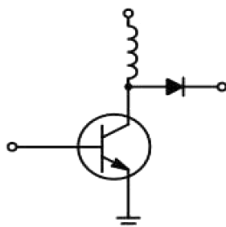


NPN Silicon Power Transistor

V_{CE0} 450V, I_C 15A, 175W, TO-3

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**RoHS
Compliant**



Features

The 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 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°C to +200°C

100° C Performance Specified for:

Reverse-Biased SOA with Inductive Loads

Switching Times with Inductive Loads

Saturation Voltage

Leakage Currents (125°C)

Applications

1. Switching Regulators
2. Inverters
3. Solenoid and Relay Drivers
4. Motor Controls
5. Deflection Circuits

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Rating	Symbol	BUX48A	Units
Collector - Emitter Voltage	$V_{CE0(SUS)}$	450	V DC
Collector - Emitter Voltage ($V_{BE} = -1.5V$)	V_{CEX}	1000	V DC
Emitter Base Voltage	V_{EB}	7	V DC
Collector Current - Continuous	I_C	15	A _{DC}
Peak	I_{CM}	30	
Overloaded	I_{OI}	60	
Base Current - Continuous	I_B	5	A _{DC}
Peak	I_{BM}	20	
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_D	175	Watts
Derate above 25°C		100	W/°C
		1	
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65°C to +200°C	°C

Thermal Characteristics

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to case	R_{JC}	1	°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%.

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Electrical Characteristics at T_a = 25°C unless otherwise specified)

Characteristic		Symbol	Min	Typ	Max	Units
Off Characteristics (1)						
Collector Emitter Sustaining Voltage (Table1) (I _C = 200mA, I _B = 0) L = 25 mH	BUX48A	V _{CEO(sus)}	400 450	- -	- -	V DC
Collector Cut Off Current (V _{CEX} = Rated Value, V _{BE(off)} = 1.5 Vdc) (V _{CEX} = Rated Value, V _{BE(off)} = 1.5 Vdc, T _C = 125°C)		I _{CEX}	- -	- -	0.2 2	mA DC
Collector Cut Off Current (V _{CE} = Rated V _{CEX}), R _{BE} = 10) TC = 25°C TC = 25°C		I _{CER}	-		0.5 3	mA DC
Emitter Cut Off Current (V _{EB} = 5V DC, I _C = 0)		I _{EBO}	-		0.1	mA DC
Emitter-Base Breakdown Voltage (I _E = 50 mA - I _C = 0)		V _{(BR)EBO}	7	-	-	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		RBSOA	See Figure 13			
On Characteristics (1)						
DC Current Gain (1) (I _C = 15A DC, V _{CE} = 5 V _{DC}) (I _C = 8A DC, V _{CE} = 5 V _{DC})	BUX48A	h _{FE}	8 8		- -	-
Collector Emitter Saturation Voltage (I _C = 10A DC, I _B = 2 A _{DC}) (I _C = 15A DC, I _B = 3 A _{DC}) (I _C = 10A DC, I _B = 2 A _{DC} , T _C = 100°C) (I _C = 8A DC, I _B = 1.6 A _{DC}) (I _C = 12A DC, I _B = 2.4 A _{DC}) (I _C = 8A DC, I _B = 1.6 A _{DC} , T _C = 100°C)	BUX48A	V _{CE(sat)}	- - - - - -	- - - - - -	1.5 5 2 1.5 5 2	V DC
Collector Emitter Saturation Voltage (I _C = 10A DC, V _{CE} = 2 A _{DC}) (I _C = 10A DC, I _B = 2 A _{DC} , T _C = 100°C) (I _C = 8A DC, V _{CE} = 1.6 A _{DC}) (I _C = 8A DC, I _B = 1.6 A _{DC} , T _C = 100°C)	BUX48A	V _{BE(sat)}	- - - -	- - - -	1.6 1.6 1.6 1.6	V DC
*Dynamic Characteristics						
Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f _{test} = 1 MHz)		C _{ob}	-	-	350	pF
Switching Characteristics Resistive Load (Table 1)						
Delay Time	I _C = 10 A, I _B = 2 A I _C = 8 A, I _B = 1.6 A Duty Cycle = 2%, V _{BE(off)} = 5 V T _P = 30 s, V _{CC} = 300 V BUX48A	t _d	-	0.1	0.2	s
Rise Time		t _r	-	0.4	0.7	
Storage Time		t _s	-	1.3	2	
Fall Time		t _f	-	0.2	0.4	

