ABSOLUTE MAXIMUM RATINGS

(Voltage Referenced to V-)
V+44V
GND25V
V _L (GND - 0.3V) to (V+ + 0.3V)
Digital Inputs V _S , V _D (Note 1)(V 2V) to (V+ + 2V) or 30mA
(whichever occurs first)
Continuous Current (any terminal)30mA Peak Current, S or D (pulsed at 1ms, 10% duty cycle max).100mA

)°C)696mW
842mW
°C)2667mW
0°C to +70°C
0°C to +85°C
°C to +150°C
+300°C

Note 1: Signals on S, D, or IN exceeding V+ or V- are clamped by internal diodes. Limit forward current to maximum current rating.

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.

ELECTRICAL CHARACTERISTICS—Dual Supplies

(V+ = 15V, V- = -15V, V_L = 5V, GND = 0, V_{INH} = 2.4V, V_{INL} = 0.8V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITI	ONS	MIN	TYP (Note 2)	MAX	UNITS		
SWITCH									
Analog Signal Range	Vanalog	(Note 3)		-15		+15	V		
Drain-Source	RDS(ON)	V+ = 13.5V, V- = -13.5V,	T _A = +25°C		50	85	Ω		
On-Resistance	1103(011)	$V_D = \pm 8.5 V$, $I_S = -10 \text{mA}$	$T_A = T_{MIN}$ to T_{MAX}			100	32		
On-Resistance Match	ΔRDS(ON)	$V_D = \pm 10V$,	T _A = +25°C			4			
Between Channels (Note 4)	ZINDS(ON)	$I_S = -10 \text{mA}$	$T_A = T_{MIN}$ to T_{MAX}			5	Ω		
On Decistance Flatness (Note 4)	D=: +=:0.11	$V_D = \pm 5V$,	T _A = +25°C			9	Ω		
On-Resistance Flatness (Note 4)	nFLAT(ON)	Is = -10mA	$T_A = T_{MIN}$ to T_{MAX}			15			
Source Leakage Current	IO(OFF)	V+ = 16.5V, V- = -16.5V, $V_D = \pm 15.5V,$	T _A = +25°C	-0.50	+0.01	+0.50	nA		
(Note 5)	IS(OFF)	$V_S = \mp 15.5V$	$T_A = T_{MIN}$ to T_{MAX}	-5		+5	IIA		
Drain Off-Leakage Current	In (oss)	V+ = 16.5V, V- = -16.5V, $V_D = \pm 15.5V,$	T _A = +25°C	-0.50	+0.01	+0.50	nA		
(Note 5)	ID(OFF)	$V_S = \pm 15.5V$	$T_A = T_{MIN}$ to T_{MAX}	-5		+5	IIA		
Drain On-Leakage Current	I _{D(ON)} V+ = 16.5V, V- = -16.5V,		T _A = +25°C	-0.50	+0.08	+0.50	υ Λ		
(Note 5)	or I _{S(ON)}	$V_D = \pm 15.5V,$ $V_S = \pm 15.5V$	$T_A = T_{MIN}$ to T_{MAX}	-10		+10	nA		
INPUT									
Input Current with Input Voltage High	I _{INH}	$V_{IN} = 2.4V$, all others = 0	.8V	-0.5	-0.00001	+0.5	μΑ		
Input Current with Input Voltage Low	I _{INL}	$V_{IN} = 0.8V$, all others = 2	.4V	-0.5	-0.00001	+0.5	μΑ		

