POWER TRANSISTORS

5A, 850V, Fast Switching, Silicon NPN Mesa

2N6542
2N6543

FEATURES

- Collector-Base Voltage: up to 850V
- Peak Collector Current: 10A
- Rise Time: $\leqslant 0.7\mu S$ } @ $I_C = 3A$
- Fall Time: $\leqslant 0.8\mu S$ }
- Key Parameters characterized at 100°C

DESCRIPTION

These high voltage glass passivated power transistors combine fast switching, low saturation voltage and rugged $E_s/_b$ capability. They are designed for use in off-line power supplies, high voltage inverters, switching regulators, ignition systems and deflection circuits.

ABSOLUTE MAXIMUM RATINGS *

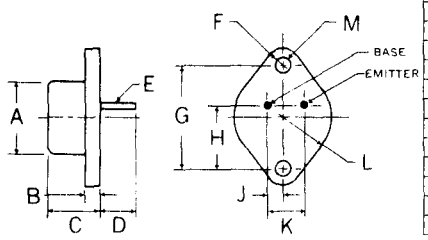
	2N6542	2N6543
Collector-Base Voltage, V_{CBO}	650V	850V
Collector-Emitter Voltage, $V_{CEO\ (SUS)}$	300V	400V
Emitter-Base Voltage, V_{EBO}	9V	9V
Collector Current, I_C, continuous	5A	5A
Collector Current, I_C peak	10A	10A
Base Current, I_B, continuous	5A	5A
Power Dissipation, 25°C Case	100W	100W
Derating Factor	.571W/°C	.571W/°C
Operating and Storage Temperature Range	—65 to 200°C	

* JEDEC registered values.

MECHANICAL SPECIFICATIONS

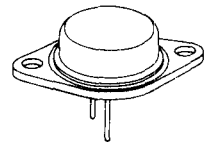
NOTE:
Leads may be soldered to within $^1/_{16}$" of base provided temperature-time exposure is less than 260°C for 10 seconds.

2N6542 2N6543



	ins.	mm.
A	.875 MAX.	22.23 MAX.
B	.135 MAX.	3.43 MAX.
C	.250-.450	6.35-11.43
D	.312 MIN.	7.92 MIN.
E	.038-.043 DIA.	0.97-1.09 DIA.
F	.188 MAX. RAD.	4.78 MAX. RAD.
G	1.177-1.197	29.90-30.40
H	.655-.675	16.64-17.15
J	.205-.225	5.21-5.72
K	.420-.440	10.67-11.18
L	.525 MAX. RAD.	13.34 MAX. RAD.
M	.151-.161 DIA.	3.84-4.09 DIA.

