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## MJ10021 T-NPN, Si, Darlington w/Base-Emitter Speedup Diode

**Description:**

The MJ10021 is a Darlington transistor in a TO3 type package designed for high-voltage, high-speed, power switching in inductive circuits where fall time is critical. This device is particularly suited for line operated switchmode applications.

**Features:**

- Continuous Collector Current –  $I_C = 60A$

**Applications:**

- Switching Regulators
- Inverters
- Solenoid and Relay Drivers
- AC and DC Motor Controls

**Absolute Maximum Ratings:**

Collector-Emitter Voltage, $V_{CEV}$ .....	250V
Collector-Emitter Voltage, $V_{CEO(SUS)}$ .....	350V
Emitter-Base Voltage, $V_{EBO}$ .....	8.0V
Collector Current	
Continuous, $I_C$ .....	60A
Peak, $I_{CM}$ .....	100A
Base Current, $I_B$ .....	20A
Total Power Dissipation, $P_D$	
$T_C = +25^\circ C$ .....	250W
$T_C = +100^\circ C$ .....	143W
Derate Above $+25^\circ C$ .....	1.43W/ $^\circ C$
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, $R_{thJC}$ .....	0.7 $^\circ C/W$

**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	$V_{CEO(SUS)}$	$I_C = 100mA, I_B = 0$	250	-	-	V	
Collector Cutoff Current	$I_{CEV}$	$V_{CEV} = 250V,$ $V_{BE(OFF)} = 1.5V$		-	-	0.25	mA
			$T_C = 150^\circ C$	-	-	5.0	mA
	$I_{CER}$	$V_{CEV} = 250V, R_{BE} = 50\Omega, T_C = +100^\circ C$	-	-	5.0	mA	
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = 2V, I_C = 0$	-	-	175	mA	

**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	$h_{FE}$	$I_C = 15\text{A}, V_{CE} = 5\text{V}$	75	-	1000	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 30\text{A}, I_B = 1.2\text{A}$	-	-	2.2	V
		$I_C = 60\text{A}, I_B = 4\text{A}$	-	-	4.0	V
		$I_C = 30\text{A}, I_B = 1.2\text{A}, T_C = +100^\circ\text{C}$	-	-	2.4	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 30\text{A}, I_B = 1.2\text{A}$	-	-	3.0	V
		$T_C = +100^\circ\text{C}$	-	-	3.5	V
Diode Forward Voltage	$V_F$	$I_F = 30\text{A}$	-	-	5.0	V
<b>Dynamic Characteristics</b>						
Output Capacitance	$C_{ob}$	$V_{CB} = 10\text{V}, I_E = 0, f = 1\text{kHz}$	160	-	750	pF
<b>Switching Characteristics</b>						
Delay Time	$t_d$	$V_{CC} = 175\text{V}, I_C = 30\text{A}, I_{B1} = 1.2\text{A},$ $V_{BE(off)} = 5\text{V}, t_p = 25\mu\text{s}, \text{Duty Cycle} \leq 2\%$	-	-	0.2	us
Rise Time	$t_r$		-	-	1.0	us
Storage Time	$t_s$		-	-	3.5	us
Fall Time	$t_f$		-	-	0.8	us

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

