POWER TRANSISTORS
2 Amp, 300V, Planar NPN

JAN, JANTX, & JANTXV 2N5660
JAN, JANTX, & JANTXV 2N5661
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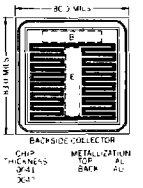
FEATURES
- Meets MIL-S-19500/454
- Collector-Base Voltage: up to 400V
- D.C. Collector Current: 5A
- Peak Collector Current: 10A
- Fast Switching

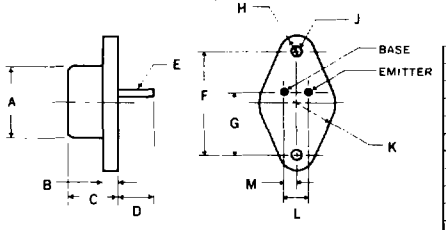


DESCRIPTION
Unitrode high voltage transistors provide a unique combination of low saturation voltage, fast switching, and excellent gain. They are ideally suited for off-line power supply designs and other applications where the increased voltage rating adds to system reliability.

ABSOLUTE MAXIMUM RATINGS	JAN, JANTX, & JANTXV 2N5660	JAN, JANTX, & JANTXV 2N5661	JAN, JANTX, & JANTXV 2N5662	JAN, JANTX, & JANTXV 2N5663
Collector-Base Voltage, V_{CBO}	250V	400V	250V	400V
Collector-Emitter Voltage, V_{CEO}	200V	300V	200V	300V
Emitter-Base Voltage, V_{EBO}	6V	6V	6V	6V
D.C. Collector Current, I_C	2A	2A	2A	2A
Peak Collector Current, I_C	5A	5A	5A	5A
Power Dissipation				
25°C Ambient	2.0W	2.0W	1.2W	1.2W
100°C Case	20W	20W	15W	15W
Operating and Storage Temperature Range	—65°C to 200°C			

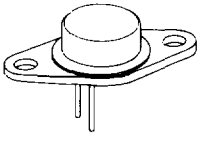
MECHANICAL SPECIFICATIONS

JAN, JANTX, & JANTXV 2N5660 JAN, JANTX, & JANTXV 2N5661

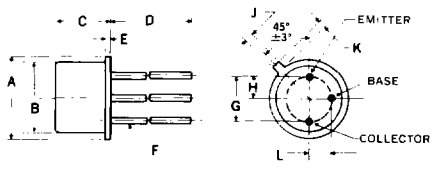


	INCHES	MILLIMETERS
A	.620 MAX.	15.75 MAX.
B	.050 - .075	1.27 - 1.90
C	.250 - .340	6.35 - 8.63
D	.360 MIN.	9.14 MIN.
E	.028 - .034 DIA	.711 - .863
F	.958 - .962	24.33 - 24.43
G	.570 - .590	14.47 - 14.98
H	.145 MAX. RAD	3.68 MAX. RAD
J	.142 - .152 DIA	3.60 - 3.86 DIA
K	.350 MAX. RAD	8.89 MAX. RAD
L	.190 - .210	4.82 - 5.33
M	.093 - .107	2.36 - 2.72

TO-66



JAN, JANTX, & JANTXV 2N5662 JAN, JANTX, & JANTXV 2N5663



	INCHES	MILLIMETERS
A	.335-.370	8.51-9.40
B	.305-.335	7.75-8.51
C	.240-.260	6.09-6.60
D	1.5 MIN.	38.10 MIN.
E	.010-.030	.254-.762
F	.017 +.002 -.001	.432 +.051 -.025
G	.200	5.08
H	.100	2.54
J	.031±.003	.787±.076
K	.029-.045	.736-1.14
L	.100	2.54

