NLHV3157N

Negative Voltage SPDT Switch

The NLHV3157N is an advanced CMOS analog switch fabricated with silicon gate CMOS technology. The device passes analog and digital negative voltages that may vary across the full power−supply range (from V_{EE} to GND).

Features

- Operating Voltage Range: V_{EE} = −12 V to −4 V
- Switch Signal Voltage Range: $V_{IS} = V_{EE}$ to GND
- Positive Control Signal Voltage: V_{IN} = 0 to 3.3 V
- Low ON Resistance: $R_{ON} \leq 5\ \Omega$ @ V_{EE} = −10 V
- Latch−up Performance Exceeds 200 mA
- Available in: SC88 6−Pin Package
- These Devices are Pb−Free, Halogen−Free/BFR-Free and are RoHS−Compliant

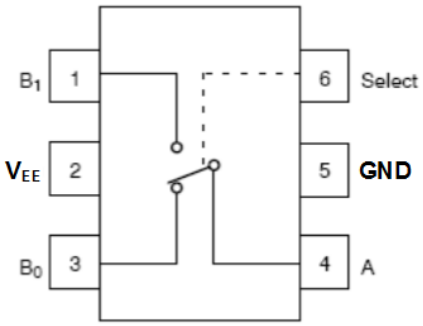


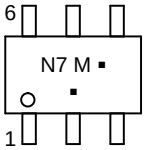
Figure 1. Pin Assignment and logic Diagram

ON Semiconductor®

www.onsemi.com

MARKING DIAGRAM

SC−88
DF SUFFIX
CASE 419B



N7 = Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position may vary depending upon manufacturing location.

FUNCTION TABLE

Select Input	Function
L	B0 Connected to A
H	B1 Connected to A

ORDERING INFORMATION

Device	Package	Shipping†
NLHV3157NDFT2G	SC88 (Pb−Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

MAXIMUM RATINGS

Symbol	Rating		Value	Unit
V_{EE}	DC Supply Voltage		−13 to +0.5	V
V_{IS}	Analog Input Voltage (Note 1)		V_{EE}−0.5 to +0.5	V
V_{IN}	Digital Select Input Voltage (Note 1)		−0.5 to +3.6	V
I_{IOK}	Switch Input/Output diode current		±50	mA
I_{IK}	Select input diode current		−50	mA
P_D	Power Dissipation in Still Air		60	mW
T_L	Lead Temperature, 1 mm from Case for 10 seconds		260	°C
T_J	Junction Bias Under Bias		150	°C
MSL	Moisture Sensitivity		Level 1	
F_R	Flammability Rating	Oxygen Index: 30% − 35%	UL94−V0 (0.125 in)	°C
I_L	Latch−up Current (Note1)	Below GND and above V_{EE} at 125°C	±200	mA
		Below GND and above V_{EE} at 25°C	±300	
T_s	Storage Temperature		−65 to +150	°C
θ_{JA}	Thermal Resistance		400	°C/W
ESD	ESD Protection	Human Body Model	3000	V
		Machine Model	150	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.
1. The input and output voltage ratings may be exceeded if the input and output diode current ratings are observed.

RECOMMENDED OPERATING CONDITIONS (Note 2)

Symbol	Parameter		Min	Max	Unit
V_{EE}	DC Supply Voltage		−12	−4	V
V_S	Switch Input / Output Voltage	(B0, B1, A)	V_{EE}	GND	V
V_{IN}	Digital Select Input Voltage		GND	3.3	V
T_A	Operating Temperature Range		−55	+125	°C
t_r, t_f	Input Transition Rise or Fall Time (Select Input)		0	100	ns/V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.
2. Select input must be held HIGH or LOW, it must not float.

DC ELECTRICAL CHARACTERISTICS (Voltages referenced to GND; Typical characteristics are T_A at 25°C.)

