2N5527 2N5531

NPN SILICON POWER TRANSISTORS
RADIATION RESISTANT

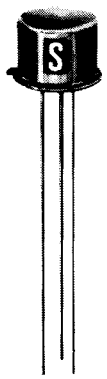
5 AMPERES

FEATURES

MEDIUM POWER
RADIATION EXPOSURE LEVEL TO 5×10^{14} nvt
TOTAL NEUTRON FLUX GREATER THAN 10 KEV

APPLICATIONS

POWER AMPLIFIER
RADIATION ENVIRONMENTS
ULTRA HIGH FREQUENCY



TO-5

ABSOLUTE MAXIMUM RATINGS

		2N5527	2N5531
V_{CBO}	COLLECTOR-BASE VOLTAGE	60 V	90 V
V_{CEO}	COLLECTOR-EMITTER VOLTAGE	40 V	75 V
V_{EBO}	EMITTER-BASE VOLTAGE	3 V	3 V
I_C	CONTINUOUS COLLECTOR CURRENT	5 A	5 A
I_B	CONTINUOUS BASE CURRENT	1 A	1 A
T_J	OPERATING JUNCTION TEMPERATURE	−65°C to +200°C	
T_{stg}	STORAGE TEMPERATURE	−65°C to +200°C	
$R_{\theta JC}$	THERMAL RESISTANCE, JUNCTION TO CASE	35°C/W	
P_D	POWER DISSIPATION (25°C)	5 W	

8-83-2R

ELECTRICAL CHARACTERISTICS (T_C = 25°C UNLESS OTHERWISE NOTED)

CHARACTERISTICS		SYMBOL	MIN.	MAX.	UNITS
COLLECTOR EMITTER SUSTAINING VOLTAGE[1]		$V_{CEO(sus)}$			
(I_C = 50 mA)	2N5527		40		V
	2N5531		75		V
(I_C = 50 mA, NOTE 2)	2N5527		40		V
	2N5531		75		V
COLLECTOR-CUTOFF CURRENT		I_{CEX}			
(V_{CE} = 30V, V_{BE} = 0, T_C = 100°C)				1.0	mA
COLLECTOR-CUTOFF CURRENT		I_{CBO}			
(V_{CB} = RATED)				1.0	mA
(V_{CB} = RATED, NOTE 2)				1.0	mA
COLLECTOR-CUTOFF CURRENT		I_{CBO}			
(V_{CB} = 30V)				0.1	mA
(V_{CB} = 30V, NOTE 2)				1.0	mA
COLLECTOR-CUTOFF CURRENT		I_{CEO}			
(V_{CE} = RATED)				50	mA
EMITTER CUTOFF CURRENT		I_{EBO}			
(V_{EB} = 3.0V)				1.0	mA
(V_{EB} = 3.0V, NOTE 2)				1.0	mA
EMITTER FLOATING POTENTIAL		V_{EBF}			
(V_{CB} = RATED, I_E = 0)				1.0	V
DC CURRENT GAIN[1]		h_{FE}			
(V_{CE} 5.0V, I_C = 0.5A)	2N5527		40	300	
(V_{CE} 5.0V, I_C = 0.5A)	2N5531		25	300	
(V_{CE} 5.0V, I_C = 3.0A)	2N5527		40	200	
(V_{CE} 5.0V, I_C = 3.0A)	2N5531		30	150	
(V_{CE} 5.0V, I_C = 5.0A)	2N5527		25		
(V_{CE} 5.0V, I_C = 5.0A)	2N5531		20		
(V_{CE} 5.0V, I_C = 3.0A NOTE 2)	2N5527		15		
(V_{CE} 5.0V, I_C = 3.0A NOTE 2)	2N5531		7.0		
COLLECTOR-EMITTER SATURATION VOLTAGE[1]		$V_{CE(sat)}$			
(I_C = 3.0A, I_B = 0.3A)	2N5527			1.25	V
(I_C = 3.0A, I_B = 0.5A)	2N5531			1.25	V
(I_C = 5.0A, I_B = 0.2A)	2N5527			5.0	V
(I_C = 5.0A, I_B = 0.25A)	2N5531			5.0	V
(I_C = 3.0A, I_B = 0.3A, NOTE 2)	2N5527			2.0	V
(I_C = 3.0A, I_B = 0.5A, NOTE 2)	2N5531			3.0	V
BASE-EMITTER SATURATION VOLTAGE[1]		$V_{BE(sat)}$			
(I_C = 3.0A, I_B = 0.3A)	2N5527			1.5	V
(I_C = 3.0A, I_B = 0.5A)	2N5531			1.5	V
BASE-EMITTER VOLTAGE		V_{BE}			
(V_{CE} = 5.0V, I_C = 3.0A)				1.5	V
MAGNITUDE OF SMALL SIGNAL GAIN		$[h_{fe}]$			
(V_{CE} = 28V, I_C = 0.5A, f = 25 MHz)			8.0		
SMALL SIGNAL GAIN		h_{fe}			
(V_{CB} = 5.0V, I_C = 0.5A, f = 1.0 KHz)	2N5527		20		
	2N5531		15		
OUTPUT CAPACITANCE		C_{obo}			
(V_{CB} = 30V, f = 1.0 MHz)				75	pF
PROMPT PRIMARY PHOTO CURRENT ($\dot{\gamma}$ = 1×10^9 R/sec, $\epsilon \geq$ 1.0 MeV, V_{CB} = 10V)		I_{ppc}		500	mA(PK)

Note 1: Pulsed 300 μsec, 1.8 Duty Cycle

Note 2: After exposure, 1×10^{14} nvt, FLUX $\geq$ 10 KEV

SAFE OPERATING AREA (SOAR) CONTINUOUS DC OPERATION

SOAR VALUES

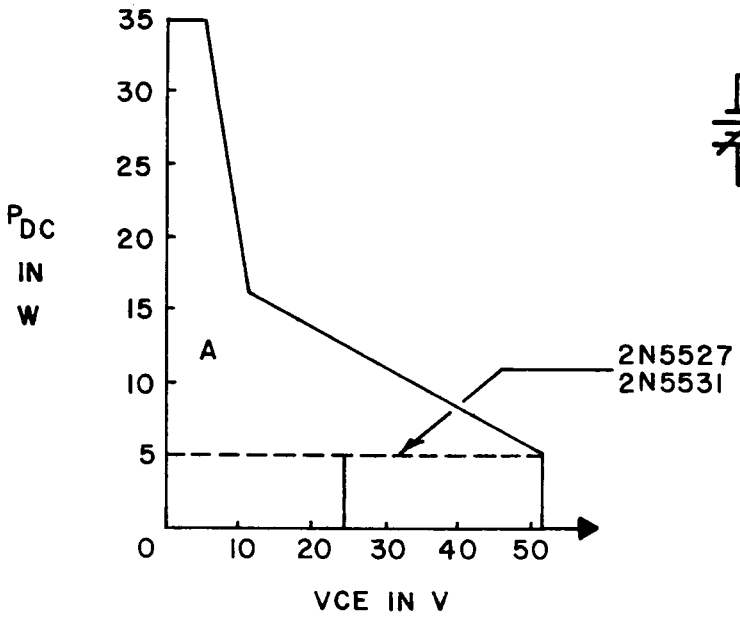
TYPE NUMBER	V1 V	V2 V
2N5527	30	60
2N5531	65	90

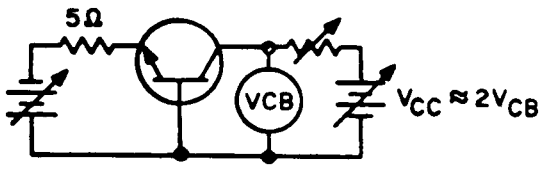
Conditions: 1. $T_J = T_{CASE} + \Theta_{J-C}$ PDC $\leq$ 200°C

2. PDC = PDC max rating for specified transistor type

3. PDC = PDC = f (V_{CE}) Area A

4. V_{CE} = 0.8V1 rating for specified transistor type



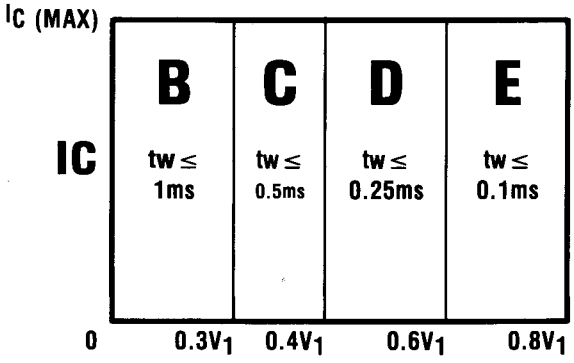


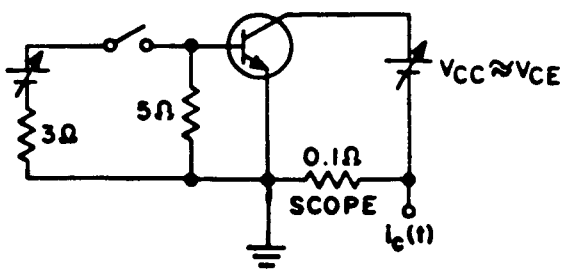
PULSED OPERATION

Conditions: 1. $T_J = T_{CASE} + \Theta_{J-C}$ Pavg $\leq$ 200°C

2. Pavg = $\frac{1}{2ms} \int_0^{2ms}$ ic vce dt $\leq$ the allowed DC power dissipation for a V_{CE} equal to the highest v_{ce} applied to the transistor

3. Operation in the active region should be limited to a maximum pulse width of tw = 1 ms for Area B, tw = 0.5 ms for Area C, tw = 0.25 ms for Area D, and tw = 0.10 ms for Area E. tr$\leq$ 20 μs and tf $\leq$ 20μs for Areas B-E.



