Transistor, NPN
TO-3

Description:

High power NPN silicon power transistors.
These devices are designed for linear amplifiers, series pass regulators, and inductive switching applications.

Features:

- Forward biased second breakdown current capability
  $I_{S/b}$ = 2.5A DC at V_{CE} = 60V DC
- Pb-free packages

Maximum Ratings

Rating	Symbol	2N3772	Unit
Collector-Emitter Voltage	V_{CEO}	60	V DC
Collector-Emitter Voltage	V_{CEX}	80	
Collector-Base Voltage	V_{CB}	100	
Emitter-Base Voltage	V_{EB}	7	
Collector Current - Continuous - Peak	I_C	20 30	A DC
Base Current - Continuous - Peak	I_B	5 15	
Total Device Dissipation at T_C = 25°C Derate above 25°C	P_D	150 0.855	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	°C

Thermal Characteristics

Characteristic	Symbol	Max.	Unit
Thermal Resistance Junction to Case	R_{jc}	1.17	°C/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.

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Page <1>

16/09/19   V1.0

Transistor, NPN
TO-3

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

Characteristic	Symbol	Min.	Max.	Unit
Off Characteristics				
Collector-Emitter Sustaining Voltage (Note 2 and 3) (I_C = 0.2 A DC, I_B = 0)	$V_{EO (sus)}$	60	-	V DC
Collector-Emitter Sustaining Voltage (I_C = 0.2A DC, $V_{EB (off)}$ = 1.5 V DC, R_{BE} = 100Ω)	$V_{CEX (sus)}$	80	-	
Collector-Emitter Sustaining Voltage (I_C = 0.2A DC, R_{BE} = 100Ω)	$V_{CER (sus)}$	70	-	
Collector Cut off Current (Note 2) (V_{CE} = 50V DC, I_B = 0) (V_{CE} = 25VDC, I_B = 0)	I_{CEO}	-	10	mA DC mA DC
Collector Cut off Current (Note 2) (V_{CE} = 100V DC $V_{EB (off)}$ = 1.5V DC) (V_{CE} = 45V DC, $V_{EB (off)}$ = 1.5V DC, T_C = 150°C	I_{CEV}	-	5 10	
Collector Cut off Current (Note 2) (VCB = 100V DC, IE = 0)	I_{CBO}	-	5	
Emitter Cut off Current (Note 2) (VBE = 7V DC, IC = 0)	I_{EBO}	-	5	
On Characteristics (Note 2)				
DC Current Gain (Note 3) (I_C = 10A DC, V_{CE} = 4V DC) (I_C = 20A DC, V_{CE} = 4V DC)	h_{FE}	15 5	60 -	-
Collector-Emitter Saturation Voltage (I_C = 10A DC, I_B = 1A DC) (I_C = 20A DC, I_B = 4A DC)	$V_{CE (sat)}$	-	1.4 4	V DC
Base-Emitter on Voltage (I_C = 10A DC, V_{CE} = 4V DC) (I_C = 8A DC, V_{CE} = 4V DC)	$V_{BE (on)}$	-	2.2	
Dynamic Characteristics (Note 2)				
Current-Gain - Bandwidth Product (I_C = 1A DC, V_{CE} = 4V DC, f_{test} = 50kHz)	f_T	0.2	-	MHz
Small-Signal Current Gain (I_C = 1A DC, V_{CE} = 4V DC, f = 1kHz)	h_{fe}	40	-	-
Second Breakdown				
Second Breakdown Energy with Base Forward Biased, t = 1s (non-repetitive) (V_{CE} = 60V DC)	$I_{S/b}$	2.5	-	A DC

