



Low Capacitance, Low Charge Injection, 4- / 8-Channel, Triple SPDT, ± 5 V / 12 V / 5 V / 3 V Analog Multiplexers

DESCRIPTION

The DG4051E, DG4052E, and DG4053E are high precision CMOS analog multiplexers. The DG4051E is an 8-channel multiplexer, the DG4052E is a dual 4-channel multiplexer, and the DG4053E is a triple 2-channel multiplexer or triple SPDT.

The DG4051E, DG4052E, and DG4053E feature low leakage, parasitic capacitance, and low charge injection of 0.3 pC over the full voltage range. These devices are ideal for high precision signal switching and multiplexing.

Designed to operate from a 3 V to 16 V single supply or from a ± 3 V to ± 8 V dual supplies, the DG4051E, DG4052E, and DG4053E are fully specified at 3 V, 5 V, 12 V and ± 5 V. All control logic inputs have guaranteed 2 V logic high limit when operating from 5 V or ± 5 V supplies and 1.4 V when operating from a 3 V supply.

All switches conduct equally well in both directions, offering rail to rail analog signal switching and can be used both as multiplexers as well as de-multiplexers.

The DG4051E, DG4052E, and DG4053E operating temperature is specified from -40 °C to +125 °C and are available in 16 pin TSSOP and the ultra compact 1.8 mm x 2.6 mm miniQFN16 packages.

BENEFITS

- Wide operation voltage range
- Low charge injection
- Low parasitic capacitance
- Compact package option

FEATURES

- 3 V to 16 V single supply or ± 3 to ± 8 V dual supply operation
- Low parasitic capacitance:
 - $C_{D(ON)}$: 8.5 pF / typ. (DG4053E)
 - $C_{S(OFF)}$: 2.0 pF / typ. (DG4053E)
- Less than 0.3 pC charge injection over the full signal swing range
- Low leakage: < 50 pA, typ.
- Fast switching t_{ON} : 35 ns, typ.
- 3 V logic compatible for control
- Bi-directional rail to rail signal switching
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS COMPLIANT

APPLICATIONS

- Automatic test equipment
- Process control and automation
- Data acquisition systems
- Meters and instruments
- Medical and healthcare systems
- Communication systems
- Audio and video signal routing
- Relay replacement
- Battery powered systems

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



ENABLE = LO, all switches are controlled by addr pins.
ENABLE = HI, all switches are off.



ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted)			
PARAMETER	LIMIT		UNIT
V+ to V-	-0.3 to +18		V
GND to V-	-18		
Digital Inputs ^a , V _S , V _D	(V-) - 0.3 to (V+) + 0.3 or 30 mA, whichever occurs first		
Continuous Current (any terminal)	30		mA
Peak Current, S or D (pulsed 1 ms, 10 % duty cycle)	100		
Storage Temperature	-65 to +150		°C
Power Dissipation ^b	16-pin TSSOP ^c	450	mW
	16-pin miniQFN ^{d, f}	525	
	16-pin narrow SOIC ^e	640	
Thermal Resistance ^b	16-pin TSSOP ^c	178	°C/W
	16-pin miniQFN ^{d, f}	152	
	16-pin narrow SOIC ^e	125	
ESD Human Body Model (HBM); per ANSI / ESDA / JEDEC® JS-001	2500		V
Latch Up Current, per JESD78D	400		mA

Notes

- a. Signals on SX, DX, or INX exceeding V+ or V- will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
- b. All leads welded or soldered to PC board.
- c. Derate 5.6 mW/°C above 70 °C.
- d. Derate 6.6 mW/°C above 70 °C.
- e. Derate 8.0 mW/°C above 70 °C.
- f. Manual soldering with iron is not recommended for leadless components. The miniQFN-16 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper lip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

SPECIFICATIONS FOR DUAL SUPPLIES									
PARAMETER	SYMBOL	TEST CONDITIONS UNLESS OTHERWISE SPECIFIED V+ = 5 V, V- = -5 V V _{IN(A, B, C, and enable)} = 2 V, 0.8 V ^a	TEMP. ^b	TYP. ^c	-40 °C to +125 °C		-40 °C to +85 °C		UNIT
					MIN. ^d	MAX. ^d	MIN. ^d	MAX. ^d	
Analog Switch									
Analog Signal Range ^e	V _{ANALOG}		Full	-	-5	5	-5	5	V
On-Resistance	R _{ON}	I _S = 1 mA, V _D = -3 V, 0 V, 3 V	Room	68	-	78	-	78	Ω
			Full	-	-	106	-	97	
On-Resistance Match	ΔR _{ON}	I _S = 1 mA, V _D = ± 3 V	Room	0.91	-	6	-	6	Ω
			Full	-	-	6	-	6	
On-Resistance Flatness	R _{FLATNESS}	I _S = 1 mA, V _D = -3 V, 0 V, 3 V	Room	10	-	17	-	17	Ω
			Full	-	-	20	-	19	
Switch Off Leakage Current	I _{S(off)}	V+ = 5.5 V, V- = -5.5 V, V _D = ± 4.5 V, V _S = ± 4.5 V	Room	± 0.05	-1	1	-1	1	nA
			Full	-	-50	50	-5	5	
	Room		± 0.05	-1	1	-1	1		
	Full		-	-50	50	-5	5		
Channel On Leakage Current	I _{D(on)}	V+ = 5.5 V, V- = -5.5 V, V _S = V _D = ± 4.5 V	Room	± 0.05	-1	1	-1	1	nA
			Full	-	-50	50	-5	5	
Digital Control									
Input Current, V _{IN} Low	I _{IL}	V _{IN(A, B, C, and enable)} under test = 0.6 V	Full	0.02	-1	1	-1	1	μA
Input Current, V _{IN} High	I _{IH}	V _{IN(A, B, C, and enable)} under test = 2 V	Full	0.02	-1	1	-1	1	
Input Capacitance ^e	C _{IN}	f = 1 MHz	Room	3.4	-	-	-	-	pF