ELECTRICAL CHARACTERISTICS—Dual Supplies (continued) (V+ = 15V, V- = -15V, V_L = 5V, GND = 0, V_{INH} = 2.4V, V_{INL} = 0.8V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITI	ONS	MIN	TYP (Note 2)	MAX	UNITS
SWITCH							
Power-Supply Range	V+, V-			±4.5		±20.0	V
Positive Supply Current	l+	All channels on or off, V+ = 16.5V, V- = -16.5V, V _{IN} = 0V	$T_A = +25$ °C	-1	-0.001	+1	μA
Tositive Supply Current	17	or 5V	$T_A = T_{MIN}$ to T_{MAX}	-5		+5	μΛ
Negative Supply Current	I-	All channels on or off, $V+=$ 16.5 V , $V-=-16.5V$, $V_{IN}=0V$	T _A = +25°C	-1	-0.0001	+1	μA
Negative Supply Culterit	-	or 5V	$T_A = T_{MIN}$ to T_{MAX}	-5		+5	μΑ
Logic Supply Current	IL	All channels on or off, V+ = 16.5V, V- = -16.5V, V _{IN} = 0V	T _A = +25°C	-1	-0.001	+1	μA
Logic Supply Current	'L	or 5V	TA = TMIN to TMAX	-5		+5	μΑ
Ground Current	lovis	All channels on or off, V+ =	T _A = +25°C	-1	-0.0001	+1	
Ground Current	IGND	16.5V, V- = -16.5V, V _{IN} = 0V or 5V	TA = TMIN to TMAX	-5		+5	μA
INPUT				•			
Turn-On Time	ton	$V_S = \pm 10V$, Figure 2	T _A = +25°C		150	250	ns
Turn-Off Time		DG444, V _S = ±10V, Figure 2	T _A = +25°C		90	120	ns
Turn-Off Time top		DG445, $V_S = \pm 10V$, Figure 2	T _A = +25°C		110	170	ns
Charge Injection (Note 3)	Q	$C_L = 1nF$, $V_{GEN} = 0$, $R_{GEN} = 0\Omega$, Figure 3	T _A = +25°C		5	10	рС
Off-Isolation Rejection Ratio (Note 6)	OIRR	$R_L = 50\Omega$, $C_L = 5pF$, $f = 1MHz$, Figure 4	T _A = +25°C		60		dB
Crosstalk (Note 7)		R_L -50 Ω , C_L = 5pF, f = 1MHz, Figure 5	T _A = +25°C		100		dB
Source Off-Capacitance	C _{S(OFF)}	f = 1MHz, Figure 6	T _A = +25°C		4		рF
Drain Off-Capacitance	C _D (OFF)	f = 1MHz, Figure 6	T _A = +25°C		4		рF
Source On-Capacitance	C _{S(ON)}	f = 1MHz, Figure 7	T _A = +25°C		16		рF
Drain On-Capacitance	C _{D(ON)}	f = 1MHz, Figure 7	T _A = +25°C		16		pF

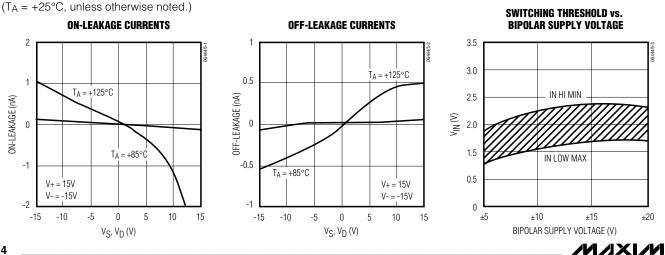
ELECTRICAL CHARACTERISTICS—Single Supply

 $(V+ = 12V, V- = 0, V_L = 5V, GND = 0, V_{INH} = 2.4V, V_{INL} = 0.8V, T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted.)

PARAMETER	SYMBOL	CONDITI	ONS	MIN	TYP (Note 2)	MAX	UNITS	
SWITCH								
Analog Signal Range	VANALOG	(Note 3)		0		12	V	
Drain-Source	_	V+ = 10.8V; V _L = 5.25V;	T _A = +25°C		100	160		
On-Resistance	R _{DS} (ON)	$V_D = 3V, 8V; I_S = -10mA$	$T_A = T_{MIN}$ to T_{MAX}			200	Ω	
SUPPLY								
Power-Supply Range	V+, V-			10.8		24.0	V	
Dower Cupply Current	1.	All channels on or off,	T _A = +25°C	-1	+0.001	+1	Λ	
Power-Supply Current	l+	$V_{IN} = 0V \text{ or } 5V$	$T_A = T_{MIN}$ to T_{MAX}	-5		+5	μΑ	
Negative Cumply Current	I-	All channels on or off,	T _A = +25°C	-1	-0.0001	+1		
Negative Supply Current	1-	$V_{IN} = 0V \text{ or } 5V$	TA = TMIN to TMAX	-5		+5	μΑ	
Logic Supply Current	IL	All channels on or off,	T _A = +25°C	-1	+0.001	+1	μΑ	
Logic Supply Current	'L	$V_{IN} = 0V \text{ or } 5V$	$T_A = T_{MIN}$ to T_{MAX}	-5		+5	μΑ	
Ground Current	lovo	All channels on or off,	T _A = +25°C	-1	-0.0001	+1	μΑ	
Circuita Current	IGND	$V_{IN} = 0V \text{ or } 5V$	$T_A = T_{MIN}$ to T_{MAX}	-5		+5	μΑ	
DYNAMIC								
Turn-On Time	ton	V _S = 8V, Figure 2	T _A = +25°C		300	400	ns	
Turn-Off Time	toff	V _S = 8V, Figure 2	T _A = +25°C		60	200	ns	
Charge Injection (Note 3)	Q	$C_L = 1nF$, $V_{GEN} = 0$, $R_{GEN} = 0\Omega$, Figure 3	T _A = +25°C		5	10	рС	