TO-5

UNITRODE

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)
2N5660, 2N5662

Test	Symbol	Min.	Max.	Units	/454 Sub group	MIL-STD-750 Method	MIL-STD-750 Test conditions
Visual and mechanical					A-1	2071	See Mechanical Data
25°C							
Collector-Emitter Breakdown Voltage (Note 1)	BV_{CER}*	250	—	Vdc	A-2	3011	I_C = 10mAdc; R_{BE} = 100Ω; Cond. B
Collector-Emitter Breakdown Voltage (Note 1)	BV_{CEO}*	200	—	Vdc	A-2	3011	I_C = 10mAdc; Cond. D
Emitter-Base Breakdown Voltage	BV_{EBO}*	6	—	Vdc	A-2	3026	I_E = 10μAdc; Cond. D
Collector-Emitter Cutoff Current	I_{CES}*	—	0.2	μAdc	A-2	3041	V_{CE} = 200Vdc; Cond. C
Collector-Base Cutoff Current	I_{CBO}	—	0.1	μAdc	A-2	3036	V_{CB} = 200Vdc; Cond. D
Collector-Base Cutoff Current	I_{CBO}	—	1.0	mAdc	A-2	3036	V_{CB} = 250Vdc; Cond. D
D.C. Current Gain (Note 1)	h_{FE}*	40	—	—	A-3	3076	I_C = 50mAdc, V_{CE} = 2Vdc
D.C. Current Gain (Note 1)	h_{FE}*	40	120	—	A-3	3076	I_C = 0.5Adc, V_{CE} = 5Vdc
D.C. Current Gain (Note 1)	h_{FE}*	15	—	—	A-3	3076	I_C = 1Adc, V_{CE} = 5Vdc
D.C. Current Gain (Note 1)	h_{FE}	5	—	—	A-3	3076	I_C = 2Adc, V_{CE} = 5Vdc
Collector Saturation Voltage (Note 1)	V_{CE}(sat)*	—	0.4	Vdc	A-3	3071	I_C = 1Adc, I_B = 0.1Adc
Collector Saturation Voltage (Note 1)	V_{CE}(sat)	—	0.8	Vdc	A-3	3071	I_C = 2Adc, I_B = 0.4Adc
Base Saturation Voltage (Note 1)	V_{BE}(sat)*	—	1.2	Vdc	A-3	3066	I_C = 1Adc, I_B = 0.1Adc; Cond. A
Base Saturation Voltage (Note 1)	V_{BE}(sat)	—	1.5	Vdc	A-3	3066	I_C = 2Adc, I_B = 0.4Adc; Cond. A
Gain-Bandwidth Product	f_t*	20	70	MHz	A-4	3306	I_C = 0.1Adc, V_{CE} = 5Vdc, f = 10MHz
Output Capacitance	C_{ob}	—	45	pf	A-4	3236	V_{CB} = 10Vdc, I_E = 0, f = 1MHz
Thermal Resistance	θ_{J-C}				C-1	3151	
2N5660		—	5.0	°C/W			
2N5662		—	6.7	°C/W			
Switching Speeds — Turn-on time	t_{on}*	—	0.25	μs	A-4	—	I_C = 0.5Adc
Switching Speeds — Turn-off time	t_{off}*	—	0.85	μs	A-4	—	
100°C							
Forward Biased Second Breakdown							
2N5660	$I_{s/b}$	2	—	Adc	B-6	3051	V_{CE} = 10Vdc, t = 1Sec
	$I_{s/b}$	0.5	—	Adc	B-6	3051	V_{CE} = 40Vdc, t = 1Sec
	$I_{s/b}$	36	—	mAdc	B-6	3051	V_{CE} = 200Vdc, t = 1Sec
2N5662	$I_{s/b}$	2	—	Adc	B-7	3051	V_{CE} = 7.5 Vdc, t = 1Sec
	$I_{s/b}$	0.6	—	Adc	B-7	3051	V_{CE} = 25Vdc, t = 1Sec
	$I_{s/b}$	27	—	mAdc	B-7	3051	V_{CE} = 200Vdc, t = 1Sec
Unclamped Reverse Biased Second Breakdown	$E_{s/b}$	0.2	—	mj	B-8	3053	I_C = 2Adc, L = 0.1 mh
Clamped Reverse Biased Second Breakdown	$E_{s/b}$	80	—	mj	B-9	3053	I_C = 2Adc, L = 40mh, V_{clamp} = 200V
150°C							
Collctor-Emitter Cutoff Current	I_{CES}*	—	100	μAdc	A-5	3041	V_{CE} = 200Vdc, Cond. C
−65°C							
D.C. Current Gain (Note 1)	h_{FE}	15	—	—	A-6	3076	I_C = 0.5Adc, V_{CE} = 5Vdc

Notes:
1. Pulse width = 300μS; duty cycle ≤2%.
* Those parameters marked with a * are JEDEC registered and devices meeting these specifications are available as commercial 2N devices.