Symbol	Parameter	Condition	V_{EE}, V	−55° to 125°C			Unit
				Min	Typ	Max	
SELECT INPUT							
V_{IH}	Minimum High−Level Input Voltage		< −10	2.0		3.3	V
			−10 to < −8	1.8		3.3	
			−8 to < −6	1.7		3.3	
			≥ −6	1.4		3.3	
V_{IL}	Maximum Low−Level Input Voltage		< −10	0		0.7	V
			−10 to −6	0		0.7	
			−8 to < −6	0		0.7	
			≥ −6	0		0.5	
I_{IN}	Maximum Input Leakage Current	V_{IN} = 3.3 V or GND	−10		±0.2	±20	μA
POWER SUPPLY							
I_{CC}	Maximum Quiescent Supply Current	Select = 3.3 V or GND, $V_{IS} = V_{EE}$ or GND	−10 to −4		25	50	μA
ANALOG SWITCH							
R_{ON}	Maximum ON Resistance (Note 3)	$V_{IN} = V_{IL}$ or V_{IH} $V_{IS} = V_{EE}$ to GND $I_O \leq 10$ mA	−12		2.6	4.5	Ω
			−10		3.0	5	
			−8		3.5	5.8	
			−6		4.5	7.5	
		$V_{IN} = V_{IL}$ or V_{IH} $V_{IS} = V_{EE}$ to GND $I_O \leq 5$ mA	−4		9	15	
R_{FLAT}	ON Resistance Flatness (Notes 3, 4, 6)	$V_{IN} = V_{IL}$ or V_{IH} $V_{IS} = V_{EE}$ to GND $I_O \leq 10$ mA	−12		0.4		Ω
			−10		1.2		
			−8		1.7		
			−6		2.5		
		$V_{IN} = V_{IL}$ or V_{IH} $V_{IS} = V_{EE}$ to GND $I_O \leq 5$ mA	−4		6		
ΔR_{ON}	R_{ON} Mismatch Between (Notes 3, 4, 5)	I_A = −10 mA, V_{Bn} = −8.4 V	−12		0.2		Ω
		I_A = −10 mA, V_{Bn} = −7 V	−10		0.2		
		I_A = −10 mA, V_{Bn} = −5.6 V	−8		0.25		
		I_A = −10 mA, V_{Bn} = −4.2 V	−6		0.25		
		I_A = −5 mA, V_{Bn} = −2.8 V	−4		0.3		
$I_{NC(OFF)}$, $I_{NO(OFF)}$	NC or NO OFF Leakage Current (Figure 9)	$V_{IN} = V_{IL}$ or V_{IH}, V_{Bn} = GND, $V_A = V_{EE}$ to GND	−10		±1.0	±20	μA
$I_{COM(ON)}$	COM ON Leakage Current (Figure 9)	$V_{IN} = V_{IL}$ or V_{IH}; V_A = GND V or V_{EE}; V_{B1} = GND or V_{EE} with V_{B0} floating, or V_{B0} = GND or V_{EE} with V_{B1} floating	−10		±2.0	±20	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. Measured by the voltage drop between A and B pins at the indicated current through the switch. On Resistance is determined by the lower of the voltages on the two (A or B Ports).
4. Parameter is characterized but not tested in production.
5. $\Delta R_{ON} = R_{ON}max - R_{ON}min$ measured at identical V_{EE}, temperature and voltage levels.
6. Flatness is defined as the difference between the maximum and minimum value of ON Resistance over the specified range of conditions.

AC ELECTRICAL CHARACTERISTICS (Voltages referenced to GND; Typical characteristics are T_A at 25°C.)

