	G	Tape Box
81**C**XXL-①-T92-D-K	81**C**XXG-①-T92-D-K			TO-92	I	G	O	Bulk
81**C**XXL-①-T92-E-K	81**C**XXG-①-T92-E-K			TO-92	O	I	G	Bulk
81**C**XXL-①-T92-D-R	81**C**XXG-①-T92-D-R			TO-92	I	G	O	Tape Reel
81**C**XXL-①-T92-E-R	81**C**XXG-①-T92-E-R			TO-92	O	I	G	Tape Reel

■ ORDERING INFORMATION(Cont.)

N-Channel:

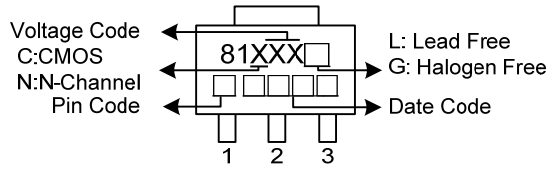
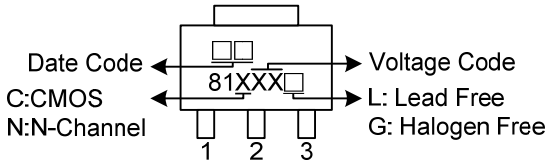
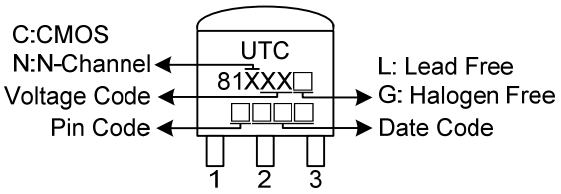
Ordering Number		①:Delay Time		Package	Pin Assignment			Packing
Lead Free	Halogen Free	Duration	Code		1	2	3	
81**N**XXL-①-AA3-B-R	81**N**XXG-①-AA3-B-R	1~50 ms 50~200 ms 200~400 ms	H J K	SOT-223	O	G	I	Tape Reel
81**N**XXL-①-AB3-E-R	81**N**XXG-①-AB3-E-R			SOT-89	O	I	G	Tape Reel
81**N**XXL-①-AE3-3-R	81**N**XXG-①-AE3-3-R			SOT-23	O	G	I	Tape Reel
81**N**XXL-①-AE3-5-R	81**N**XXG-①-AE3-5-R			SOT-23	G	O	I	Tape Reel
81**N**XXL-①-AE3-2-R	81**N**XXG-①-AE3-2-R			SOT-23	I	O	G	Tape Reel
81**N**XXL-①-AE2-3-R	81**N**XXG-①-AE2-3-R			SOT-23-3	O	G	I	Tape Reel
81**N**XXL-①-AE2-5-R	81**N**XXG-①-AE2-5-R			SOT-23-3	G	O	I	Tape Reel
81**N**XXL-①-AE2-2-R	81**N**XXG-①-AE2-2-R			SOT-23-3	I	O	G	Tape Reel
81**N**XXL-①-T92-D-B	81**N**XXG-①-T92-D-B			TO-92	I	G	O	Tape Box
81**N**XXL-①-T92-E-B	81**N**XXG-①-T92-E-B			TO-92	O	I	G	Tape Box
81**N**XXL-①-T92-D-K	81**N**XXG-①-T92-D-K			TO-92	I	G	O	Bulk
81**N**XXL-①-T92-E-K	81**N**XXG-①-T92-E-K			TO-92	O	I	G	Bulk
81**N**XXL-①-T92-D-R	81**N**XXG-①-T92-D-R			TO-92	I	G	O	Tape Reel
81**N**XXL-①-T92-E-R	81**N**XXG-①-T92-E-R			TO-92	O	I	G	Tape Reel

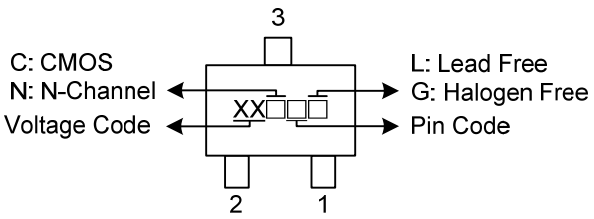
Note: 1. Pin assignment: I:V_{IN} O:V_{OUT} G:V_{SS}
2. XX: Output Voltage, refer to Marking Information.



(1) R: Tape Reel, B: Tape Box, K: Bulk
(2) refer to Pin Assignment
(3) AA3: SOT-223,AE2: SOT-23-3 AB3: SOT-89, AE3: SOT-23, T92: TO-92,
(4) ①: refer to Delay Time
(5) G: Halogen Free, L: Lead Free
(6) XX: refer to Marking Information
(7) C: CMOS, N: N-Cannel

