

# NEC

## SILICON POWER TRANSISTOR 2SD2161

### NPN SILICON EPITAXIAL TRANSISTOR (DARLINGTON CONNECTION) FOR LOW-FREQUENCY POWER AMPLIFIERS AND LOW-SPEED SWITCHING

The 2SD2161 is a Darlington power transistor that can directly drive from the IC output. This transistor is ideal for motor drivers and solenoid drivers in such as OA and FA equipment.

In addition, a small resin-molded insulation type package contributes to high-density mounting and reduction of mounting cost.

#### FEATURES

- High  $h_{FE}$  due to Darlington connection  
 $h_{FE} \geq 2,000$  ( $V_{CE} = 2.0\text{ V}$ ,  $I_C = 2.0\text{ A}$ )
- Full mold package that does not require an insulating board or insulation bushing

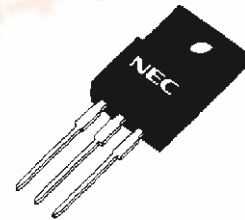
#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

Parameter	Symbol	Conditions	Ratings	Unit
Collector to base voltage	$V_{CBO}$		100	V
Collector to emitter voltage	$V_{CEO}$		100	V
Emitter to base voltage	$V_{EBO}$		7.0	V
Collector current (DC)	$I_{C(DC)}$		$\pm 5.0$	A
Collector current (pulse)	$I_{C(pulse)}$	$PW \leq 300\ \mu s$ , duty cycle $\leq 10\%$	$\pm 10$	A
Base current (DC)	$I_{B(DC)}$		0.5	A
Total power dissipation	$P_T$	$T_C = 25^\circ\text{C}$	20	W
		$T_A = 25^\circ\text{C}$	2.0	W
Junction temperature	$T_j$		150	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

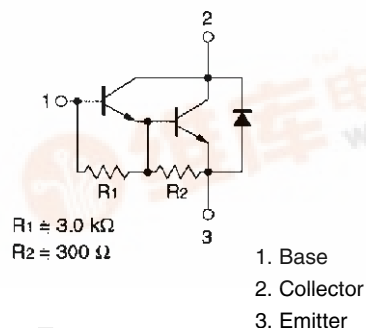
#### ORDERING INFORMATION

Ordering Name	Package
2SD2161	Isolated TO-220

(Isolated TO-220)



#### INTERNAL EQUIVALENT CIRCUIT



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**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

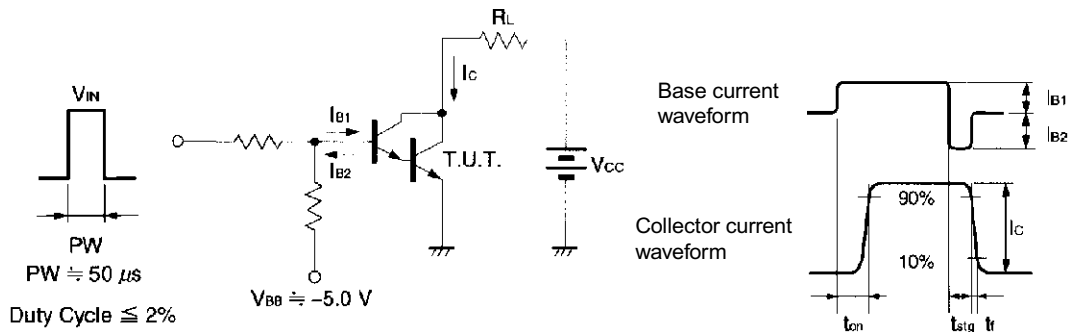
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector cutoff current	I <sub>CB0</sub>	V <sub>CB</sub> = 100 V, I <sub>E</sub> = 0 A			1.0	μA
DC current gain	h <sub>FE1</sub>	V <sub>CE</sub> = 2.0 V, I <sub>C</sub> = 2.0 A <sup>Note</sup>	2,000	8,000	20,000	
	h <sub>FE2</sub>	V <sub>CE</sub> = 2.0 V, I <sub>C</sub> = 4.0 A <sup>Note</sup>	500			
Collector saturation voltage	V <sub>CE(sat)</sub>	I <sub>C</sub> = 2.0 A, I <sub>B</sub> = 2.0 mA <sup>Note</sup>			1.5	V
Base saturation voltage	V <sub>BE(sat)</sub>	I <sub>C</sub> = 2.0 A, I <sub>B</sub> = 2.0 mA <sup>Note</sup>			2.0	V
Gain bandwidth product	f <sub>T</sub>	V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 0.5 A		30		MHz
Collector capacitance	C <sub>ob</sub>	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0 A, f = 1.0 MHz		35		pF
Turn-on time	t <sub>on</sub>	I <sub>C</sub> = 2.0 A, R <sub>L</sub> = 25 Ω, I <sub>B1</sub> = -I <sub>B2</sub> = 2.0 mA, V <sub>CC</sub> ≐ 50 V Refer to the test circuit.		1.0		μs
Storage time	t <sub>stg</sub>			3.5		μs
Fall time	t <sub>f</sub>			1.2		μs