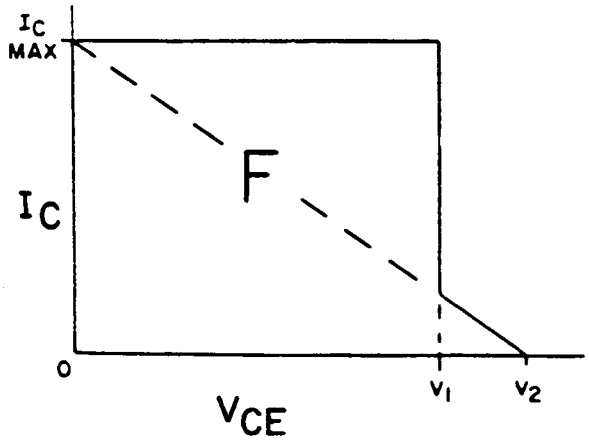


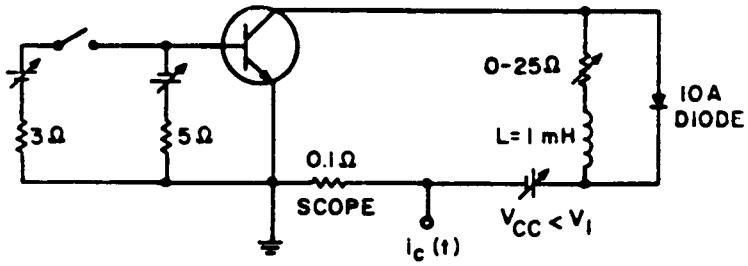
RESISTIVE AND CLAMPED INDUCTIVE SWITCHING

(Switching from saturation to cutoff)

Conditions:

1. $T_J = T_C + \Theta_{J\text{-}C}$ Pavg $\leq$ 200°C
2. Pavg $= \frac{1}{2ms} \int_0^{2ms}$ ic vce dt $\leq$ PDC max.
3. For the resistive loadline, L = 0 and V_{CC} = V2
4. tr $\leq$ 2μs, tf $\leq$ 2 μs in Area F



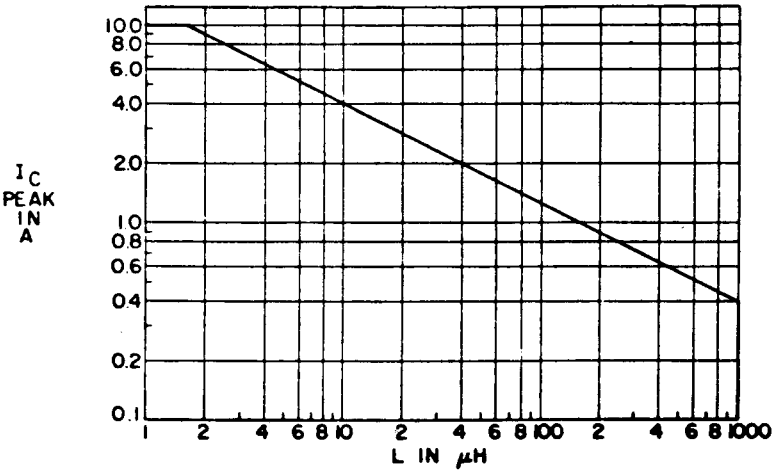


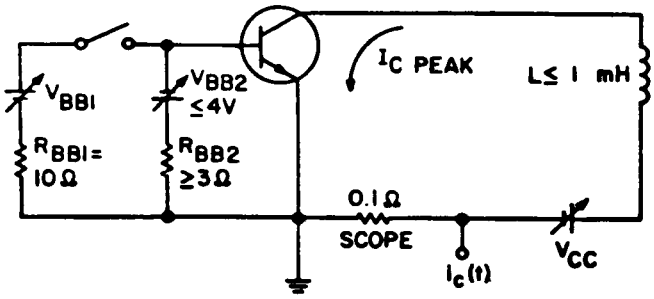
UNCLAMPED SWITCHING

(Switching from saturation to cutoff)

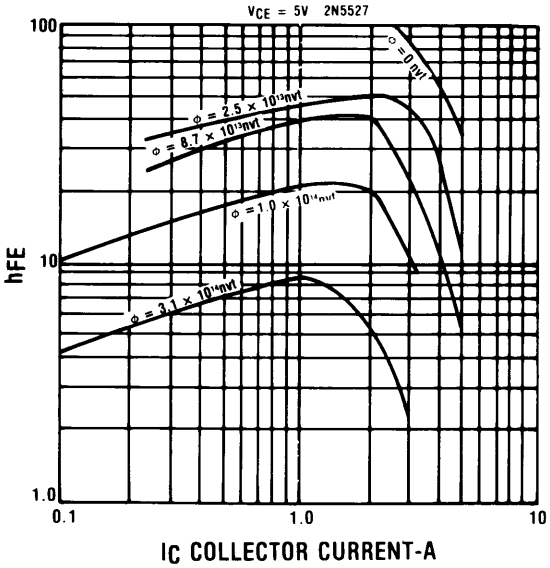
Conditions:

1. $T_J = T_C + \Theta_{J\text{-}C}$ Pavg $\leq$ 200°C
2. Pavg $= \frac{1}{2ms} \int_0^{2ms}$ ic vce dt $\leq$ PDC max.
3. I_C peak $\leq$ I_C max rating for specified transistor type
4. ½ $LIC^2 \leq 80\mu Ws$

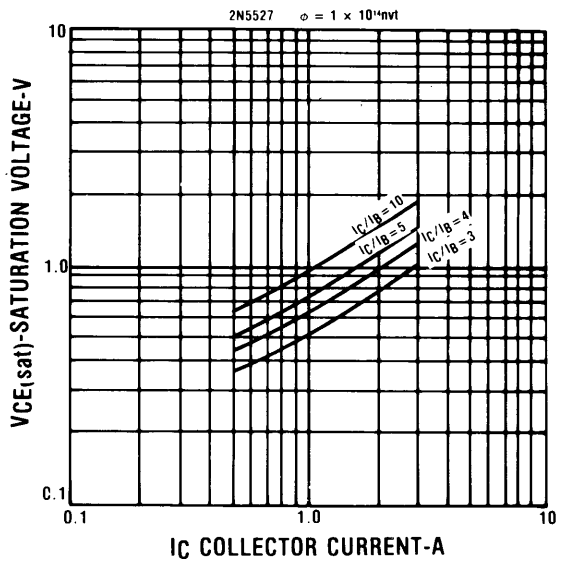




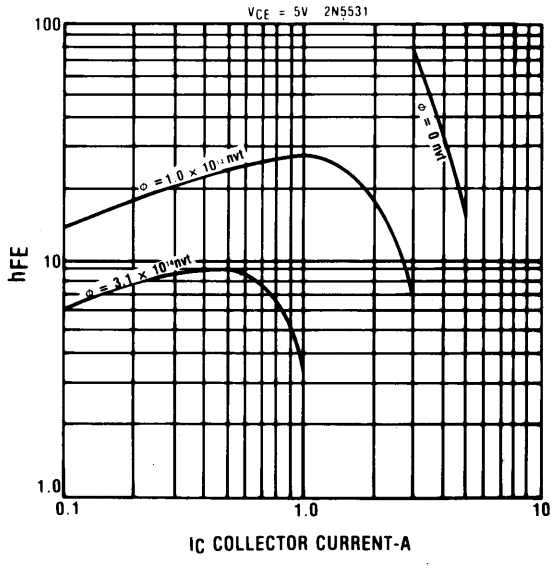
TYPICAL STATIC FORWARD CURRENT TRANSFER RATIO



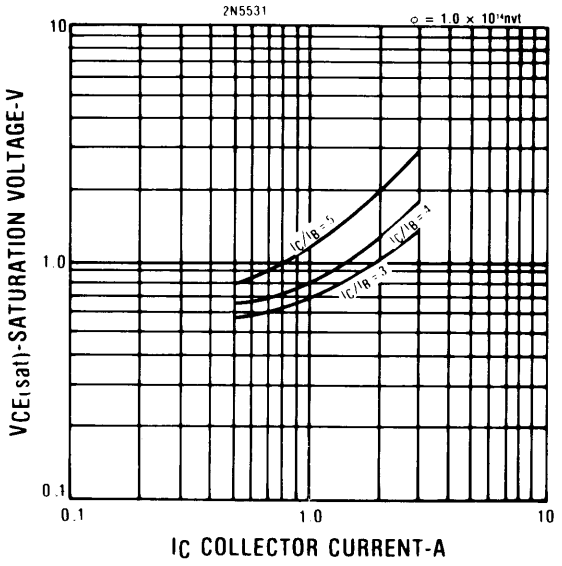
TYPICAL COLLECTOR-EMITTER SATURATION VOLTAGE



TYPICAL STATIC FORWARD CURRENT TRANSFER RATIO



TYPICAL COLLECTOR-EMITTER SATURATION VOLTAGE



NPN SILICON POWER TRANSISTORS

RADIATION RESISTANT

10 AMPERES

FEATURES

HIGH POWER
RADIATION EXPOSURE LEVEL TO 5×10^{14} nvt
TOTAL NEUTRON FLUX GREATER THAN 10 KEV

APPLICATIONS

POWER AMPLIFIER
RADIATION ENVIRONMENTS
ULTRA HIGH FREQUENCY

TO-*61

*All leads isolated from case

ABSOLUTE MAXIMUM RATINGS

		2N5529 2N5530*	2N5533 2N5534*
V_{CBO}	COLLECTOR-BASE VOLTAGE	60 V	90 V
V_{CEO}	COLLECTOR-EMITTER VOLTAGE	40 V	75 V
V_{EBO}	EMITTER-BASE VOLTAGE	3 V	3 V
I_C	CONTINUOUS COLLECTOR CURRENT	10 A	10 A
I_B	CONTINUOUS BASE CURRENT	4 A	4 A
T_J	OPERATING JUNCTION TEMPERATURE	−65°C to +200°C	
T_{stg}	STORAGE TEMPERATURE	−65°C to +200°C	
$R_{\theta JC}$	THERMAL RESISTANCE, JUNCTION TO CASE	5°C/W	
P_D	POWER DISSIPATION (25°C)	35 W	

8-83-2R

2N5529 2N5530 2N5533 2N5534

ELECTRICAL CHARACTERISTICS (T_C = 25°C UNLESS OTHERWISE NOTED)

CHARACTERISTICS		SYMBOL	MIN.	MAX.	UNITS
COLLECTOR EMITTER SUSTAINING VOLTAGE[1]		$V_{CEO(sus)}$			
(I_C = 50 mA)	2N5529, 2N5530		40		V
	2N5533, 2N5534		75		V
(I_C = 50 mA, NOTE 2)	2N5529, 2N5530		40		V
	2N5533,2N5534		75		V
COLLECTOR-CUTOFF CURRENT		I_{CEX}			
(V_{CE} = 30V, V_{BE} = 0, T_C = 100°C)				1.0	mA
COLLECTOR-CUTOFF CURRENT		I_{CBO}			
(V_{CB} = RATED)				1.0	mA
(V_{CB} = RATED, NOTE 2)				1.0	mA
COLLECTOR-CUTOFF CURRENT		I_{CBO}			
(V_{CB} = 30V)				0.1	mA
(V_{CB} = 30V, NOTE 2)				1.0	mA
COLLECTOR-CUTOFF CURRENT		I_{CEO}			
(V_{CE} = RATED)				50	mA
EMITTER CUTOFF CURRENT		I_{EBO}			
(V_{EB} = 3.0V)				1.0	mA
(V_{EB} = 3.0V, NOTE 2)				1.0	mA
EMITTER FLOATING POTENTIAL		V_{EBF}			
(V_{CB} = RATED, I_E = 0)				1.0	V
DC CURRENT GAIN[1]		h_{FE}			
(V_{CE} 5.0V, I_C = 0.5A)	2N5529, 2N5530		40	300	
(V_{CE} 5.0V, I_C = 0.5A)	2N5533. 2N5534		25	300	
(V_{CE} 5.0V, I_C = 3.0A)	2N5529, 2N5530		40	200	
(V_{CE} 5.0V, I_C = 3.0A)	2N5533, 2N5534		30	150	
(V_{CE} 5.0V, I_C = 5.0A)	2N5529, 2N5530		25		
(V_{CE} 5.0V, I_C = 5.0A)	2N5533, 2N5534		20		
(V_{CE} 2.0V, I_C = 10A)			2.5		
(V_{CE} 5.0V, I_C = 3.0A NOTE 2)	2N5529, 2N5530		15		
(V_{CE} 5.0V, I_C = 3.0A NOTE 2)	2N5533, 2N5534		7.0		
COLLECTOR-EMITTER SATURATION VOLTAGE[1]		$V_{CE(sat)}$			
(I_C = 3.0A, I_B = 0.3A)	2N5529, 2N5530			1.25	V
(I_C = 0.5A, I_B = 4.0A)	2N5533, 2N5534			1.25	V
(I_C = 10A, I_B = 4.0A)				2.0	V
(I_C = 3.0A, I_B = 0.3A, NOTE 2)	2N5529, 2N5530			2.0	V
(I_C = 3.0A, I_B = 0.5A, NOTE 2)	2N5533, 2N5534			3.0	V
BASE-EMITTER SATURATION VOLTAGE[1]		$V_{BE(sat)}$			
(I_C = 3.0A, I_B = 0.3A)	2N5529, 2N5530			1.5	V
(I_C = 3.0A, I_B = 0.5A)	2N5533, 2N5534			1.5	V
BASE-EMITTER VOLTAGE		V_{BE}			
(V_{CE} = 5.0V, I_C = 3.0A)				1.5	V
(V_{CE} = 5.0V, I_C = 5.0A)				3.0	V
MAGNITUDE OF SMALL SIGNAL GAIN		$[h_{fe}]$			
(V_{CE} = 28V, I_C = 0.5A, f = 25 MHz)			8.0		
SMALL SIGNAL GAIN		h_{fe}			
(V_{CE} = 5.0V, I_C = 3.0A, f = 1.0 KHz)	2N5529, 2N5530		20		
	2N5533, 2N5534		15		
OUTPUT CAPACITANCE		C_{obo}			
(V_{CB} = 30V, f = 1.0 MHz)				75	pF