2. Indicates JEDEC registered data

3. Pulse Test: 300μs, Rep. Rate 60cps

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Transistor, NPN
TO-3

Power Derating

Turn-Off Time

$V_{CC} = 30V$
$I_C/I_B = 10$
$I_{B1} = I_{B2}$
$T_J = 25°C$

Capacitance

$T_J = 25°C$

DC Current Gain

$T_J = 150°C$
$V_{CE} = 4.0V$
25°C
-55°C
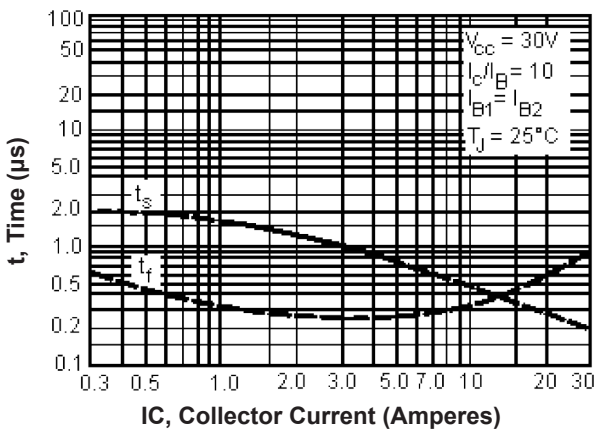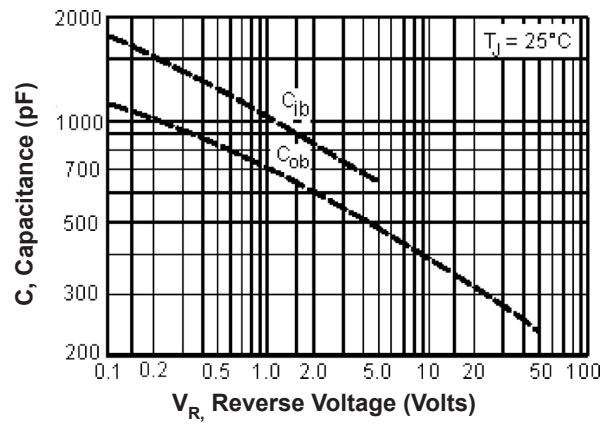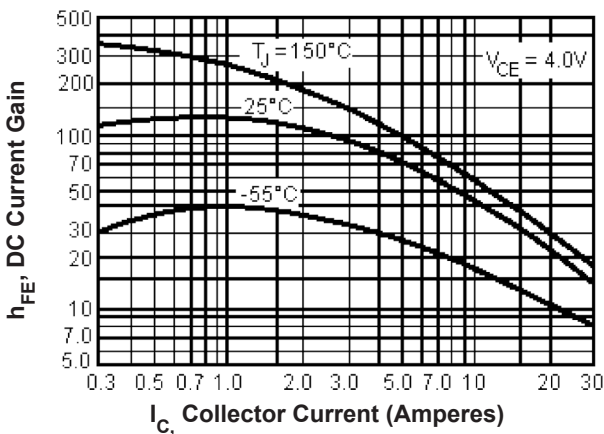
Collector Saturation Region

$T_J = 25°C$
$I_C = 2.0A$ 5.0A   10A   20A

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Page <3>   16/09/19   V1.0

Transistor, NPN
TO-3

Thermal Response

$\theta_{JC}(t) = r(t)\theta_{JC}$

$\theta_{JC} = 0.875\,°C/W$
Maximum
D Curves Apply for Power
Pulse Train Shown
Read Time at t_1
$T_{J(pk)} - T_C = P_{(pk)}\theta_{JC}(t)$

Duty Cycle, $D = t_1/t_2$

t, Time (ms)
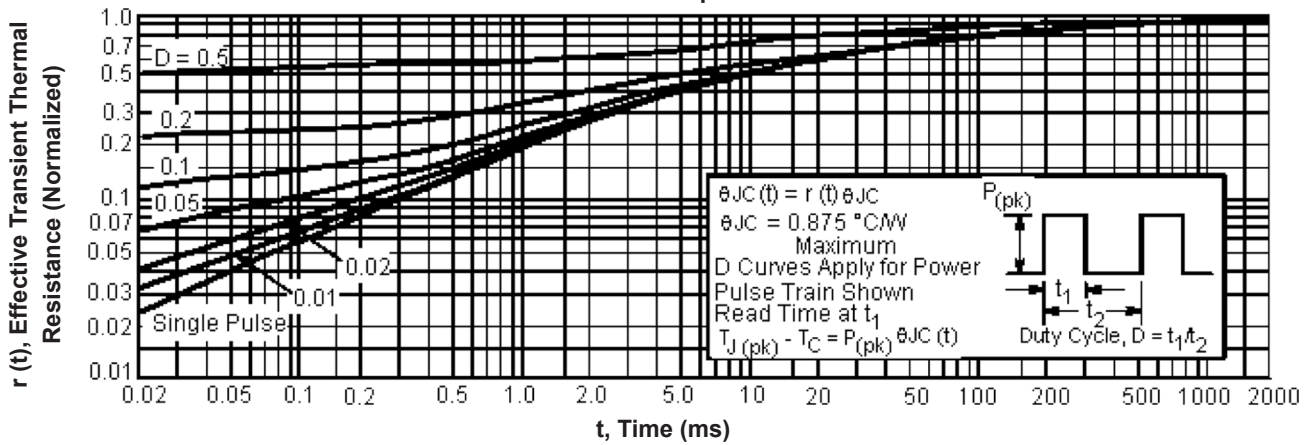
Active-Region Safe Operating Area

