

6367254 MOTOROLA SC (XSTRS/R F)

96D-80721 D

T-33-13

MOTOROLA SEMICONDUCTOR TECHNICAL DATA

**BUS47
BUS47A**

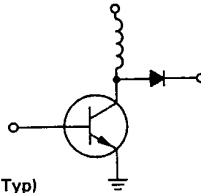
**SWITCHMODE II^Δ SERIES
NPN SILICON POWER TRANSISTORS**

The BUS 47 and BUS 47A transistors are designed for high-voltage, high-speed, power switching in inductive circuits where fall time is critical. They are particularly suited for line-operated switch-mode applications such as:

- Switching Regulators
- Inverters
- Solenoid and Relay Drivers
- Motor Controls
- Deflection Circuits

Fast Turn-Off Times

60 ns Inductive Fall Time—25°C (Typ)
120 ns Inductive Crossover Time—25°C (Typ)



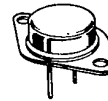
Operating Temperature Range - 65 to +200°C
100°C Performance Specified for:
Reverse-Biased SOA with Inductive Loads
Switching Times with Inductive Loads
Saturation Voltages
Leakage Currents (125°C)

**9 AMPERES
NPN SILICON
POWER TRANSISTORS**

**400 AND 450 VOLTS (BVCEO)
150 WATTS
850 - 1000 V (BVCEES)**

**Designer's Data for
"Worst Case" Conditions**

The Designer's Data Sheet permits the design of most circuits entirely from the information presented. Limit data - representing device characteristics boundaries - are given to facilitate "worst case" design.



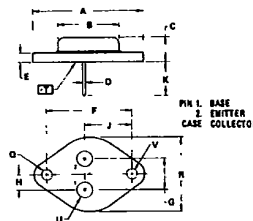
MAXIMUM RATINGS

Rating	Symbol	BUS 47	BUS 47A	Unit
Collector-Emitter Voltage	V _{CEO(sus)}	450	450	Vdc
Collector-Emitter Voltage	V _{CEV}	850	1000	Vdc
Emitter Base Voltage	V _{EB}	7		Vdc
Collector Current - Continuous	I _C	9		Adc
Collector Current - Peak (1)	I _{CM}	18		Adc
Collector Current - Overload	I _{OL}	36		Adc
Base Current - Continuous	I _B	5		Adc
Base Current - Peak (1)	I _{BM}	10		Adc
Total Power Dissipation - T _C = 25°C	P _D	150		Watts
Derate above 25°C		85.5		W/°C
		0.86		
Operating and Storage Junction Temperature Range	T _J , T _{stg}	-65 to +200		°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	R _{θJC}	1.17	°C/W
Maximum Lead Temperature for Soldering Purposes: 1/8" from Case for 5 Seconds	T _L	275	°C

(1) Pulse Test: Pulse Width = 5 ms, Duty Cycle ≤ 10%.



- NOTES
1 DIMENSIONS Q AND V ARE DATUMS
2 IS SEATING PLANE AND DATUM
3 POSITIONAL TOLERANCE FOR MOUNTING HOLE Ø
4 DIMENSIONS AND TOLERANCES PER ANSI Y14.5, 1972

MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN
A	19.27	19.27	0.759
B	21.04	21.04	0.830
C	0.33	0.47	0.013
D	0.97	1.01	0.038
E	1.52	1.78	0.059
F	0.15 BSC	0.15 BSC	0.006 BSC
G	10.92 BSC	10.92 BSC	0.430 BSC
H	4.48 BSC	4.48 BSC	0.176 BSC
J	16.83 BSC	16.83 BSC	0.663 BSC
K	11.18	11.18	0.440
L	3.81	4.13	0.150
M	26.67	26.67	1.050
N	4.83	5.15	0.190
U	3.81	4.13	0.150
V	3.81	4.13	0.150