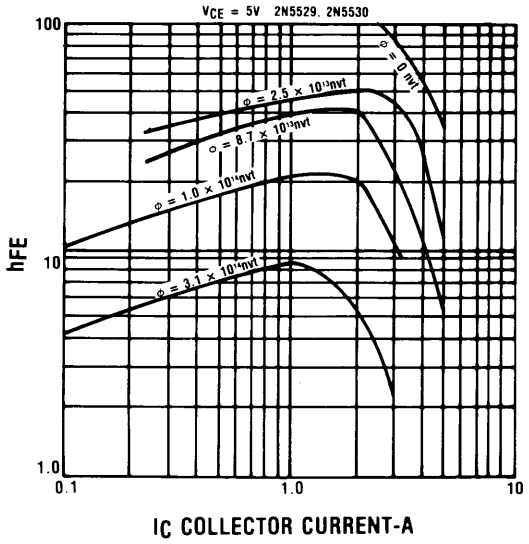
Note 1: Pulsed 300 μsec, 1.8% Duty Cycle

Note 2: After exposure 1×10^{14} nvt, FLUX ≥ 10 KEV

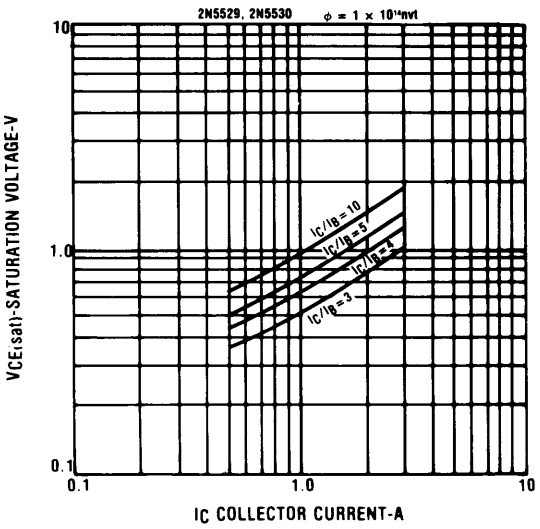
ELECTRICAL CHARACTERISTICS (T_C = 25°C UNLESS OTHERWISE NOTED)

CHARACTERISTICS	SYMBOL	MIN.	MAX.	UNITS
PROMPT PRIMARY PHOTOCURRENT ($\dot{\gamma}$ = 1×10^9 R/sec, $\in \geq$ 1Mev, V_{CB} = 10V)	I_{ppc}		500	mA(PK)

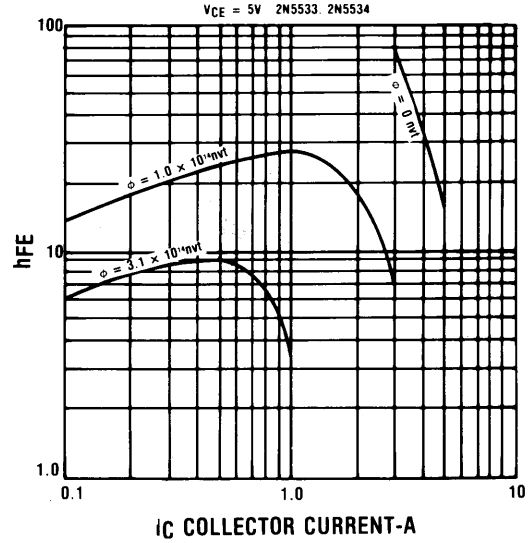
TYPICAL STATIC FORWARD CURRENT TRANSFER RATIO



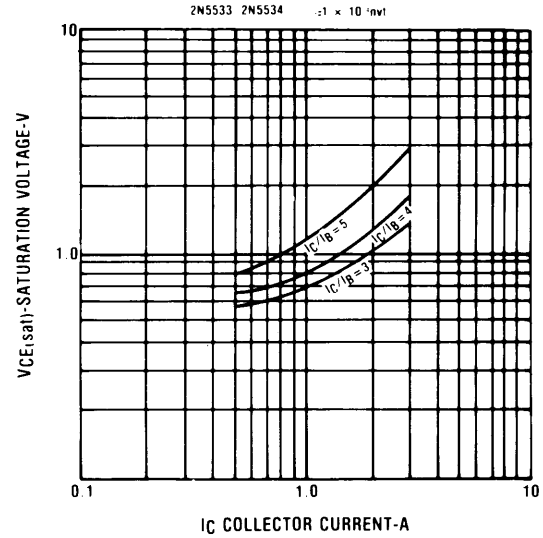
TYPICAL COLLECTOR-EMITTER SATURATION VOLTAGE



TYPICAL STATIC FORWARD CURRENT TRANSFER RATIO



TYPICAL COLLECTOR-EMITTER SATURATION VOLTAGE



2N5529 2N5530 2N5533 2N5534

SAFE OPERATING AREA (SOAR) INFORMATION

The Safe Operating ARea (SOAR) principle is a method of specifying the exact transistor to use in an amplifier, switching or DC application. SOAR defines the region which encloses all of the points representing simultaneous values of the collector current and the collector-to -emitter voltage which a transistor can safely handle under specified conditions for base current, time, junction temperature and average power dissipation. With transistors specified under the Solitron SOAR technique, secondary breakdown is virtually eliminated.

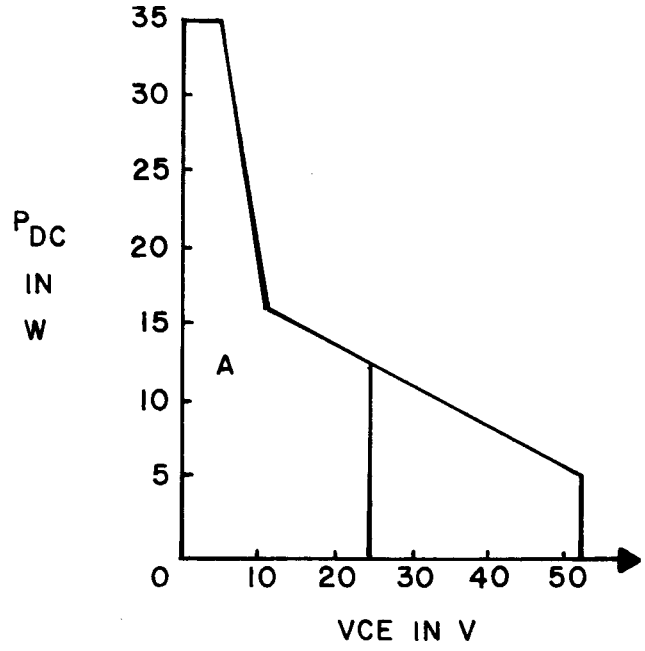
The suggested test circuits are shown for each type of SOAR operation. Any other thermally stable circuit may also be used as long as the SOAR conditions and maximum ratings are observed.

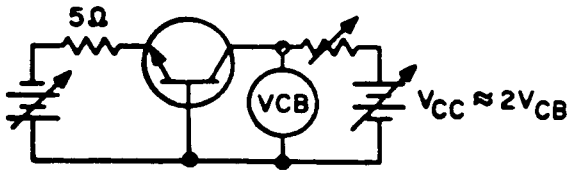
SOAR VALUES

TYPE NUMBER	V1 V	V2 V
2N5530	30	60
2N5534	65	90

CONTINUOUS DC OPERATION

Conditions: 1. $T_J = T_{CASE} + \Theta_{J-C}$ PDC $\leq$ 200°C
2. PDC $\leq$ PDC max rating for specified transistor type
3. PDC $\leq$ PDC = f (V_{CE}) Area A
4. $V_{CE} \leq$ 24V (2N5529, 2N5530)
52V (2N5533, 2N5534)

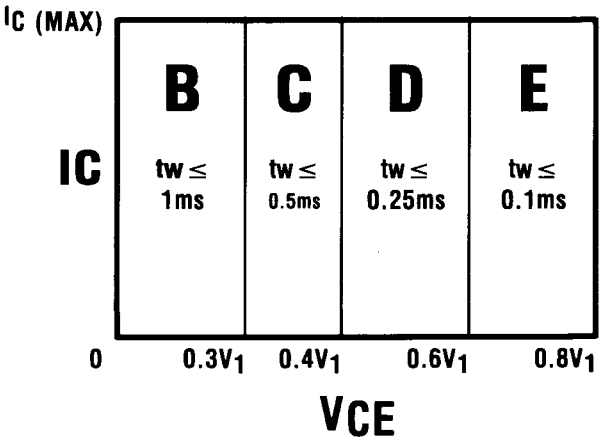


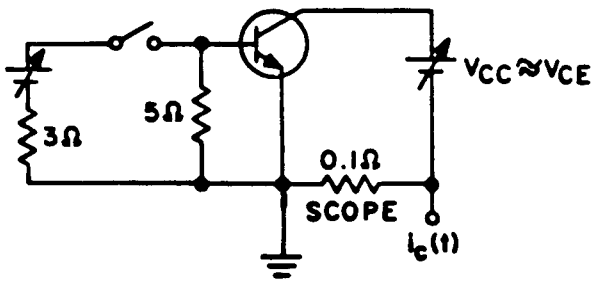


PULSED OPERATION

Conditions:

1. $T_J = T_{CASE} + \Theta_{J-C}$ Pavg $\leq$ 200°C
2. Pavg $= \frac{1}{2ms} \int_0^{2ms}$ ic vce dt $\leq$ the allowed DC power dissipation for a V_{CE} equal to the highest v_{ce} applied to the transistor
3. Operation in the active region should be limited to a maximum pulse width of tw = 1 ms for Area B, tw = 0.5 ms for Area C, tw = 0.25 ms for Area D, and tw = 0.10 ms for Area E. tr $\leq$ 20 μs and tf $\leq$ 20μs for Areas B-E.



