

2N4060-2N4227

TYPE	MATERIAL	POLARITY	REPLACE- MENT	PAGE NUMBER	USE	MAXIMUM RATINGS						ELECTRICAL CHARACTERISTICS									
						P _D	Ref Point	T _J	V _{CB}	V _{CE}	Subscript	h _{FE} @ I _C		V _{CE(SAT)} @ I _C		h _{FE}	Subscript	f _T	Subscript		
						@ 25°C		°C	(volts)	(volts)		(min)	(max)	Units	(volts)					Units	Units
2N4060	S	P	MPS6516	5-113	AFC	0.25W	A	150	30	30	0	45	165	1.0M	0.7	10M	45	E			
2N4061	S	P	MPS6517	5-113	AFC	0.25W	A	150	30	30	0	90	330	1.0M	0.7	10M	90	E			
2N4062	S	P	MPS6518	5-113	AFC	0.25W	A	150	30	30	0	180	660	1.0M	0.7	10M	180	E			
2N4063	S	N			LPA	10W	C	200	450	350	0	40	160	0.02A					15M		
2N4064	S	N			LPA	10W	C	200	300	250	0	40	160	0.02A					15M		
2N4065	Field Effect Transistors, see Table on Page 1-166																				
2N4066	S	N			RFA	500M	A	175	150	150	0	30		30M					50M		
2N4068	S	N			LPA	1.0W	C	175	150	150	0	30		0.03A					50M		
2N4069	S	N	2N3448	7-111	LPA	115W	C	200	100	80	0	40	120	5.0A	0.68	5.0A	40	E	10M		
2N4070	S	N		9-112	HPA	1.5W	C	200	40	20	0	10		25A					550M		
2N4072	S	N		9-112	HPA	1.5W	C	200	40	20	0	10		25A					550M		
2N4073	S	N																			
2N4074	S	N	2N3764	8-273	RFA	400M	A	175	40	40	0						400	E			
2N4075	S	N			LPA	30W	C	200		80	0	30	90						30M		
2N4076	S	N			LPA	30W	C	200		80	0	50	150						30M		
2N4080	S	P			HPA	300M	A	200	20	15	0	20		3.0M					1.0G		
2N4082	Field Effect Transistors, see Table on Page 1-166																				
2N4085	S	N	MPS6514	5-109	AFA	200M	A		12	12	0	150	300	2.0M			150	E			
2N4086	S	N	MPS6515	5-109	AFA	200M	A		12	12	0	250	500	2.0M			250	E			
2N4087	S	N	MPS6515	5-109	AFC	200M	A		12	12	0	250	500	2.0M			250	E			
2N4087A	S	N	MPS6515	5-109	AFC	200M	A		12	12	0	250	500	2.0M			250	E			
2N4088	Field Effect Transistors, see Table on Page 1-166																				
2N4095	Thyristors, see Table on Page 1-154																				
2N4096	Thyristors, see Table on Page 1-154																				
2N4098	S	N			DFA	300M	A	200	55	55	0	175		1.0M					150M		
2N4099	S	N			DFA	400M	A	200	55	55	0	175		1.0M					150M		
2N4100	Thyristors, see Table on Page 1-154																				
2N4101	Thyristors, see Table on Page 1-154																				
2N4103	S	N			RFA	300M	A	175	60	60	0						1400	E	540M		
2N4104	G	P	MP2060	7-220	AFA	1.6W	A		25			70	350	5.0M							
2N4106	Thyristors, see Table on Page 1-154																				
2N4108	Thyristors, see Table on Page 1-154																				
2N4110	S	N			LPA	30W	C		100	60	0	40	120	2.0A					70M		
2N4111	S	N			LPA	30W	C		100	60	0	100	300	2.0A					80M		
2N4112	S	N			LPA	30W	C		100	60	0	100	300	2.0A					80M		
2N4113	S	N			LPA	30W	C		120	80	0	40	120	2.0A					70M		