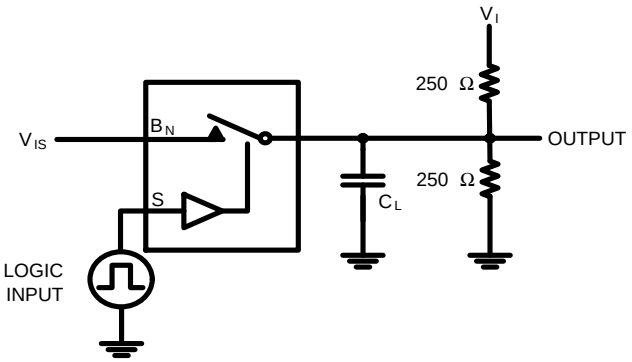
Symbol	Parameter	Condition	V_{EE}, V	−55° to 125°C			Unit
				Min	Typ	Max	
t_{PHL}, t_{PLH}	Propagation Delay, Bus to Bus (Note 8) (A to B_n)	C_L = 100 pF (Figures 2, 3)	−12 to −4			2	ns
t_{PZL}, t_{PZH}	Switch Enable Time Turn−On Time (A to B_n)	C_L = 100 pF (Figures 2, 3)	−12			220	ns
			−10			175	
			−8			165	
			−6			165	
			−4			200	
t_{PLZ}, t_{PHZ}	Switch Disable Time Turn−Off Time (A to B_n)	C_L = 100 pF (Figures 2, 3)	−12			225	ns
			−10			155	
			−8			150	
			−6			120	
			−4			145	
t_B	Switch Break Time	R_L = 50 Ω, C_L = 100 pF, V_{IS} = −2.5 V (Figure 4)	−12	10		50	ns
			−10	10		60	
			−8	20		75	
			−6	20		90	
			−4	50		135	
t_{POR}	Power ON Reset Time	Measured from V_{EE} = −4 V	−12 to −4			20	μs
Q	Charge Injection (Note 7)	C_L = 1 nF, V_{GEN} = 0 V, R_{GEN} = 0 Ω (Figure 5)	−12		170		pC
			−10		120		
			−8		95		
			−6		55		
			−4		40		
OIRR	Off−Isolation (Note 9)	R_L = 50 Ω, f = 10 MHz (Figure 6)	−12 to −4		−33		dB
Xtalk	Crosstalk	R_L = 50 Ω, f = 10 MHz (Figure 7)	−12 to −4		−42		dB
BW	−3 dB Bandwidth	R_L = 50 Ω (Figure 10)	−12 to −4		200		MHz

7. Guaranteed by Design.
8. This parameter is guaranteed by design but not tested. The bus switch contributes no propagation delay other than the RC delay of the ON Resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage source (zero output impedance).
9. Off Isolation = 20 $\log_{10}$ [V_A/V_{Bn}].

CAPACITANCES (Note 10)

Symbol	Parameter	Test Conditions	Typical @ 25°C	Unit
C_{IN}	Input Capacitance, Select Inputs	V_{EE} = −12 V	6	pF
C_{IOB}	B−Port OFF Capacitance	V_{EE} = −10 V	45	pF
C_{IOA_ON}	A Port Capacitance when Switch is Enabled	V_{EE} = −10 V	100	pF

10. T_A = +25°C, f = 1 MHz, Capacitance is characterized but not tested in production.



Note: Input V_{IS} driven by 50 Ω source terminated by 50 Ω.
Note: C_L includes load and stray capacitance.
Input PRR = 100 kHz, t_W = 5 μs.

Parameter	V_I	V_{IS}
t_{PLH} / t_{PHL}	Open	Source
t_{PZL} / t_{PLZ}	GND	V_{EE}
t_{PZH} / t_{PHZ}	2 x V_{EE}	GND