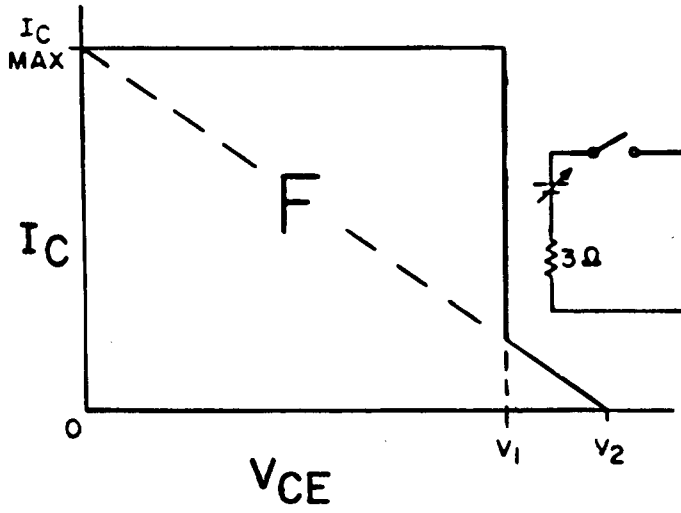


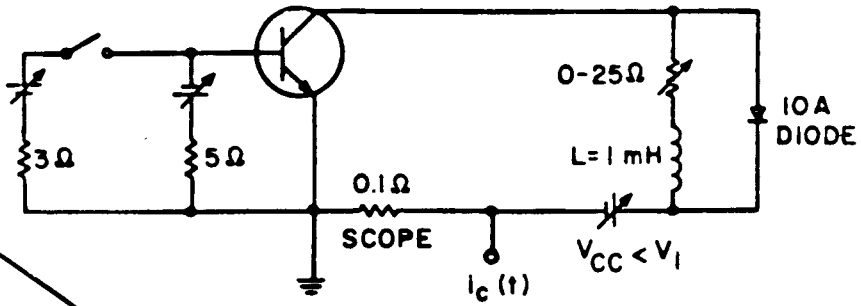
RESISTIVE AND CLAMPED INDUCTIVE SWITCHING

(Switching from saturation to cutoff)

Conditions:

1. $T_J = T_C + \Theta_{J-C}$ Pavg $\leq$ 200°C
2. Pavg $= \frac{1}{2ms} \int_0^{2ms}$ ic vce dt $\leq$ PDC max.
3. For the resistive loadline, L = 0 and V_{CC} = V2
4. tr $\leq$ 2μs, tf $\leq$ 2 μs in Area F



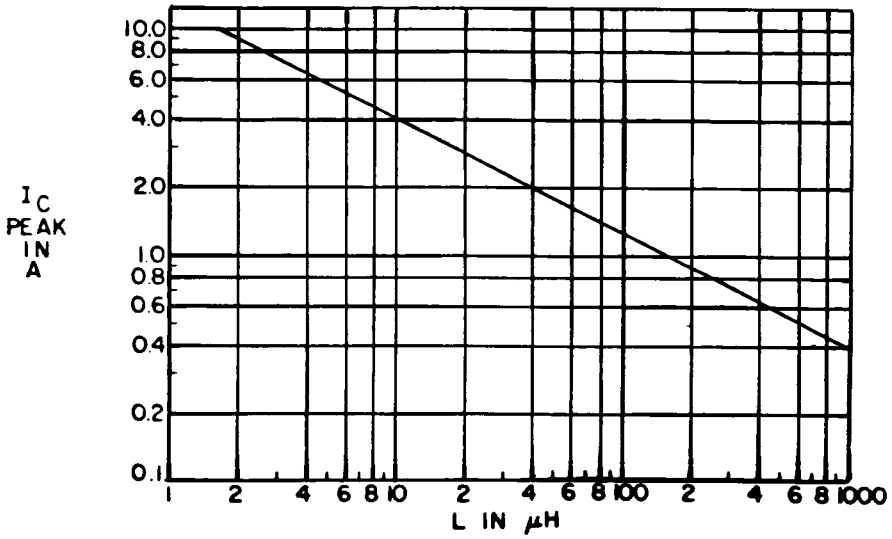


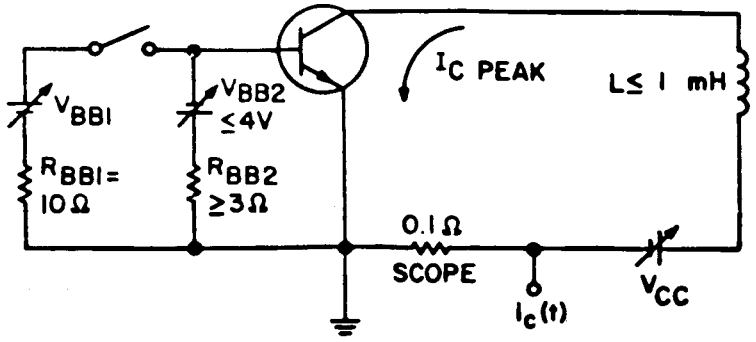
UNCLAMPED SWITCHING

(Switching from saturation to cutoff)

Conditions:

1. $T_J = T_C + \Theta_{J-C}$ Pavg $\leq 200°C$
2. Pavg $= \frac{1}{2ms} \int_0^{2ms}$ ic vce dt $\leq$ PDC max.
3. I_C peak $\leq I_C$ max rating for specified transistor type
4. ½ $LIC^2 \leq 80\mu Ws$





2N5535 2N5536 2N5537 2N5538

NPN SILICON POWER TRANSISTORS

RADIATION RESISTANT

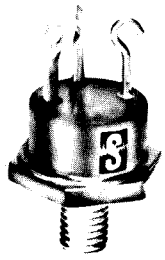
20 AMPERES

FEATURES

HIGH POWER
RADIATION EXPOSURE LEVEL TO 5×10^{14} nvt
TOTAL NEUTRON FLUX GREATER THAN 10 KEV

APPLICATIONS

POWER AMPLIFIER
RADIATION ENVIRONMENTS
ULTRA HIGH FREQUENCY



TO-*61

*All leads isolated from case

ABSOLUTE MAXIMUM RATINGS

		2N5535 2N5536*	2N5537 2N5538*
V_{CBO}	COLLECTOR-BASE VOLTAGE	60 V	90 V
V_{CEO}	COLLECTOR-EMITTER VOLTAGE	50 V	75 V
V_{EBO}	EMITTER-BASE VOLTAGE	3 V	3 V
I_C	CONTINUOUS COLLECTOR CURRENT	20 A	20 A
I_B	CONTINUOUS BASE CURRENT	8 A	.8 A
T_J	OPERATING JUNCTION TEMPERATURE	−65°C to +200°C	
T_{stg}	STORAGE TEMPERATURE	−65°C to +200°C	
$R_{\theta JC}$	THERMAL RESISTANCE, JUNCTION TO CASE	3.5°C/W	
P_D	POWER DISSIPATION (25°C)	50 W	

8-83-3R

2N5535 2N5536 2N5537 2N5538

ELECTRICAL CHARACTERISTICS (T_C = 25°C UNLESS OTHERWISE NOTED)

CHARACTERISTICS		SYMBOL	MIN.	MAX.	UNITS
COLLECTOR EMITTER SUSTAINING VOLTAGE[1]		$V_{CEO(sus)}$			
(I_C = 50 mA)	2N5535, 2N5536		50		V
	2N5537, 2N5538		75		V
(I_C = 50 mA, NOTE 2)	2N5535, 2N5536		50		V
	2N5537, 2N5538		75		V
COLLECTOR-CUTOFF CURRENT		I_{CEX}			
(V_{CE} = 30V, V_{BE} = 0, T_C = 100°C)				1.0	mA
COLLECTOR-CUTOFF CURRENT		I_{CBO}			
(V_{CB} = RATED)				1.0	mA
(V_{CB} = RATED, NOTE 2)				1.0	mA
COLLECTOR-CUTOFF CURRENT		I_{CBO}			
(V_{CB} = 30V)				0.1	mA
(V_{CB} = 30V, NOTE 2)	2N55335, 2N55336			1.0	mA
(V_{CB} = 30V, NOTE 2)	2N55337, 2N55338			2.0	mA
COLLECTOR-CUTOFF CURRENT		I_{CEO}			
(V_{CE} = RATED)				50	mA
EMITTER CUTOFF CURRENT		I_{EBO}			
(V_{EB} = 3.0V)				1.0	mA
(V_{EB} = 3.0V, NOTE 2)				1.0	mA
EMITTER FLOATING POTENTIAL		V_{EBF}			
(V_{CB} = RATED, I_E = 0)				1.0	V
DC CURRENT GAIN[1]		h_{FE}			
(V_{CE} 5.0V, I_C = 0.5A)	2N5535, 2N5536		50		
(V_{CE} 5.0V, I_C = 5.0A)	2N5537, 2N5538		40		
(V_{CE} 5.0V, I_C = 10A)	2N5535, 2N5536		30	150	
(V_{CE} 5.0V, I_C = 10A)	2N5537, 2N5538		20	150	
(V_{CE} 3.0V, I_C = 20A)			3.33		
(V_{CE} 5.0V, I_C = 5.0A, NOTE 2)	2N5535, 2N5536		15		
(V_{CE} 5.0A, I_C = 5.0A NOTE 2)	2N5537, 2N5538		10		
COLLECTOR-EMITTER SATURATION VOLTAGE[1]		$V_{CE(sat)}$			
(I_C = 5.0A, I_B = 1.0A)				1.25	V
(I_C = 20A, I_B = 6.0A)				3.0	V
(I_C = 5.0A, I_B = 1.0A, NOTE 2)	2N5535, 2N5536			2.0	V
(I_C = 5.0A, I_B = 1.0A, NOTE 2)	2N5537, 2N5538			2.5	V
BASE-EMITTER SATURATION VOLTAGE[1]		$V_{BE(sat)}$			
(I_C = 5.0A, I_B = 1.0A)				1.5	V
BASE-EMITTER VOLTAGE		V_{BE}			
(V_{CE} = 5.0V, I_C = 5.0A)				1.5	V
MAGNITUDE OF SMALL SIGNAL GAIN		$\lvert h_{fe} \rvert$			
(V_{CE} = 28V, I_C = 0.5A, f = 25 MHz)			6.0		
SMALL SIGNAL GAIN		h_{fe}			
(V_{CB} = 5.0V, I_C = 5.0A, f = 1.0 KHz)	2N5535, 2N5536		25		
	2N5537, 2N5538		20		
OUTPUT CAPACITANCE		C_{obo}			
(V_{CB} = 30V, f = 1.0 MHz)				100	pF
PULSE DELAY TIME		t_d			
(V_{CC} = 55V, I_C = 10A, I_{B1} = $-I_{B2}$ = 1.0A)				25	nsec
PULSE RISE TIME		t_r			
(V_{CC} = 55V, I_C = 10A, I_{B1} = $-I_{B2}$ = 1.0A)				200	nsec

