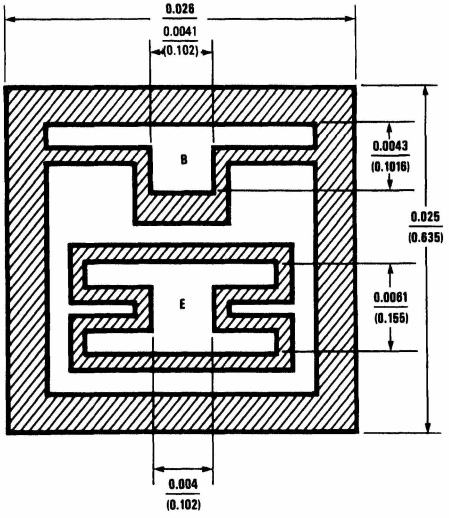
National Semiconductor

Process 05
NPN Darlington



TL/G/10034–1

DESCRIPTION

Process 05 is a monolithic, double-diffused, silicon epitaxial Darlington. Complement to Process 61.

APPLICATION

This device was designed for applications requiring extremely high current gain at collector currents to 1A.

PRINCIPAL DEVICE TYPES

TO-92 EBC: MPSA13
TO-92 ECB: 2N5306
TO-116: MPQA13
TO-202 EBC: D40C1-8, NSDU45
TO-226 EBC: MPS6724, MPSW13
TO-236: MMBTA13
TO-237 EBC: 2N6724

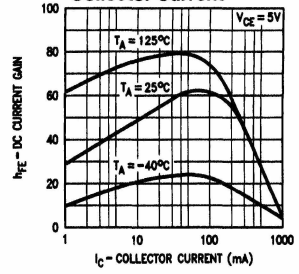
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Symbol	Conditions	Min	Typ	Max	Units
NF	I_C = 1 mA V_{CE} = 5V, R_S = 100k, f = 1 kHz		2		dB
C_{CB}	V_{CB} = 10V, I_E = 0, f = 1 MHz		4	6	pF
h_{FE}	I_C = 10 mA, V_{CE} = 5V I_C = 100 mA, V_{CE} = 5V I_C = 1A, V_{CE} = 5V	4,000 8,000 3,000	40,000	200,000	
$V_{CE(SAT)}$	I_C = 10 mA, I_B = 10 μA I_C = 100 mA, I_B = 100 μA			1.0 1.5	V V
$V_{BE(ON)}$	I_C = 10 mA, V_{CE} = 5V I_C = 100 mA, V_{CE} = 5V		1.2 1.3	1.4 1.8	V V
h_{fe}	I_C = 10 mA, V_{CE} = 5.0V, f = 1 kHz		60,000		
BV_{CES}	I_C = 100 μA	40			V
BV_{EBO}	I_E = 10 μA	12			V
I_{CES}	V_{CE} = 15V, V_{BE} = 0			100	nA
I_{CBO}	V_{CB} = 30V, I_E = 0			100	nA
I_{EBO}	V_{EB} = 10V, I_C = 0			100	nA
$P_{D(max)}$ TO-202 TO-226	 T_C = 25°C T_A = 25°C T_A = 25°C	 10 2 1			 W W W

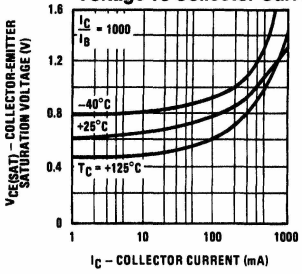
Process 05

Symbol	Conditions	Min	Typ	Max	Units
TO-237	$T_C = 25°C$	2			W
	$T_A = 25°C$	850			mW
TO-92	$T_A = 25°C$	600			mW
TO-236	$T_C = 25°C$	350			mW
θ_{JC}					
TO-202	$T_C = 25°C$			12.5	°C/W
TO-237	$T_C = 25°C$			62.5	°C/W
θ_{JA}					
TO-202	$T_A = 25°C$			62.5	°C/W
TO-226	$T_A = 25°C$			125	°C/W
TO-237	$T_A = 25°C$			147	°C/W
TO-92	$T_A = 25°C$			208	°C/W
$T_{J(max)}$	All Plastic Parts	150			°C

