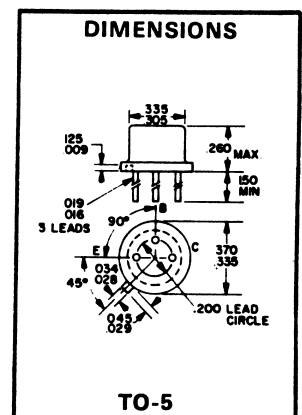
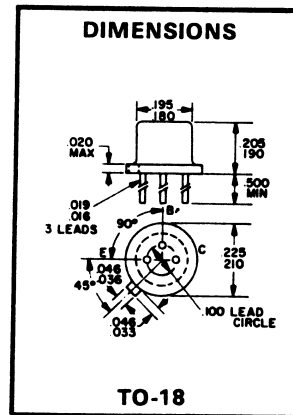
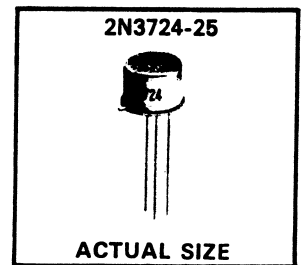
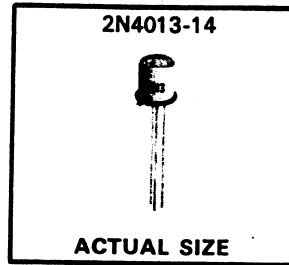


SILICON  
SWITCHING  
TRANSISTORS

**2N3724**    **2N4013**  
**2N3725**    **2N4014**

# HIGH SPEED NPN SILICON PLANAR EPITAXIAL HIGH-VOLTAGE HIGH-CURRENT TRANSISTORS

- High Voltage: 80V min. 2N3725, 2N4014
- High Gain: 65 typ. @ 1000 mA
- Low  $V_{CE(sat)}$ : 0.5V typ. @ 1000 mA
- Low  $C_{ob}$ : 4.8 pF typ. @ 10V. 2N3725, 2N4014
- Fast  $t_{on}$ : 18 nsec typ. @ 500mA
- Fast  $t_{off}$ : 45 nsec typ. @ 500mA



The ITT 2N3724 • 2N3725 and 2N4013 • 2N4014 are high-voltage, high-current NPN silicon planar epitaxial transistors useful for applications requiring breakdown voltages up to 50V and operating current to one ampere. Low saturation voltage and fast switching times make the transistor ideal for high-frequency amplifiers, core drivers, relay drivers and pulse generators.

## ABSOLUTE MAXIMUM RATINGS

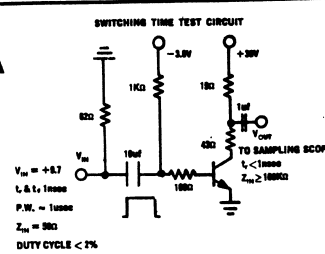
CHARACTERISTICS	2N3724 2N4013	2N3725 2N4014	UNITS
Collector-to-Base Voltage	50	80	Volts
Collector-to-Emitter Voltage (shorted base)	50	80	Volts
Collector-to-Emitter Voltage (open base)	30	50	Volts
Emitter-to-Base Voltage	6.0	6.0	Volts
Collector Current (300 $\mu$ sec; 1% duty cycle)	1.0	1.0	Amps
Junction Temperature (op. and stg.)	-65 to +200		$^{\circ}$ C
<b>Maximum Power Dissipation</b>	<b>2N4013</b> <b>2N4014</b>	<b>2N3724</b> <b>2N3725</b>	
Total Dissipation @ $T_c = 25^{\circ}$ C (derate above $25^{\circ}$ C)	1.2 (6.8 mW/ $^{\circ}$ C)	3.5 (20mW/ $^{\circ}$ C)	Watts
Total Dissipation @ $T_A = 25^{\circ}$ C (derate above $25^{\circ}$ C)	0.36 (2.06 mW/ $^{\circ}$ C)	0.8 (4.56 mW/ $^{\circ}$ C)	Watts

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**ELECTRICAL CHARACTERISTICS @ 25°C unless otherwise noted.**

