LOW VOLTAGE NPN TRANSISTOR

UBT430

T-33-13

40Amp, 50V, Planar NPN
Low Saturation Voltage (.3V @ 30A);
High Efficiency

FEATURES

- Very Low On Resistance — Typically 7 milliohms
- Reverse Blocking Voltage — V_{ECS} = 20V
- Low Temperature Coefficient of On Resistance
- Fast Switching Times Make Operation at High Frequency Easy
- High Gain Reduces Base Losses

DESCRIPTION

The UBT430 is a planar NPN bipolar transistor that has been designed to optimize performance for low voltage circuits. It features a very low saturation voltage of only .30V max at 30A, and .10V at 10A. Because of its excellent switching speed (rise and fall times typically under 100ns and storage times under 500ns) it offers excellent performance even in high frequency switching circuits.

This is the ideal transistor to use for emitter switching in off-line switching power supplies. The low drop of this device also makes it the best choice for a battery back-up circuit. Considerable improvement in efficiency can be achieved by using the UBT430 transistor in boost regulators operating off a 5V line and low voltage buck regulators.

Design Note DN-20 provides additional information on the application of the UBT430 transistor.

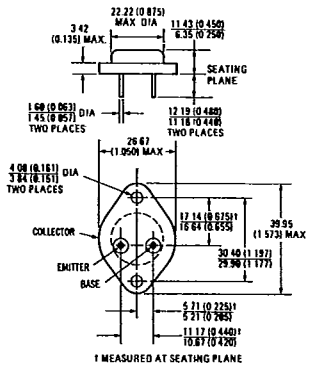
8

ABSOLUTE MAXIMUM RATINGS

Continuous Collector Current	I_C	40A
Peak Emitter Current	I_M	150A
Inductive Collector Current Clamped	I_{LM}	80A
Continuous Base Current	I_B	8A
Peak Base Current	I_{BM}	50A
Collector-Emitter Voltage	V_{CES}	50V
Emitter-Base Voltage	V_{EBO}	20V
Thermal Resistance	$R\theta$	1°C/W
Power Dissipation		150W @ 25°C
Derating Factor		1W/°C
Operating Temperature Range		−65°C to +175°C

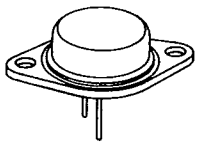
MECHANICAL SPECIFICATIONS

UBT430



Dimensions in Millimeters and (Inches)

TO-204AE (TO-3 modified, 60 mil. pin)



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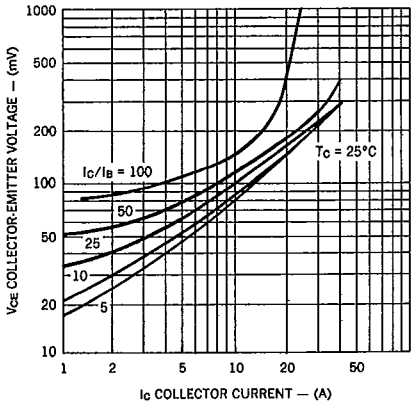
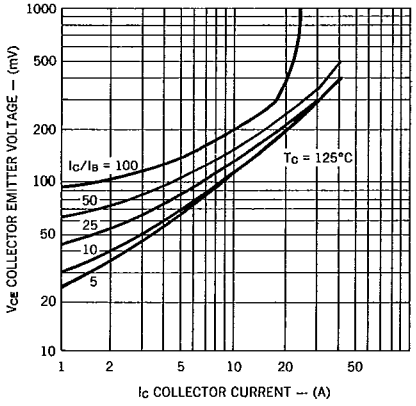
ELECTRICAL CHARACTERISTICS (at 25°C unless noted)