2N4114	S	N			LPA	3.0W	A		120	80	0	100	300	2.0A					80M		
2N4115	S	N			LPA	37W	C		120	80	0	40	120	2.0A					70M		
2N4116	S	N			LPA	37W	C		120	80	0	100	300	2.0A					80M		
2N4117A	Field Effect Transistors, see Table on Page 1-166																				
2N4120A	S	P	2N3905	5-16	RFA	200M	A	125	40	40	0	70		10M			50	E	400M		
2N4121	S	P	2N3906	5-16	RFA	200M	A	125	40	40	0	150		10M			150	E	450M		
2N4122	S	N		5-21	HPA	310M	A	135	40	30	0	50	150	2.0M	0.3	50M	50	E	250M		
2N4123	S	N		5-21	HPA	310M	A	135	30	25	0	120	360	2.0M	0.3	50M	120	E	300M		
2N4124	S	P		5-25	HPA	310M	A	135	30	30	0	50	150	2.0M	0.4	50M	50	E	200M		
2N4125	S	P		5-25	HPA	310M	A	135	25	25	0	120	360	2.0M	0.4	50M	120	E	250M		
2N4126	S	N			LPA	25W	C		60	40	0	10	80	0.2A					300M		
2N4127	S	N			LPA	40W	C		60	40	0	10	80	0.2A					200M		
2N4128	S	N			LPA	120W	C		80	65	0	10	60	2.0A					1.25M		
2N4130	S	N			LPA	60W	C		90	80	0	10	80	1.0A					150M		
2N4131	S	N			RFA	200M	A	200	30	30	0						200	E	350M		
2N4134	S	N			RFA	200M	A	200	30	30	0						200	E	425M		
2N4135	Pair of 2N430 and 2N431																				
2N4136	S	N			PMS	360M	A	200	40	40	0	40	120	10M					500M		
2N4137	S	N			CHP	300M	A	200	30	30	0	50		1.0M					20M		
2N4138	Thyristors, see Table on Page 1-154																				
2N4139	S	N	2N4400	5-34	RFA	300M	A	125	60	30	0		120	150M					250M		
2N4140	S	N	2N4401	5-34	RFA	300M	A	125	60	30	0		300	150M					250M		
2N4141	S	P	2N4402	5-39	RFA	300M	A	125	60	40	0		120	150M					200M		
2N4142	S	P	2N4403	5-39	RFA	300M	A	125	60	40	0		300	150M					200M		
2N4143	Thyristors, see Table on Page 1-154																				
2N4144	Thyristors, see Table on Page 1-154																				
2N4149	S	N			LPA	5W	C		100	80	0	40	120	5.0A					15M		
2N4150	Thyristors, see Table on Page 1-154																				
2N4151	Thyristors, see Table on Page 1-154																				
2N4204	S	P			HSS	300M	A	200	6.0	6.0	0	50	120	10M					650M		
2N4207	S	P			HSS	300M	A	200	12	12	0	30	120	10M					700M		
2N4208	S	P			HSS	300M	A	200	15	15	0	50	120	10M					850M		
2N4209	S	N			LPA	100W	C		80	60	0	20	100	10A					10M		
2N4210	S	N			LPA	100W	C		100	80	0	20	100	10A					10M		
2N4211	Thyristors, see Table on Page 1-154																				
2N4212	Thyristors, see Table on Page 1-154																				
2N4216	Field Effect Transistors, see Table on Page 1-166																				
2N4220A	Field Effect Transistors, see Table on Page 1-166																				
2N4224	S	N			LPA	5.0W	C		100	40	0	40	150	1.0A					150M		
2N4225	S	N			LPA	5.0W	C		200	60	0	40	150	1.0A					150M		
2N4226	S	N	2N4400	5-34	MSA	300M	A	125	60	30	0		150	150M					250M		
2N4227	S	N																			