Note 1: Pulsed 300μsec, 1.8% Duty Cycle

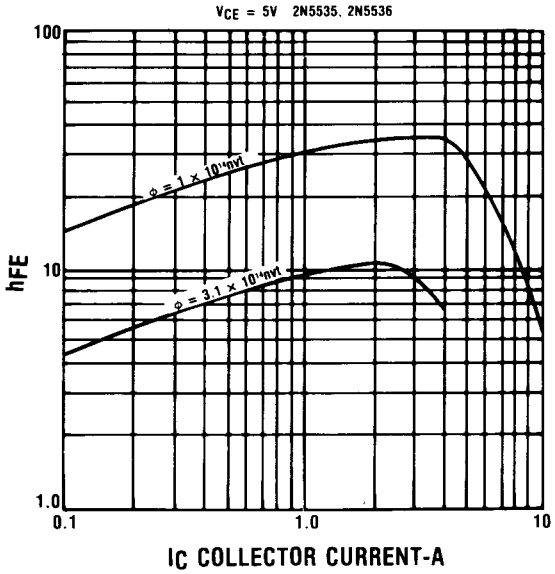
Note 2: After exposure, 1×10^{14} nvt, FLUX $\geq$ 10 KEV

ELECTRICAL CHARACTERISTICS (T_C = 25°C UNLESS OTHERWISE NOTED)

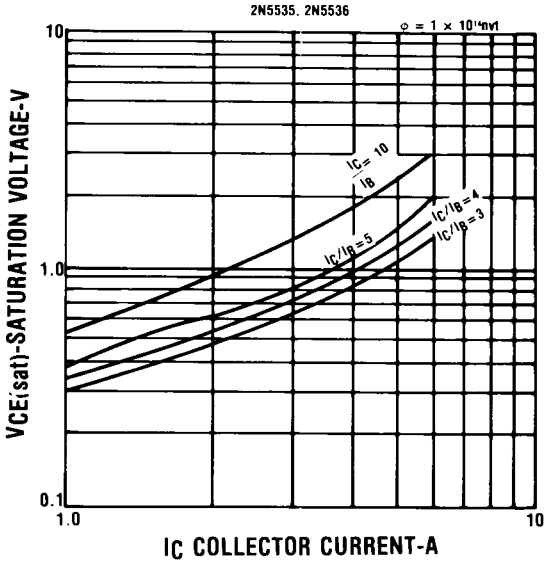
CHARACTERISTICS	SYMBOL	MIN.	MAX.	UNITS
PULSE STORAGE TIME (V_{CC} = 55V, I_C = 10A, I_{B1} = $-I_{B2}$ = 1.0A)	t_s		300	nsec
PULSE FALL TIME (V_{CC} = 55V, I_C = 10A, I_{B1} = $-I_{B2}$ = 1.0A)	t_f		300	nsec
PROMPT PRIMARY PHOTO CURRENT ($\dot{\gamma}$ = 1×10^9 R/sec, $\in \geq$ 1 Mev, V_{CB} = 10V)	I_{ppc}		2.0	A(PK)

2N5535 2N5536 2N5537 2N5538

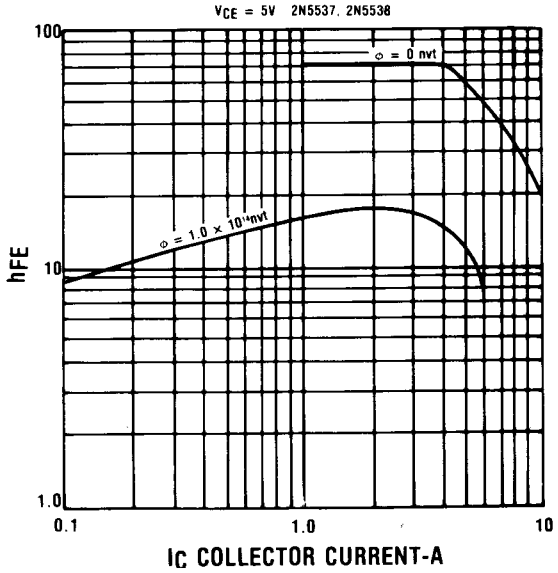
TYPICAL STATIC FORWARD CURRENT TRANSFER RATIO



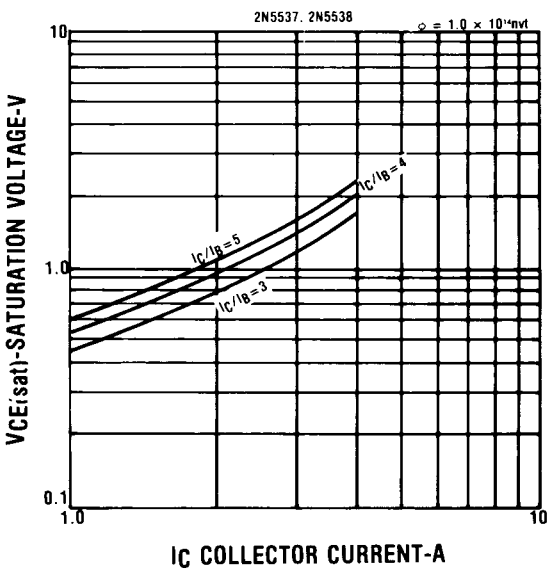
TYPICAL COLLECTOR-EMITTER SATURATION VOLTAGE



TYPICAL STATIC FORWARD CURRENT TRANSFER RATIO



TYPICAL COLLECTOR-EMITTER SATURATION VOLTAGE



SAFE OPERATING AREA (SOAR) INFORMATION

The Safe Operating ARea (SOAR) principle is a method of specifying the exact transistor to use in an amplifier, switching or DC application. SOAR defines the region which encloses all of the points representing simultaneous values of the collector current and the collector-to-emitter voltage which a transistor can safely handle under specified conditions for base current, time, junction temperature and average power dissipation. With transistors specified under the Solitron SOAR technique, secondary breakdown is virtually eliminated.

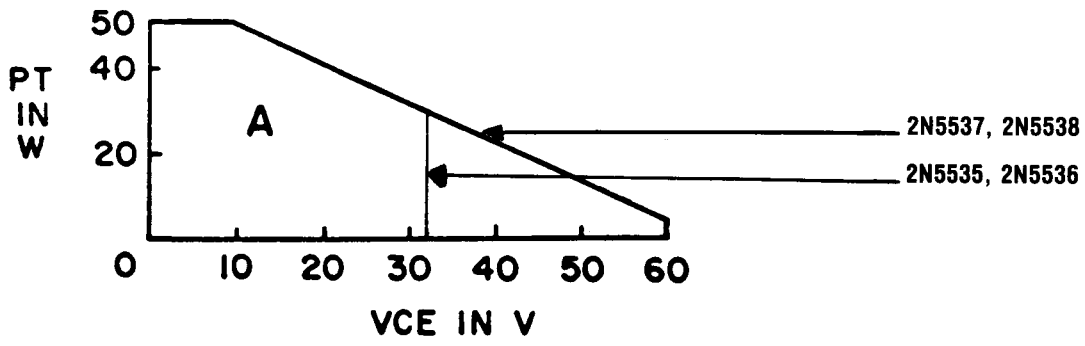
The suggested test circuits are shown for each type of SOAR operation. Any other thermally stable circuit may also be used as long as the SOAR conditions and maximum ratings are observed.

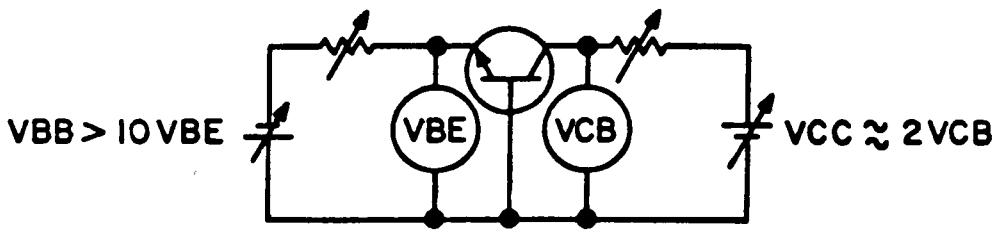
SOAR VALUES

TYPE NUMBER	V1 V	V2 V
2N5535	40	60
2N5536	40	60
2N5537	65	90
2N5538	65	90

CONTINUOUS DC OPERATION

Conditions: 1. $T_J = T_{CASE} + \Theta_{J\text{-}C}$ PDC $\leq$ 200°C
2. $V_{CE} \leq$ 0.8 V1 rating for specified transistor type
3. $P_T \leq P_T$ max rating for specified transistor type.
4. $I_C \leq$ 20A
5. $P_T \leq P_T = f(V_{CE})$ Area A



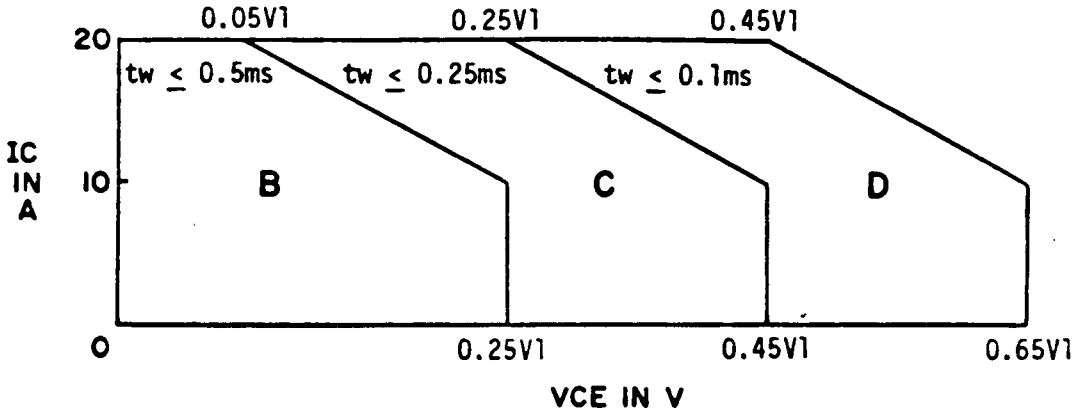


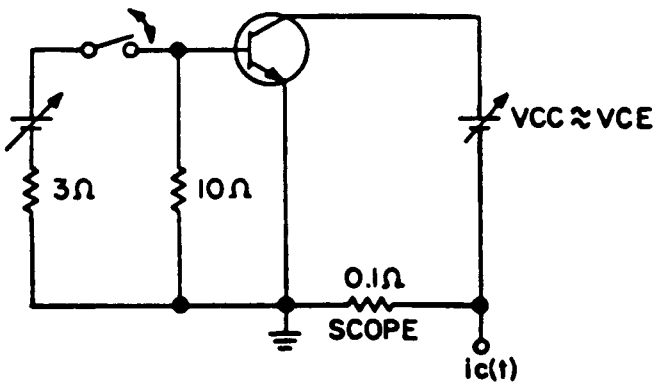
2N5535 2N5536 2N5537 2N5538

PULSED FORWARD BIASED OPERATION

Conditions:

1. $T_J = T_{CASE} + \Theta_{J\text{-}C}$ Pavg $\leq$ 200°C
2. Pavg = $\frac{1}{4\text{ ms}} \int_0^{4\text{ms}}$ ic vce dt $\leq$ the allowed continuous DC power dissipation for a V_{CE} equal to the highest v_{ce} applied to the transistor.
3. Operation in the active region should be limited to a maximum pulse width of t_W = 0.5 ms for Area B, t_W = 0.25 ms for Area C and t_W = 0.1 ms for Area D. $t_r \leq 5\mu s$ and $t_f \leq 5\mu s$ for Areas B-D.