Figure 2. AC Test Circuit

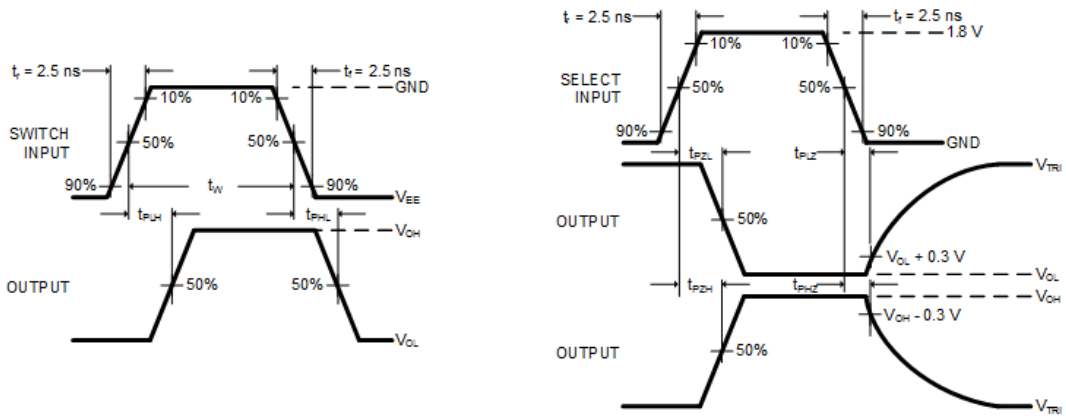


Figure 3. AC Test Waveforms

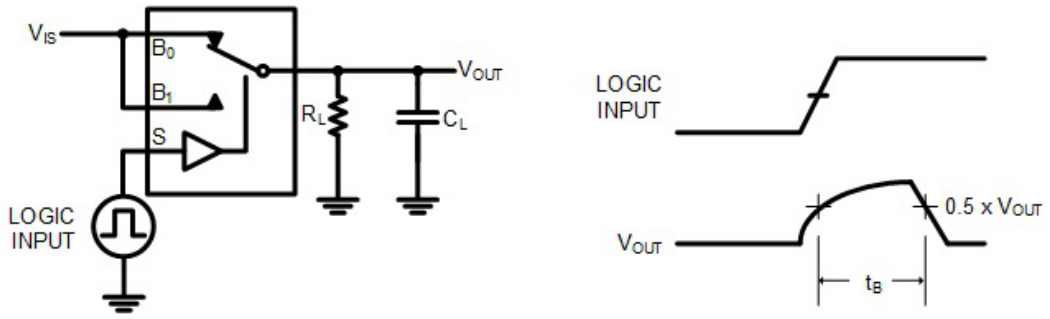


Figure 4. Switch Break Interval Timing

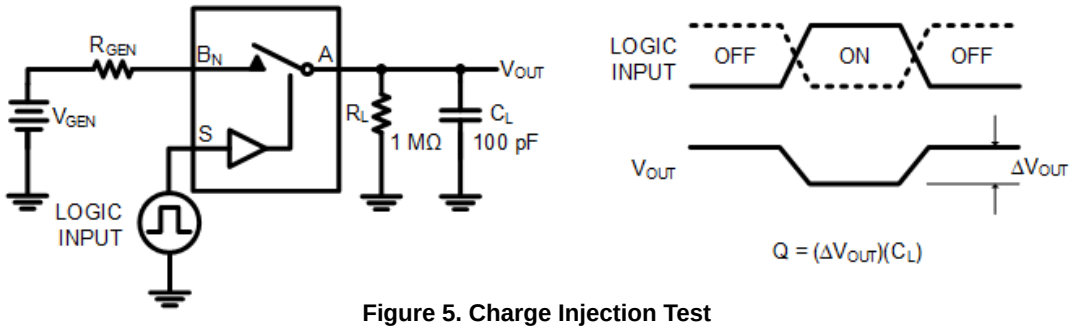


Figure 5. Charge Injection Test

