

2N4044, 2N4045, 2N4100, 2N4878, 2N4879, 2N4880 Dual Monolithic Matched NPN Silicon Planar Transistors

FEATURES

- High Gain At Low Current $h_{FE} > 200 @ 10 \mu A$
- Low Output Capacitance $C_{obo} < 0.8 \text{ pF}$
- h_{FE} Match $h_{FE1} / h_{FE2} < 10\%$
- Tight V_{BE} Tracking
 $\Delta (V_{BE1} - V_{BE2}) < 3 \mu V / ^\circ C -55^\circ C \text{ to } +125^\circ C$
- Dielectrically isolated matched pairs for differential amplifiers.

ABSOLUTE MAXIMUM RATINGS

@ 25°C (unless otherwise noted)

Maximum Temperatures

Storage Temperature -65°C to +200°C

Operating Junction Temperature +200°C

Maximum Power Dissipation

	TO-71		TO-78	
	ONE SIDE	BOTH SIDES	ONE SIDE	BOTH SIDES
Total Dissipation at 25°C Case Temperature	0.3 Watt	0.5 Watt	0.4 Watt	0.75 Watt
Derating Factor	1.7mW/°C	2.9mW/°C	2.3mW/°C	4.3mW/°C

		2N4044	2N4100	2N4045
		2N4878	2N4879	2N4880
V_{CBO}	Collector to Base Voltage	60 V	55 V	45 V
V_{CEO}	Collector to Emitter Voltage	60 V	55 V	45 V
V_{EBO}	Emitter to Base Voltage (Note 2)	7 V	7 V	7 V
V_{CCO}	Collector to Collector Voltage	100 V	100 V	100 V
I_C	Collector Current	10mA	10mA	10mA

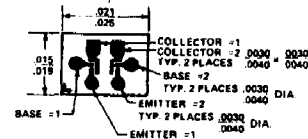
PIN CONFIGURATION

TO-71
TO-78



CHIP TOPOGRAPHY

4000



ORDERING INFORMATION

	TO-78	TO-71	WAFER	DICE
2N4044			2N4044/W	2N4044/D
2N4045			2N4045/W	2N4045/D
2N4100			2N4100/W	2N4100/D
		2N4878		
		2N4879		
		2N4880		

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

PARAMETER		2N4044		2N4100		2N4045		UNIT	TEST CONDITIONS
		2N4878	2N4879	2N4878	2N4879	2N4880	2N4880		
h_{FE}	DC Current Gain	200	600	150	600	80	800		$I_C = 10 \mu A, V_{CE} = 5V$
h_{FE}	DC Current Gain	225		175		100			$I_C = 1.0 \text{ mA}, V_{CE} = 5V$
$h_{FE}(-55^\circ C)$	DC Current Gain	75		50		30			$I_C = 10 \mu A, V_{CE} = 5V$
$V_{BE(on)}$	Emitter-Base On Voltage		0.7		0.7		0.7	V	$I_C = 10 \mu A, V_{CE} = 5V$
$V_{CE(sat)}$	Collector Saturation Voltage		0.35		0.35		0.35	V	$I_C = 1.0 \text{ mA}, I_B = 0.1 \text{ mA}$
I_{CBO}	Collector Cutoff Current		0.1		0.1		0.1	nA	$I_E = 0, V_{CB} = 45V, 30V^*$
$I_{CBO}(+150^\circ C)$	Collector Cutoff Current		0.1		0.1		0.1	μA	$I_E = 0, V_{CB} = 45V, 30V^*$
I_{EBO}	Emitter Cutoff Current		0.1		0.1		0.1	nA	$I_C = 0, V_{EB} = 5V$
C_{obo}	Output Capacitance		0.8		0.8		0.8	pF	$I_E = 0, V_{CB} = 5V$