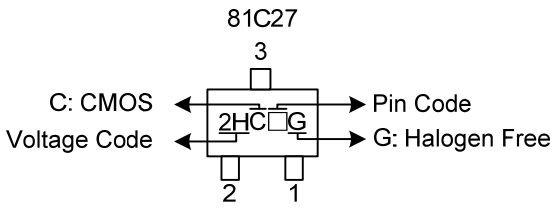
■ MARKING INFORMATION

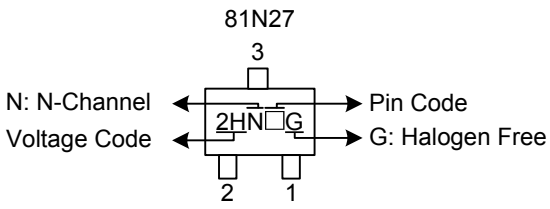
PACKAGE	VOLTAGE CODE			MARKING
SOT-223	10:1.0V 11:1.1V 12:1.2V 13:1.3V 14:1.4V 15:1.5V 16:1.6V 17:1.7V 18:1.8V 19:1.9V 20:2.0V 21:2.1V 22:2.2V 23:2.3V 24:2.4V 25:2.5V	26:2.6V 27:2.7V 28:2.8V 29:2.9V 30:3.0V 31:3.1V 32:3.2V 33:3.3V 34:3.4V 35:3.5V 36:3.6V 37:3.7V 38:3.8V 39:3.9V 40:4.0V 41:4.1V	42:4.2V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

PACKAGE	INTEGER (Note 1)	CODE	DECIMAL (Note 2)	CODE	MARKING
SOT-23 SOT-23-3	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	

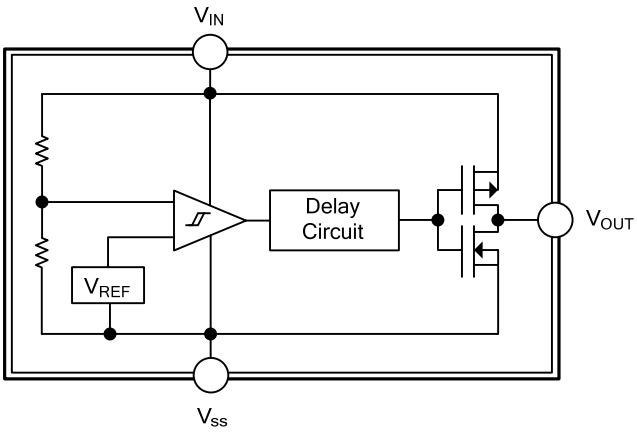
Notes: 1. Represents the integer of the Detect Voltage
2. Represents the decimal number of the Detect Voltage

■ EXAMPLE:

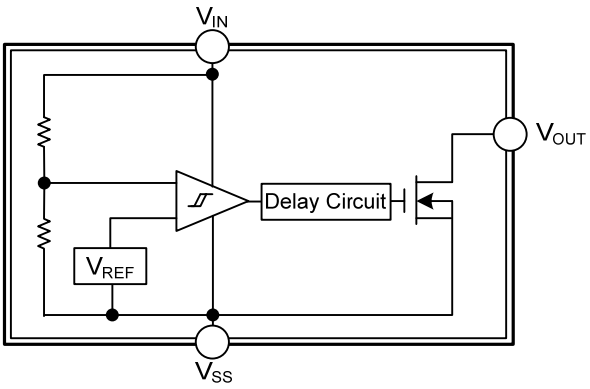




■ BLOCK DIAGRAM



CMOS Output



N-channel Open Drain Output

■ ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V_{IN}	12	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	
	SOT-89		500	
	TO-92		300	
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	
	SOT-89		45	
	TO-92		100	

■ ELECTRICAL CHARACTERISTICS (T_A=25℃)

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		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/°C
Transient Delay Time (V_{DR} → V_{OUT} inversion)		t_{DLY} *	5	V_{IN} 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) ×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}=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/°C
Transient Delay Time (V_{DR} →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) ×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} =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/°C
Transient Delay Time (V_{DR} →V_{OUT} inversion)		t_{DLY} *	5	V_{IN} changes from 0.6V ~ 10V	50		200	ms

■ ELECTRICAL CHARACTERISTICS(Cont.)

Detection voltage (4.0V ~ 4.9V)

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}=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/°C
Transient Delay Time (V_{DR} →V_{OUT} inversion)		t_{DLY} *	5	V_{IN} changes from 0.6V ~ 10V	50		200	ms

Detection voltage (5.0V)

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}=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/°C
Transient Delay Time (V_{DR} →V_{OUT} inversion)		t_{DLY} *	5	V_{IN} changes from 0.6V ~ 10V	50		200	ms

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

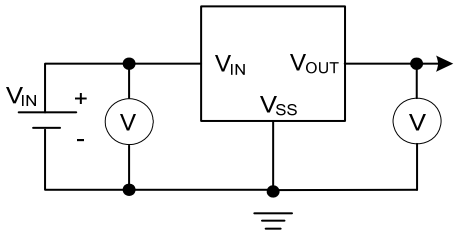
Release Voltage: $V_{DR} = V_{DF} + V_{HYS}$

* 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 2μA greater than it is after that period (completion of release operation) because of delay circuit through current.