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(1) Pulse Test: Pulse Width = 300s, Duty Cycle $\leq 12\%$
 $V_{CI} = 300V$, $V_{BE(off)} = 5V$, $L_C = 180\text{ H}$

	$V_{CE0}(\text{sus})$	RBSOA AND INDUCTIVE SWITCHING	RESISTIVE SWITCHING
INPUT CONDITIONS	PW Varied to Attain $I_C = 200 \text{ mA}$		TURN-ON TIME I_{B1} adjusted to obtain the forced h_{FE} desired TURN-OFF TIME Use inductive switching driver as the input to the resistive test circuit.
CIRCUIT VALUES	$L_{\text{coil}} = 25 \text{ mH}$, $V_{CC} = 10 \text{ V}$ $R_{\text{coil}} = 0.7$	$L_{\text{coil}} = 180 \text{ H}$ $R_{\text{coil}} = 0.05$ $V_{CC} = 20 \text{ V}$ $V_{\text{clamp}} = 300 \text{ V}$ R_B ADJUSTED TO ATTAIN DESIRED I_{B1}	$V_{CC} = 300 \text{ V}$ $R_L = 83$ Pulse Width = 10 s
TEST CIRCUITS	INDUCTIVE TEST CIRCUIT SEE ABOVE FOR DETAILED CONDITIONS	OUTPUT WAVEFORMS t_1 Adjusted to Obtain I_C $t_1 \propto \frac{L_{\text{coil}} (I_{Cpk})}{V_{CC}}$ $t_2 \propto \frac{L_{\text{coil}} (I_{Cpk})}{V_{\text{Clamp}}}$ Test Equipment Scope — Tektronix 475 or Equivalent	RESISTIVE TEST CIRCUIT

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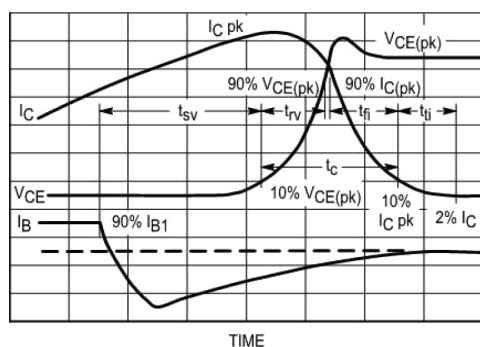