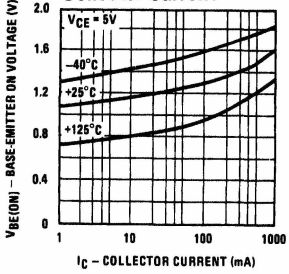
DC Pulsed Current Gain vs Collector Current



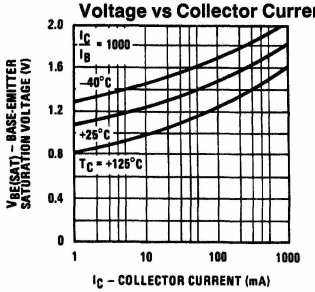
Collector-Emitter Saturation Voltage vs Collector Current



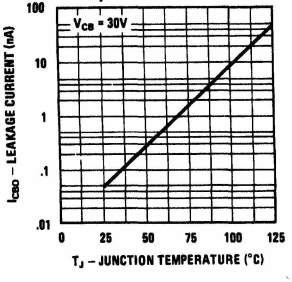
Base-Emitter ON Voltage vs Collector Current



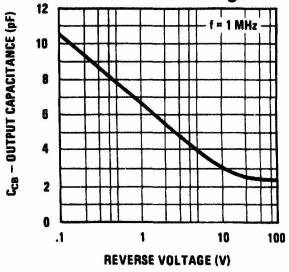
Base -Emitter Saturation Voltage vs Collector Current



Collector-Base Diode Reverse Current vs Temperature



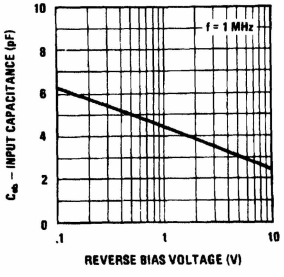
Output Capacitance vs Reverse Bias Voltage



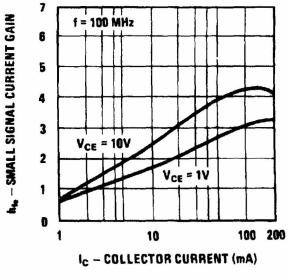
TL/G/10034–2

Process 05

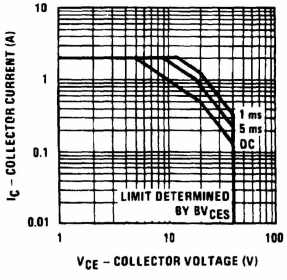
Input Capacitance vs Reverse Bias Voltage



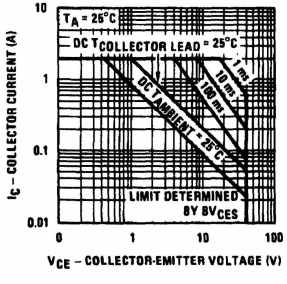
Small Signal Current Gain vs Collector Current



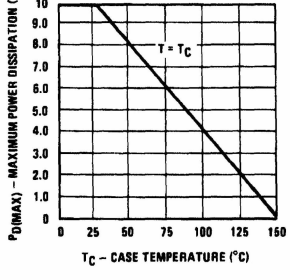
Safe Operating Area TO-202



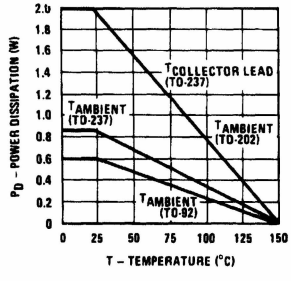
Safe Operating Area TO-237



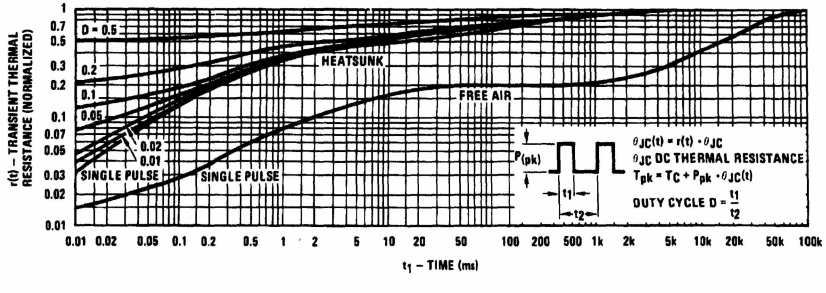
Maximum Power Dissipation TO-202 vs Case Temperature



Thermal Derating Curve



Thermal Response in TO-202 Package



TL/G/10034–3