THYRISTOR INDEX (continued)

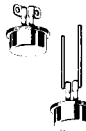
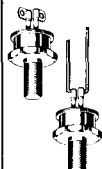
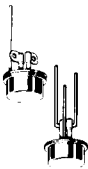
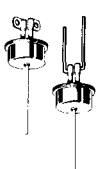
2N4098-2N4213

TYPE	REPLACEMENT	PAGE NUMBER	I_F A	V_{FOM}/V_{ROM} V	T_J °C	I_{GT} mA	V_{GT} V
2N4098	2N4158 2N4166 MCR649P-8	4-26 4-26 4-46	0.2	50	125	0.2	0.8
2N4101			3.2	600	100	15	2.0
2N4102			1.3	600	100	15	2.0
2N4103			8.0	600	100	40	2.0
2N4108				50	125		
2N4109				100	125		
2N4110				200	125		
2N4144			0.250	15	150	1.0	0.8
2N4145			0.250	30	150	1.0	0.8
2N4146			0.250	60	150	1.0	0.8
2N4147			0.250	100	150	1.0	0.8
2N4148			0.250	150	150	1.0	0.8
2N4149			0.250	200	150	1.0	0.8
2N4151		4-26	8.0	25	100	20	1.5
2N4152		4-26	8.0	50	100	20	1.5
2N4153		4-26	8.0	100	100	20	1.5
2N4154		4-26	8.0	200	100	20	1.5
2N4155		4-26	8.0	300	100	20	1.5
2N4156		4-26	8.0	400	100	20	1.5
2N4157		4-26	8.0	500	100	20	1.5
2N4158		4-26	8.0	600	100	20	1.5
2N4159		4-26	8.0	25	100	20	1.5
2N4160		4-26	8.0	50	100	20	1.5
2N4161		4-26	8.0	100	100	20	1.5
2N4162		4-26	8.0	200	100	20	1.5
2N4163		4-26	8.0	300	100	20	1.5
2N4164		4-26	8.0	400	100	20	1.5
2N4165		4-26	8.0	500	100	20	1.5
2N4166		4-26	8.0	600	100	20	1.5
2N4167		4-26	8.0	25	100	20	1.5
2N4168		4-26	8.0	50	100	20	1.5
2N4169		4-26	8.0	100	100	20	1.5
2N4170		4-26	8.0	200	100	20	1.5
2N4171		4-26	8.0	300	100	20	1.5
2N4172		4-26	8.0	400	100	20	1.5
2N4173		4-26	8.0	500	100	20	1.5
2N4174		4-26	8.0	600	100	20	1.5
2N4175		4-26	8.0	25	100	20	1.5
2N4176		4-26	8.0	50	100	20	1.5
2N4177		4-26	8.0	100	100	20	1.5
2N4178		4-26	8.0	200	100	20	1.5
2N4179		4-26	8.0	300	100	20	1.5
2N4180		4-26	8.0	400	100	20	1.5
2N4181		4-26	8.0	500	100	20	1.5
2N4182		4-26	8.0	600	100	20	1.5
2N4183		4-26	8.0	25	100	20	1.5
2N4184		4-26	8.0	50	100	20	1.5
2N4185		4-26	8.0	100	100	20	1.5
2N4186		4-26	8.0	200	100	20	1.5
2N4187		4-26	8.0	300	100	20	1.5
2N4188		4-26	8.0	400	100	20	1.5
2N4189		4-26	8.0	500	100	20	1.5
2N4190		4-26	8.0	600	100	20	1.5
2N4191		4-26	8.0	25	100	20	1.5
2N4192		4-26	8.0	50	100	20	1.5
2N4193		4-26	8.0	100	100	20	1.5
2N4194		4-26	8.0	200	100	20	1.5
2N4195		4-26	8.0	300	100	20	1.5
2N4196		4-26	8.0	400	100	20	1.5
2N4197		4-26	8.0	500	100	20	1.5
2N4198		4-26	8.0	600	100	20	1.5
2N4199		4-30	100*	300	105	50	1.5
2N4200		4-30	100*	400	105	50	1.5
2N4201		4-30	100*	500	105	50	1.5
2N4202		4-30	100*	600	105	50	1.5
2N4203		4-30	100*	700	105	50	1.5
2N4204		4-30	100*	800	105	50	1.5
2N4212		4-36	1.6	25	125	0.1	1.5
2N4213		4-36	1.6	50	125	0.1	1.5