Figure 7. Inductive Switching Measurements

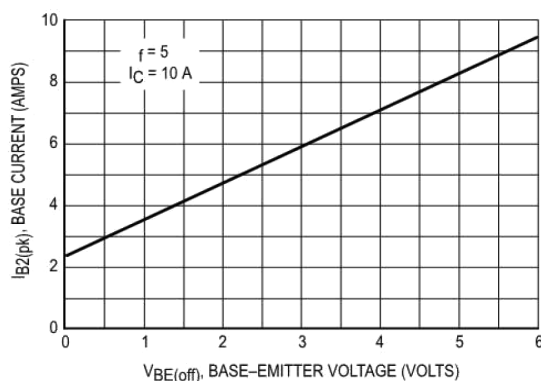


Figure 8. Peak-Reverse Current

INDUCTIVE SWITCHING

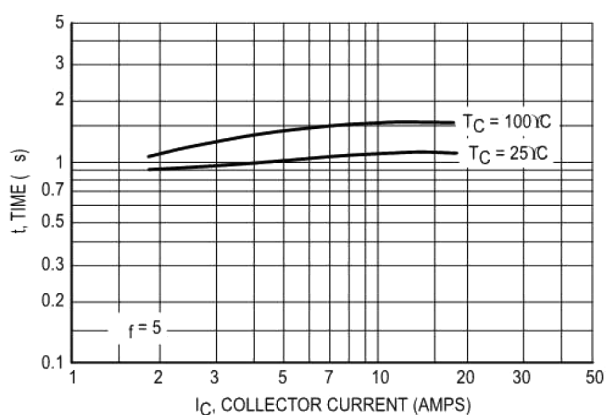


Figure 9. Storage Time, t_{sv}

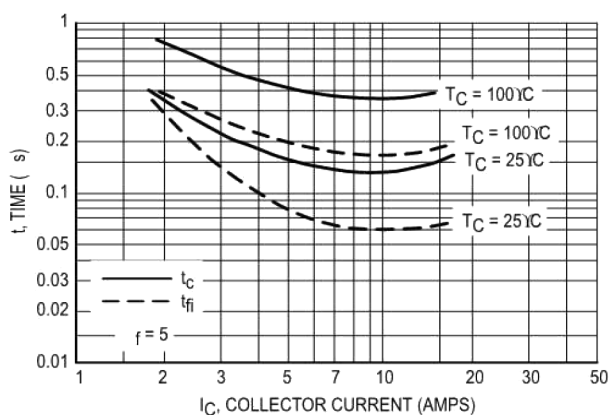


Figure 10. Crossover and Fall Times

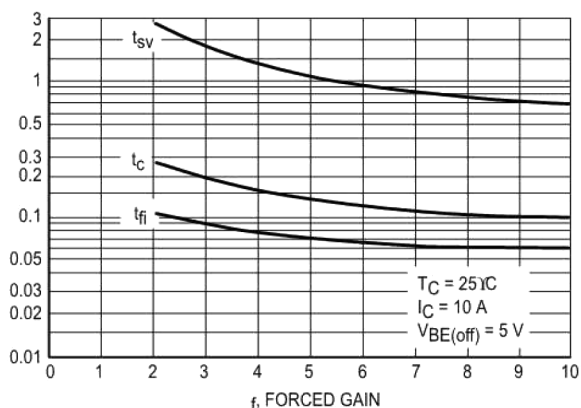


Figure 11a. Turn-Off Times versus Forced Gain

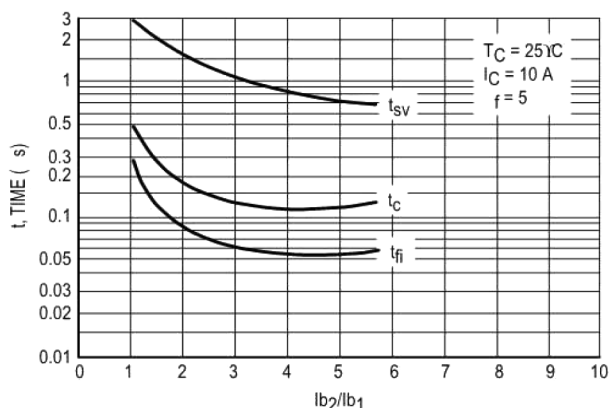


Figure 11b. Turn-Off Times versus I_{B2}/I_{B1}

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Typical Characteristic Curves

The Safe Operating Area figures shown in Figures 12 and 13 are specified for these devices under the test conditions shown.