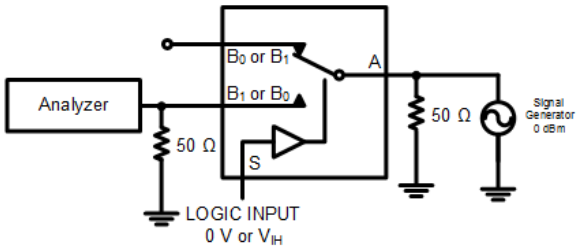


Figure 6. Off Isolation

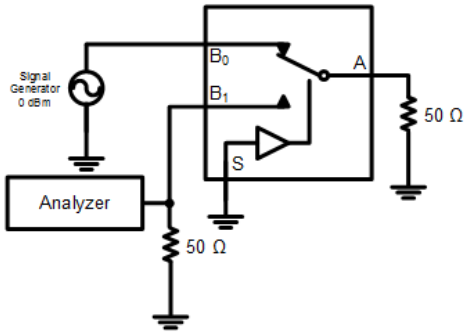


Figure 7. Crosstalk

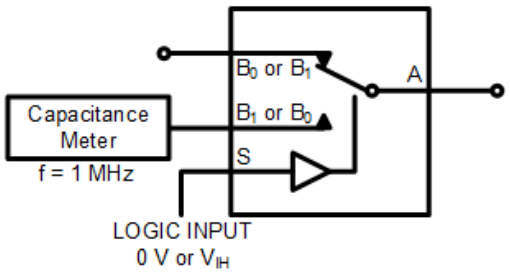


Figure 8. Channel Off Capacitance

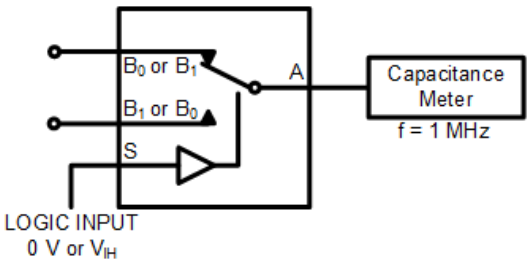
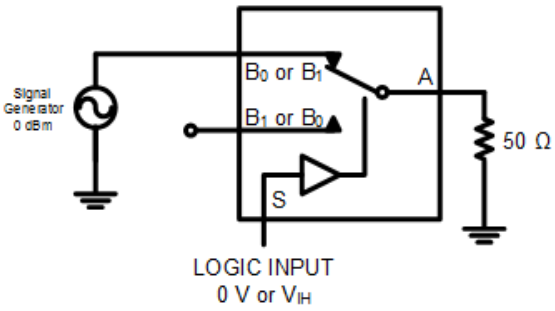