SPECIFICATIONS FOR DUAL SUPPLIES											
PARAMETER	SYMBOL	TEST CONDITIONS UNLESS OTHERWISE SPECIFIED V+ = 5 V, V- = -5 V VIN(A, B, C, and enable) = 2 V, 0.8 V ^a	TEMP. ^b	TYP. ^c	-40 °C to +125 °C		-40 °C to +85 °C		UNIT		
					MIN. ^d	MAX. ^d	MIN. ^d	MAX. ^d			
Dynamic Characteristics											
Off Isolation ^e	OIRR	R _L = 50 Ω, C _L = 1 pF	f = 100 kHz	Room	-106	-	-	-	-	dB	
Channel-to-Channel Crosstalk ^e	X _{TALK}		f = 10 MHz	Room	-68	-	-	-	-		
			f = 100 MHz	Room	-49	-	-	-	-		
		f = 100 kHz	Room	-105	-	-	-	-			
Bandwidth, 3 dB	BW	R _L = 50 Ω	DG4051E	Room	308	-	-	-	-		MHz
			DG4052E	Room	353	-	-	-	-		
			DG4053E	Room	930	-	-	-	-		
Transition Time	t _{TRANS}	R _L = 300 Ω, C _L = 35 pF see Fig. 1, 2, 3	Room	72	-	112	-	112	ns		
Enable Turn-On Time	t _{ON}		Full	-	-	139	-	131			
Enable Turn-Off Time	t _{OFF}		Room	35	-	75	-	75			
			Full	-	-	86	-	80			
Break-Before-Make Time Delay	t _D		Room	48	-	88	-	88			
			Full	-	-	97	-	95			
Charge Injection ^e	Q		V _g = 0 V, R _g = 0 Ω, C _L = 1 nF	Room	0.38	-	-	-		-	pC
Source Off Capacitance ^e	C _{S(off)}		f = 1 MHz	DG4051E	Room	2.2	-	-		-	-
		DG4052E		Room	2.1	-	-	-	-		
		DG4053E		Room	2	-	-	-	-		
Drain Off Capacitance ^e	C _{D(off)}	f = 1 MHz	DG4051E	Room	9.2	-	-	-	-		
			DG4052E	Room	4.8	-	-	-	-		
			DG4053E	Room	3.1	-	-	-	-		
Channel On Capacitance ^e	C _{D(on)}	f = 1 MHz	DG4051E	Room	14.9	-	-	-	-		
			DG4052E	Room	10	-	-	-	-		
			DG4053E	Room	8.5	-	-	-	-		
Total Harmonic Distortion ^e	THD	Signal = 5 V _{RMS} , 20 Hz to 20 kHz, R _L = 600 Ω	Room	0.065	-	-	-	-	%		
Power Supplies											
Power Supply Current	I+	V+ = 5 V, V- = -5 V VIN(A, B, C, and enable) = 0 V or 5 V	Room	0.05	-	1	-	1	μA		
			Full	-	-	10	-	10			
Negative Supply Current	I-		Room	-0.05	-1	-	-1	-			
			Full	-	-10	-	-10	-			
Ground Current	I _{GND}		Room	-0.05	-1	-	-1	-			
			Full	-	-10	-	-10	-			



SPECIFICATIONS FOR UNIPOLAR SUPPLIES										
PARAMETER	SYMBOL	TEST CONDITIONS UNLESS OTHERWISE SPECIFIED V+ = 12 V, V- = 0 V VIN(A, B, C, and enable) = 2 V, 0.8 V ^a	TEMP. ^b	TYP. ^c	-40 °C to +125 °C		-40 °C to +85 °C		UNIT	
					MIN. ^d	MAX. ^d	MIN. ^d	MAX. ^d		
Analog Switch										
Analog Signal Range ^e	V _{ANALOG}		Full	-	0	12	0	12	V	
On-Resistance	R _{ON}	I _S = 1 mA, V _D = 0.7 V, 11.3 V	Room	85	-	103	-	103	Ω	
			Full	-	-	133	-	125		
On-Resistance Match	ΔR _{ON}	I _S = 1 mA, V _D = 11.3 V	Room	1.24	-	8	-	8	Ω	
			Full	-	-	8	-	8		
On-Resistance Flatness	R _{FLATNESS}	I _S = 1 mA, V _D = 0.7 V, 11.3 V	Room	27	-	37	-	37	Ω	
			Full	-	-	44	-	43		
Switch Off Leakage Current	I _{S(off)}	V+ = 13.2 V, V- = 0 V V _D = 1 V / 12.2 V, V _S = 12.2 V / 1 V	Room	± 0.05	-1	1	-1	1	nA	
			Full	-	-50	50	-5	5		
	Room		± 0.05	-1	1	-1	1			
	Full		-	-50	50	-5	5			
Channel On Leakage Current	I _{D(on)}	V+ = 13.2 V, V- = 0 V V _D = V _S = 1 V / 12.2 V	Room	± 0.05	-1	1	-1	1	nA	
			Full	-	-50	50	-5	5		
Digital Control										
Input Current, V _{IN} Low	I _L	V _{IN(A, B, C, and enable)} under test = 0.8 V	Full	0.02	-1	1	-1	1	μA	
Input Current, V _{IN} High	I _H	V _{IN(A, B, C, and enable)} under test = 2 V	Full	0.02	-1	1	-1	1		
Dynamic Characteristics										
Transition Time	t _{TRANS}	R _L = 300 Ω, C _L = 35 pF see Fig. 1, 2, 3	Room	43	-	83	-	83	ns	
			Full	-	-	95	-	90		
Enable Turn-On Time	t _{ON}		Room	22	-	62	-	62		
			Full	-	-	71	-	67		
Enable Turn-Off Time	t _{OFF}		Room	47	-	87	-	87		
			Full	-	-	94	-	93		
Break-Before-Make Time Delay	t _D		Room	25	1	-	1	-		
			Full	-	-	-	-	-		
Charge Injection ^e	Q		V _g = 0 V, R _g = 0 Ω, C _L = 1 nF	Full	-	-	-	-		pC
Off Isolation ^e	OIRR		R _L = 50 Ω, C _L = 1 pF f = 100 kHz	Room	-	-	-	-		-
Channel-to-Channel Crosstalk ^e	X _{TALK}	Room		-	-	-	-	-		
Source Off Capacitance ^e	C _{S(off)}	f = 1 MHz	DG4051E	Room	-	-	-	-	pF	
			DG4052E	Room	-	-	-	-		
			DG4053E	Room	-	-	-	-		
Drain Off Capacitance ^e	C _{D(off)}	f = 1 MHz	DG4051E	Room	-	-	-	-	pF	
			DG4052E	Room	-	-	-	-		
			DG4053E	Room	-	-	-	-		
Channel On Capacitance ^e	C _{D(on)}	f = 1 MHz	DG4051E	Room	-	-	-	-	pF	
			DG4052E	Room	-	-	-	-		
			DG4053E	Room	-	-	-	-		
Power Supplies										
Power Supply Current	I+	V _{IN(A, B, C, and enable)} = 0 V or 5 V	Room	0.05	-	1	-	1	μA	
			Full	-	-	10	-	10		
Negative Supply Current	I-		Room	-0.05	-1	-	-1	-		
			Full	-	-10	-	-10	-		
Ground Current	I _{GND}		Room	-0.05	-1	-	-1	-		
			Full	-	-10	-	-10	-		