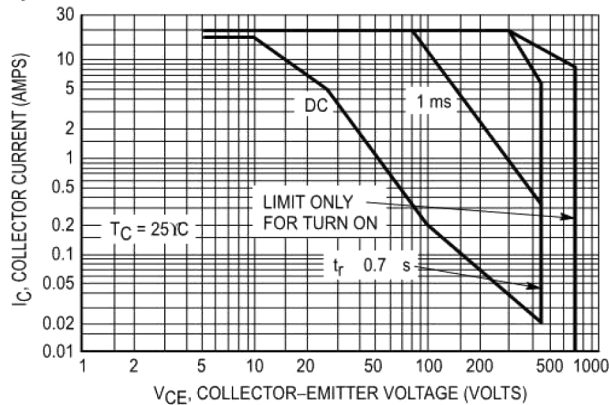


Figure 12. Forward Bias Safe Operating Area

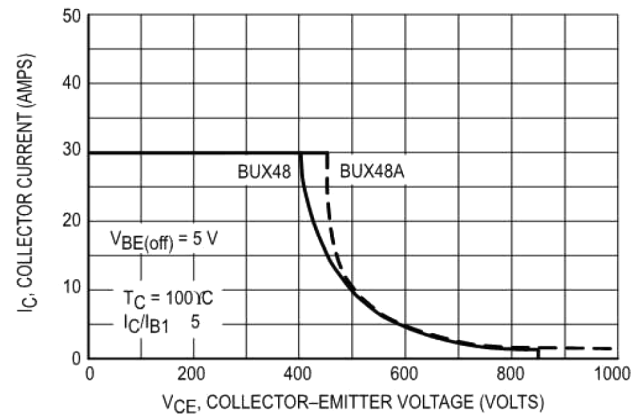


Figure 13. Reverse Bias Safe Operating Area

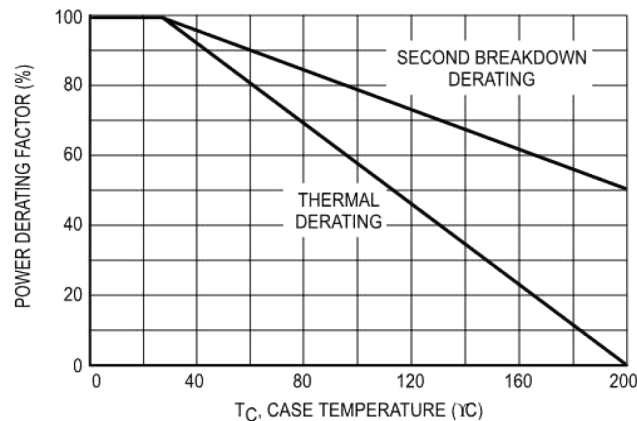


Figure 14. Power Derating

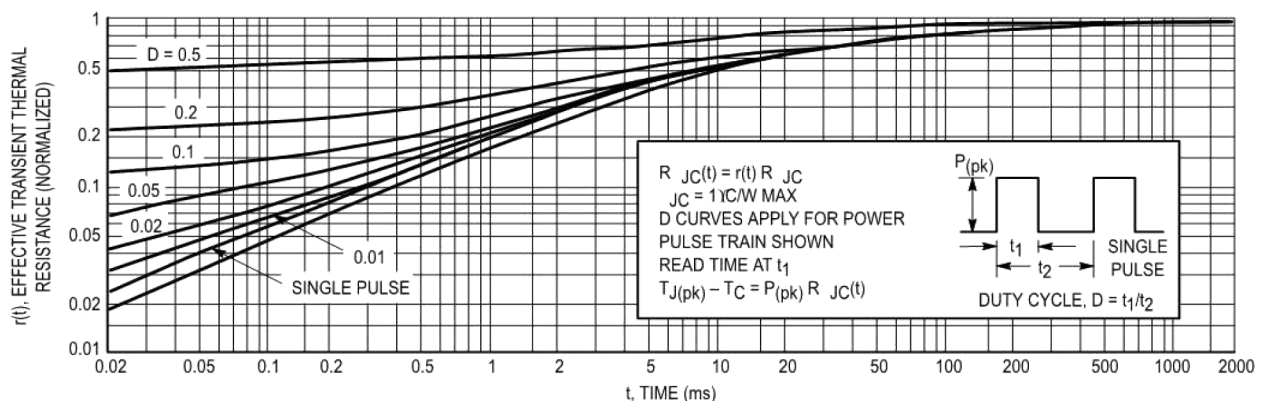


Figure 15. Thermal Response

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Typical Characteristic Curves

OVERLOAD CHARACTERISTICS

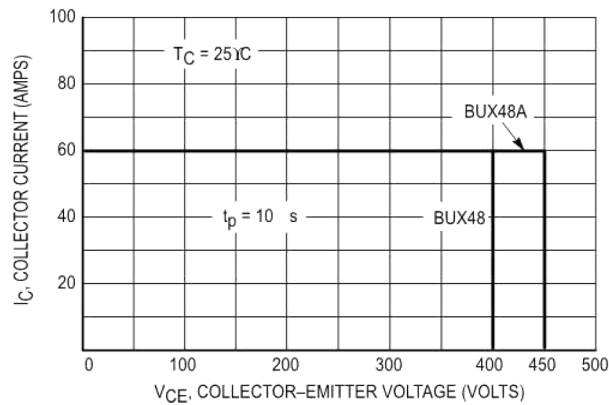


Figure 16. Rated Overload Safe Operating Area (OLSOA)