THYRISTOR PRODUCTS

THYRISTOR QUICK SELECTION

THYRISTORS —
SILICON
CONTROLLED
RECTIFIERS

		800 mA		1.6 AMP	2.0 AMP	8.0 AMP			
THYRISTORS — SILICON CONTROLLED RECTIFIERS		 Plastic Case 29 (10)	 Case 31A	 Case 63	 Plastic Case 90	 Case 85 Case 85L ^① (Leads)	 Case 86 Case 86L ^① (Leads)	 Case 87 Case 87L ^① (Leads)	 Case 88 Case 88L ^① (Leads)
BLOCKING VOLTAGE (DC OR PEAK) VOLTS	25 V	—	2N2322 2N4212#	MCR846-1	—	2N4151 2N4159 ^①	2N4167 2N4175 ^②	MCR2604-1 2N4183 ^③	MCR2605-1 2N4191 ^④
	30 V	2N5060#	—	—	—	—	—	—	—
	50 V	—	2N1595 2N2323# 2N4213#	MCR846-2	2N4441	2N4152 2N4160 ^①	2N4168 2N4176 ^②	MCR2604-2 2N4184 ^③	MCR2605-2 2N4192 ^④
	60 V	2N5061#	—	—	—	—	—	—	—
	100 V	2N5062#	2N1596 2N2324# 2N4214#	MCR846-3	—	2N4153 2N4161 ^①	2N4169 2N4177 ^②	MCR2604-3 2N4185 ^③	MCR2605-3 2N4193 ^④
	150 V	2N5063#	2N2325# 2N4215#	—	—	—	—	—	—
	200 V	—	2N1597 2N2326# 2N4216#	MCR846-4	2N4442	2N4154 2N4162 ^①	2N4170 2N4178 ^②	MCR2604-4 2N4186 ^③	MCR2605-4 2N4194 ^④
	250 V	—	—	—	—	—	—	—	—
	300 V	—	2N1598	—	—	2N4155 2N4163 ^①	2N4171 2N4179 ^②	MCR2604-5 2N4187 ^③	MCR2605-5 2N4195 ^④
	400 V	—	2N1599	—	2N4443	2N4156 2N4164 ^①	2N4172 2N4180 ^②	MCR2604-6 2N4188 ^③	MCR2605-6 2N4196 ^④
	500 V	—	—	—	—	2N4157 2N4165 ^①	2N4173 2N4181 ^②	MCR2604-7 2N4189 ^③	MCR2605-7 2N4197 ^④
	600 V	—	—	—	2N4444	2N4158 2N4166 ^①	2N4174 2N4182 ^②	MCR2604-8 2N4190 ^③	MCR2605-8 2N4198 ^④
	700 V	—	—	—	—	—	—	—	—
	800 V	—	—	—	—	—	—	—	—

*Reverse polarity available (add suffix "R": i.e. 2N5164R)

**Formerly MCR2818 and MCR2918, -2, -4, -6, -8 respectively.

#Sensitive gate devices

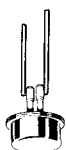
2N4151 thru 2N4198

$$I_f = 8 \text{ A}$$

$$V_{\text{ROM(rep)}} = 25\text{-}600 \text{ V}$$



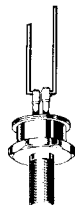
2N4151-58
CASE 85



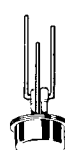
2N4159-66
CASE 85L



2N4167-74
CASE 86



2N4175-82
CASE 86L



2N4183-90
CASE 87L



2N4191-98
CASE 88L

Multi-purpose silicon controlled rectifiers suited for industrial, consumer, and military applications. Offered in a choice of space-saving, economical packages for mounting versatility.