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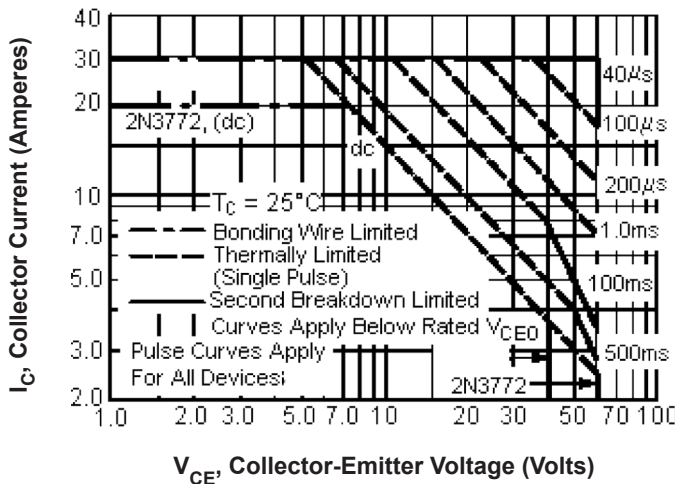
There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation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

Is based on JEDEC registered data. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 200°C$.

$T_{J(pk)}$ may be calculated from the data of using data of and the pulse power limits of Figure 3, T_J (pk) will be found to be less than $T_{J(max)}$ for pulse widths of 1ms and less. When using ON Semiconductor transistors, it is permissible to increase the
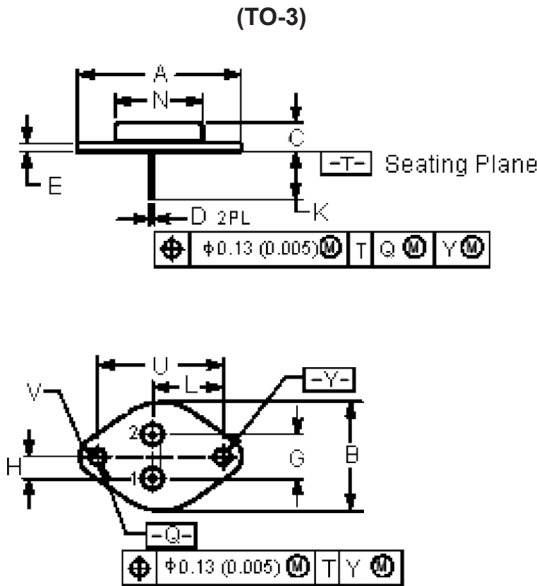
pulse power limits until limited by $T_{J(max.)}$
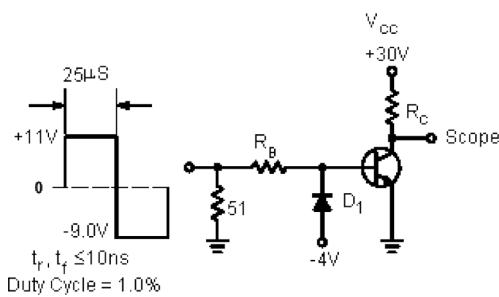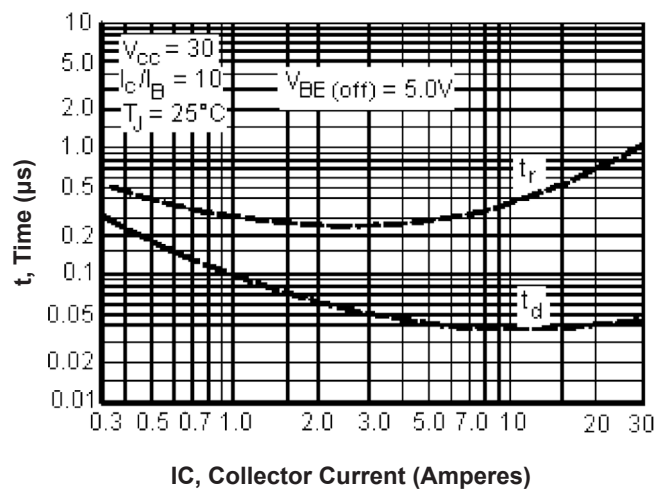
RB and RC are varied to obtain desired current levels
D1 must be fast recovery type, e.g.:
1N5825 used above IB to 100mA
MSD6100 used below IB to 100mA

Switching Time Test Circuit

Turn-On Time

IC, Collector Current (Amperes)

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Page <4>   16/09/19   V1.0

Transistor, NPN
TO-3

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Dimensions

(TO-3)

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
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16/09/19   V1.0