SPECIFICATIONS FOR UNIPOLAR SUPPLIES											
PARAMETER	SYMBOL	TEST CONDITIONS UNLESS OTHERWISE SPECIFIED V ₊ = 5 V, V ₋ = 0 V V _{IN(A, B, C, and enable)} = 2 V, 0.8 V ^a	TEMP. ^b	TYP. ^c	-40 °C to +125 °C		-40 °C to +85 °C		UNIT		
					MIN. ^d	MAX. ^d	MIN. ^d	MAX. ^d			
Analog Switch											
Analog Signal Range ^e	V _{ANALOG}		Full	-	0	5	0	5	V		
On-Resistance	R _{ON}	I _S = 1 mA, V _D = 0 V, 3.5 V	Room	125	-	147	-	147	Ω		
			Full	-	-	176	-	168			
On-Resistance Match	ΔR _{ON}	I _S = 1 mA, V _D = 3.5 V	Room	1.3	-	8	-	8	Ω		
			Full	-	-	8	-	8			
On-Resistance Flatness	R _{FLATNESS}	I _S = 1 mA, V _D = 0 V, 3 V	Room	21	-	31	-	31	Ω		
			Full	-	-	25	-	29			
Switch Off Leakage Current	I _{S(off)}	V ₊ = 5.5 V, V ₋ = 0 V V _D = 1 V / 4.5 V, V _S = 4.5 V / 1 V	Room	± 0.03	-1	1	-1	1	nA		
			Full	-	-50	50	-5	5			
	I _{D(off)}		Room	± 0.03	-1	1	-1	1			
			Full	-	-50	50	-5	5			
Channel On Leakage Current	I _{D(on)}	V ₊ = 5.5 V, V ₋ = 0 V V _D = V _S = 1 V / 4.5 V	Room	± 0.03	-1	1	-1	1			
			Full	-	-50	50	-5	5			
Digital Control											
Input Current, V _{IN} Low	I _L	V _{IN(A, B, C, and enable)} under test = 0.6 V	Full	0.02	-1	1	-1	1	μA		
Input Current, V _{IN} High	I _H	V _{IN(A, B, C, and enable)} under test = 2 V	Full	0.02	-1	1	-1	1			
Dynamic Characteristics											
Transition Time	t _{TRANS}	R _L = 300 Ω, C _L = 35 pF see Fig. 1, 2, 3	Room	95	-	135	-	135	ns		
			Full	-	-	169	-	148			
Enable Turn-On Time	t _{ON}		Room	56	-	96	-	96			
			Full	-	-	117	-	107			
Enable Turn-Off Time	t _{OFF}		Room	55	-	95	-	95			
			Full	-	-	110	-	103			
Break-Before-Make Time Delay	t _D		Room	-	12	-	12	-			
			Full	-	-	-	-	-			
Charge Injection ^e	Q		V _g = 0 V, R _g = 0 Ω, C _L = 1 nF	Full	0.32	-	-	-		-	pC
Off Isolation ^e	OIRR		R _L = 50 Ω, C _L = 1 pF f = 100 kHz	Room	-86	-	-	-		-	dB
Channel-to-Channel Crosstalk ^e	X _{TALK}	Room		-105	-	-	-	-			
Source Off Capacitance ^e	C _{S(off)}	f = 1 MHz	DG4051E	Room	2.4	-	-	-	-		
			DG4052E	Room	2.4	-	-	-	-		
			DG4053E	Room	2.3	-	-	-	-		
Drain Off Capacitance ^e	C _{D(off)}	f = 1 MHz	DG4051E	Room	10.1	-	-	-	-		
			DG4052E	Room	5.3	-	-	-	-		
			DG4053E	Room	3.4	-	-	-	-		
Channel On Capacitance ^e	C _{D(on)}	f = 1 MHz	DG4051E	Room	15.9	-	-	-	-		
			DG4052E	Room	10.6	-	-	-	-		
			DG4053E	Room	8.9	-	-	-	-		
Power Supplies											
Power Supply Current	I ₊	V _{IN(A, B, C, and enable)} = 0 V or 5 V	Room	0.05	-	1	-	1	μA		
			Full	-	-	10	-	10			
Negative Supply Current	I ₋		Room	-0.05	-1	-	-1	-			
			Full	-	-10	-	-10	-			
Ground Current	I _{GND}		Room	-0.05	-1	-	-1	-			
			Full	-	-10	-	-10	-			