SYMBOL	2N3724 2N4013			2N3725 2N4014			UNIT	CONDITIONS
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
<b><math>BV_{CBO}</math></b>	50			80			Vdc	$I_C = 10\mu A$
<b><math>BV_{CES}</math></b>	50			80			Vdc	$I_C = 10\mu A$
<b><math>LV_{CEO}^{1,2}</math></b>	30			50			Vdc	$I_C = 10mA$
<b><math>BV_{EBO}</math></b>	6.0			6.0			Vdc	$I_E = 10\mu A$
<b><math>h_{FE}^1</math></b>	30	60		30	60			$I_C = 10mA$ $V_{CE} = 1.0V$
	60	90	150	60	90	150		$I_C = 100mA$ $V_{CE} = 1.0V$
	40	65		40	65			$I_C = 300mA$ $V_{CE} = 1.0V$
	35	50		35	50			$I_C = 500mA$ $V_{CE} = 1.0V$
	25	45		20	40			$I_C = 800mA$ $V_{CE} = 2.0V$
	30	65		25	65			$I_C = 1000mA$ $V_{CE} = 5.0V$
	30	45		30	40			$I_C = 100mA$ $V_{CE} = 1.0V$ $T_A = -55^\circ C$
	20	40		20	35			$I_C = 500mA$ $V_{CE} = 1.0V$ $T_A = -55^\circ C$
	<b><math>V_{CE(sat)}^1</math></b>		0.11	0.25		0.19	0.25	Vdc
		0.13	0.2		0.21	0.26	Vdc	$I_C = 100mA$ $I_B = 10mA$
		0.22	0.32		0.31	0.4	Vdc	$I_C = 300mA$ $I_B = 30mA$
		0.3	0.42		0.4	0.52	Vdc	$I_C = 500mA$ $I_B = 50mA$
		0.4	0.65		0.5	0.8	Vdc	$I_C = 800mA$ $I_B = 80mA$
		0.5	0.75		0.6	0.95	Vdc	$I_C = 1000mA$ $I_B = 100mA$
<b><math>V_{BE(sat)}^1</math></b>		0.64	0.76		0.64	0.76	Vdc	$I_C = 10mA$ $I_B = 1.0mA$
		0.75	0.86		0.75	0.86	Vdc	$I_C = 100mA$ $I_B = 10mA$
		0.89	1.1		0.89	1.1	Vdc	$I_C = 300mA$ $I_B = 30mA$
	0.9	0.95	1.2	0.9	0.95	1.2	Vdc	$I_C = 500mA$ $I_B = 50mA$
		1.0	1.5		1.0	1.5	Vdc	$I_C = 800mA$ $I_B = 80mA$
		1.1	1.7		1.1	1.7	Vdc	$I_C = 1000mA$ $I_B = 100mA$
<b><math>I_{CBO}</math></b>		0.25	1.7		0.33	1.7	$\mu A$	$V_{CB} = 40V$
							$\mu A$	$V_{CB} = 60V$
		27	120				$\mu A$	$V_{CB} = 40V$ $T_A = 100^\circ C$
					25	120	$\mu A$	$V_{CB} = 60V$ $T_A = 100^\circ C$
<b><math>C_{ob}</math></b>		6.0	12		4.8	10	pF	$V_{CB} = 10V$
	<b><math>C_{ib}</math></b>		40	55		40	55	pF
<b><math>h_{fe}</math></b>	3.0	4.5		3.0	4.5			$I_C = 50mA$ $V_{CE} = 10V$ $f = 100MHz$
<b><math>t_{on}</math></b>		18	35		18	35	nsec	<b>SWITCHING TIME TEST CIRCUIT</b>  $I_C \approx 500mA$ $I_{B1} \approx 50mA$ $I_{B2} \approx 50mA$ $V_{ce} = +0.7$ $t_r, t_f < 100ns$ $P.W. = 100ns$ $Z_{in} = 50\Omega$ DUTY CYCLE < 1%
<b><math>t_{off}</math></b>		45	60		45	60	nsec	

NOTES: 1. Pulsed width  $\leq 300 \mu sec$ ; 1% duty cycle.  
 2. Lowest emitter-to-collector voltage.