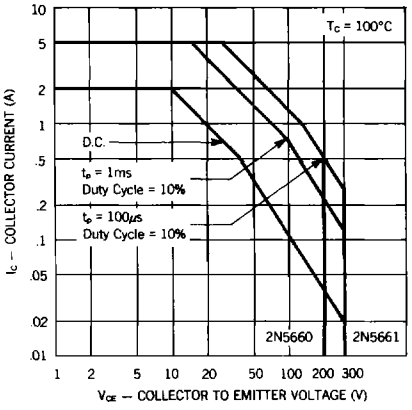
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)
2N5661, 2N5663

Test	Symbol	Min.	Max.	Units	/454 Sub group	MIL-STD-750 Method	MIL-STD-750 Test conditions
Visual and mechanical					A-1	2071	See Mechanical Data
25°C							
Collector-Emitter Breakdown Voltage (Note 1)	BV_{CER}*	400	—	Vdc	A-2	3011	I_C = 10mAdc; R_{BE} = 100Ω; Cond. B
Collector-Emitter Breakdown Voltage (Note 1)	BV_{CEO}*	300	—	Vdc	A-2	3011	I_C = 10mAdc; Cond. D
Emitter-Base Breakdown Voltage	BV_{EBO}*	6	—	Vdc	A-2	3026	I_E = 10μAdc; Cond. D
Collector-Emitter Cutoff Current	I_{CES}	—	0.2	μAdc	A-2	3041	V_{CE} = 300 Vdc; Cond. C
Collector-Base Cutoff Current	I_{CBO}	—	0.1	μAdc	A-2	3036	V_{CB} = 300Vdc; Cond. D
Collector-Base Cutoff Current	I_{CBO}	—	1.0	mAdc	A-2	3036	V_{CB} = 400Vdc; Cond. D
D.C. Current Gain (Note 1)	h_{FE}*	25	—	—	A-3	3076	I_C = 50mAdc, V_{CE} = 2Vdc
D.C. Current Gain (Note 1)	h_{FE}*	25	75	—	A-3	3076	I_C = 0.5Adc, V_{CE} = 5Vdc
D.C. Current Gain (Note 1)	h_{FE}*	15	—	—	A-3	3076	I_C = 1Adc, V_{CE} = 5Vdc
D.C. Current Gain (Note 1)	h_{FE}	5	—	—	A-3	3076	I_C = 2Adc, V_{CE} = 5Vdc
Collector Saturation Voltage (Note 1)	V_{CE}(sat)*	—	0.4	Vdc	A-3	3071	I_C = 1Adc, I_B = 0.1Adc
Collector Saturation Voltage (Note 1)	V_{CE}(sat)	—	0.8	Vdc	A-3	3071	I_C = 2Adc, I_B = 0.4Adc
Base Saturation Voltage (Note 1)	V_{BE}(sat)*	—	1.2	Vdc	A-3	3066	I_C = 1Adc, I_B = 0.1Adc; Cond. A
Base Saturation Voltage (Note 1)	V_{BE}(sat)	—	1.5	Vdc	A-3	3066	I_C = 2Adc, I_B = 0.4Adc; Cond. A
Gain-Bandwith Product	f_T*	20	70	MHz	A-4	3306	I_C = 0.2Adc, V_{CE} = 10Vdc, f = 10MHz
Output Capacitance	C_{ob}	—	45	pf	A-4	3236	V_{CB} = 10Vdc, I_E = 0, f = 1MHz
Thermal Resistance	Θ_{J-C}				C-1	3151	
2N5661		—	5.0	°C/W			
2N5663		—	6.7	°C/W			
Switching Speeds — Turn-on time	t_{on}*	—	0.25	μs	A-4	—	I_C = 0.5Adc
Switching Speeds — Turn-off time	t_{off}*	—	1.2	μs	A-4	—	
100°C							
Forward Biased Second Breakdown							
2N5661	$I_{S/B}$	2	—	Adc	B-6	3051	V_{CE} = 10Vdc, t = 1Sec
	$I_{S/B}$	0.5	—	Adc	B-6	3051	V_{CE} = 40Vdc, t = 1Sec
	$I_{S/B}$	19	—	mAdc	B-6	3051	V_{CE} = 300Vdc, t = 1Sec
2N5663	$I_{S/B}$	2	—	Adc	B-7	3051	V_{CE} = 7.5 Vdc, t = 1Sec
	$I_{S/B}$	0.6	—	Adc	B-7	3051	V_{CE} = 25Vdc, t = 1Sec
	$I_{S/B}$	14	—	mAdc	B-7	3051	V_{CE} = 300Vdc, t = 1Sec
Unclamped Reverse Biased Second Breakdown	$E_{S/B}$	0.2	—	mj	B-8	3053	I_C = 2Adc, L = 0.1 mh
Clamped Reverse Biased Second Breakdown	$E_{S/B}$	80	—	mj	B-9	3053	I_C = 2Adc, L = 40mh, V_{clamp} = 300V
150°C							
Collector-Emitter Cutoff Current	I_{CES}	—	100	μAdc	A-5	3041	V_{CE} = 300Vdc, Cond. C
−65°C							
D.C. Current Gain (Note 1)	h_{FE}	10	—	—	A-6	3076	I_C = 0.5Adc, V_{CE} = 5Vdc