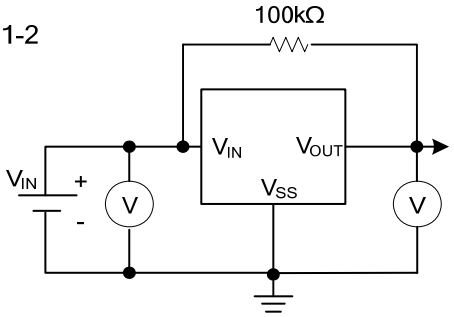
■ TEST CIRCUITS

1-1



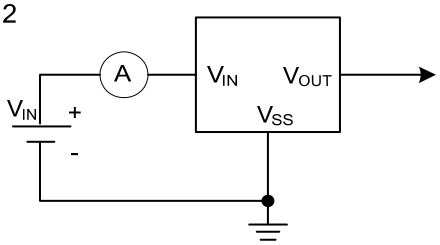
Cmos Output

1-2

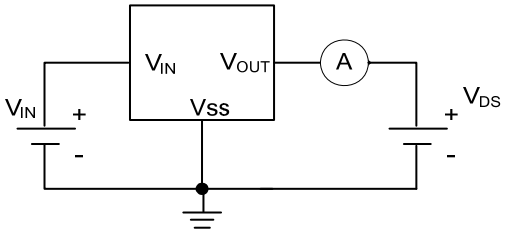


N-channel Open Drain Output

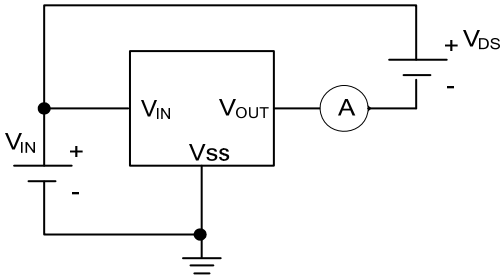
2



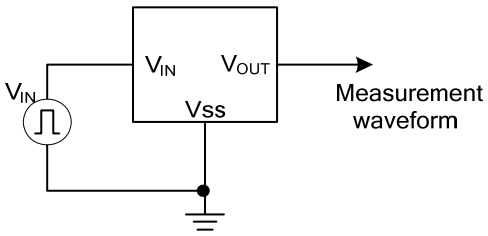
3



4

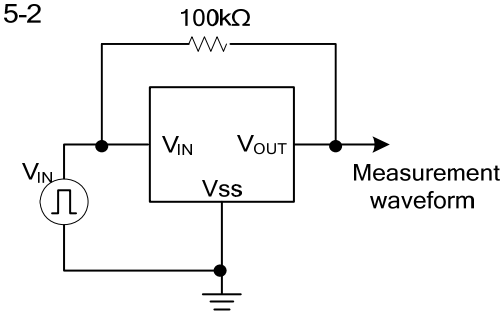


5-1



Cmos Output

5-2

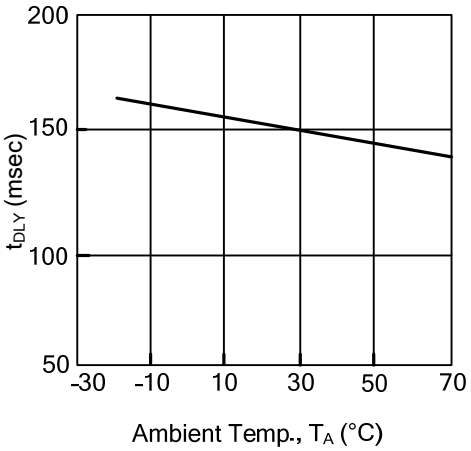


N-channel Open Drain Output

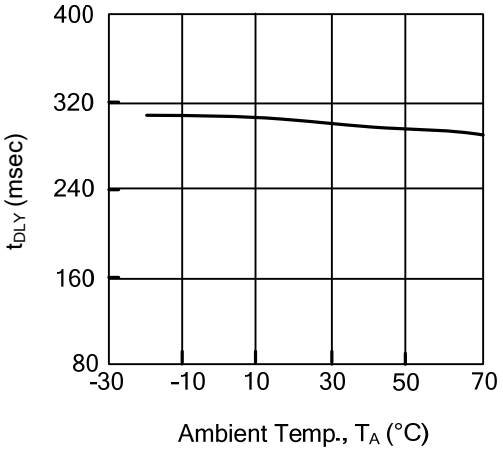
■ TYPICAL PERFORMANCE CHARACTERISTICS