CASE 1-05 TO-3 TYPE

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96D 80722 D

BUS47, BUS47A

T-33-13

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS (1)					
Collector-Emitter Sustaining Voltage (Table 1) (I _C = 200 mA, I _B = 0) L = 25 mH	BUS47 BUS47A	V _{CEO(sus)}	400 450	-	V _{dc}
Collector Cutoff Current (V _{CEV} = Rated Value, V _{BE(off)} = 1.5 V _{dc}) (V _{CEV} = Rated Value, V _{BE(off)} = 1.5 V _{dc} , T _C = 125°C)		I _{CEV}	-	0.15 1.5	mAdc
Collector Cutoff Current (V _{CE} = Rated V _{CEV} , R _{BE} = 10 Ω)	T _C = 25°C T _C = 125°C	I _{CER}	-	0.4 3.0	mAdc
Emitter Cutoff Current (V _{EB} = 5 V _{dc} , I _C = 0)		I _{EBO}	-	0.1	mAdc
Emitter-base breakdown Voltage (I _E = 50 mA - I _C = 0)		B _{VEBO}	7.0	-	V _{dc}

SECOND BREAKDOWN

Second Breakdown Collector Current with Base Forward Biased	I _{S/b}	See Figure 12
Clamped Inductive SOA with Base Reverse Biased	R _B SOA	See Figure 13

ON CHARACTERISTICS (1)

DC Current Gain (I _C = 6 Adc, V _{CE} = 5 V _{dc}) (I _C = 5 Adc, V _{CE} = 5 V)	BUS47 BUS47A	h _{FE}	7	-	-
Collector-Emitter Saturation Voltage (I _C = 6 Adc, I _B = 1.2 Adc) (I _C = 9 Adc, I _B = 1.8 Adc) (I _C = 6 Adc, I _B = 1.2 Adc, T _C = 100°C) (I _C = 5 Adc, I _B = 1 Adc) (I _C = 8 Adc, I _B = 1.6 Adc) (I _C = 5 Adc, I _B = 1 Adc, T _C = 100°C)	BUS47 BUS47A	V _{CE(sat)}	-	-	1.5 5.0 2.5 1.5 5.0 2.5
Base-Emitter Saturation Voltage (I _C = 6 Adc, I _B = 1.2 Adc) (I _C = 6 Adc, I _B = 1.2 Adc, T _C = 100°C) (I _C = 5 Adc, I _B = 1 Adc) (I _C = 5 Adc, I _B = 1 Adc, T _C = 100°C)	BUS47 BUS47A	V _{BE(sat)}	-	-	1.6 1.6 1.6 1.6

DYNAMIC CHARACTERISTICS

Output Capacitance (V _{CB} = 10 V _{dc} , I _E = 0, f _{test} = 100 KHz)	C _{ob}	-	-	300	pF
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SWITCHING CHARACTERISTICS

Resistive Load (Table 1)

Delay Time	(V _{CC} = 250 V _{dc} , I _C = 6 A, I _{B1} = 1.2 A, t _p = 30 μs, Duty Cycle 2, V _{BE(off)} = 5 V)	t _d	-	0.05	0.2	μs
Rise Time		t _r	-	0.5	0.8	
Storage Time		t _s	-	1	2.0	
Fall Time		t _f	-	0.2	0.4	

Inductive Load, Clamped (Table 1)

Storage Time	I _{C(pk)} = 6 A, I _{B1} = 1.2 A, V _{BE(off)} = 5 V, V _{CE(c1)} = 250 V)	BUS47	(T _C = 25°C)	t _{sv}	-	0.9	-	μs
Fall Time				t _{fi}	-	0.06	-	
Storage Time	I _{C(pk)} = 5 A, I _{B1} = 1 A	BUS47A	(T _C = 100°C)	t _{sv}	-	1.0	2.5	
Crossover Time				t _c	-	0.2	0.5	
Fall Time				t _{fi}	-	0.1	0.3	

(1) Pulse Test: PW = 300 μs, Duty Cycle ≤ 2%.