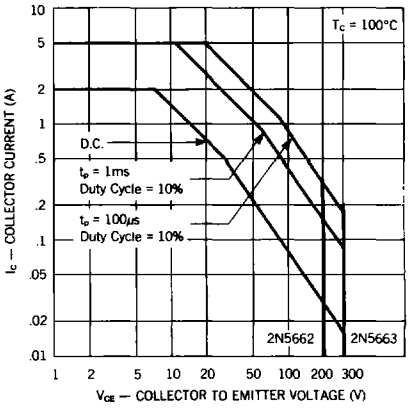
Notes:
1. Pulse width = 300μS; duty cycle ≤2%.
* Those parameters marked with a * are JEDEC registered and devices meeting these specifications are available as commercial 2N devices.

2

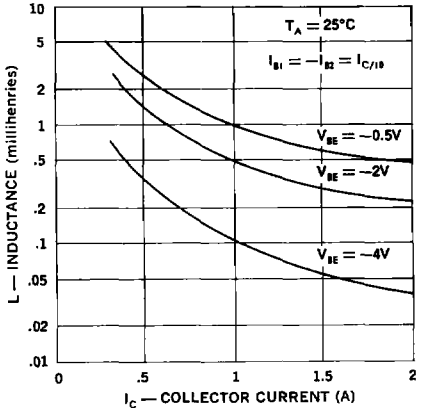
Forward Bias
Safe Operating Area
2N5660, 2N5661



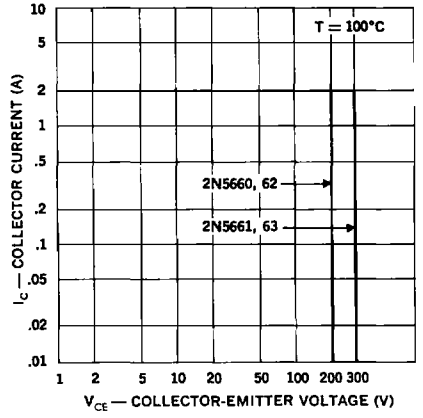
Forward Bias
Safe Operating Area
2N5662, 2N5663



