

Transistor, NPN TO-3



Description:

Fast switching speeds and high current capacity ideally suit these parts for use in switching regulators, inverters, wide-band amplifiers and power oscillators in industrial and commercial applications

Features:

- High speed - $t_f = 0.5\mu\text{s}$ (Max.)
- High current - I_C (max.) = 30A
- Low saturation - V_{CE} (sat) = 2.5V (max.) at $I_C = 20\text{A}$
- Pb-free package

Maximum Ratings

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	90	V DC
Collector-Base Voltage	V_{CBO}	150	
Collector-Emitter Voltage	V_{CEV}		
Emitter-Base Voltage	V_{EBO}	7	A DC
Collector Current-Continuous	I_C	20	
-Peak (Note 2)	I_{CM}	30	
Base Current-Continuous	P_B	5	
Total Power Dissipation at $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	140 0.8	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{Stg}	-65 to +200	$^\circ\text{C}$

Thermal Characteristics

Characteristic	Symbol	Max.	Unit
Thermal Resistance Junction to Case	$R_{\theta JC}$	1.25	$^\circ\text{C}/\text{W}$

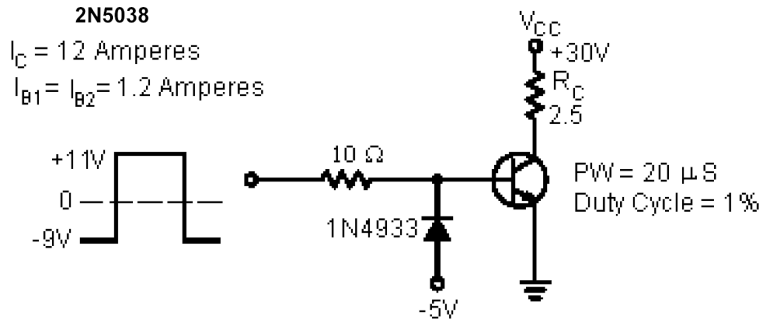
Stresses exceeding maximum ratings may damage the device. Maximum ratings are stress ratings only. Functional operation above the recommended operating conditions is not implied. Extended exposure to stresses above the recommended operating conditions may affect device reliability

1. Indicates JEDEC registered data
2. Pulse test: pulse width $\leq 10\text{ms}$, duty cycle $\leq 50\%$

Transistor, NPN TO-3



Switching Time Test Circuit



Electrical Characteristics (TC = 25°C unless otherwise noted)

Characteristic	Symbol	Min.	Max.	Unit
----------------	--------	------	------	------

Off Characteristics

Collector-Emitter Sustaining Voltage (Note 4) ($I_C = 200mA$ DC, $I_B = 0$)	$V_{CEO(sus)}$	90	-	V DC
Collector Cut off Current ($V_{CE} = 140V$ DC, $V_{BE(off)} = 1.5V$) ($V_{CE} = 100V$ DC, $V_{BE(off)} = 1.5V$ DC, $T_C = 150^\circ C$)	I_{CEX}	-	50 10	mA DC
Emitter Cut off Current ($V_{EB} = 5V$ DC, $I_C = 0$) ($V_{EB} = 7V$ DC, $I_C = 0$)	I_{EBO}	-	5 50	

On Characteristics (Note 4)

DC Current Gain ($I_C = 12A$ DC, $V_{CE} = 5V$ DC)	h_{FE}	20	100	-
Collector-Emitter Saturation Voltage ($I_C = 20A$ DC, $I_B = 5A$ DC)	$V_{CE(sat)}$	-	2.5	V DC
Base-Emitter Saturation Voltage ($I_C = 20A$ DC, $I_B = 5A$ DC)	$V_{BE(sat)}$	-	3.3	

Dynamic Characteristics

Magnitude of Common-Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio ($I_C = 2A$ DC, $V_{CE} = 10V$ DC, $f = 5MHz$)	$ h_{fe} $	12	-	-
--	------------	----	---	---

Switching Characteristics

Resistive Load					
Rise Time	$(V_{CC} = 30V$ DC) ($I_C = 12A$ DC, $I_{B1} = I_{B2} = 1.2A$ DC)	t_r	-	0.5	μs
Storage Time		t_s	-	1.5	