(1) Ambient Temperature vs. Transient Delay Time

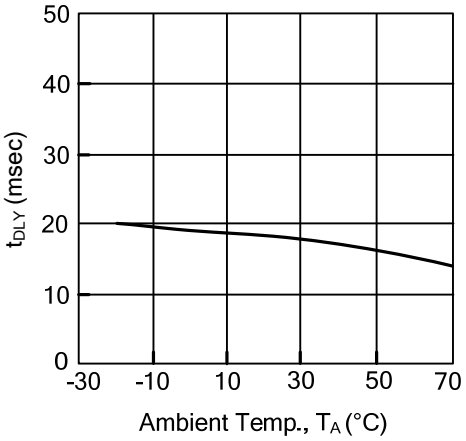
81C30Q



81C30R



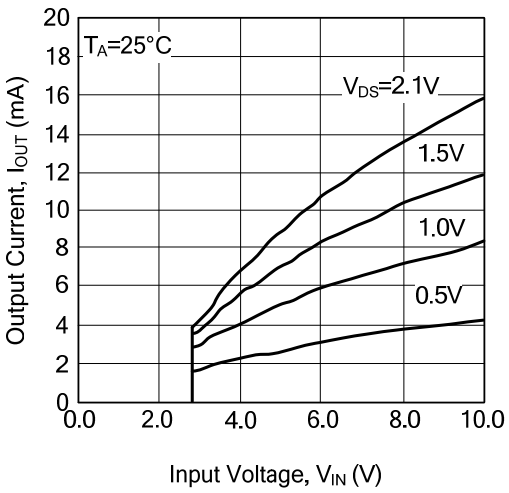
81C30P



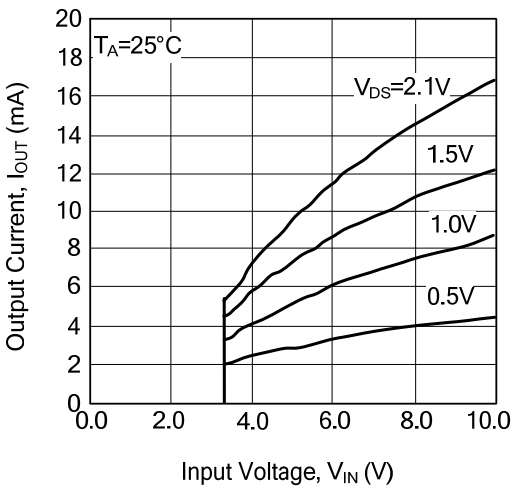
■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)

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

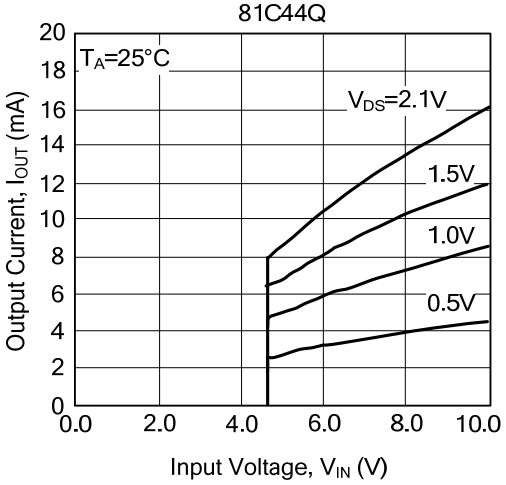
81C27Q



81C33Q

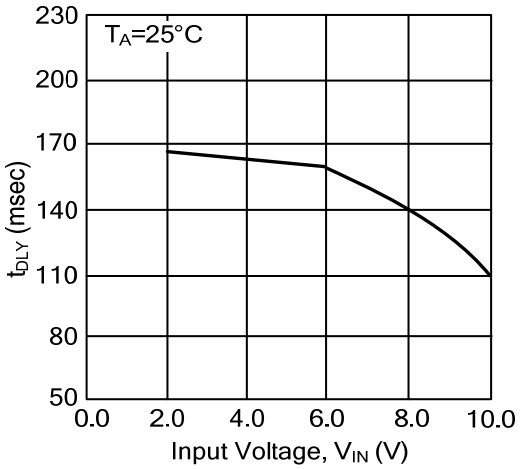


81C44Q



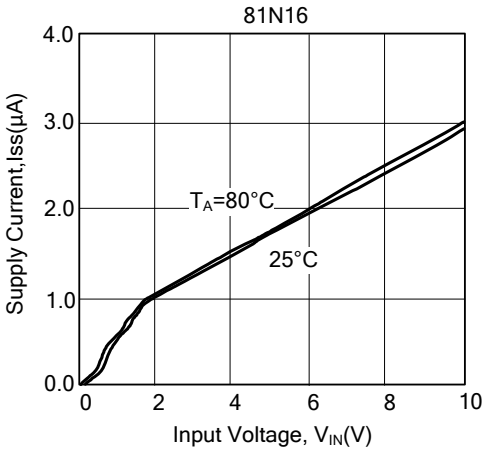
(2) Transient Delay Time vs. Input Voltage