MAXIMUM RATINGS

(Apply over operating temperature range and for all case types unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Reverse Blocking Voltage*† 2N4151, 59, 67, 75, 83, 91 2N4152, 60, 68, 76, 84, 92 2N4153, 61, 69, 77, 85, 93 2N4154, 62, 70, 78, 86, 94 2N4155, 63, 71, 79, 87, 95 2N4156, 64, 72, 80, 88, 96 2N4157, 65, 73, 81, 89, 97 2N4158, 66, 74, 82, 90, 98	$V_{\text{ROM(rep)}}^{* \dagger}$	25 50 100 200 300 400 500 600	Volts
Non-repetitive Peak Reverse Blocking Voltage 2N4151, 59, 67, 75, 83, 91 2N4152, 60, 68, 76, 84, 92 2N4153, 61, 69, 77, 85, 93 2N4154, 62, 70, 78, 86, 94 2N4155, 63, 71, 79, 87, 95 2N4156, 64, 72, 80, 88, 96 2N4157, 65, 73, 81, 89, 97 2N4158, 66, 74, 82, 90, 98	$V_{\text{ROM(non-rep)}}$	75 100 150 300 400 500 600 700	Volts
Forward Current RMS	I_f	8.0	Amp
Circuit Fusing Considerations ($T_J = -40$ to $+100^\circ\text{C}$; $t \leq 8.3$ ms)	I^2t	40	A^2s
Peak Forward Surge Current † (One cycle, 60 Hz, $T_J = -40$ to $+100^\circ\text{C}$)	$I_{\text{FM(surge)}}^\dagger$	100	Amp
Peak Forward Gate Power †	$P_{\text{GFM}}^\dagger$	5.0	Watt
Average Forward Gate Power †	$P_{\text{GF(AV)}}^\dagger$	0.5	Watt
Peak Forward Gate Current †	$I_{\text{GFM}}^\dagger$	2.0	Amp
Peak Gate Voltage — Forward** Reverse	V_{GFM}^{**} V_{GRM}	10 10	Volts
Operating Temperature Range †	$T_J^\dagger$	-40 to $+100$	$^\circ\text{C}$
Storage Temperature Range †	$T_{\text{stg}}^\dagger$	-40 to $+150$	$^\circ\text{C}$
Stud Torque	2N4167-2N4182	15	in. lb.

2N4151 thru 2N4198 (continued)

THERMAL CHARACTERISTICS

Characteristic	Symbol	Typ	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	1.5	2.5 †	°C/W
Thermal Resistance, Case to Ambient (See Fig. 11) 2N4151-66, 2N4183-98	θ_{CA}	50	—	°C/W

* $V_{ROM(rep)}$ for all types can be applied on a continuous dc basis without incurring damage. Ratings apply for zero or negative gate voltage. Devices should not be tested for blocking capability in a manner such that the voltage applied exceeds the rated blocking voltage.

**Devices should not be operated with a positive bias applied to the gate concurrently with a negative potential applied to the anode.