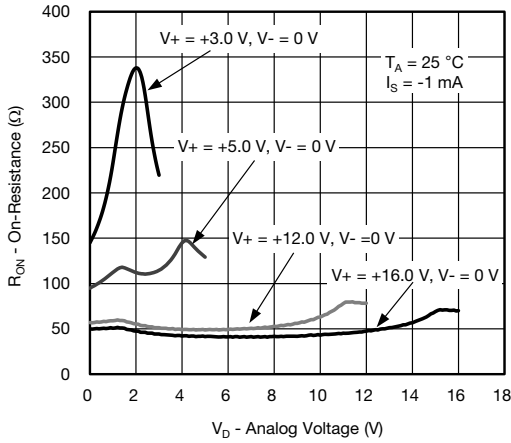
SPECIFICATIONS FOR UNIPOLAR SUPPLIES											
PARAMETER	SYMBOL	TEST CONDITIONS UNLESS OTHERWISE SPECIFIED V ₊ = 3 V, V ₋ = 0 V V _{IN(A, B, C, and enable)} = 1.4 V, 0.6 V ^a	TEMP. ^b	TYP. ^c	-40 °C to +125 °C		-40 °C to +85 °C		UNIT		
					MIN. ^d	MAX. ^d	MIN. ^d	MAX. ^d			
Analog Switch											
Analog Signal Range ^e	V _{ANALOG}		Full	-	0	3	0	3	V		
On-Resistance	R _{ON}	I _S = 1 mA, V _D = 1.5 V	Room	221	-	-	-	-	Ω		
			Full	-	-	-	-	-			
Switch Off Leakage Current	I _{S(off)}	V ₊ = 3.3 V, V ₋ = 0 V V _D = 0.3 V / 3 V, V _S = 3 V / 0.3 V	Room	± 0.02	-1	1	-1	1	nA		
			Full	-	-50	50	-5	5			
	I _{D(off)}		Room	± 0.02	-1	1	-1	1			
			Full	-	-50	50	-5	5			
Channel On Leakage Current	I _{D(on)}	V ₊ = 3.3 V, V ₋ = 0 V V _D = V _S = 0.3 V / 3 V	Room	± 0.02	-1	1	-1	1			
			Full	-	-50	50	-5	5			
Digital Control											
Input Current, V _{IN} Low	I _L	V _{IN(A, B, C, and enable)} under test = 0.6 V	Full	0.02	-1	1	-1	1	μA		
Input Current, V _{IN} High	I _H	V _{IN(A, B, C, and enable)} under test = 1.4 V	Full	0.02	-1	1	-1	1			
Dynamic Characteristics											
Transition Time	t _{TRANS}	R _L = 300 Ω, C _L = 35 pF see Fig. 1, 2, 3	Room	200	-	-	-	-	ns		
			Full	-	-	-	-	-			
Enable Turn-On Time	t _{ON}		Room	130	-	-	-	-			
			Full	-	-	-	-	-			
Enable Turn-Off Time	t _{OFF}		Room	78	-	-	-	-			
			Full	-	-	-	-	-			
Break-Before-Make Time Delay	t _D		Room	130	-	-	-	-			
			Full	-	-	-	-	-			
Charge Injection ^e	Q		V _g = 0 V, R _g = 0 Ω, C _L = 1 nF	Room	0.34	-	-	-		-	pC
Off Isolation ^e	OIRR		R _L = 50 Ω, C _L = 1 pF f = 100 kHz	Room	-88	-	-	-		-	dB
Channel-to-Channel Crosstalk ^e	X _{TALK}	Room		-105	-	-	-	-			
Source Off Capacitance ^e	C _{S(off)}	f = 1 MHz	DG4051E	Room	2.6	-	-	-	-		
			DG4052E	Room	2.6	-	-	-	-		
			DG4053E	Room	2.5	-	-	-	-		
Drain Off Capacitance ^e	C _{D(off)}	f = 1 MHz	DG4051E	Room	10.7	-	-	-	-		
			DG4052E	Room	5.7	-	-	-	-		
			DG4053E	Room	3.6	-	-	-	-		
Channel On Capacitance ^e	C _{D(on)}	f = 1 MHz	DG4051E	Room	16.4	-	-	-	-		
			DG4052E	Room	10.9	-	-	-	-		
			DG4053E	Room	9.1	-	-	-	-		
Power Supplies											
Power Supply Current	I ₊	V _{IN(A, B, C, and enable)} = 0 V or 3 V	Room	0.05	-	1	-	1	μA		
			Full	-	-	10	-	10			
Negative Supply Current	I ₋		Room	-0.05	-1	-	-1	-			
			Full	-	-10	-	-10	-			
Ground Current	I _{GND}		Room	-0.05	-1	-	-1	-			
			Full	-	-10	-	-10	-			

Notes

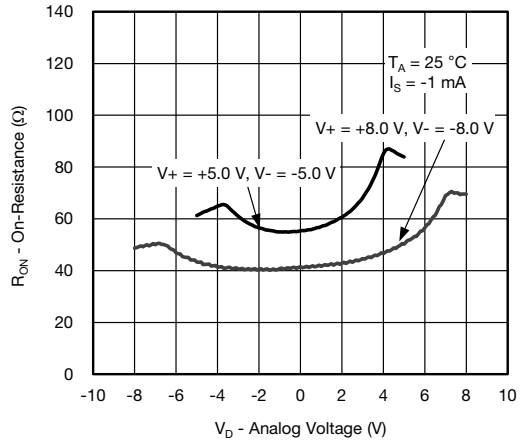
- a. V_{IN} = input voltage to perform proper function.
- b. Room = 25 °C, full = as determined by the operating temperature suffix.
- c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- d. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this datasheet.
- e. Guaranteed by design, not subject to production test.



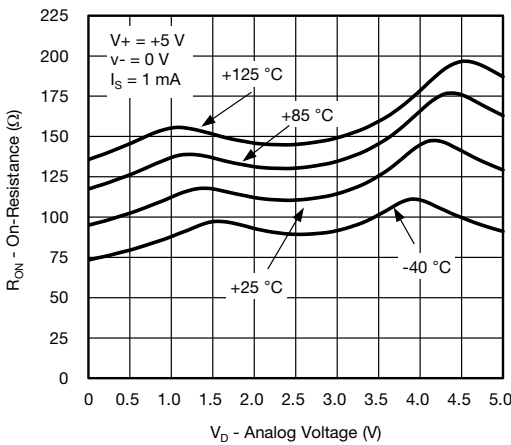
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



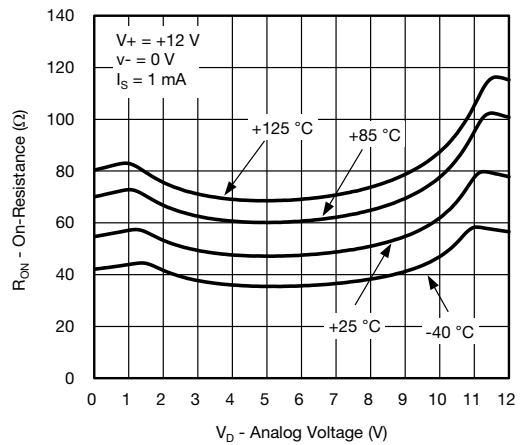
On-Resistance vs. Analog Voltage (Single Supply)