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ELECTRICAL CHARACTERISTICS (25 °C unless otherwise noted)									
PARAMETER		2N4044 2N4878		2N4100 2N4879		2N4045 2N4880		UNIT	TEST CONDITIONS
		MIN	MAX	MIN	MAX	MIN	MAX		
C_{TE}	Emitter Transition Capacitance		1		1		1	pF	$I_C = 0, V_{EB} = 0.5V$
C_{C_1, C_2}	Collector to Collector Capacitance		0.8		0.8		0.8	pF	$V_{CC} = 0$
I_{C_1, C_2}	Collector to Collector Leakage Current		5		5		5	pA	$V_{CC} = \pm 100V$
$V_{CEO(sust)}$	Collector to Emitter Sustaining Voltage	60		55		45		V	$I_C = 1mA, I_B = 0$
f_T	Current Gain Bandwidth Product	200		150		150		MHz	$I_C = 1mA, V_{CE} = 10V$
f_T	Current Gain Bandwidth Product	20		15		15		MHz	$I_C = 10\mu A, V_{CE} = 10V$
NF	Narrow Band Noise Figure		2		3		3	dB	$I_C = 10\mu A, V_{CE} = 5V, f = 1kHz$ $R_G = 10\text{ kohms}, BW = 200\text{ Hz}$
BV_{CBO}	Collector Base Breakdown Voltage	60		55		45		V	$I_C = 10\mu A, I_E = 0$
BV_{EBO}	Emitter Base Breakdown Voltage	7		7		7		V	$I_E = 10\mu A, I_C = 0$
MATCHING CHARACTERISTICS (25 °C unless otherwise noted)									
h_{FE_1}/h_{FE_2}	DC Current Gain Ratio (Note 3)	0.9	1	0.85		0.8	1		$I_C = 10\mu A \text{ to } 1mA, V_{CE} = 5V$
$ V_{BE_1} - V_{BE_2} $	Base Emitter Voltage Differential		3		5		5	mV	$I_C = 10\mu A, V_{CE} = 5V$
$ I_{B_1} - I_{B_2} $	Base Current Differential		5		10		25	nA	$I_C = 10\mu A, V_{CE} = 5V$
$ \Delta(V_{BE_1} - V_{BE_2}) /^\circ C$	Base Current Differential Voltage Differential Change with Temperature		3		5		10	$\mu V/^\circ C$	$I_C = 10\mu A, V_{CE} = 5V$ $T_A = -55^\circ C \text{ to } +125^\circ C$
$ \Delta(I_{B_1} - I_{B_2}) /^\circ C$	Base Current Differential Change with Temperature		0.3		0.5		1	nA/°C	$I_C = 10\mu A, V_{CE} = 5V$ $T_A = -55^\circ C \text{ to } +125^\circ C$
SMALL SIGNAL CHARACTERISTICS									
PARAMETER		TYPICAL VALUE		UNIT		TEST CONDITIONS			
h_{ib}	Input Resistance	28		ohms		$I_C = 1mA, V_{CB} = 5V$			
h_{rb}	Voltage Feedback Ratio	4.3		$\times 10^{-4}$		$I_C = 1mA, V_{CB} = 5V$			
h_{fe}	Small Signal Current Gain	250				$I_C = 1mA, V_{CB} = 5V$			
h_{ob}	Output Conductance	0.8		$\times 10^{-7}\text{ mhos}$		$I_C = 1mA, V_{CB} = 5V$			
h_{ie}	Input Resistance	9.6		k ohms		$I_C = 1mA, V_{CB} = 5V$			
h_{re}	Voltage Feedback Ratio	4.2		$\times 10^{-4}$		$I_C = 1mA, V_{CB} = 5V$			
h_{oe}	Output Conductance	12		μmhos		$I_C = 1mA, V_{CB} = 5V$			
NOTES:									
1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.									
2. The reverse base-to-emitter voltage must never exceed 7.0 volts and the reverse base-to-emitter current must never exceed 10 μamps .									
3. The lowest of two h_{FE} readings is taken as h_{FE_1} for purposes of this ratio.									