† JEDEC Registered Values

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
Peak Forward Blocking Voltage † ($T_J = 100^\circ\text{C}$)	$V_{FOM}^\dagger$	25 50 100 200 300 400 500 600	— — — — — — — —	Volts
Peak Forward Blocking Current † (Rated V_{FOM} @ $T_J = 100^\circ\text{C}$, gate open)	$I_{FOM}^\dagger$	—	2.0	mA
Peak Reverse Blocking Current † (Rated V_{ROM} @ $T_J = 100^\circ\text{C}$, gate open)	$I_{ROM}^\dagger$	—	2.0	mA
Gate Trigger Current (Continuous dc)** (Anode Voltage = 7.0 Vdc, $R_L = 100\ \Omega$) (Anode Voltage = 7.0 Vdc, $R_L = 100\ \Omega$, $T_C = -40^\circ\text{C}$) †	I_{GT}^{**}	— —	20 50 †	mA
Gate Trigger Voltage (Continuous dc) (Anode Voltage = 7.0 Vdc, $R_L = 100\ \Omega$) (Anode Voltage = 7.0 Vdc, $R_L = 100\ \Omega$, $T_C = -40^\circ\text{C}$) † (Anode Voltage = 7.0 Vdc, $R_L = 100\ \Omega$, $T_J = 100^\circ\text{C}$) †	V_{GT}	— — 0.2 †	1.5 2.5 † —	Volts
Forward "On" Voltage (pulsed, 1.0 ms max, duty cycle $\leq 1\%$) ($I_F = 5.0\ \text{A}$) ($I_F = 15.7\ \text{A}$) †	V_F	— —	1.3 2.0 †	Volts
Holding Current (Anode Voltage = 7.0 Vdc, gate open) (Anode Voltage = 7.0 Vdc, gate open, $T_C = -40^\circ\text{C}$) †	I_{HO}	— —	25 60 †	mA
Turn-On Time ($t_d + t_r$) ($I_G = 20\ \text{mAdc}$, $I_F = 5.0\ \text{Adc}$)	t_{on}	Typical		μs
		1.0		
Turn-Off Time ($I_F = 5.0\ \text{Adc}$, $I_R = 5.0\ \text{Adc}$) ($I_F = 5.0\ \text{Adc}$, $I_R = 5.0\ \text{Adc}$, $T_J = 100^\circ\text{C}$) (V_{FXM} = rated voltage) ($dv/dt = 30\ \text{V}/\mu\text{s}$)	t_{off}	15 25		μs
Forward Voltage Application Rate (Gate open, $T_J = 100^\circ\text{C}$)	dv/dt	50		$\text{V}/\mu\text{s}$

* V_{FOM} for all types can be applied on a continuous dc basis without incurring damage. Ratings apply for zero or negative gate voltage. These devices should not be tested with a constant current source for forward or reverse blocking capability such that the voltage applied exceeds the rated blocking voltage.

**For optimum operation, i.e. faster turn-on, lower switching losses, best di/dt capability, recommended $I_{GT} = 200\ \text{mA}$.

† JEDEC Registered Values

2N4151 thru 2N4198 (continued)

EFFECT OF TEMPERATURE UPON TYPICAL TRIGGER CHARACTERISTICS

FIGURE 1 — GATE TRIGGER CURRENT

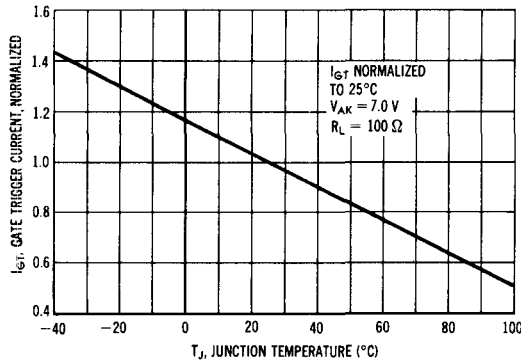
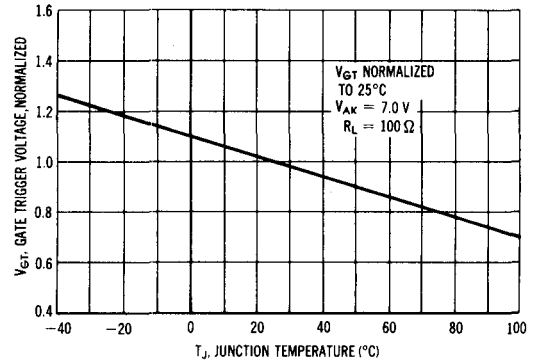