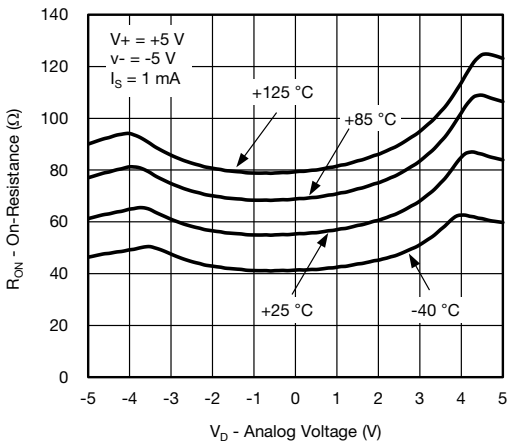
On-Resistance vs. Analog Voltage (Dual Supply)



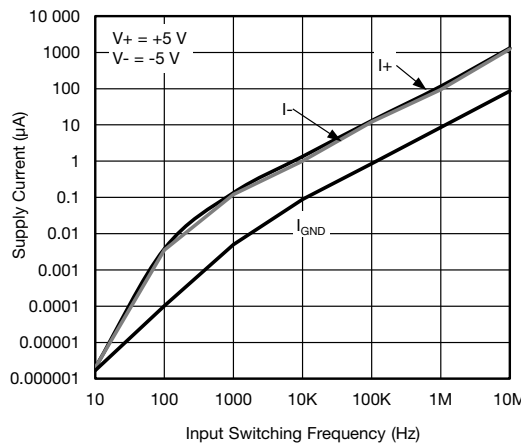
On-Resistance vs. Analog Voltage (Temperature)



On-Resistance vs. Analog Voltage (Temperature)



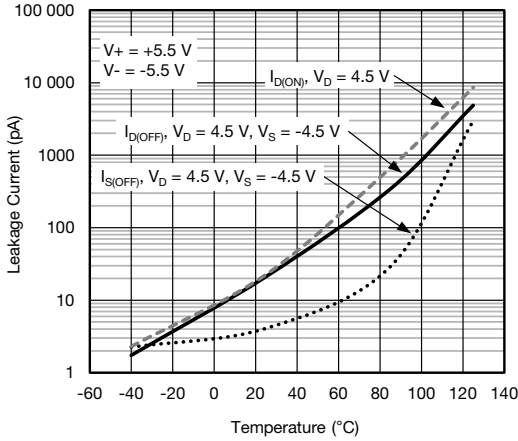
On-Resistance vs. Analog Voltage (Temperature)



Supply Current vs. Input Switching Frequency



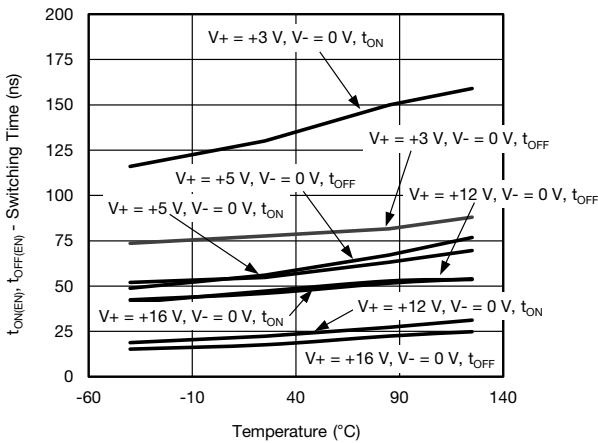
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Leakage Current vs. Temperature



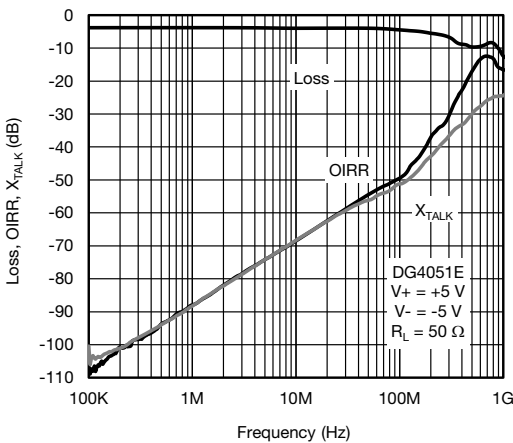
Leakage Current vs. Temperature



Switching Time vs. Temperature (Single Supply)



Switching Time vs. Temperature (Dual Supply)



DG4051E Insertion Loss, Off-Isolation, Crosstalk vs. Frequency



DG4052E Insertion Loss, Off-Isolation, Crosstalk vs. Frequency



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



DG4053E Insertion Loss, Off-Isolation, Crosstalk vs. Frequency



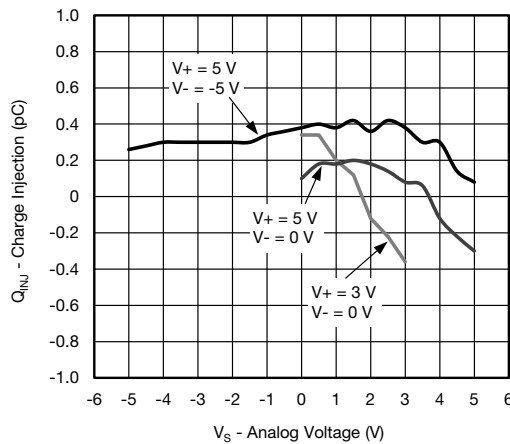
Switching Threshold vs. V_+ Supply Voltage



