

BUS48 BUS48A

SWITCHMODE II⁺ SERIES NPN SILICON POWER TRANSISTORS

The BUS 48 and BUS 48A 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

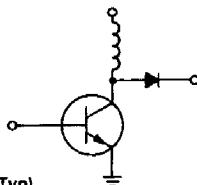
Fast Turn-Off Times

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:

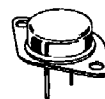
Reverse-Biased SOA with Inductive Loads
Switching Times with Inductive Loads
Saturation Voltages
Leakage Currents (125°C)



15 AMPERES
NPN SILICON
POWER TRANSISTORS
400 and 450 VOLTS (BVCEO)
850 - 1000 VOLTS (BVCEs)
175 WATTS

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.



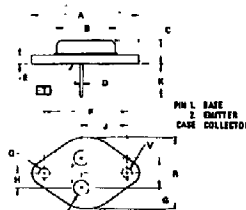
MAXIMUM RATINGS

Rating	Symbol	BUS 48	BUS 48A	Unit
Collector-Emitter Voltage	V _{CEO(sus)}	400	450	V _{dc}
Collector-Emitter Voltage	V _{CEV}	850	1000	V _{dc}
Emitter Base Voltage	V _{EB}	7		V _{dc}
Collector Current - Continuous	I _C	15		A _{dc}
Collector Current - Peak(1)	I _{CM}	30		A _{dc}
Collector Current - Overload	I _{OL}	60		A _{dc}
Base Current - Continuous	I _B	5		A _{dc}
Base Current - Peak(1)	I _{BM}	20		A _{dc}
Total Power Dissipation - T _C = 25°C	P _D	175		Watts
Derate above 25°C - T _C = 100°C		100		W/°C
Derate above 25°C		1.0		W/°C
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}	1.0	°C/W
Maximum Lead Temperature for Soldering Purposes: 1/8" from Case for 5 Seconds	T _L	275	°C

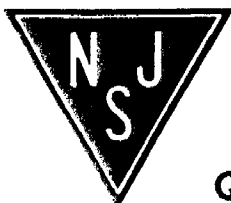
(1) Pulse Test: Pulse Width = 5 ms, Duty Cycle ≤ 10%.



NOTES:
1. DIMENSIONS D AND V ARE DATUMS
2. (U) IS SEATING PLANE AND DATUM
3. POSITIONAL TOLERANCE FOR MOUNTING HOLE D
4. DIMENSIONS AND TOLERANCES PER ASME Y14.5-1993

DIM.	INCH	MILLIMETER
A	0.1875	4.76
B	0.1875	4.76
C	0.1875	4.76
D	0.1875	4.76
E	0.1875	4.76
F	0.1875	4.76
G	0.1875	4.76
H	0.1875	4.76
I	0.1875	4.76
J	0.1875	4.76
K	0.1875	4.76
L	0.1875	4.76
M	0.1875	4.76
N	0.1875	4.76
O	0.1875	4.76
P	0.1875	4.76
Q	0.1875	4.76
R	0.1875	4.76
S	0.1875	4.76
T	0.1875	4.76
U	0.1875	4.76
V	0.1875	4.76