FIGURE 2 — GATE TRIGGER VOLTAGE



MAXIMUM ALLOWABLE NON-RECURRENT SURGE CURRENT

FIGURE 3 — 60 Hz SURGES

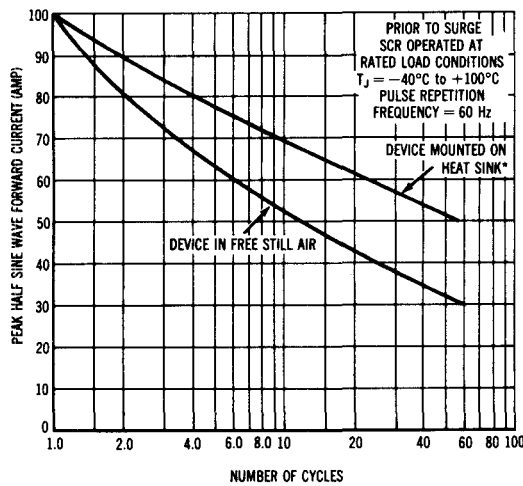


FIGURE 4 — SUB-CYCLE SURGES

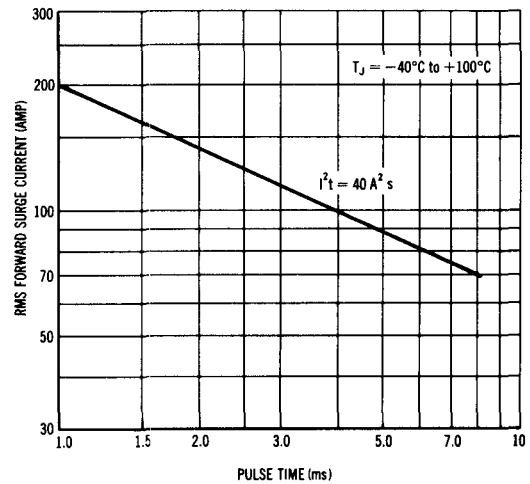


FIGURE 5 — GATE TRIGGER CHARACTERISTICS

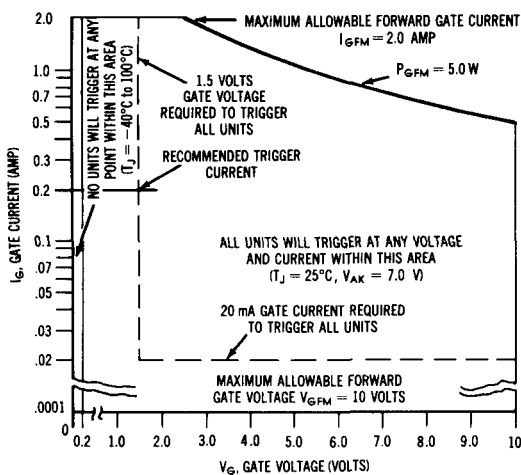
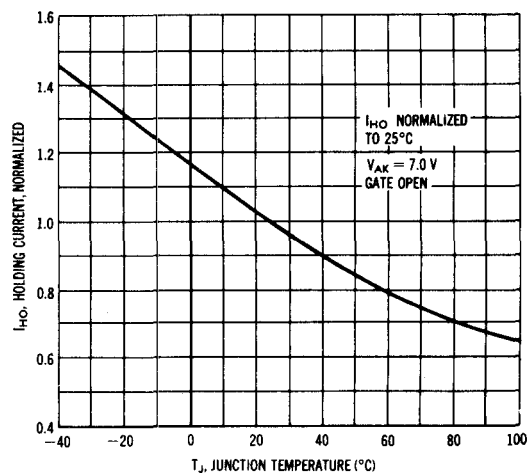


FIGURE 6 — TYPICAL HOLDING CURRENT



*Heat sink sufficient to maintain allowable case temperature for 180 degree conduction angle during normal operation, see Figure 7.