Figure 9. Channel On Capacitance



$$BW = \frac{0.707 \cdot VA}{VBn}, \quad n = 0 \text{ or } 1$$

Figure 10. Bandwidth

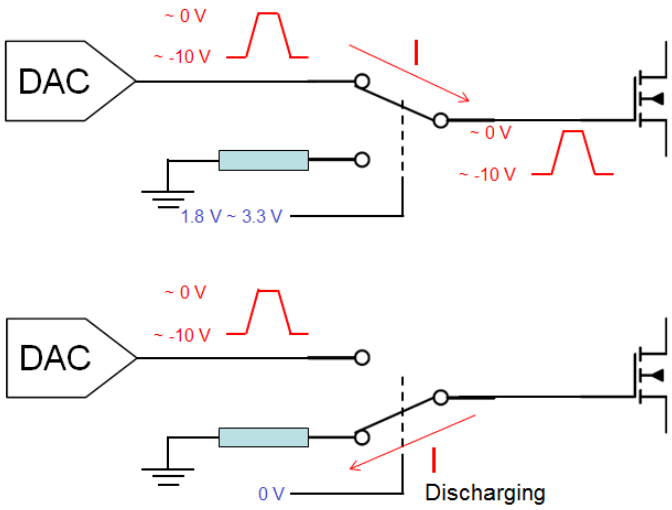
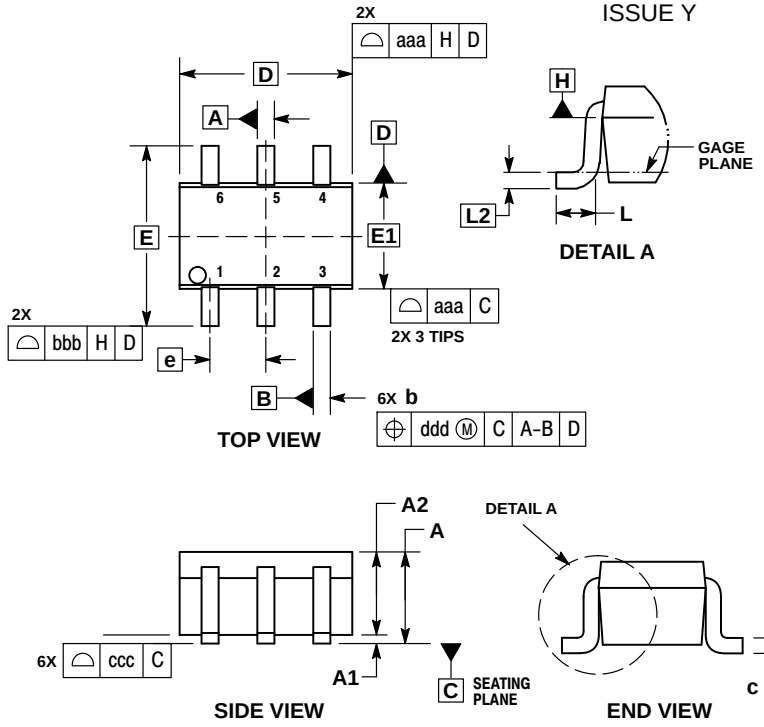


Figure 11. Typical Application

PACKAGE DIMENSIONS

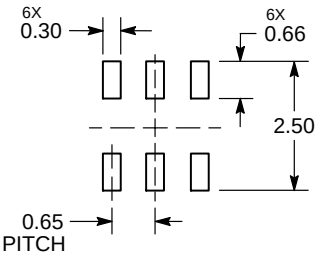
SC−88/SC70−6/SOT−363
CASE 419B−02
ISSUE Y



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	−−−	−−−	1.10	−−−	−−−	0.043
A1	0.00	−−−	0.10	0.000	−−−	0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.010
C	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.070	0.078	0.086
E	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			0.006 BSC		
aaa	0.15			0.006		
bbb	0.30			0.012		
ccc	0.10			0.004		
ddd	0.10			0.004		

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Analogue Switch ICs ***category:***

Click to view products by ON Semiconductor ***manufacturer:***

Other Similar products are found below :

FSA3051TMX NLAS4684FCTCG NLAS5223BLMNR2G NLX2G66DMUTCG 425541DB 425528R 099044FB NLAS5123MNR2G PI5A4157CEX PI5A4599BCEX NLAS4717EPFCT1G PI5A3167CCEX SLAS3158MNR2G PI5A392AQE PI5A4157ZUEX PI5A3166TAEX FSA634UCX XS3A1T3157GMX TC4066BP(N,F) DG302BDJ-E3 PI5A100QEX HV2605FG-G HV2301FG-G RS2117YUTQK10 RS2118YUTQK10 RS2227XUTQK10 ADG452BRZ-REEL7 MAX4066ESD+ MAX391CPE+ MAX4730EXT+T MAX314CPE+ BU4066BCFV-E2 MAX313CPE+ BU4S66G2-TR NLASB3157MTR2G TS3A4751PWR NLAST4599DFT2G NLAST4599DTT1G DG300BDJ-E3 DG2503DB-T2-GE1 TC4W53FU(TE12L,F) HV2201FG-G 74HC2G66DC.125 DG3257DN-T1-GE4 ADG619BRMZ-REEL ADG1611BRUZ-REEL7 DG2535EDQ-T1-GE3 LTC201ACN#PBF 74LV4066DB,118 ISL43410IUZ