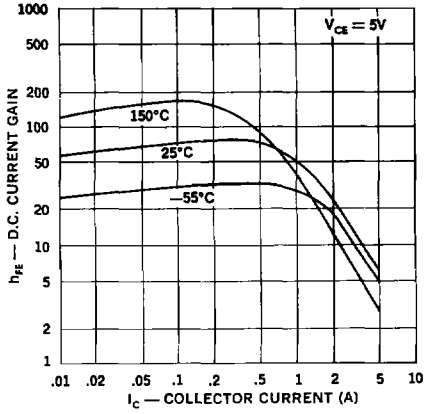
Unclamped Reverse Bias
Second Breakdown



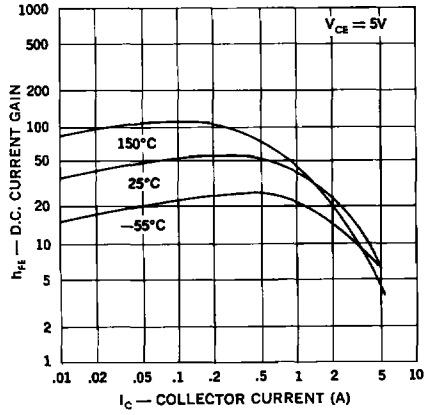
Reverse Bias
Safe Operating Area
Clamped Inductive Switching



D.C. Current Gain
2N5660, 2N5662



D.C. Current Gain
2N5661, 2N5663



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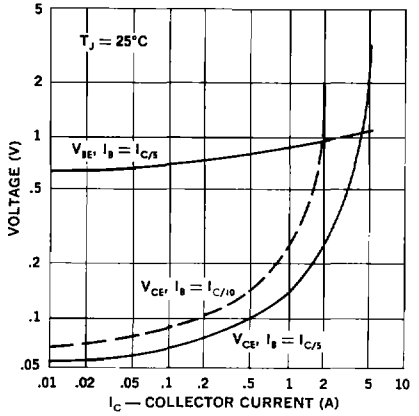
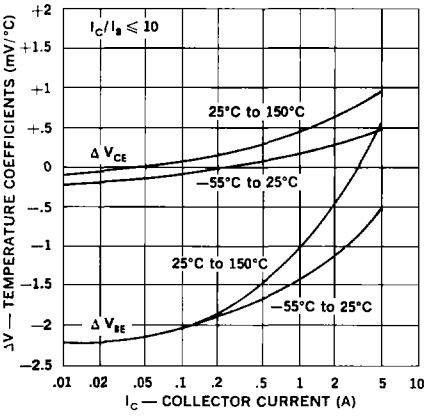
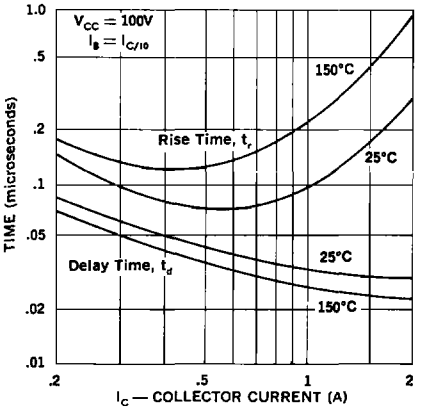
Saturation Voltages



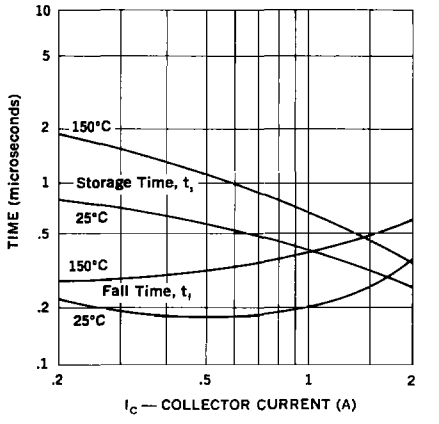
Saturation Voltage Temperature Coefficients



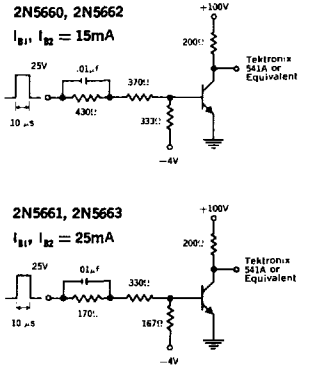
Switching Speed Characteristics



Switching Speed Characteristics



Switching Speed Circuits



Thermal Response