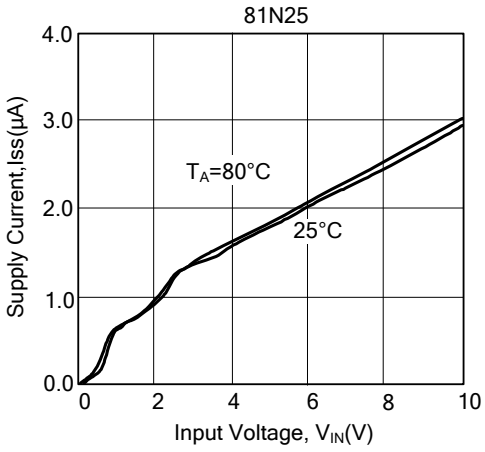
81C33Q

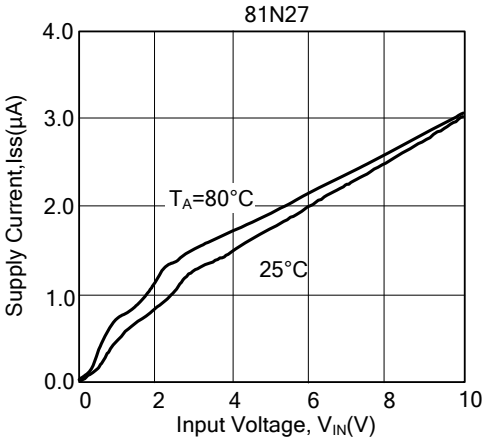


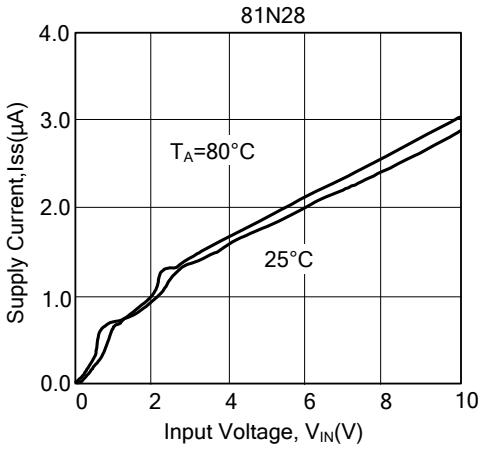
■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)

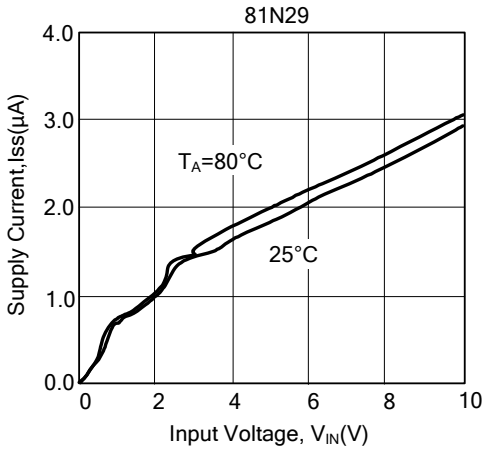
(3) Supply Current vs. Input Voltage

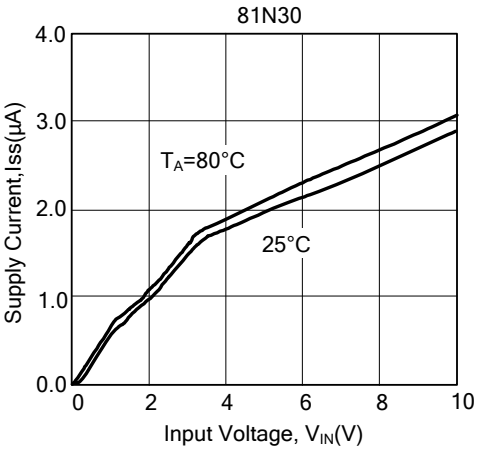




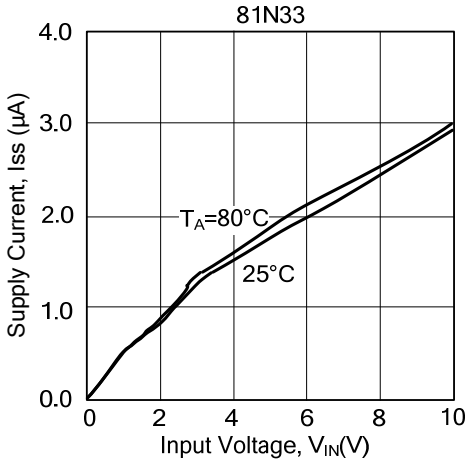


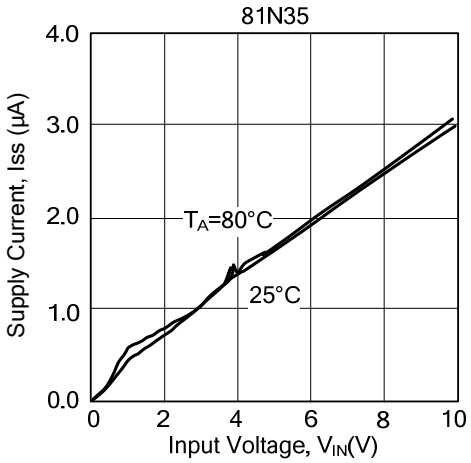




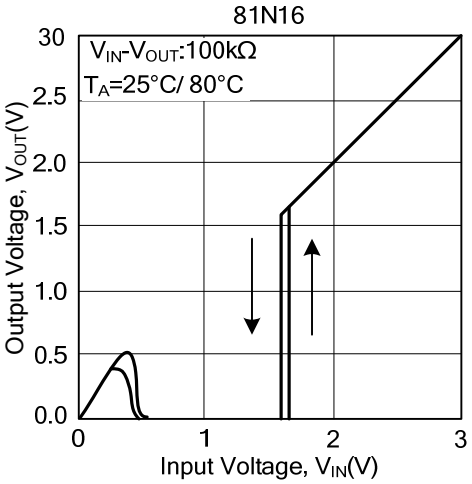


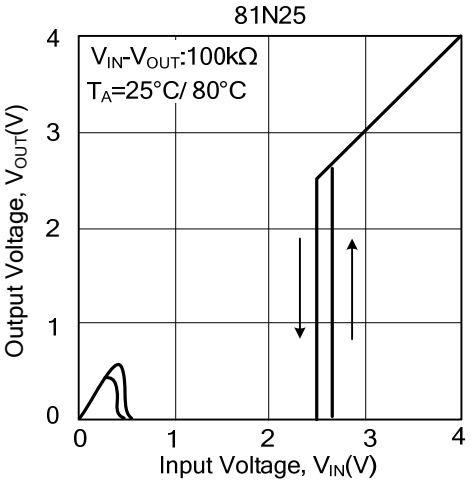
■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)