TO-3



ELECTRICAL SPECIFICATIONS (at 25°C unless noted)*

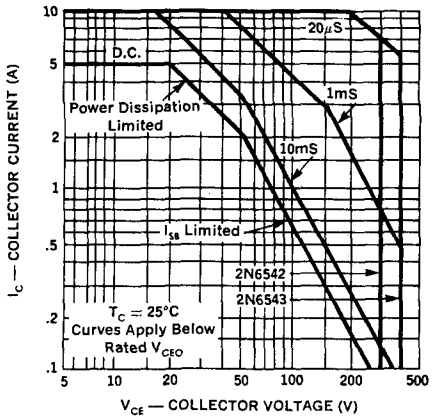
Test	Symbol	2N6542 MIN.	2N6542 MAX.	2N6543 MIN.	2N6543 MAX.	Units	Test Conditions
D.C. Current Gain (Note 1)	h_{FE}	12	60	12	60		$I_C = 1.5A, V_{CE} = 2V$
D.C. Current Gain (Note 1)	h_{FE}	7	35	7	35		$I_C = 3.0A, V_{CE} = 2V$
Collector Saturation Voltage (Note 1)	$V_{CE(sat)}$	—	1.0	—	1.0	V	$I_C = 3.0A, I_B = 0.6A$
Collector Saturation Voltage, $T_C = 100°C$ (Note 1)	$V_{CE(sat)}$	—	2.0	—	2.0	V	$I_C = 3.0A, I_B = 0.6A$
Collector Saturation Voltage (Note 1)	$V_{CE(sat)}$	—	5.0	—	5.0	V	$I_C = 5.0A, I_B = 1.0A$
Base Saturation Voltage (Note 1)	$V_{BE(sat)}$	—	1.4	—	1.4	V	$I_C = 3.0A, I_B = 0.6A$
Base Saturation Voltage, $T_C = 100°C$ (Note 1)	$V_{BE(sat)}$	—	1.4	—	1.4	V	$I_C = 3.0A, I_B = 0.6A$
Collector-Emitter Sustaining Voltage (Note 2)	$V_{CEO(sus)}$	300	—	400	—	V	$I_C = 0.1A, I_B = 0$
Collector-Emitter Sustaining Voltage $T_C = 100°C$ (Note 2)	$V_{CEX(sus)}$	350	—	450	—	V	$L = 180\mu H, I_C = 2.6A$ $V_{BE} = -5V$ V_{CE} clamped to rated $V_{CEX(sus)}$
Collector-Emitter Sustaining Voltage $T_C = 100°C$ (Note 2)	$V_{CEX(sus)}$	200	—	300	—	V	$L = 180\mu H, I_C = 5A$ $V_{BE(off)} = -5V$ V_{CE} clamp to $V_{CEO} -100V$
Emitter-Base Cutoff Current	I_{EBO}	—	1	—	1	mA	$V_{EB} = 9V$
Collector Cutoff Current	I_{CEV}	— —	0.5 —	— —	— 0.5	mA	$V_{CE} = 650V, V_{BE} = -1.5V$ $V_{CE} = 850V, V_{BE} = -1.5V$
Collector Cutoff Current, $T_C = 100°C$	I_{CEV}	— —	2.5 —	— —	— 2.5	mA	$V_{CE} = 650V, V_{BE} = -1.5V$ $V_{CE} = 850V, V_{BE} = -1.5V$
Collector Cutoff Current, $T_C = 100°C$	I_{CER}	— —	3.0 —	— —	— 3.0	mA	$V_{CE} = 650V, R = 50\Omega$ $V_{CE} = 850V, R = 50\Omega$
Output Capacitance, Common Base	C_{obo}	50	150	50	150	pF	$V_{CB} = 10V, f = 1$ MHz
Gain-Bandwidth Product	F_T	6	24	6	24	MHz	$V_{CE} = 10V, I_C = 0.2A, f = 1$ MHz
Forward Bias Second Breakdown	$I_{s/b}$	200	—	200	—	mA	P.W. = 1 sec. single shot $V_{CE} = 100V$
Energy Second Breakdown (unclamped)	$E_{s/b}$	180	—	180	—	μJ	$I_C = 3.0A$ $L = 40\mu H, V_{BE(off)} = 4.0$ Vdc
Resistive Switching Speeds Delay Time Rise Time Storage Time Fall Time	 t_d t_r t_s t_f	 — — — —	 0.05 0.7 4.0 0.8	 — — — —	 0.05 0.7 4.0 0.8	μS	$I_C = 3.0A, t_p = 100\mu$sec $V_{CC} = 250V$ $I_{B1} = I_{B2} = 0.6A$ $V_{BE(off)} = 5V$
Inductive Switching Speeds $T_C = 100°C$ Storage Time Fall Time	 t_f t_s	 — —	 4.0 0.8	 — —	 4.0 0.8	μS	$I_C = 3.0A$ $I_B = 0.6A, V_{BE(off)} = 5.0$ Vdc $V_{BE(off)} = 5V$ V_{CE} clamp = rated $V_{CEX(sus)}$
Thermal Resistance, Junction-to-Case	$R_{\Theta JC}$	—	1.75	—	1.75	°C/W	

Notes:
1. Pulse width = 250μS; duty cycle ≤1%.
2. Sustaining Voltage. Measured at a high current point where collector-emitter voltage is lowest. Current pulse length ≅ 50μS; duty cycle ≤ 1%. Voltage clamped at maximum collector-emitter voltage.

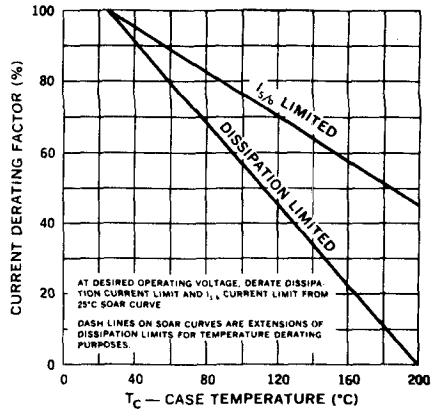
* JEDEC registered values.