TEST		SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
Collector Saturation Voltage		$V_{CE(sat)}$		0.07	0.1	V	I_C = 10A, I_B = .5A
				0.21	0.3		I_C = 30A, I_B = 1.2A
				0.30	0.4		I_C = 30A, I_B = 1.2A, T = 125°C
On-Resistance		$R_{CE(ON)}$		7	10	mΩ	I_C = 30A, I_B = 1.2A
Current Gain		H_{FE}	50	100			I_C = 20A, V_{CE} = .5V
Base Saturation Voltage		$V_{BE(sat)}$		1.2	1.5	V	I_C = 30A, I_B = 1.2A
Collector-Emitter Sustaining Voltage		$V_{CEO(sus)}$	17	20		V	I_C = 100mA
Resistive Switching Speed	Rise Time	t_r		85	120	ns	I_C = 20A, I_{B1} = I_{B2} = 2A, V_{CC} = 10V
	Storage Time	t_s		300	500	ns	I_C = 20A, I_{B1} = I_{B2} = 2A, V_{CC} = 10V
	Fall Time	t_f		75	120	ns	I_C = 20A, I_{B1} = I_{B2} = 2A, V_{CC} = 10V
Inductive Switching Speed	Voltage Storage Time	t_{sv}		400	600	ns	I_C = 20A, I_{B1} = I_{B2} = .8A, V_{CC} = 10V, L = 10μH
	Current Fall Time	t_{fi}		85	120	ns	I_C = 20A, I_{B1} = I_{B2} = .8A, V_{CC} = 10V, L = 10μH
Collector-Emitter Cutoff Current		I_{CES}			100	μA	V_{CE} = 50V
					1	mA	V_{CE} = 50V, T = 125°C
Emitter-Base Cutoff Current		I_{EBO}			200	μA	V_{EB} = 20V
					1	mA	V_{EB} = 20V, T = 125°C

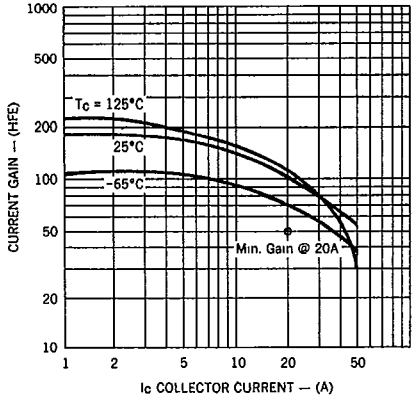
Collector-Emitter Voltage vs Collector Current at Various Forced Gains



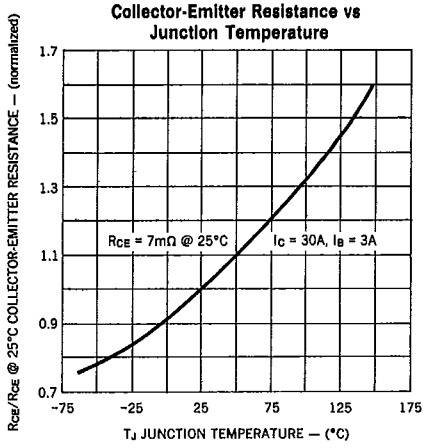
Collector-Emitter Voltage vs Collector Current at Various Forced Gains



Gain vs Collector Current @ V_{CE} = 0.5V at Various Temperatures



Collector-Emitter Resistance vs Junction Temperature



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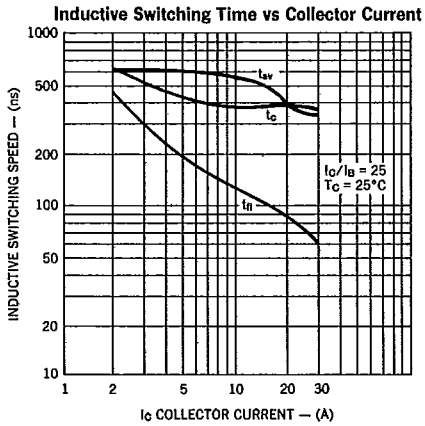

