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## 2N4398 & 2N4399 Silicon PNP Transistor High Power

**Description:**

The 2N4398 and 2N4399 are silicon PNP high power transistors in a TO3 type package designed for use in power amplifier and switching circuits.

**Features:**

- Low Collector–Emitter Saturation Voltage:  $I_C = 15A$ ,  $V_{CE(sat)} = 1.0V$  Max
- DC Current Gain Specified: 1.0 o 30A

**Absolute Maximum Ratings:**

Collector–Emitter Voltage, $V_{CEO}$		
2N4398	40V	
2N4399	60V	
Collector–Base Voltage, $V_{CB}$		
2N4398	40V	
2N4399	60V	
Emitter–Base Voltage, $V_{EB}$		5.0V
Collector Current, $I_C$		
Continuous	30A	
Peak	50A	
Base Current, $I_B$		
Continuous	7.5A	
Peak	15A	
Total Power Dissipation, $P_D$		
$T_A = +25^\circ C$	5W	
Derate Above $+25^\circ C$	28.8W/ $^\circ C$	
$T_C = +25^\circ C$	200W	
Derate Above $+25^\circ C$	1.15W/ $^\circ C$	
Operating Junction Temperature Range, $T_j$		$-65^\circ$ to $+200^\circ C$
Storage Temperature Range, $T_{stg}$		$-65^\circ$ to $+200^\circ C$
Thermal Resistance, Junction–to–Case, $R_{thJC}$		0.875 $^\circ C/W$
Thermal Resistance, Junction–to–Ambient, $R_{thJA}$		35 $^\circ C/W$

**Electrical Characteristics:** ( $T_C = +25^\circ C$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Collector–Emitter Sustaining Voltage	$V_{CEO(SUS)}$	$I_C = 200mA$ , $I_B = 0$ , Note 1	40	–	–	V
2N4398						
2N4399			60	–	–	V
Collector Cutoff Current	$I_{CEO}$	$V_{CE} = \text{Rated Value}$ , $V_{BE(OFF)} = 1.5V$	–	–	5	mA
	$I_{CEX}$	$V_{CE} = 30V$ , $V_{BE(OFF)} = 1.5V$	–	–	5	mA
					$T_C = +150^\circ C$	10
	$I_{CBO}$	$V_{CE} = \text{Rated Value}$ , $I_E = 0$	–	–	1	mA
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = 5V$ , $I_C = 0$	–	–	5	mA

Note 1. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .

**Electrical Characteristics (Cont'd):** ( $T_C = +25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
<b>On Characteristics (Note 1)</b>							
DC Current Gain	$h_{FE}$	$V_{CE} = 2V$	$I_C = 1A$	40	-	-	
			$I_C = 15A$	15	-	60	
			$I_C = 30A$	5	-	-	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 10A, I_B = 1A$	-	-	0.75	V	
		$I_C = 15A, I_B = 1.5A$	-	-	1.0	V	
		$I_C = 20A, I_B = 2A$	-	-	2.0	V	
		$I_C = 30A, I_B = 6A$	-	-	4.0	V	
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 10A, I_B = 1A$	-	-	1.6	V	
		$I_C = 15A, I_B = 1.5A$	-	-	1.85	V	
		$I_C = 20A, I_B = 2A$	-	-	2.5	V	
Base-Emitter ON Voltage	$V_{BE(on)}$	$I_C = 15A, V_{CE} = 2V$	-	-	1.7	V	
		$I_C = 30A, V_{CE} = 4V$	-	-	3.0	V	
<b>Dynamic Characteristics</b>							
Current Gain Bandwidth Product	$f_T$	$I_C = 1A, V_{CE} = 10V, f = 1\text{MHz}$	4	-	-	MHz	
Small-Signal Current Gain	$h_{fe}$	$I_C = 1A, V_{CE} = 10V, f = 1\text{MHz}$	40	-	-		
<b>Switching Characteristics</b>							
Rise Time	$t_r$	$V_{CC} = 30V, I_C = 10A, I_{B1} = I_{B2} = 1A$	-	-	0.4	us	
Storage Time	$t_s$		-	-	1.5	us	
Fall Time	$t_f$		-	-	0.6	us	

Note 1. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