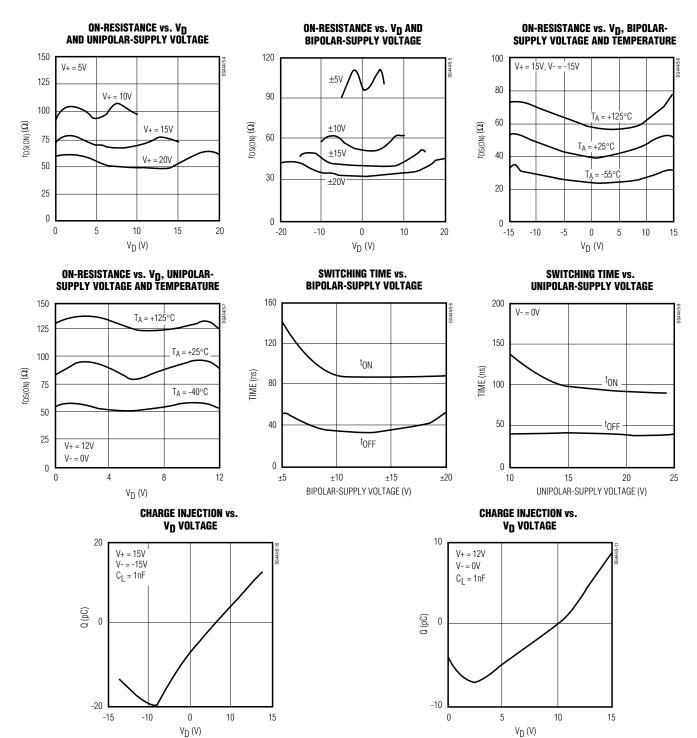
- Note 2: Typical values are for design aid only, are not guaranteed, and are not subject to production testing. The algebraic convention, where the most negative value is a minimum and the most positive value a maximum, is used in this data sheet.
- Note 3: Guaranteed by design.
- Note 4: On-resistance match between channels and flatness are guaranteed only with bipolar-supply operation. Flatness is defined as the difference between the maximum and the minimum value of on-resistance as measured at the extremes of the speci-
- Note 5: Leakage parameters Is(OFF), ID(OFF), ID(ON), and IS(ON) are 100% tested at the maximum rated hot temperature and guaranteed at +25°C.
- **Note 6:** Off-Isolation Rejection Ratio = 20log (V_D/V_S), V_D = output, V_S = input to off switch.
- Note 7: Between any two switches.

Typical Operating Characteristics



Typical Operating Characteristics

 $(T_A = +25^{\circ}C, \text{ unless otherwise noted.})$



Pin Description

PI	N	NAME	EUNCTION				
DIP/SO	THIN QFN	NAME	FUNCTION				
1, 16, 9, 8	15, 14, 7, 6	IN1-IN4	Logic Control Inputs				
2, 15, 10, 7	16, 13, 8, 5	D1-D4	Drain Outputs				
3, 14, 11, 6	1, 12, 9 4	S1–S4	Source Outputs				
4	2	V-	Negative-Supply Voltage Input				
5	3	GND	Ground				
12	10	VL	Logic-Supply Voltage Input				
13	11	V+	Positive-Supply- Voltage Input—Connected to Substrate				
_	EP	PAD	Exposed Pad Connect Pad to V+				

Applications Information

General Operation

- Switches are open when power is off.
- IN, D, and S should not exceed V+ or V-, even with the power off.
- Switch leakage is from each analog switch terminal to V+ or V-, not to other switch terminals.