**Note** Pulse test PW ≤ 350 μs, duty cycle ≤ 2%

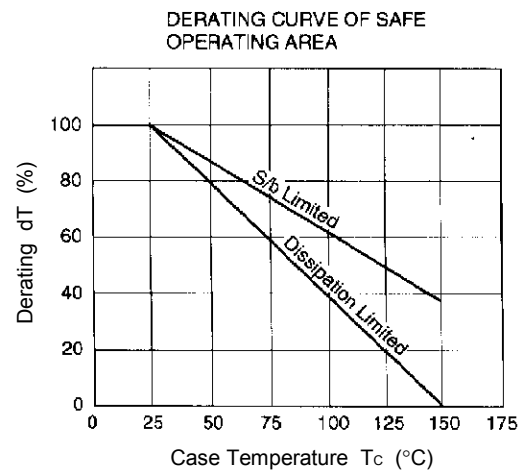
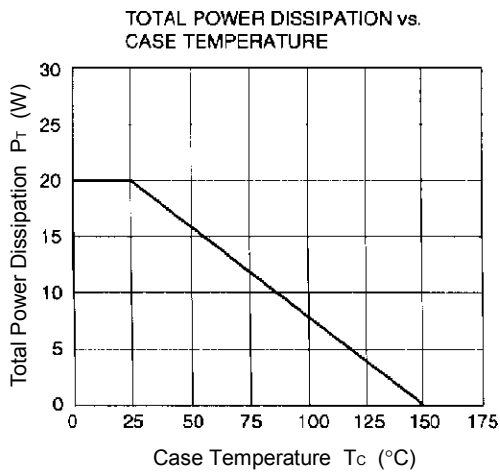
**h<sub>FE</sub> CLASSIFICATION**

Marking	M	L	K
h <sub>FE1</sub>	2,000 to 5,000	4,000 to 10,000	8,000 to 20,000

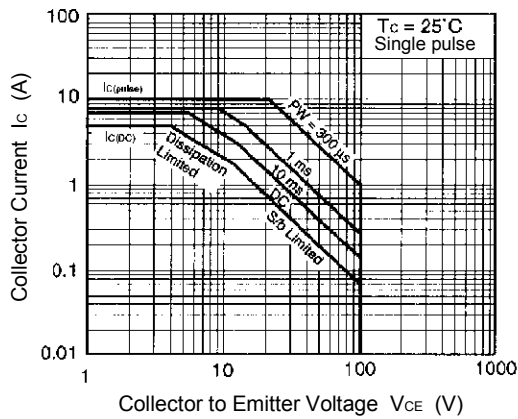
**SWITCHING TIME (t<sub>on</sub>, t<sub>stg</sub>, t<sub>f</sub>) TEST CIRCUIT**



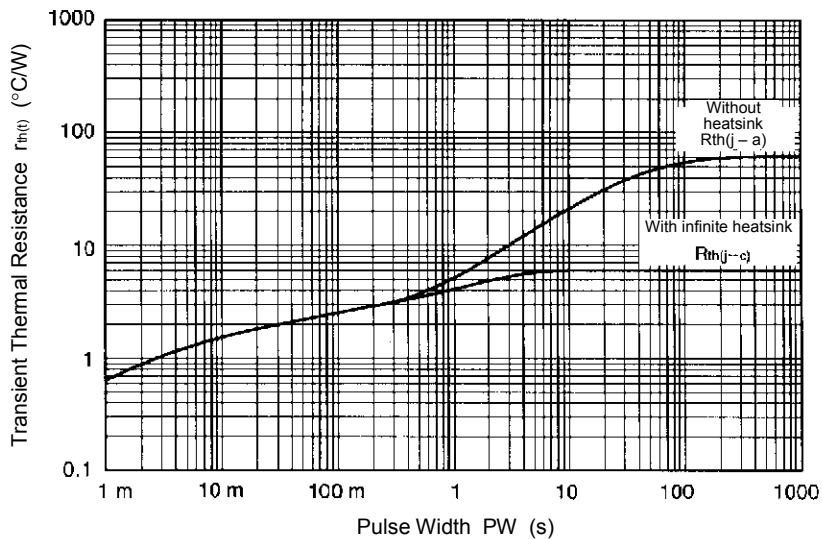
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