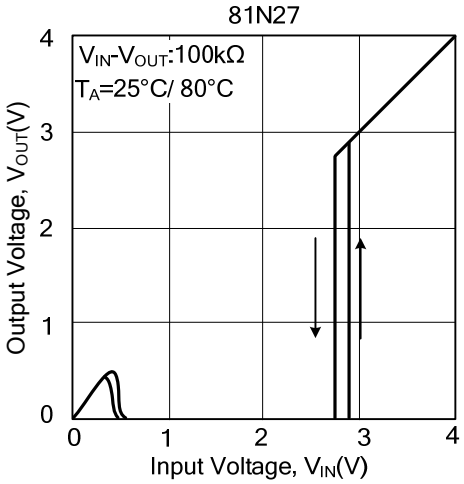


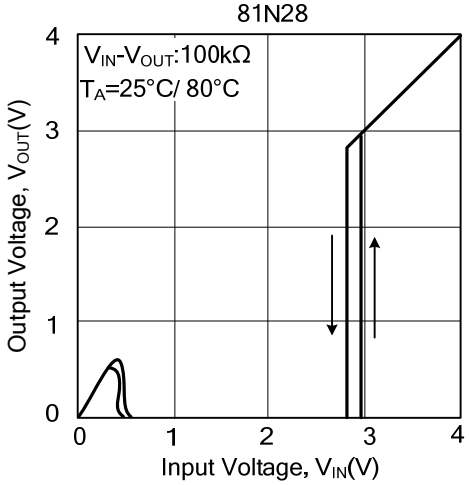


(4) Output Voltage vs. Input Voltage

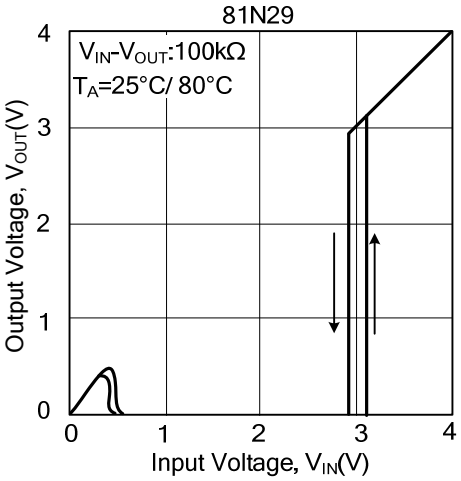


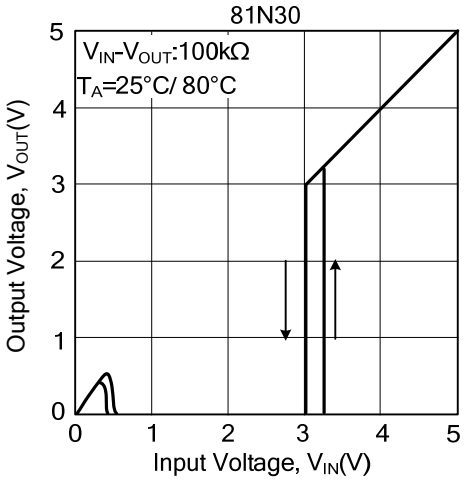


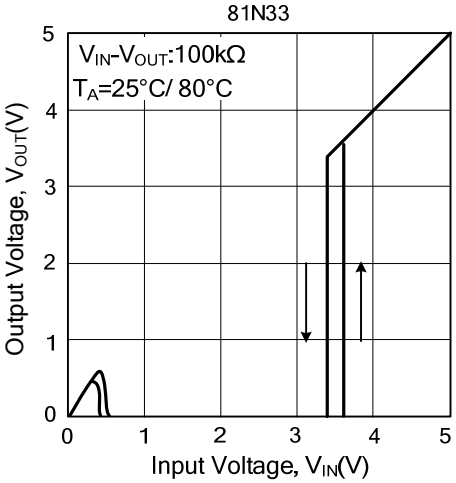


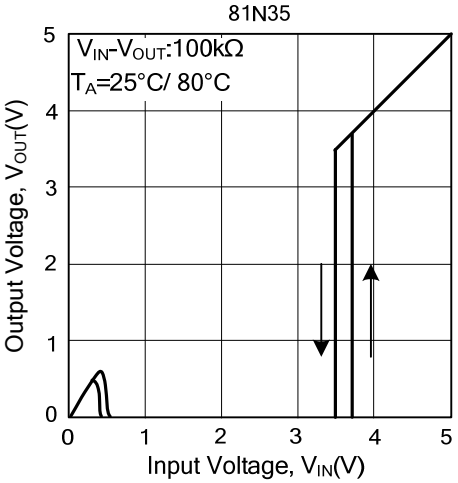


■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)