Operation with Supply Voltages Other than ±15V

Using supply voltages other than $\pm 15V$ will reduce the analog signal range. The DG444/DG445 switches oper-

ate with $\pm 4.5 \text{V}$ to $\pm 20 \text{V}$ bipolar supplies or with a +10 V to +30 V single supply; connect V- to 0V when operating with a single supply. Also, all device types can operate with unbalanced supplies such as +24 V and -5 V. V_L must be connected to +5 V to be TTL compatible, or to V+ for CMOS-logic level inputs. The *Typical Operating Characteristics* graphs show typical on-resistance with $\pm 20 \text{V}$, $\pm 15 \text{V}$, $\pm 10 \text{V}$, and $\pm 5 \text{V}$ supplies. (Switching times increase by a factor of two or more for operation at $\pm 5 \text{V}$.)

Overvoltage Protection

Proper power-supply sequencing is recommended for all CMOS devices. Do not exceed the absolute maximum ratings because stresses beyond the listed ratings may cause permanent damage to the devices. Always sequence V+ on first, followed by VL , V-, and logic inputs. If power-supply sequencing is not possible, add two small, external signal diodes in series with supply pins for overvoltage protection (Figure 1). Adding diodes reduces the analog signal range to 1V below V+ and 1V above V-, but low switch resistance and low leakage characteristics are unaffected. Device operation is unchanged, and the difference between V+ and V-should not exceed +44V.

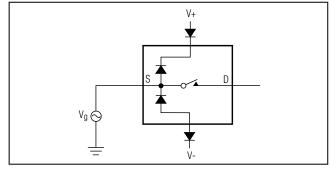


Figure 1. Overvoltage Protection Using External Blocking Diodes

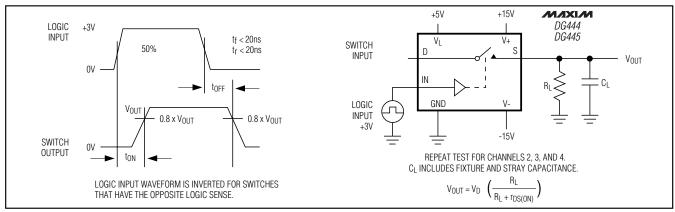


Figure 2. Switching Time

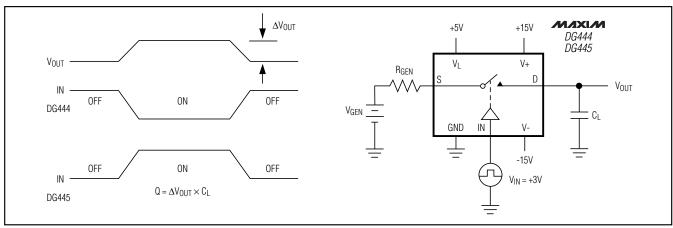


Figure 3. Charge Injection

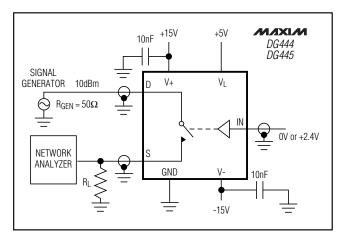


Figure 4. Off-Isolation Rejection Ratio

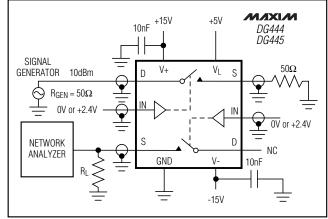


Figure 5. Crosstalk

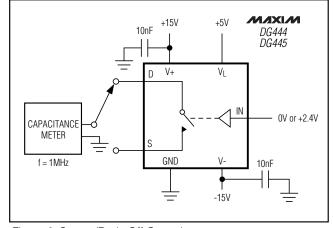


Figure 6. Source/Drain Off-Capacitance

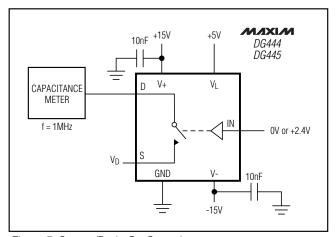
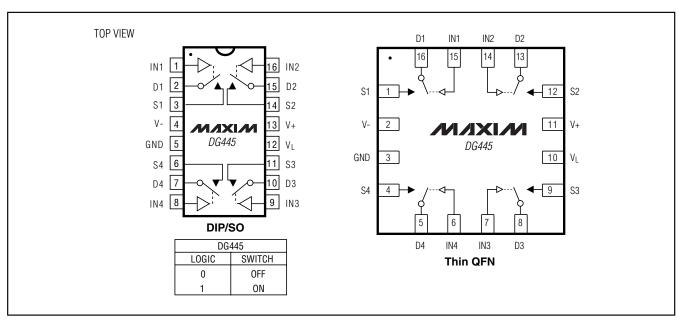


