MD2369AHX, HXV (DUAL)
MD2369AFHXV (DUAL)
MHQ2369HX, HXV (QUAD)
MQ2369AHXV (QUAD)

CRYSTALONICS
2805 Veterans Highway
Suite 14
Ronkonkoma, N.Y. 11779

NPN Silicon Dual/Quad Small-Signal Transistors

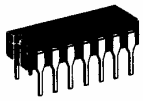
. . .designed for general-purpose switching and amplifier applications.

MAXIMUM RATINGS

Rating	Symbol	Value		Unit
Collector-Emitter Voltage	V_{CEO}	15		Vdc
Collector-Base Voltage	V_{CBO}	40		Vdc
Emitter-Base Voltage	V_{EBO}	4.5		Vdc
Collector Current — Continuous	I_C	500		mAdc
		One Die	All Die Equal Power	
Device Dissipation @ T_A = 25°C	P_T			mW
MD2369A		550	600	
MD2369AF		250	400	
MHQ2369A		500	1500	
MQ2369A		400	600	
Derate above 25°C				mW/°C
MD2369A		3.14	3.42	
MD2369AF		2.0	2.28	
MHQ2369A		2.86	8.58	
MQ2369A		2.28	3.42	
@ T_C = 25°C				Watts
MD2369A		1.4	2.0	
MD2369AF		0.7	1.4	
MHQ2369A		1.0	3.5	
MQ2369A		0.7	2.8	
Derate above 25°C				mW/°C
MD2369A		8.0	11.4	
MD2369AF		4.0	80	
MHQ2369A		5.71	20	
MQ2369A		4.0	16	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	−65 to 200		°C

MD2369A
CASE 654-07
(TO-78)

MD2369AF
CASE 610A-04



MHQ2369A
CASE 632-08
(TO-116)

MQ2369A
CASE 607-04

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)				
Characteristic	**Symbol**	**Min**	**Max**	**Unit**
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage[1] (I_C = 10 mAdc, I_B = 0)	$V_{(BR)CEO}$	15	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 10 μAdc, I_B = 0)	$V_{(BR)CES}$	40	—	Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	$V_{(BR)CBO}$	40	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	$V_{(BR)EBO}$	4.5	—	Vdc
Collector Cutoff Current (V_{CB} = 20 Vdc, I_E = 0) (T_A = 150°C)	I_{CBO}	— —	0.2 30	μAdc
Collector Cutoff Current (V_{CE} = 10 Vdc, V_{BE} = 0.25 Vdc) (T_A = 125°C)	I_{CEX}	— —	0.3 30	μAdc
Collector Cutoff Current (V_{CB} = 20 Vdc, I_E = 0)	I_{CES}	—	0.4	μAdc
Emitter Cutoff Current (V_{BE} = 4.0 Vdc, I_C = 0)	I_{EBO}	—	0.25	μAdc
ON CHARACTERISTICS				
DC Current Gain[1] (I_C = 10 mAdc, V_{CE} = 0.35 Vdc) (I_C = 30 mAdc, V_{CE} = 0.4 Vdc) (I_C = 10 mAdc, V_{CE} = 1.0 Vdc) (I_C = 100 mAdc, V_{CE} = 1.0 Vdc) (I_C = 10 mAdc, V_{CE} = 1.0 Vdc, T_A = −55°C)	h_{FE}	 40 30 40 20 20	 120 120 120 120 —	—
Collector-Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 1.0 mAdc) (I_C = 30 mAdc, I_B = 3.0 mAdc) (I_C = 100 mAdc, I_B = 10 mAdc) (I_C = 10 mAdc, I_B = 1.0 mAdc, T_A = 125°C)	$V_{CE(sat)}$	 — — — —	 0.2 0.25 0.45 0.3	Vdc
Base-Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 1.0 mAdc) (I_C = 30 mAdc, I_B = 3.0 mAdc) (I_C = 100 mAdc, I_B = 10 mAdc) (I_C = 10 mAdc, I_B = 1.0 mAdc, T_A = 125°C) (I_C = 10 mAdc, I_B = 1.0 mAdc, T_A = −55°C)	$V_{BE(sat)}$	 0.7 — 0.8 0.59 —	 0.85 0.9 1.2 — 1.02	Vdc
MATCHING CHARACTERISTICS (Duals Only)				
Base-Emitter Voltage Differential (I_C = 3.0 mAdc, V_{CE} = 1.0 Vdc)	$V_{BE1}-V_{BE2}$	—	5.0	mV
Base-Emitter Voltage Differential Gradient (I_C = 3.0 mAdc, V_{CE} = 1.0 Vdc, T_A = −55°C to +125°C)	$\frac{\Delta(V_{BE1}-V_{BE2})}{\Delta T_A}$	—	10	μV/°C
SMALL-SIGNAL CHARACTERISTICS				
Output Capacitance (V_{CB} = 5.0 Vdc, I_E = 0, f = 0.1 to 1.0 MHz)	C_{obo}	—	4.0	pF
Input Capacitance (V_{BE} = 0.5 Vdc, I_C = 0, f = 0.1 to 1.0 MHz)	C_{ibo}	—	5.0	pF
Small-Signal Current Transfer Ratio, Magnitude (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)	$\lvert h_{fe} \rvert$	5.0	10	—

(1) Pulsed: Pulse Width 250 to 350 μs, Duty Cycle 1.0 to 2.0%

(continued)

ELECTRICAL CHARACTERISTICS —continued (T_A = 25°C unless otherwise noted.)				
Characteristic	**Symbol**	**Min**	**Max**	**Unit**
SWITCHING CHARACTERISTICS				
Storage Time (I_C = 10 mA, I_{B1} = 10 mA, I_{B2} = −10 mA)	t_s	—	13	ns
Turn-On Time (I_C = 10 mA, I_{B1} = 3.0 mA, I_{B2} = −1.5 mA)	t_{on}	—	12	ns
Turn-Off Time (I_C = 10 mA, I_{B1} = 3.0 mA, I_{B2} = −1.5 mA)	t_{off}	—	18	ns

ASSURANCE TESTING (Pre/Post Burn-In)				
		Initial and End Point Limits		
Characteristics Tested	**Symbol**	**Min**	**Max**	**Unit**
Collector Cutoff Current (V_{CE} = 20 Vdc)	I_{CES}	—	0.4	μAdc
DC Current Gain[1] (I_C = 10 mAdc, V_{CE} = 1.0 Vdc)	h_{FE}	40	120	—

Delta from Pre-Burn-In Measured Values		**Min**	**Max**	
Delta Collector Cutoff Current	ΔI_{CES}	—	±100 or ±25 whichever is greater	% of Initial Value nAdc
Delta DC Current Gain[1]	Δh_{FE}	—	±15	% of Initial Value

(1) Pulsed: Pulse Width 250 to 350 μs, Duty Cycle 1.0 to 2.0%