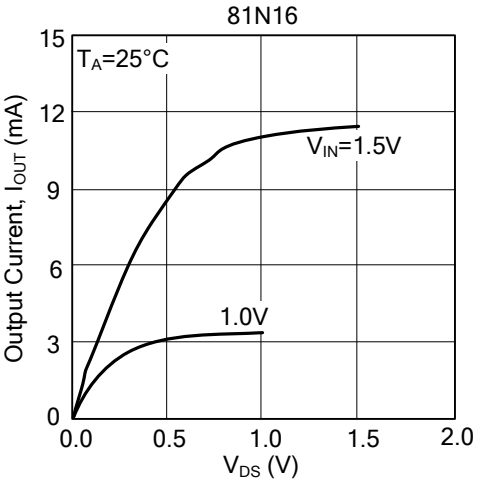


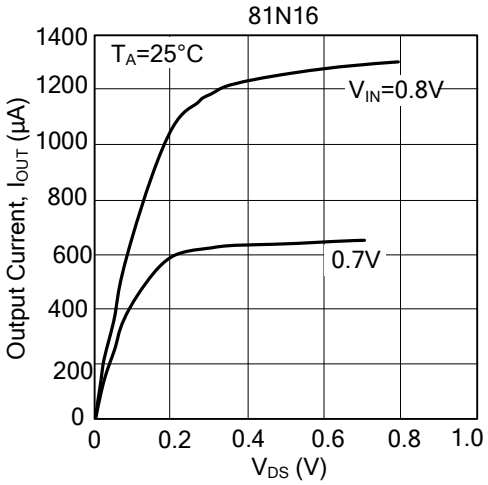




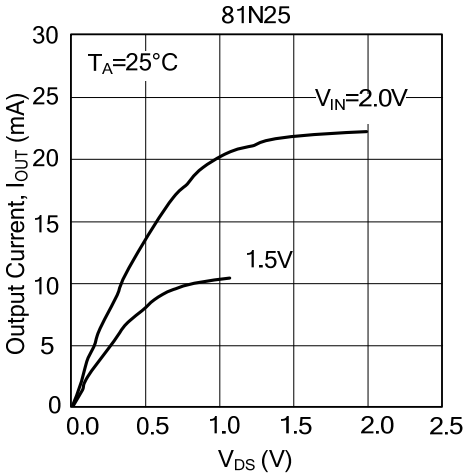


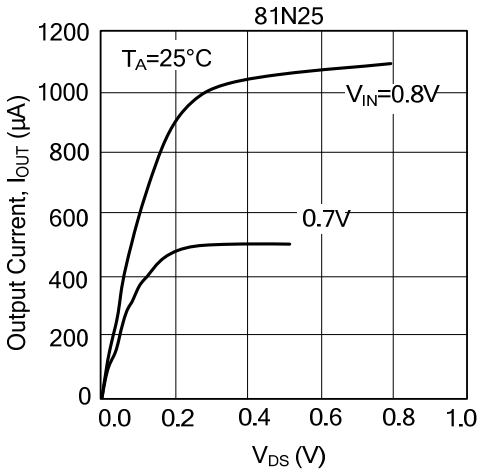
(5) N-Channel Drivre Output Current vs. V_{DS}

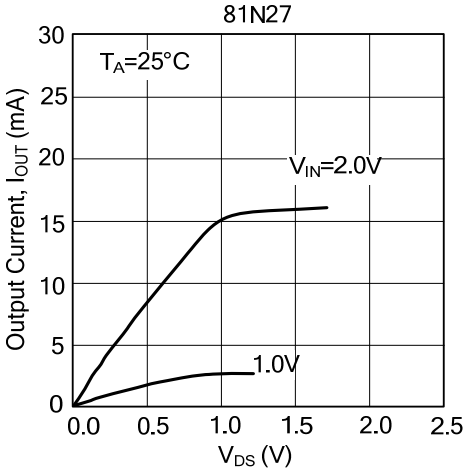


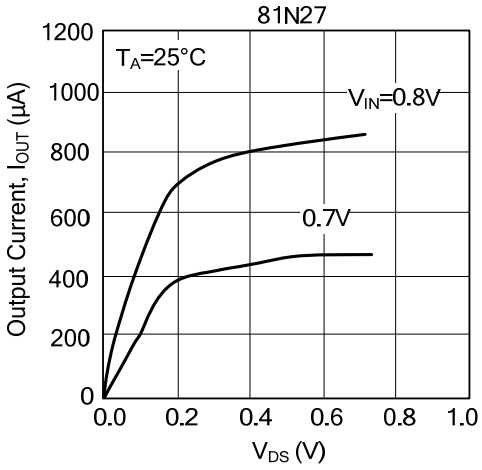


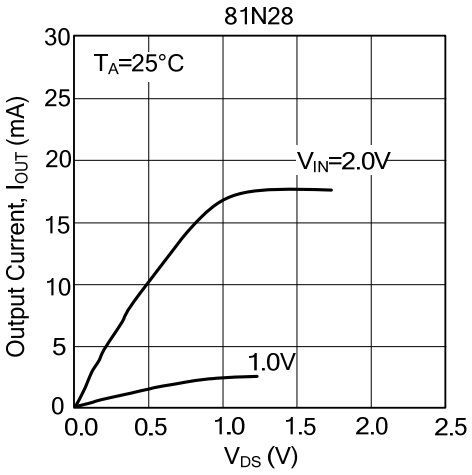
■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)