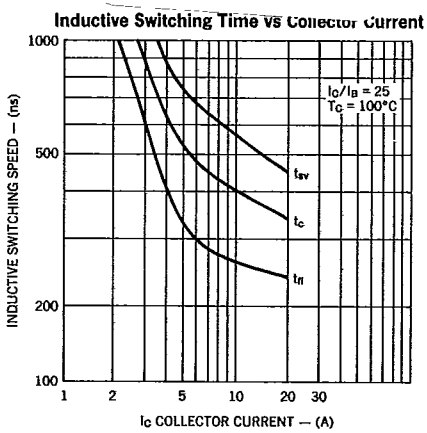

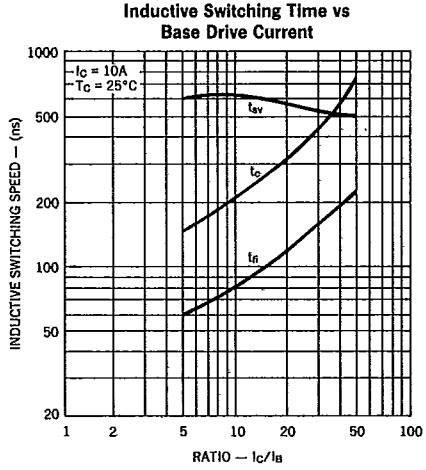

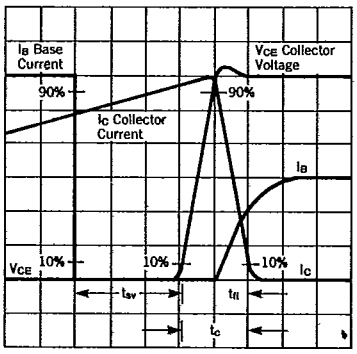

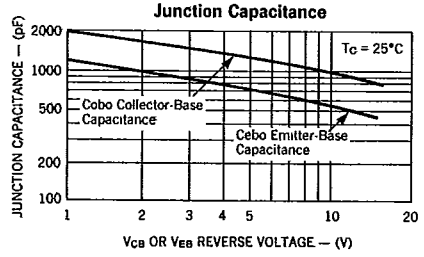

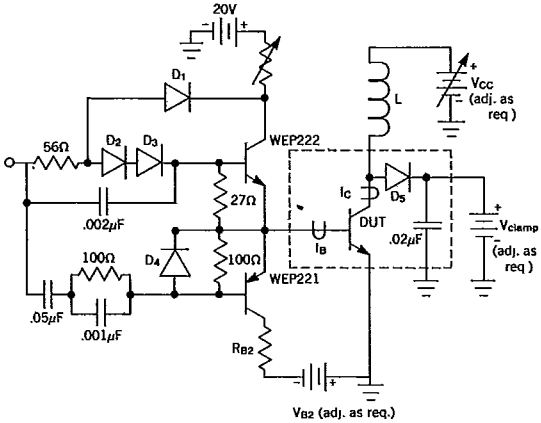

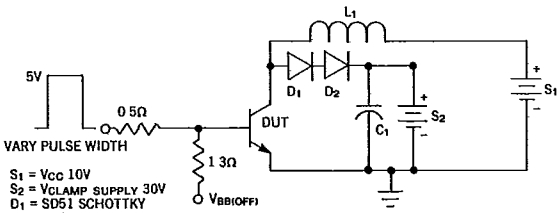

S1 = VCC 10V
S2 = VCLAMP SUPPLY 30V
D1 = SD51 SCHOTTKY
D2 = SD51 SCHOTTKY
C1 = .1μF
L1 ≈ 10μH

FIGURE #1 TEST CIRCUIT FOR I_{LPK}

NOTES: 1. All resistors are in ohms.
2 All capacitors are in microfarads.
3. D_1 — D_4 are 1N914 diodes.
4 D_5 is 1N6391 or equivalent
5. L is selected as required (5 to 15 microhenries).
6. Adjust R_{B2} and/or V_{B2} for desired I_{B2}.
7 Circuit, DUT and adjacent circuit is critical due to fast switching time Ringing voltage produced by Ldi/dt effects may be reduced by proper layout of PC board.