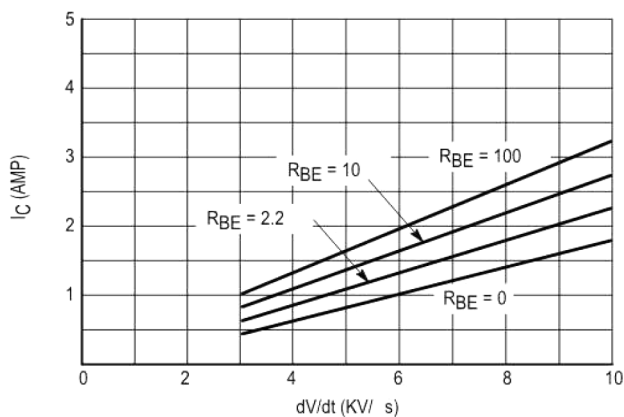


Figure 17. $I_C = f(dV/dt)$

Notes:

- ∞ $V_{CE} = V_{CC} + V_{BE}$
- ∞ Adjust pulsed current source for desired I_C , t_p

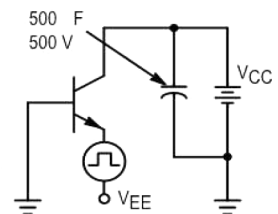


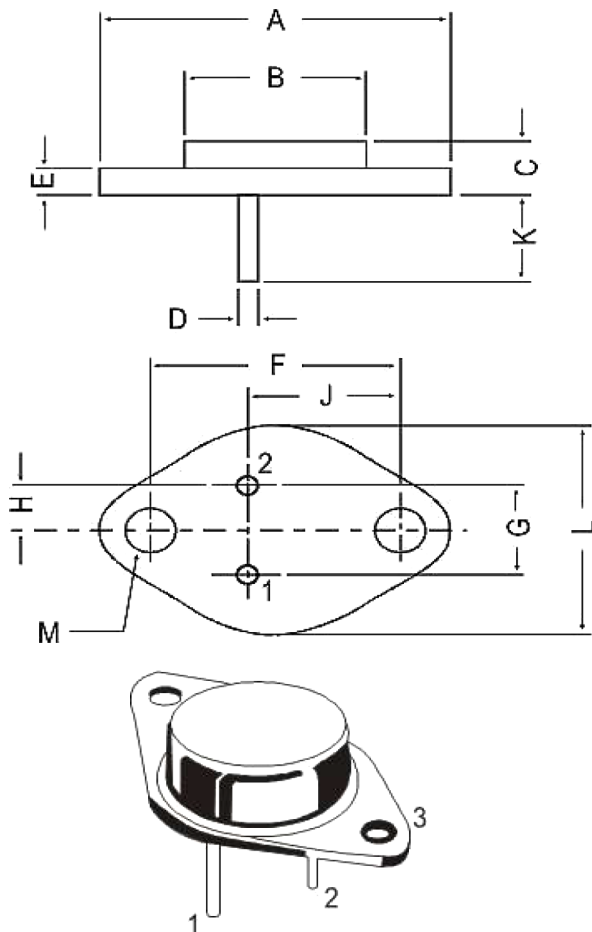
Figure 18. Overload SOA Test Circuit

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Package Details



Dimensions : Millimetres

PIN CONFIGURATION

1. BASE
2. EMITTER
3. COLLECTOR

Dim	Min.	Max.
A	-	39.37
B	-	22.22
C	6.35	8.5
D	0.96	1.09
E	-	1.77
F	29.9	30.4
G	10.69	11.18
H	5.2	5.72
J	16.64	17.15
K	11.15	12.25
L	-	26.67
M	3.84	4.19

Part Number Table

Description	Part Number
Silicon High Power Transistor, NPN, 450V, 15A, TO-3	BUX48A

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