Figure 7. Source/Drain On-Capacitance

Pin Configurations/Functional Diagrams (continued)



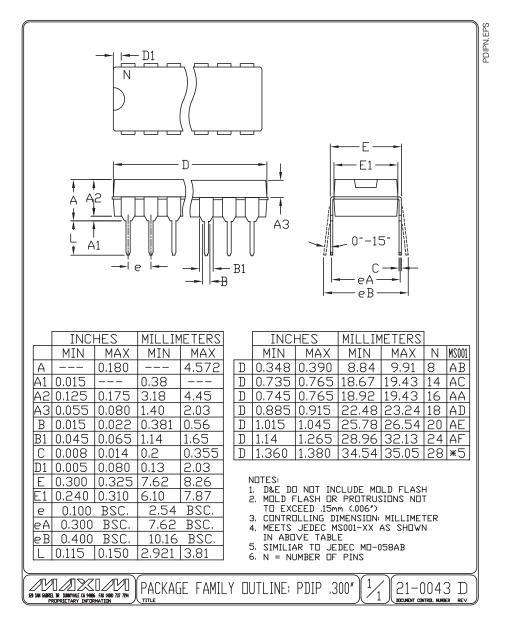
_Ordering Information (continued)

PART	TEMP RANGE	PIN-PACKAGE
DG444ETE	-40°C to +85°C	16 Thin QFN (5mm x 5mm)
DG445CJ	0°C to +70°C	16 Plastic DIP
DG445CY	0°C to +70°C	16 Narrow SO
DG445C/D	0°C to +70°C	Dice*
DG445DJ	-40°C to +85°C	16 Plastic DIP
DG445DY	-40°C to +85°C	16 Narrow SO
DG445ETE	-40°C to +85°C	16 Thin QFN (5mm x 5mm)

^{*}Contact factory for dice specifications.

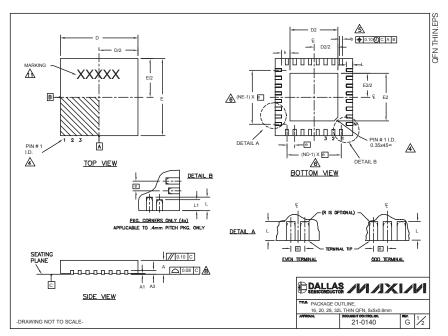
Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to www.maxim-ic.com/packages.)



Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to www.maxim-ic.com/packages.)



SYMBOL INIT NOM MAX MIN ROM MAX MIN MAX MIN ROM MAX MIN ROM MAX MIN MAX MI	SYMBOL MIN. NOM. MAX. 2 to 1 ALLOWER A 0.70 0.75 0.80 0.75 0.90 0.75 0.90 0.70 0.75 0.80 A1 0 0.02 0.05 0 0.02 0.05 0 0.02 0.05 0.00 0.70 0.02 0.05 D 0.22 0.05 0 0.02 0.05 0 0.02 0.05 0.00 0.70 0.02 0.05 D 0.22 0.05 0 0.02 0.05 0 0.02 0.05 0.00 0.02 0.05 D 0.25 0.30 0.35 0.35 0.25 0.30 0.35 0.20 0.25 0.30 0.20 0.25 0.30 D 4.90 5.00 5.10 4.90 5.00 5.10 4.90 5.00 5.10 4.90 5.00 5.10 E 4.90 5.00 5.10 4.90 5.00 5.10 4.90 5.00 5.10 4.90 5.00 5.10 E 4.90 5.00 5.10 4.90 5.00 5.00 5.00 5.00 5.00 5.00 5.00 5				О	OMMO	ON DI	MENS	IONS								EXF	POSED	PAD	VARIA	TIONS	6					
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A3	A3	Α	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80	80 0.70 0.75 0.80		T1655-1	3.00	3.10	3.20	3.00	3.10	3.20	**	NO					
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B	D	A3	0	_		0			0		_	0:				T1655N-1	3.00	3.10	3.20	3.00	3.10	3.20	**	NO			
Table	Test	b	_	_	_	0.25	0.30	0.35	0.20	0.25	0.30	0.20	0.25	0.30		T2055-2	3.00	3.10	3.20	3.00	3.10	3.20	**	NO			
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K	R	е	0	80 BS	C	0	65 BS	SC.	0	50 BS	SC.	0	50 BS	SC.		T2055-5	3.15	3.25	3.35	3.15	3.25	3.35	0.40	Y			
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