FIGURE #2 INDUCTIVE SWITCHING CIRCUIT WITH CLAMPED COLLECTOR

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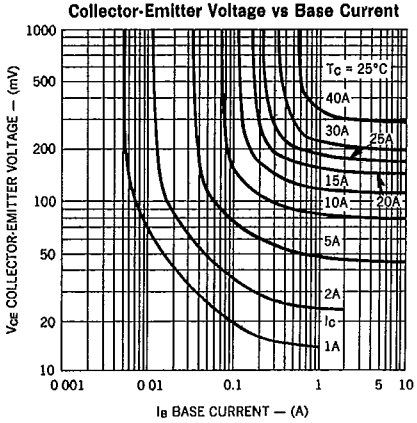
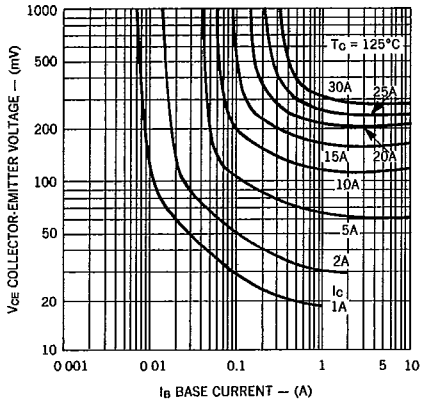
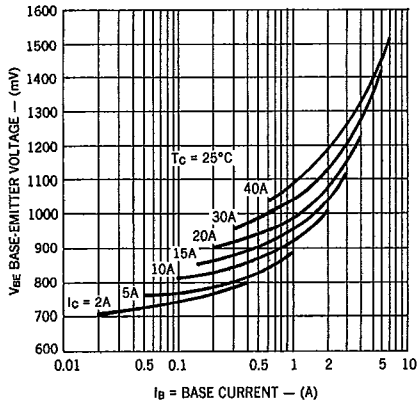
Collector-Emitter Voltage vs Base Current



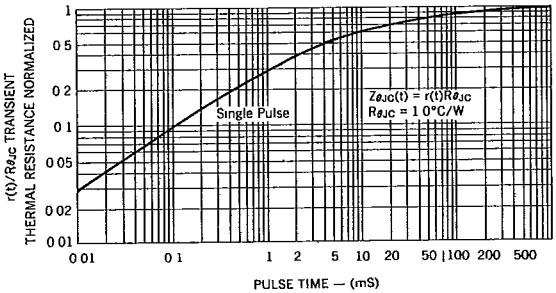
Collector-Emitter Voltage vs Base Current



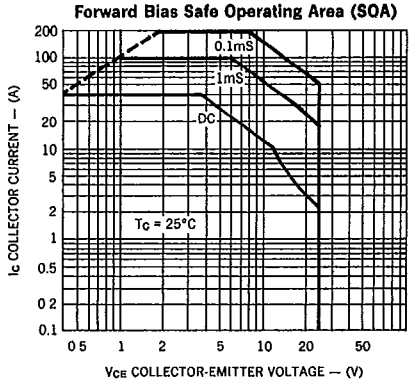
Base Emitter Voltage vs Base Current at Various Collector Currents



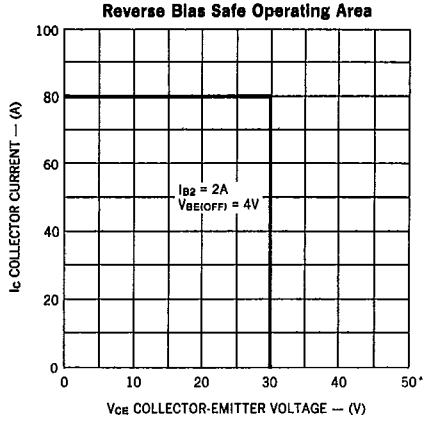
Transient Thermal Resistance vs Time



Forward Bias Safe Operating Area (SOA)



Reverse Bias Safe Operating Area



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