IV

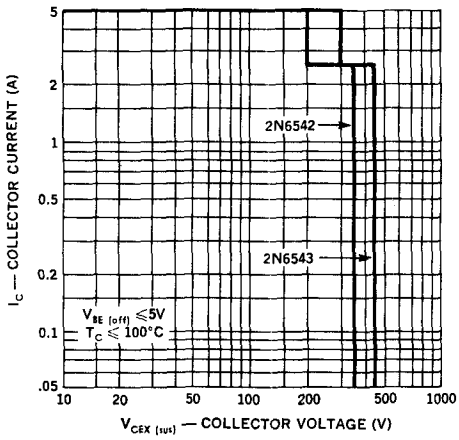
Forward Bias Safe Operating Area



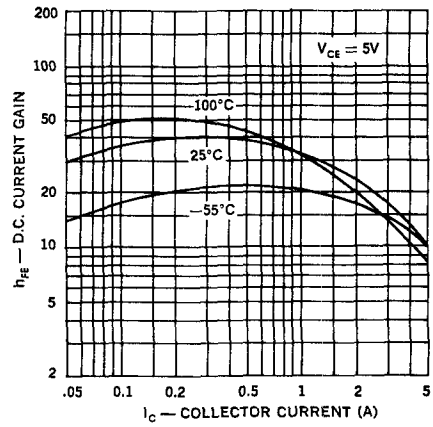
Power Derating



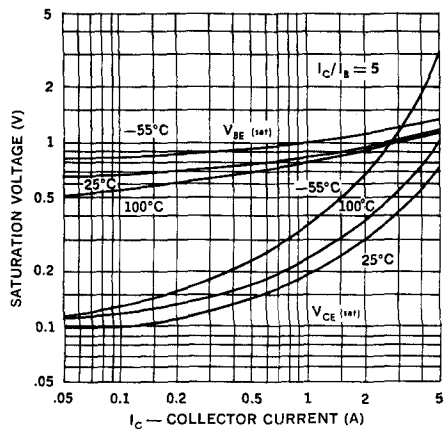
Reverse Biased Safe Operating Area



D.C. Current Gain



Saturation Voltages



Typical Inductive Load Switching Performance

I_C Amps	T_J °C	t_s μS	t_{fv} nS	t_{fi} nS
3.0	25	.45	70	10
	100	.575	100	20
5.0	25	.475	25	4
	100	.60	45	10
8.0	25	.525	20	10
	100	.625	45	15

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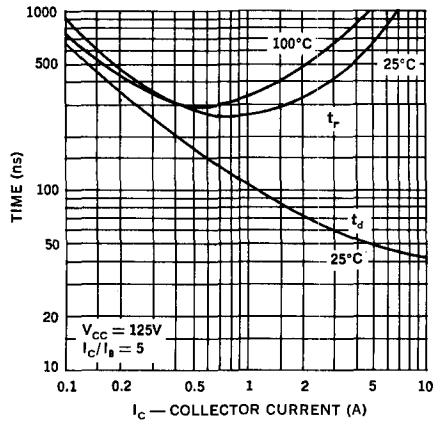
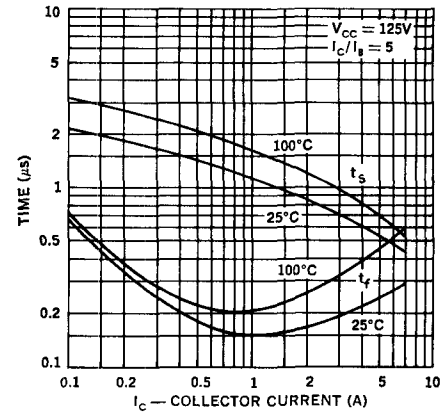
Resistive Turn-On Time

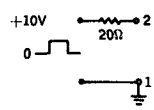
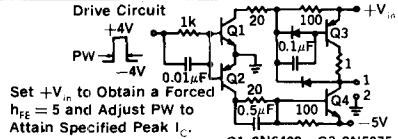
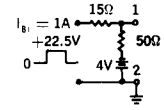
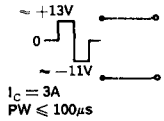
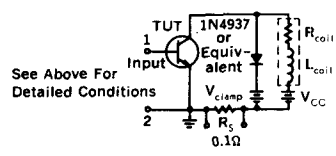
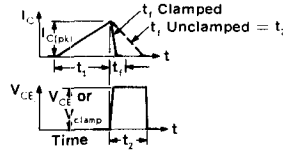


Resistive Turn-Off Time



IV

TEST CONDITIONS FOR DYNAMIC PERFORMANCE

	$V_{CEO(SUS)}$	$V_{CEX\ (SUS)}$ AND INDUCTIVE SWITCHING	$E_{S/b}$	RESISTIVE SWITCHING
INPUT CONDITIONS	 PW Varied to Attain I_C = 100mA	 Set +V_{in} to Obtain a Forced h_{FE} = 5 and Adjust PW to Attain Specified Peak I_C. Duty Cycle ≤ 3% f = 1kHz Q1 2N6408 Q3 2N5875 Q2 2N6406 Q4 2N5877 Diodes 1N4933	 PW Varied to Attain I_C	 I_C = 3A PW ≤ 100μs t_r ≤ 5ns t_f ≤ 50ns Duty Cycle ≤ 2%
CIRCUIT VALUES	L_{coil} = 80mH V_{CC} = 10V R_{coil} = 0.7Ω V_{clamp} (Unclamped)	L_{coil} = 180μH R_{coil} = 0.05Ω V_{CC} = 20V f_o = 500kHz V_{clamp} = Rated V_{CEX} Value	L_{coil} = 40μH V_{CC} = 10V R_{coil} = 0.2Ω V_{clamp} (Unclamped)	V_{CC} = 250V R_L = 83Ω D1 = 1N5820 or Equiv. R_B = 20Ω
TEST CIRCUITS	INDUCTIVE TEST CIRCUIT  See Above For Detailed Conditions	OUTPUT WAVEFORMS 	t_1 Adjusted to Obtain I_C $t_1 \approx \frac{L_{coil}\ (I_{Cpk})}{V_{CC}}$ $t_2 \approx \frac{L_{coil}\ (I_{Cpk})}{V_{clamp}}$ Test Equipment Tektronix Scope 475 or Equivalent	RESISTIVE TEST CIRCUIT