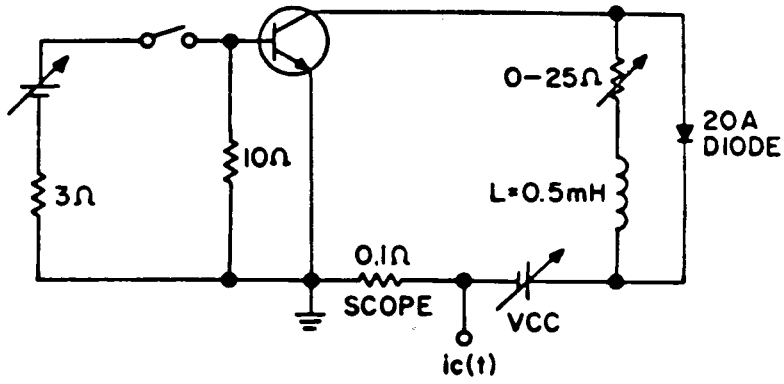
SUGGESTED TEST FREQUENCY f=25Hz

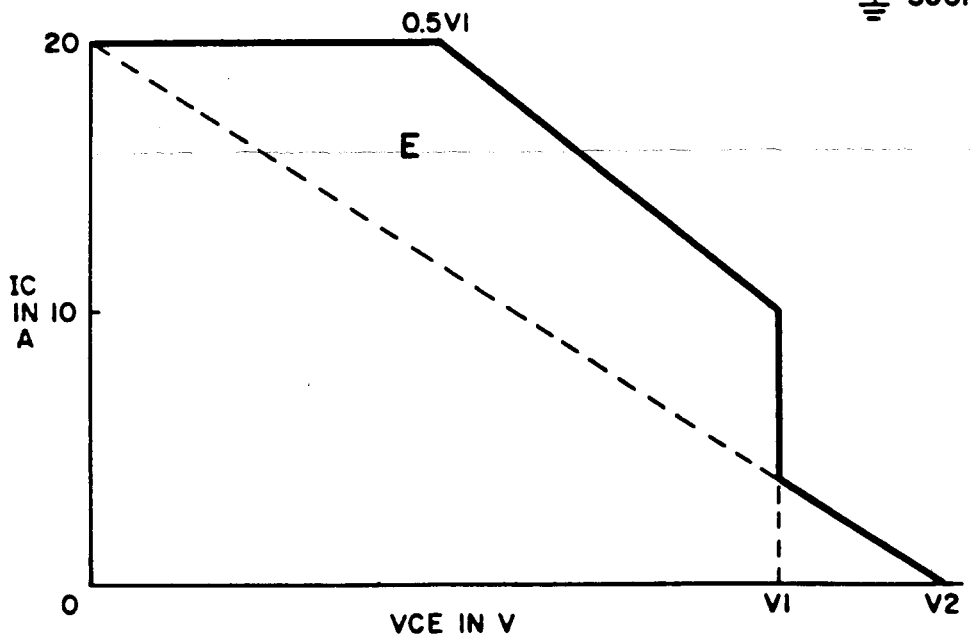
RESISTIVE AND CLAMPED INDUCTIVE SWITCHING

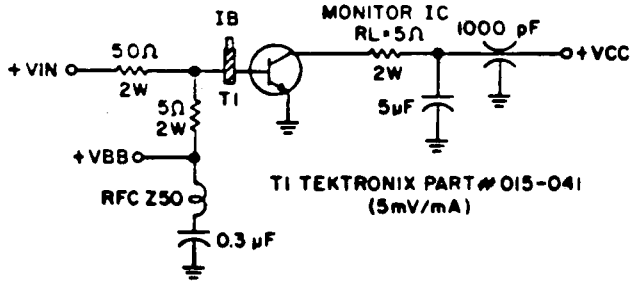
(Switching from saturation to cutoff)

Conditions:

1. $T_J = T_C + \Theta_{J\text{-}C}$ Pavg $\leq$ 200°C
2. Pavg $= \frac{1}{4ms} \int_0^{4ms}$ ic vce dt $\leq P_T$ max.
3. For the resistive loadline, L = 0 and V_{CC} = V2 in the given circuit
4. tr $\leq 2\mu s$, tf $\leq 2\ \mu s$ in Area E







SATURATED SWITCHING TEST CIRCUIT

Maximum Switching Times: $t_d \leq$ 25 ns:

$t_r \leq$ 200 ns; $t_s \leq$ 300 ns; $t_f \leq$ 300 ns

Test Conditions: V_{in} = 70 V when generator with 50Ω internal impedance is terminated in a 50 Ω load. V_{BB} = −5 V; V_{CC} = 55 V; $I_C \cong$ 10 A; IB_1 = 1 A, $IB_2 \cong$ 1 A; t_p = 400 ns; f = 720 Hz.

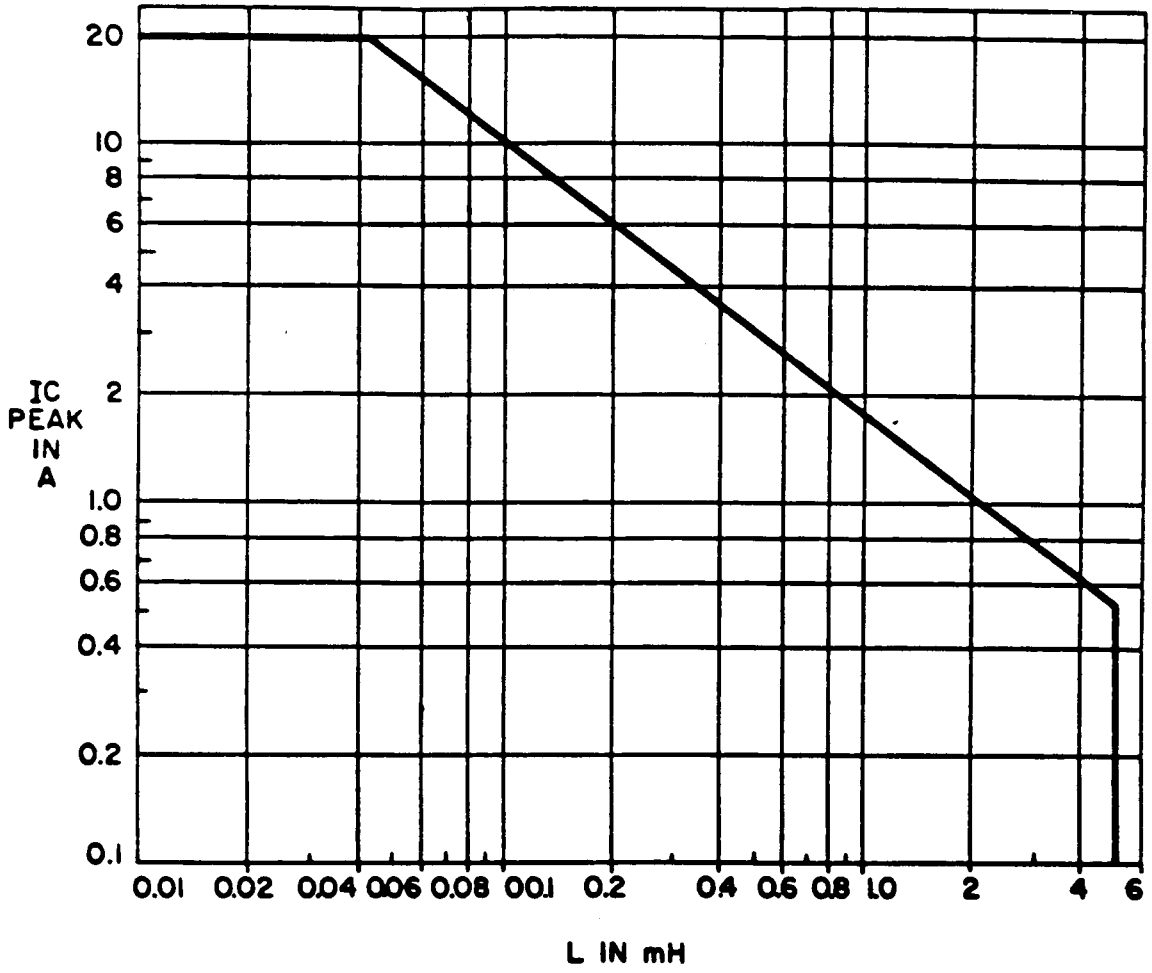
2N5535 2N5536 2N5537 2N5538

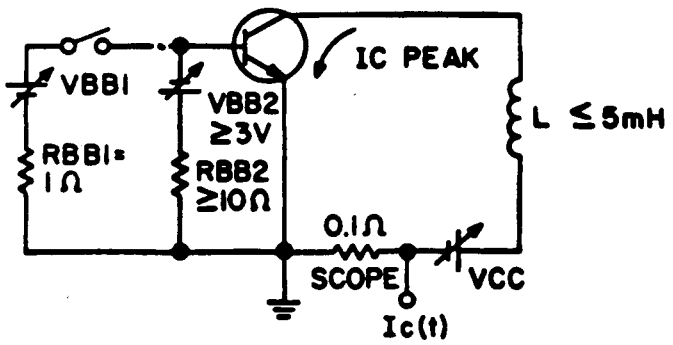
UNCLAMPED INDUCTIVE SWITCHING

(Switching from saturation to cutoff)

Conditions:

1. $T_J = T_C + \Theta_{J\text{-}C}$ Pavg $\leq$ 200°C
2. $\text{Pavg} = \frac{1}{4\text{ms}} \int_0^{4\text{ms}}$ ic vce dt $\leq P_T$ of Area A at 0.8 V1
3. ½ $LIC^2 \leq$ 8 mWs





Solitron

2N5592
2N5593
N-Kanal-Silizium-Epitaxial-Junction-FET 2N5594

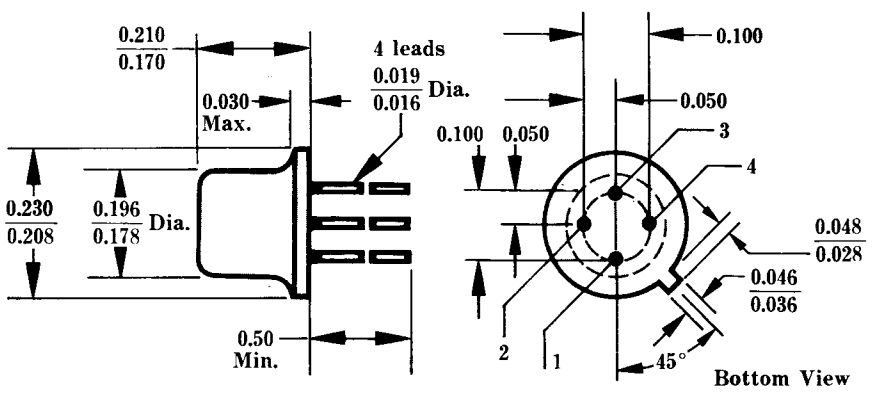
- Hohe Verstärkung
- Geringes Rauschen
- Kleiner Ausgangs-Scheinleitwert
- Symmetrischer Aufbau
- Source und Drain vertauschbar
- Rechteck-Übertragungscharakteristik
- Hohe Vorwärtssteilheit
- Hohe Durchbruchspannungen