DG4051E Charge Injection vs. Analog Voltage

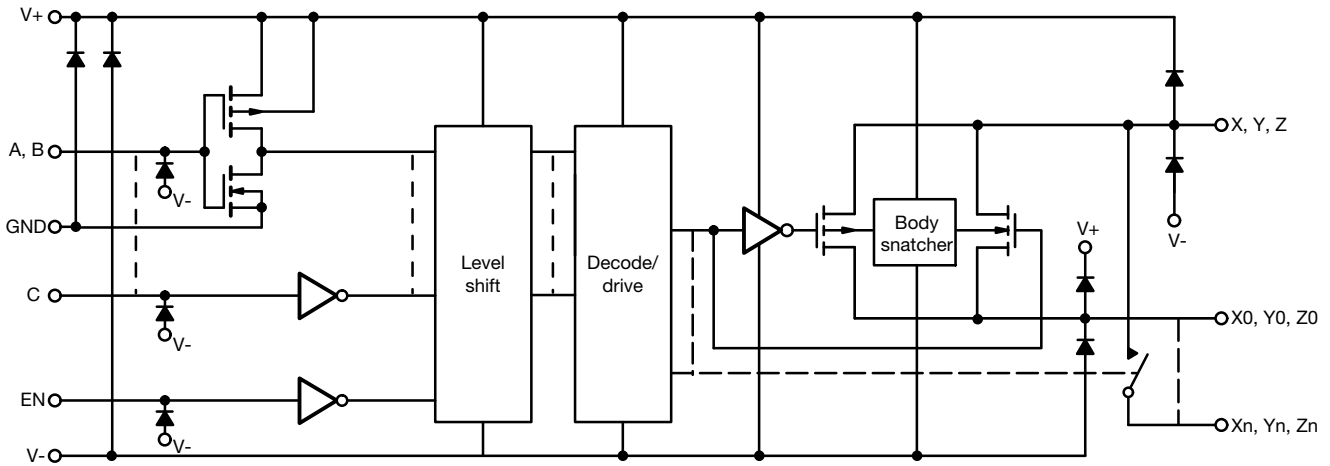


DG4053E Charge Injection vs. Analog Voltage



DG4052E Charge Injection vs. Analog Voltage

SCHEMATIC DIAGRAM (Typical Channel)



TEST CIRCUITS

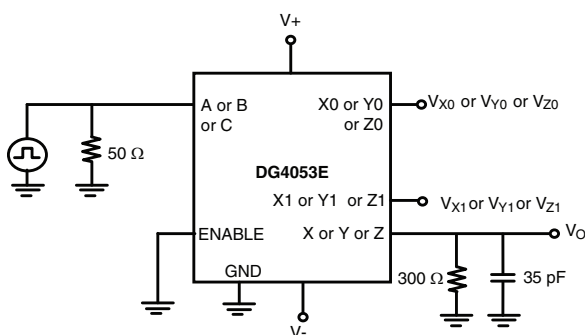
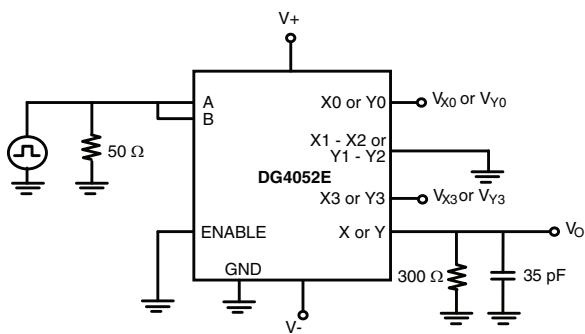
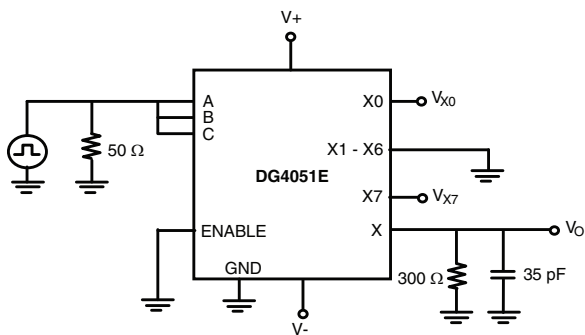
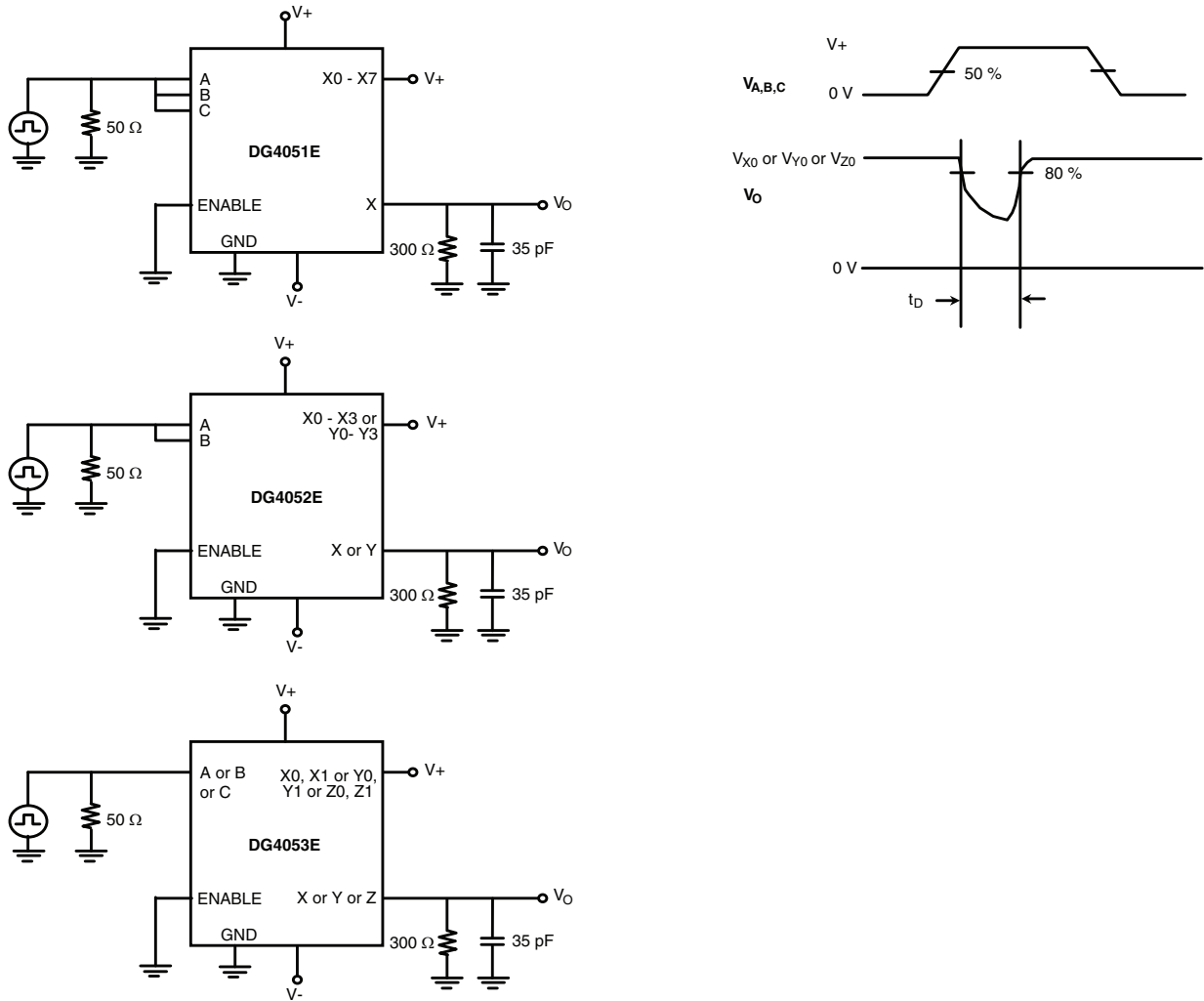
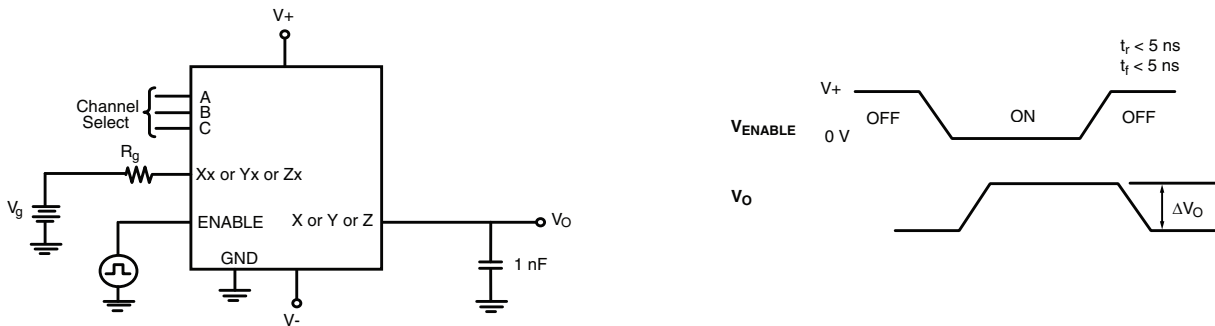