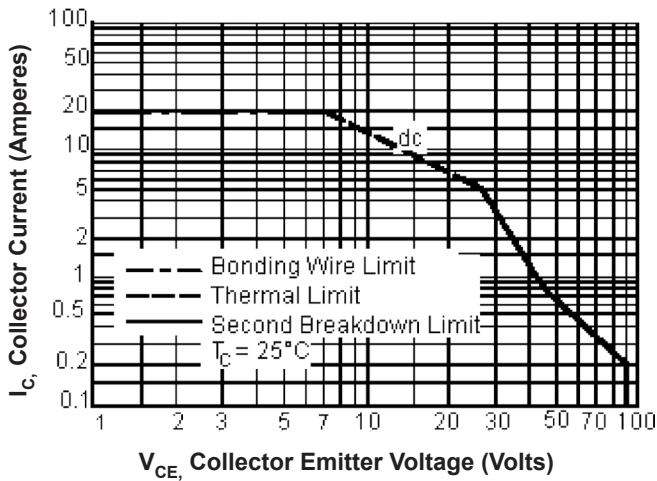
Note:

- Indicates JEDEC Registered Data.
- Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

Transistor, NPN TO-3



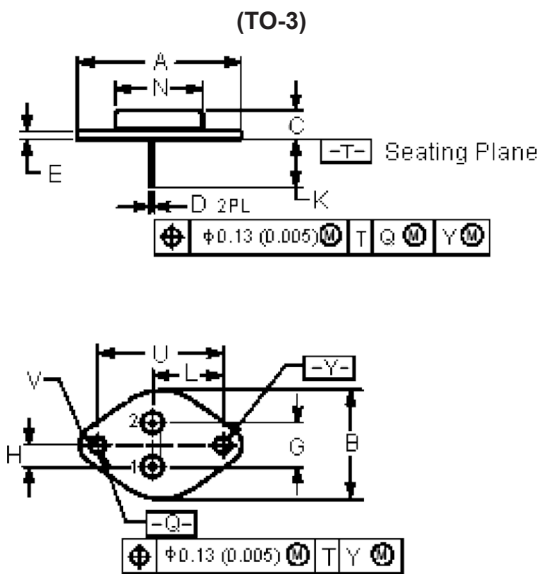
Active-Region Safe Operating Area



There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate.

Second breakdown pulse limits are valid for duty cycles to 10%. At high case temperatures, thermal limitations may reduce the power that can be handled to values less than the limitations imposed by second breakdown.

Dimensions



Dimensions	Min.	Max.
A	1.55 (39.37)	Reference
B	-	1.05 (26.67)
C	0.25 (6.35)	0.335 (8.51)
D	0.038 (0.97)	0.043 (1.09)
E	0.055 (1.4)	0.07 (1.77)
G	0.43 (10.92)	BSC
H	0.215 (5.46)	BSC
K	0.44 (11.18)	0.48 (12.19)
L	0.665 (16.89)	BSC
N	-	0.83 (21.08)
Q	0.151 (3.84)	0.165 (4.19)
U	1.187 (30.15)	BSC
V	0.131 (3.33)	0.188 (4.77)

Dimensions : Inches (Millimetres)

Pin Configuration:

- Pin 1. Base
- 2. Emitter
- Collector (Case)

Part Number Table

Description	Part Number
Transistor, NPN, TO-3	2N5038

Important Notice : This data sheet and its contents (the "Information") belong to the members of the Premier Farnell group of companies (the "Group") or are licensed to it. No licence is granted for the use of it other than for information purposes in connection with the products to which it relates. No licence of any intellectual property rights is granted. The Information is subject to change without notice and replaces all data sheets previously supplied. The Information supplied is believed to be accurate but the Group assumes no responsibility for its accuracy or completeness, any error in or omission from it or for any use made of it. Users of this data sheet should check for themselves the Information and the suitability of the products for their purpose and not make any assumptions based on information included or omitted. Liability for loss or damage resulting from any reliance on the Information or use of it (including liability resulting from negligence or where the Group was aware of the possibility of such loss or damage arising) is excluded. This will not operate to limit or restrict the Group's liability for death or personal injury resulting from its negligence. Multicomp is the registered trademark of the Group. © Premier Farnell plc 2012.