Grenzwerte

Gate-Source-Sperrspannung	$U_{GS(r)}$	-50V
Drain-Source-Spannung	U_{DS}	50V
Drain-Gate-Spannung	U_{DG}	50V
Durchlaß-Gate-Strom	$I_{G(f)}$	50mA
Dauer-Verlustleistung bei 25°C Umgebungstemperatur	P_D	300mW
Leistungsabnahme		2mW/°C
Betriebs-Sperrschichttemperatur	T_J	-55°C bis +175°C
Lagertemperatur	T_{STG}	-65°C bis +200°C
Löttemperatur ca. 1,6mm vom Gehäuse, 10sec max.	T_L	+300°C

Abmessungen in Zoll

Case: JEDEC TO-72
Lead 1: Source
Lead 2: Drain
Lead 3: Gate
Lead 4: Case



Alle Anschlüsse isoliert gegen Gehäuse

Preise

	Stück	1-24	ab 25	ab 100
2N5592	DM	76,--	71,--	62,--
2N5593	DM	69,50	63,--	58,--
2N5594	DM	36,--	33,--	24,40

NEUMÜLLER GMBH
8 MÜNCHEN 2 · KARLSTRASSE 55 · TELEFON 592421 · TELEX 0522106

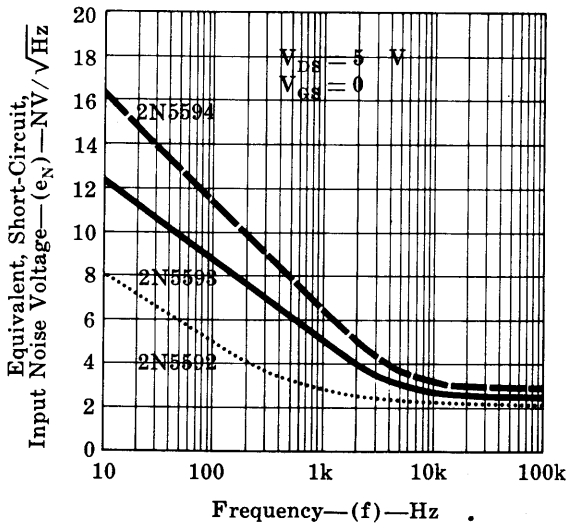
Kennwerte bei 25°C (wenn nicht anders angegeben)

		min	max			Fig.
Statisch						
Gate-Source-Durchbruchspg.	$U_{(BR)GSS}$	-50		V	$I_G = -1\mu A, U_{DS} = 0V$	
Gate-Sperrstrom	I_{GSS}		-0,25	nA	$U_{GS} = -30V, U_{DS} = 0V$	13
Gate-Sperrstrom (150°C)	I_{GSS}		-0,50	μA	$U_{GS} = -30V, U_{DS} = 0V$	13
Drainstrom (Gate 0V)	I_{DSS}	1	10	mA	$U_{DS} = 20V, U_{GS} = 0V$	5,12
Gate-Source-Restspg.	$U_{GS(off)}$	-1	-5	V	$U_{DS} = 20V, I_D = 1nA$	6,8
Dynamisch						
Kleinsignal-Vorwärtssteilheit Sourceschaltung (kurzgeschl.)	$\lvert Y_{fs} \rvert$	2000	7000	μS	$U_{DS} = 20V, U_{GS} = 0V$, f = 1kHz	5,12
Kleinsignal-Ausgangs-Scheinleitwert Sourceschaltung (kurzgeschl.)	$\lvert Y_{os} \rvert$		10	μS	$U_{DS} = 20V, U_{GS} = 0V$, f = 1kHz	9,10
Kleinsignal-Eingangskapazität Sourceschaltung (kurzgeschl.)	C_{iss}		20	pF	$U_{DS} = 20V, U_{GS} = 0V$, f = 1MHz	14
Kleinsignal-Rückwirkkapazität Sourceschaltung (kurzgeschl.)	C_{rss}		5	pF	$U_{DS} = 20V, U_{GS} = 0V$, f = 1MHz	14
Rauschverhalten						
Äquivalente Eingangsrauschspg. (kurzgeschl.)	e_N					
2N5592			10	nV/$\sqrt{Hz}$	$U_{DS} = 5V, U_{GS} = 0V$ f = 10Hz	1
2N5593			15			
2N5594			20			
Rauschzahl (1), Sourceschaltung	NF					
2N5592			2,5	dB	$U_{DS} = 5V, U_{GS} = 0V$, f = 10Hz, $R_G = 10k\Omega$	2,3, 4
2N5593			6			
2N5594			10			

(1) Quellwiderstand (R_G) entspricht nicht dem Wert für optimales Rauschen. Die Angabe des Rauschwertes (NF) bei nichtangepasstem Qellwiderstand ist beabsichtigt, um den Zusammenhang zwischen NF und e_N zu zeigen. Quellwiderstände für optimales Rauschen siehe Fig. 2, 3, 4.

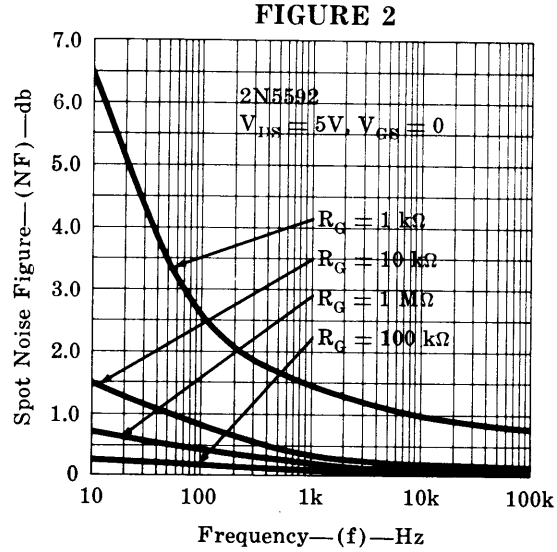
Typische Kennlinien bei 25°C (wenn nicht anders angegeben)

FIGURE 1



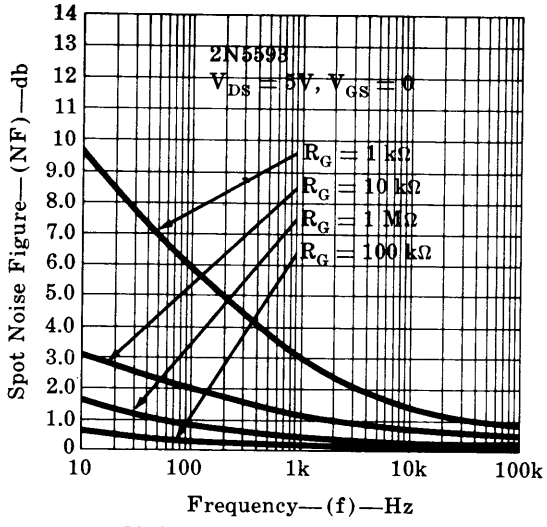
Noise Voltage Characteristic

FIGURE 2



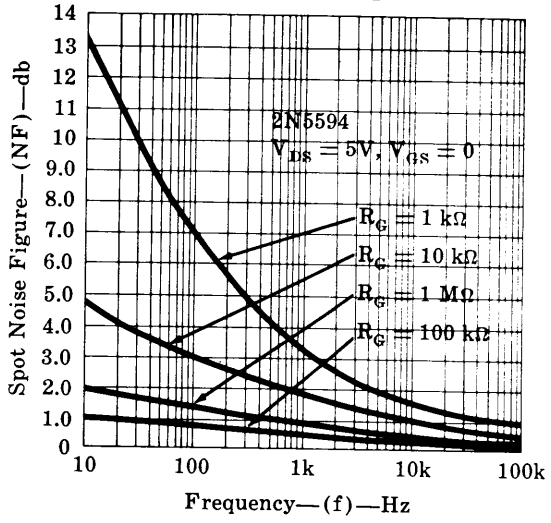
Noise Figure Characteristic

FIGURE 3



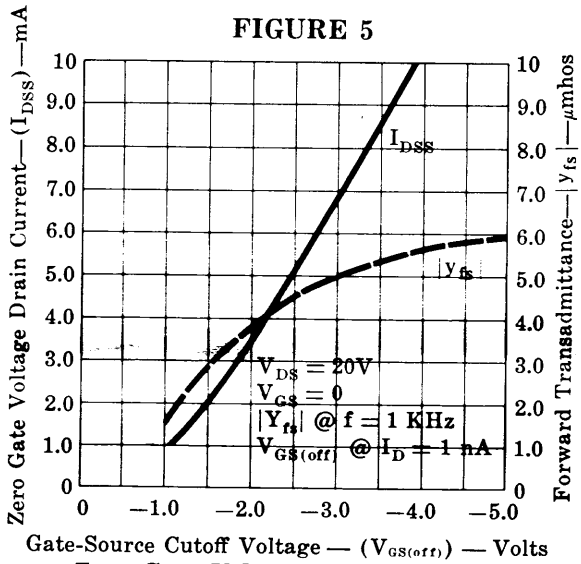
Noise Figure Characteristic

FIGURE 4



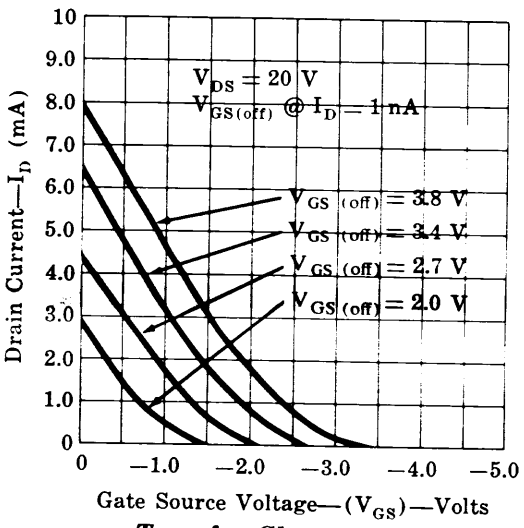
Noise Figure Characteristic

FIGURE 5



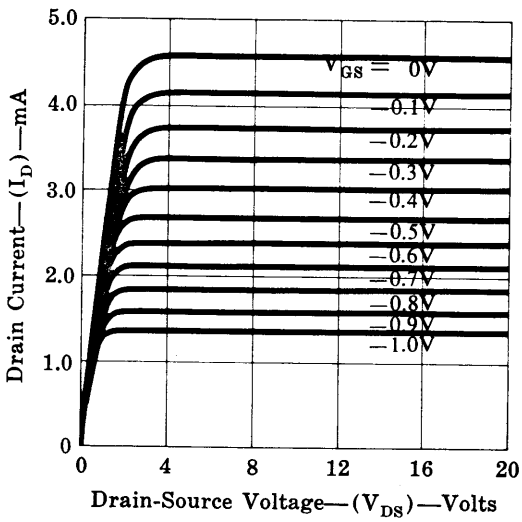
Zero Gate Voltage Drain Current and Common-Source Short-Circuit, Forward Transadmittance vs. Gate-Source Cut-off Voltage