FO-3



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Quality Semi-Conductors

BUS48, BUS48A

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit	
OFF CHARACTERISTICS (1)							
Collector-Emitter Sustaining Voltage (Table 1) ($I_C = 200\text{ mA}$, $I_B = 0$) $L = 26\text{ mH}$	BUS48 BUS48A	$V_{CE(sus)}$	400 450	—	—	Vdc	
Collector Cutoff Current ($V_{CEV} = \text{Rated Value}$, $V_{BE(off)} = 1.5\text{ Vdc}$) ($V_{CEV} = \text{Rated Value}$, $V_{BE(off)} = 1.5\text{ Vdc}$, $T_C = 125^\circ\text{C}$)		I_{CEV}	— —	— —	0.2 2.0	mA _{dc}	
Collector Cutoff Current ($V_{CE} = \text{Rated } V_{CEV}$, $R_{BE} = 10\ \Omega$)	$T_C = 25^\circ\text{C}$ $T_C = 125^\circ\text{C}$	I_{CER}	— —	— —	0.5 3.0	mA _{dc}	
Emitter Cutoff Current ($V_{EB} = 5\text{ Vdc}$, $I_C = 0$)		I_{EBO}	—	—	0.1	mA _{dc}	
Emitter-base breakdown Voltage ($I_E = 60\text{ mA}$ - $I_C = 0$)		B_{VEBO}	7.0	—	—	Vdc	
SECOND BREAKDOWN							
Second Breakdown Collector Current with Base Forward Biased		$I_{S/b}$	See Figure 12				
Clamped Inductive SOA with Base Reverse Biased		$RBSOA$	See Figure 13				
ON CHARACTERISTICS (1)							
DC Current Gain ($I_C = 10\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 8\text{ Adc}$, $V_{CE} = 5\text{ V}$)	BUS48 BUS48A	h_{FE}	8	—	—		
Collector-Emitter Saturation Voltage ($I_C = 10\text{ Adc}$, $I_B = 2\text{ Adc}$) ($I_C = 15\text{ Adc}$, $I_B = 3\text{ Adc}$) ($I_C = 10\text{ Adc}$, $I_B = 2\text{ Adc}$, $T_C = 100^\circ\text{C}$) ($I_C = 8\text{ Adc}$, $I_B = 1.6\text{ Adc}$) ($I_C = 12\text{ Adc}$, $I_B = 2.4\text{ Adc}$) ($I_C = 8\text{ Adc}$, $I_B = 1.6\text{ Adc}$, $T_C = 100^\circ\text{C}$)	BUS48 BUS48A	$V_{CE(sat)}$	— — — — — —	— — — — — —	1.5 5.0 2.0 1.5 5.0 2.0	Vdc	
Base-Emitter Saturation Voltage ($I_C = 10\text{ Adc}$, $I_B = 2\text{ Adc}$) ($I_C = 10\text{ Adc}$, $I_B = 2\text{ Adc}$, $T_C = 100^\circ\text{C}$) ($I_C = 8\text{ Adc}$, $I_B = 1.6\text{ Adc}$) ($I_C = 8\text{ Adc}$, $I_B = 1.6\text{ Adc}$, $T_C = 100^\circ\text{C}$)	BUS48 BUS48A	$V_{BE(sat)}$	— — — —	— — — —	1.6 1.6 1.6 1.6	Vdc	
DYNAMIC CHARACTERISTICS							
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f_{test} = 100\text{ KHz}$)		C_{ob}	—	—	350	pF	
SWITCHING CHARACTERISTICS							
Resistive Load (Table 1)							
Delay Time	$(V_{CC} = 250\text{ Vdc}$, $I_C = 10\text{ A}$, $I_{B1} = 2.0\text{ A}$, $t_p = 30\ \mu\text{s}$, Duty Cycle $\leq 2\%$, $V_{BE(off)} = 5\text{ V}$)	t_d	—	0.1	0.2	μs	
Rise Time		t_r	—	0.4	0.7		
Storage Time		t_s	—	1.3	2.0		
Fall Time		t_f	—	0.2	0.4		
Inductive Load, Clamped (Table 1)							
Storage Time	$(I_{C(pk)} = 10\text{ A}$, $I_{B1} = 2.0\text{ A}$, $V_{BE(off)} = 5\text{ V}$, $V_{CE(c1)} = 250\text{ V}$)	$(T_C = 25^\circ\text{C})$	t_{SV}	—	1.3	—	μs
Fall Time			t_{f1}	—	0.06	—	
Storage Time		$(T_C = 100^\circ\text{C})$	t_{SV}	—	1.5	2.5	
Crossover Time			t_c	—	0.3	0.6	
Fall Time			t_{f1}	—	0.17	0.36	