Fig. 1 - Transition Time

TEST CIRCUITS

Fig. 2 - Enable Switching Time

TEST CIRCUITS

Fig. 3 - Break-Before-Make

Fig. 4 - Charge Injection

TEST CIRCUITS



Fig. 5 - Insertion Loss



Fig. 7 - Off Isolation



Fig. 6 - Crosstalk



Fig. 8 - Source, Drain Capacitance

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?69685.

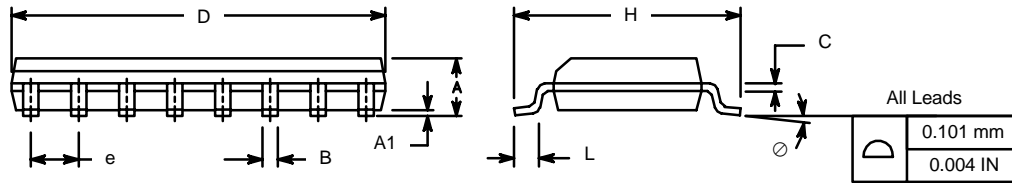


SOIC (NARROW): 16-LEAD
JEDEC Part Number: MS-012



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A ₁	0.10	0.20	0.004	0.008
B	0.38	0.51	0.015	0.020
C	0.18	0.23	0.007	0.009
D	9.80	10.00	0.385	0.393
E	3.80	4.00	0.149	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
L	0.50	0.93	0.020	0.037
∅	0°	8°	0°	8°