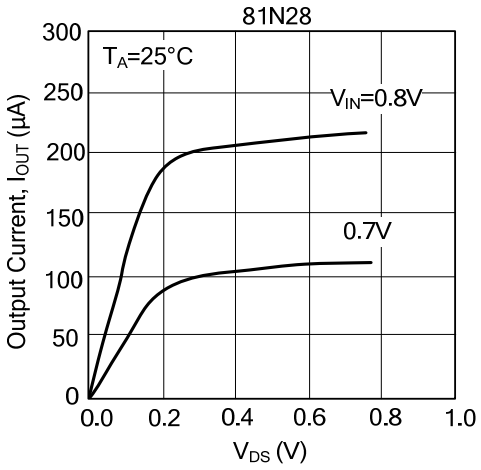




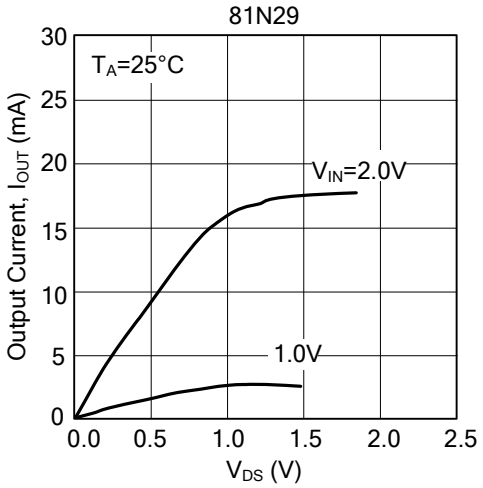


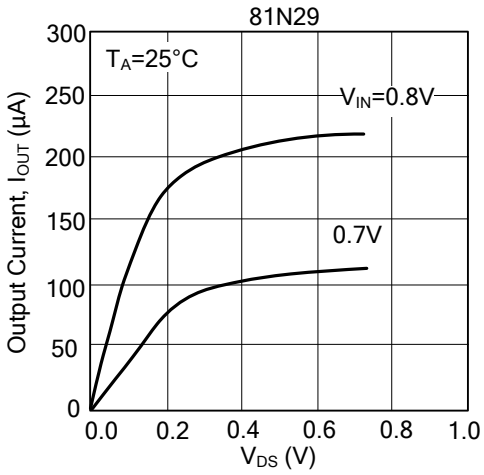


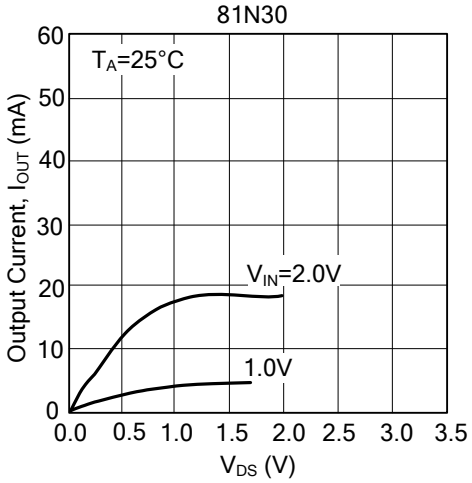


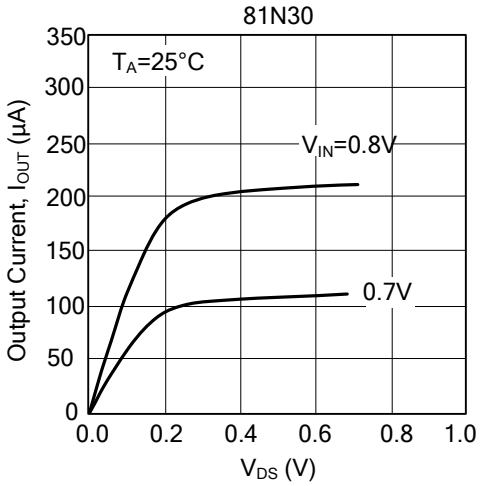


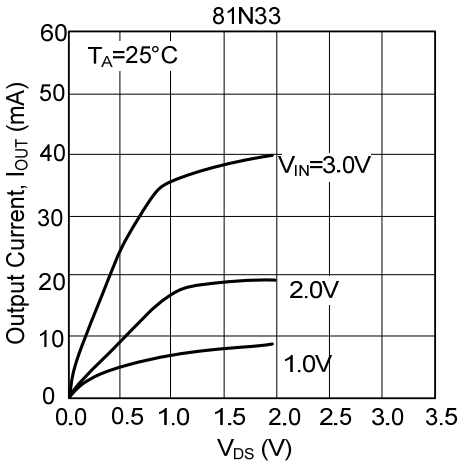
■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)

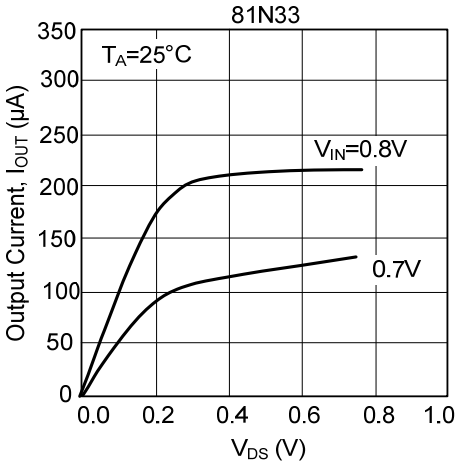












■ TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)