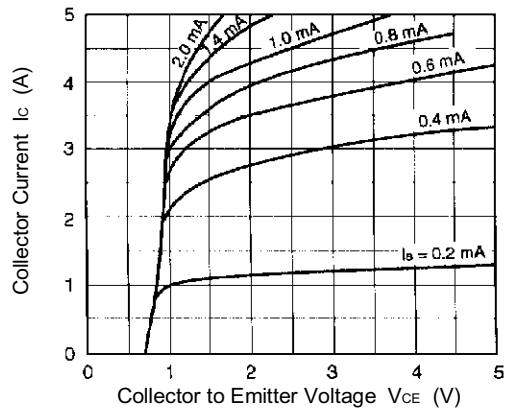
FORWARD BIAS SAFE OPERATING AREA



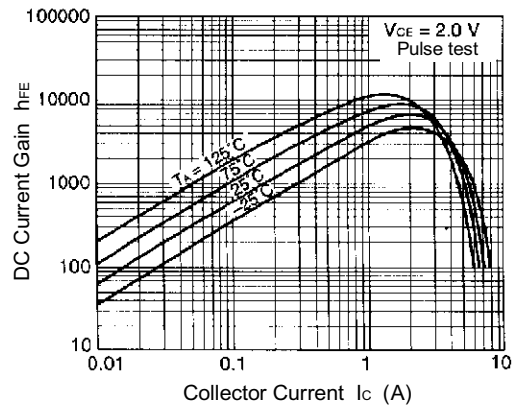
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



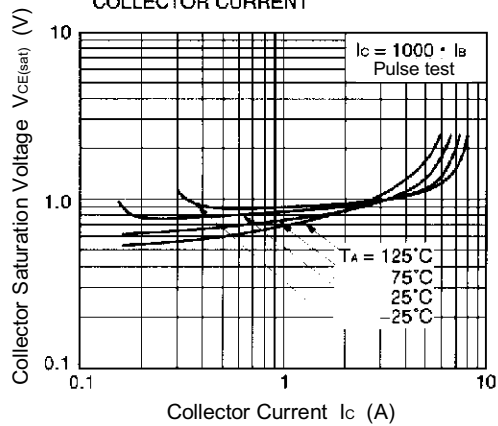
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



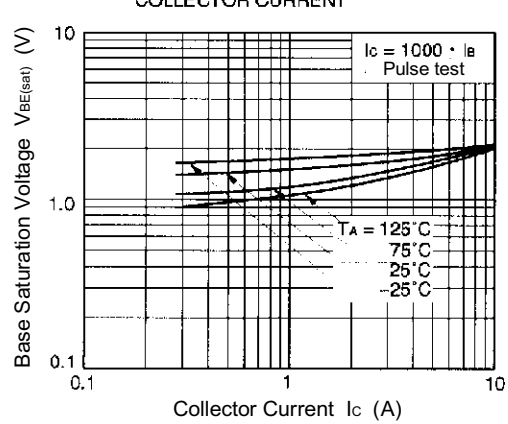
DC CURRENT GAIN vs. COLLECTOR CURRENT



COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT

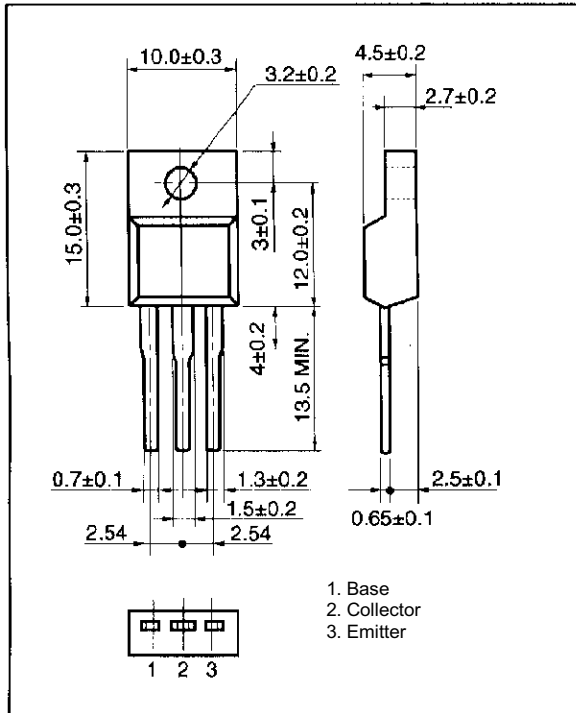


BASE SATURATION VOLTAGE vs. COLLECTOR CURRENT



PACKAGE DRAWING (UNIT: mm)

Isolated TO-220 (MP-45F)



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