ECN: S-03946—Rev. F, 09-Jul-01
DWG: 5300

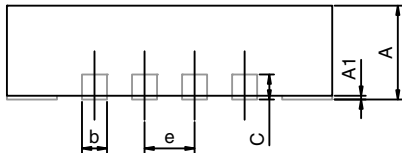




miniQFN-16L



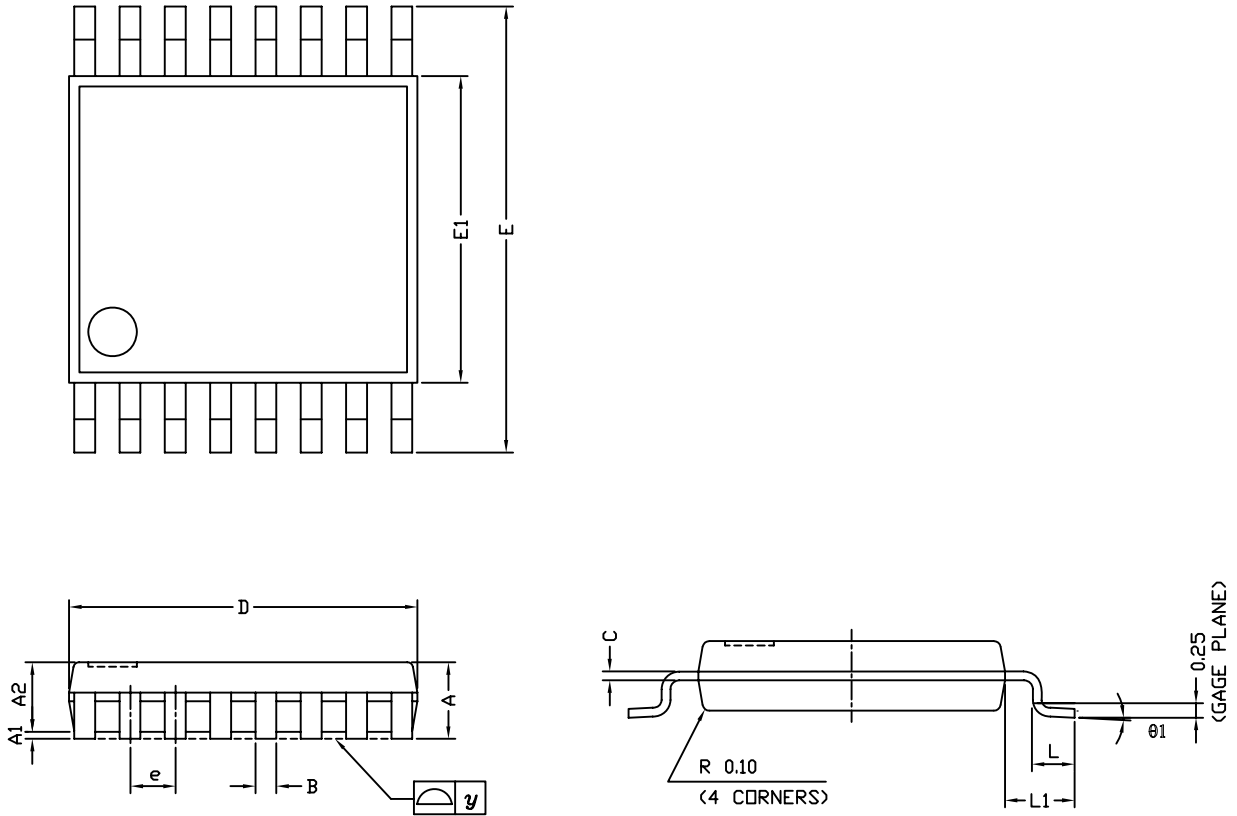
BACK SIDE VIEW



DIM	MILLIMETERS			INCHES		
	MIN.	NAM	MAX.	MIN.	NAM	MAX.
A	0.70	0.75	0.80	0.0275	0.0295	0.0315
A1	0	-	0.05	0	-	0.002
b	0.15	0.20	0.25	0.0059	0.0078	0.0098
C	0.15	0.20	0.25	0.0059	0.0078	0.0098
D	2.50	2.60	2.70	0.0984	0.1023	0.1063
E	1.70	1.80	1.90	0.0669	0.0708	0.0748
e	0.40 BSC			0.0157 BSC		
L	0.35	0.40	0.45	0.0137	0.0157	0.0177
L1	0.45	0.50	0.55	0.0177	0.0196	0.0216

ECN T16-0234-Rev. B, 09-May-16
 DWG: 5954

TSSOP: 16-LEAD



Symbols	DIMENSIONS IN MILLIMETERS		
	Min	Nom	Max
A	-	1.10	1.20
A1	0.05	0.10	0.15
A2	-	1.00	1.05
B	0.22	0.28	0.38
C	-	0.127	-
D	4.90	5.00	5.10
E	6.10	6.40	6.70
E1	4.30	4.40	4.50
e	-	0.65	-
L	0.50	0.60	0.70
L1	0.90	1.00	1.10
y	-	-	0.10
θ1	0°	3°	6°

ECN: S-61920-Rev. D, 23-Oct-06
DWG: 5624



RECOMMENDED MINIMUM PAD FOR TSSOP-16



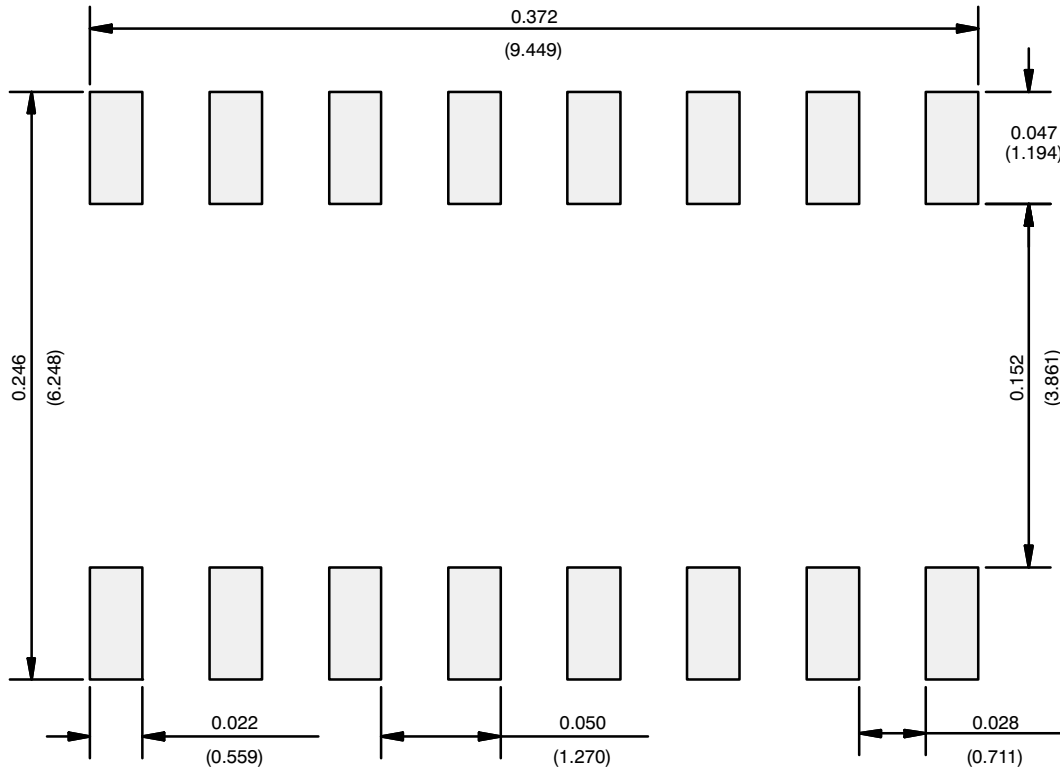
Recommended Minimum Pads
Dimensions in inches (mm)

RECOMMENDED MINIMUM PADS FOR MINI QFN 16L



Mounting Footprint
Dimensions in mm (inch)

RECOMMENDED MINIMUM PADS FOR SO-16



Recommended Minimum Pads
Dimensions in Inches/(mm)

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Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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