2N4151 thru 2N4198 (continued)

DERATING AND DISSIPATION FOR RESISTIVE AND INDUCTIVE LOADS (f = 60 to 400 Hz, SINE WAVE)

FIGURE 7 — CURRENT DERATING

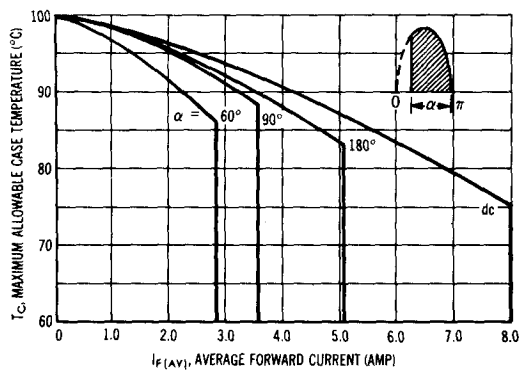


FIGURE 8 — FORWARD POWER DISSIPATION

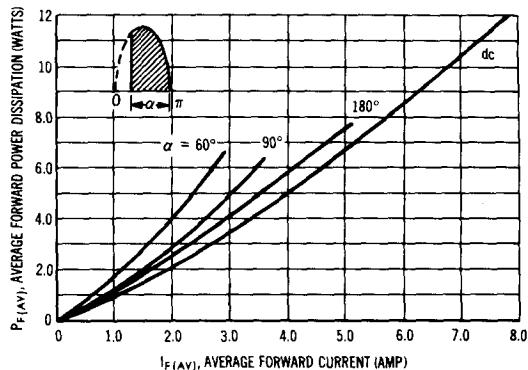


FIGURE 9 — FORWARD CONDUCTION CHARACTERISTICS

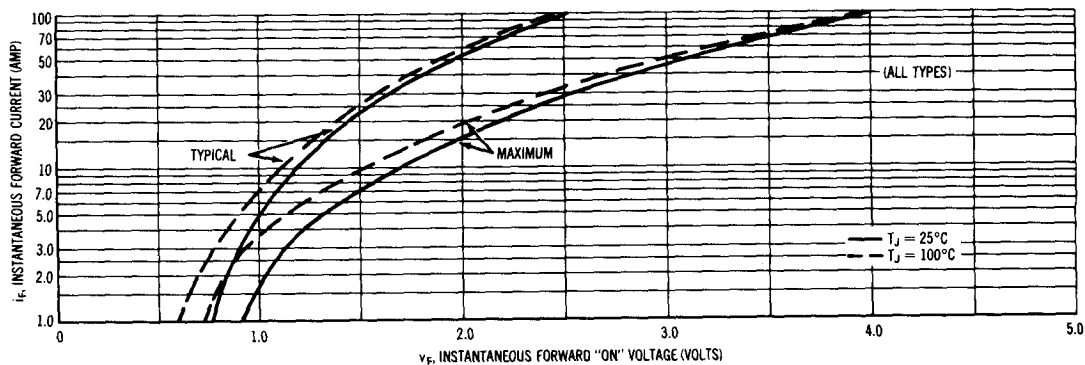


FIGURE 10 — TYPICAL THERMAL RESISTANCE OF PLATES

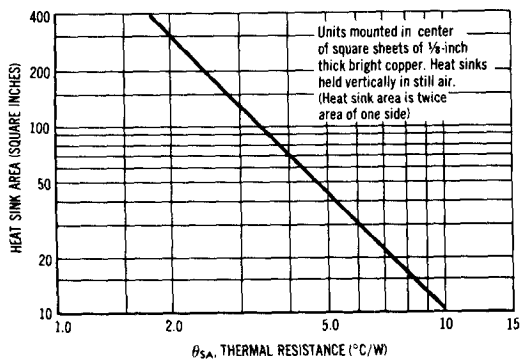


FIGURE 11 — CASE-TO-AMBIENT THERMAL RESISTANCE