FIGURE 6



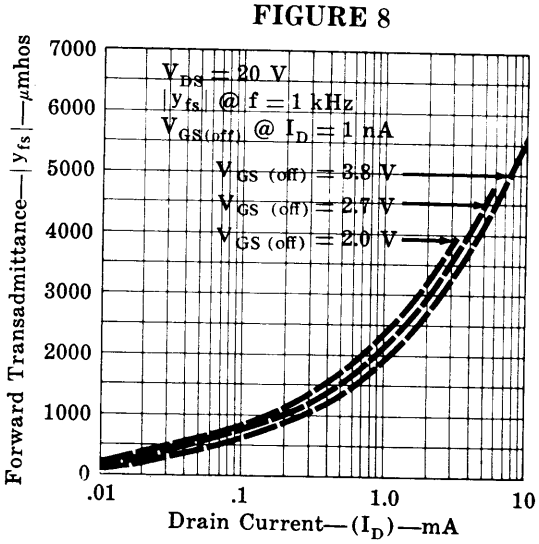
Transfer Characteristics

FIGURE 7



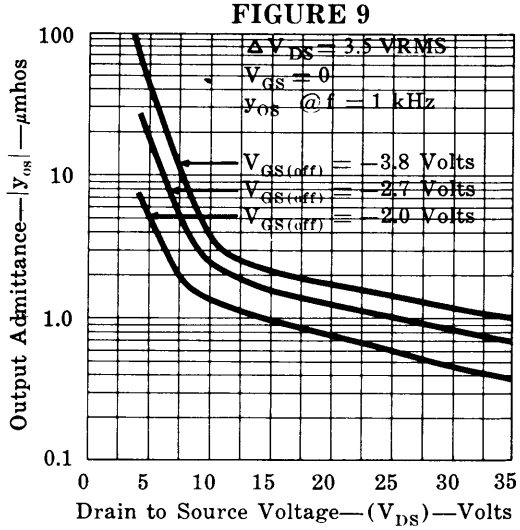
Drain Characteristics—Common-Source

FIGURE 8



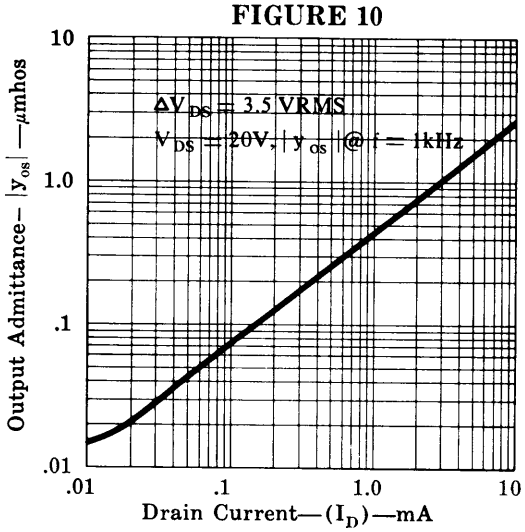
Common-Source, Short-Circuit Forward Transadmittance vs. Operating Drain Current

FIGURE 9



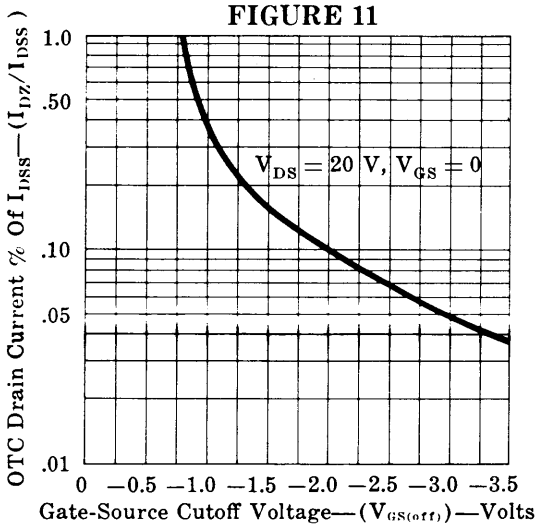
Common-Source, Short-Circuit, Output Admittance vs. Drain-Source Voltage

FIGURE 10



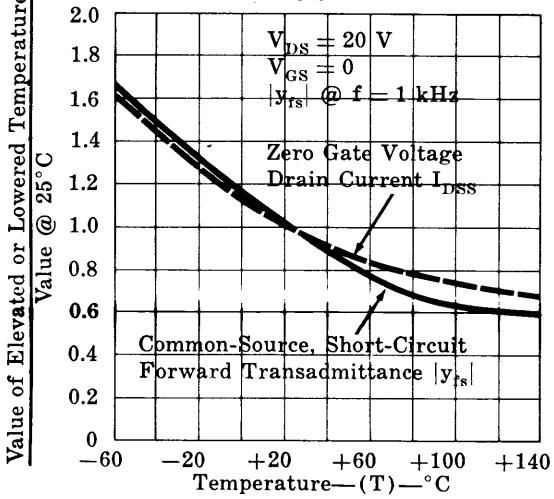
Common-Source, Short-Circuit Output Admittance vs. Drain Current

FIGURE 11



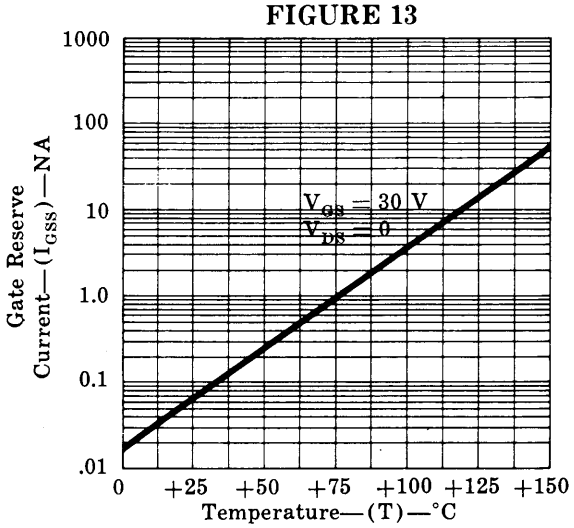
Drain Current "0" Temperature Coefficient Point

FIGURE 12



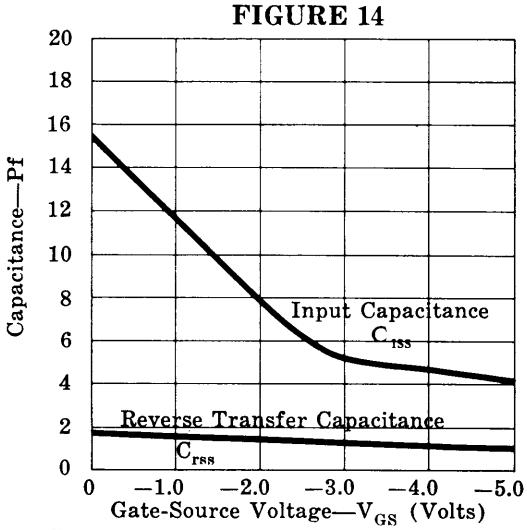
Normalized Zero Gate Voltage Drain Current and Common-Source, Short-Circuit Forward Transadmittance vs. Temperature

FIGURE 13



Gate Reverse Current vs. Temperature

FIGURE 14



Common-Source, Short-Circuit Junction Capacitances vs. Gate-Source Voltage

5.0 SUMMARY

SOLITRON RADIATION RESISTANT SILICON POWER TRANSISTORS

TYPE	CASE	MAXIMUN RATINGS				RADIATION PERFORMANCE								Θ_{JC} (°C/W)
						Before				After 1x10¹⁴n/cm**				
		V_{CBO} (V)	V_{CEO} (V)	I_C (A)	P_T@ 25°C CASE (N)	hFE@ V_{CE} = 5		$V_{CE(SAT)}$@ I_C/I_E=5		hFE@ V_{CE}= 5V		$V_{CE(SAT)}$@ I_C/I_{B5}		
						Min	IC(A)	Max (V)	IC(A)	Min	IC(A)	Max (V)	IC(A)	
2N5527	TO-5	60	40	5	5	40	3	1.0	3	15	3	2.0	3	35
2N5528	TO-111	60	40	10	35	40	3	1.0	3	15	3	2.0	3	5.0
2N5529	TO-61	60	40	10	35	40	3	1.0	3	15	3	2.0	3	5.0
2N5530	TO-61*	60	40	10	35	40	3	1.0	3	15	3	2.0	3	5.0
2N5531	TO-5	90	75	5	5	30	3	1.0	3	7	3	3.0	3	35
2N5532	TO-111	90	75	10	35	30	3	1.0	3	7	3	3.0	3	5.0
2N5533	TO-61	90	75	10	35	30	3	1.0	3	7	3	3.0	3	5.0
2N5534	TO-61*	90	75	10	35	30	3	1.0	3	7	3	3.0	3	5.0
2N5535	TO-61	60	50	20	50	50	5	1.0	5	15	5	2.0	5	3.5
2N5536	TO-61*	60	50	20	50	50	5	1.0	5	15	5	2.0	5	3.5
2N5537	TO-61	90	75	20	50	40	5	1.0	5	10	5	2.5	5	3.5
2N5538	TO-61*	90	75	20	50	40	5	1.0	5	10	5	2.5	5	3.5
BR100A	TO-5	75	60	5	5	75	2	0.3	2	15	2	2.0	2	35
BR100C	TO-111	75	60	10	35	75	2	0.3	2	15	2	2.0	2	5.0
BR100E	TO-61	75	60	10	35	75	2	03	2	15	2	2.0	2	5.0
BR100F	TO-61*	75	60	10	35	75	2	0.3	2	15	2	2.0	2	5.0
BR101A	TO-5	90	80	5	5	70	2	0.3	2	15	2	3.0	2	35
BR101C	TO-111	90	80	10	35	70	2	0.3	2	15	2	3.0	2	5.0
BR101E	TO-61	90	80	10	35	70	2	0.3	2	15	2	3.0	2	5.0
BR101F	TO-61*	90	80	10	35	70	2	0.3	2	15	2	3.0	2	5.0
BR200A	TO-61	70	60	20	50	50	5	0.3	4	15	5	1.8	4	35
BR200B	TO-61*	70	60	20	50	50	5	0.3	4	15	5	1.8	4	35
BR201A	TO-61	80	80	20	50	50	5	0.3	4	10	5	2.8	4	35
BR201B	TO-61*	80	80	20	50	50	5	0.3	4	10	5	2.8	4	35

* WITH ISOLATED COLLECTOR
** NEUTRON FLUENCE - MEV EQUIVALENT
† EXCEPTION TO JEDEC SPEC.

5.1. Detailed specifications for above devices follow except: for 2N5528, 2N5532 which, except for case, are similar to 2N5529, 2N5533 respectively.