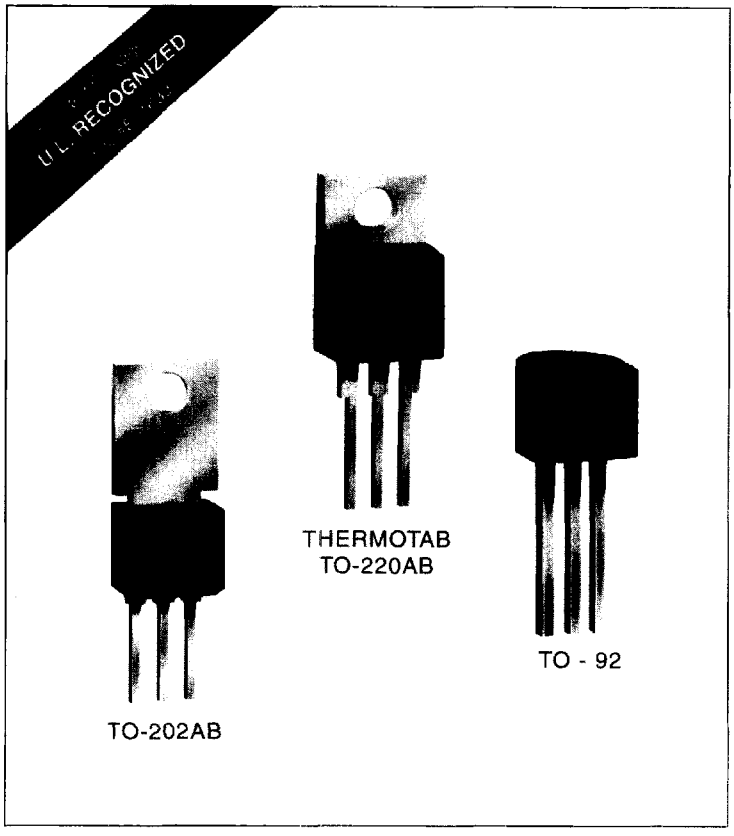
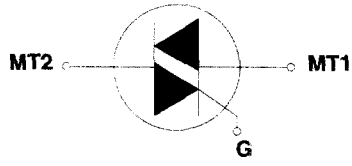




Triacs

(0.8 – 25 Amps)

General Description

These gated triacs from Teccor Electronics are part of a broad line of bidirectional semiconductors. The devices range in current ratings from 0.8 to 25 amperes and in voltages from 200 to 800 volts.

The triac may be gate triggered from a blocking to conduction state for either polarity of applied voltage and is designed for AC switching and phase control applications such as speed and temperature modulation controls, lighting controls and static switching relays. The triggering signal is normally applied between the gate and MT1.

Teccor's gated triacs are available in a choice of different packages as shown above. Isolated packages are offered with internal construction, having the case or mounting tab electrically isolated from the semiconductor chip. This feature facilitates the use of low-cost assembly and convenient packaging techniques. Tape-and-reel capability is available. See "Packing Options" section of this catalog.

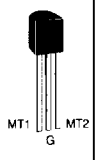
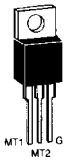
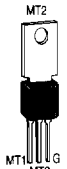
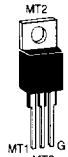
All Teccor triacs have glass-passivated junctions to ensure long term device reliability and parameter stability. Teccor's glass offers a rugged, reliable barrier against junction contamination.

Variations of devices covered in this data sheet are available for custom design applications. Please consult factory for more information.

Features

- **Electrically-isolated packages**
- **Glass-passivated junctions**
- **Voltage capability — up to 800 Volts**
- **Surge capability — up to 200 Amps**

Electrical Specifications

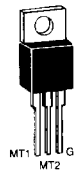
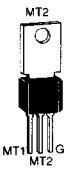
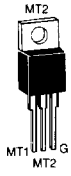
$I_{T(RMS)}$	Part Number				V_{DRM}	I_{GT}					I_{DRM}			V_{TM}	V_{GT}	
		Isolated	Non-Isolated			DC Gate Trigger Current in Specific Operating Quadrants V_D = 12VDC R_L = 60Ω (3) (7)					Peak Off-State Current Gate Open V_{DRM} = Max Rated Value (1) (16)			Peak On-State Voltage at Max Rated RMS Current T_C = 25°C (1) (5)	DC Gate Trigger Voltage V_D = 12VDC R_L = 60Ω (2) (6) (18)	
RMS On-State Current Conduction Angle of 360° (4)					Repetitive Peak Blocking Voltage (1)	mAmps					mAmps				Volts	
	TO-92	THERMOTAB TO-220AB	TO-202AB	TO-220AB	Volts	QI	QII	QIII	QIV	QIV	T_C = 25°C	T_C = 100°C	T_C = 125°C	Volts	T_C = 125°C	T_C = 25°C
MAX	See "Package Dimensions" section for variations.				MIN	MAX				TYP	MAX			MAX	MIN	MAX
0.8 Amp	Q2X8E3				200	10	10	10		25	.02	0.5	1.0	1.6	0.2	2.0
	Q4X8E3				400	10	10	10		25	.02	0.5	1.0	1.6	0.2	2.0
	Q5X8E3				500	10	10	10		25	.02	0.5	1.0	1.6	0.2	2.0
	Q6X8E3				600	10	10	10		25	.02	0.5	1.0	1.6	0.2	2.0
	Q2X8E4				200	25	25	25		50	.02	0.5	1.0	1.6	0.2	2.5
	Q4X8E4				400	25	25	25		50	.02	0.5	1.0	1.6	0.2	2.5
	Q5X8E4				500	25	25	25		50	.02	0.5	1.0	1.6	0.2	2.5
	Q6X8E4				600	25	25	25		50	.02	0.5	1.0	1.6	0.2	2.5
1.0 Amp	Q201E3				200	10	10	10		25	.02	0.5	1.0	1.6	0.2	2.0
	Q401E3				400	10	10	10		25	.02	0.5	1.0	1.6	0.2	2.0
	Q501E3				500	10	10	10		25	.02	0.5	1.0	1.6	0.2	2.0
	Q601E3				600	10	10	10		25	.02	0.5	1.0	1.6	0.2	2.0
	Q201E4				200	25	25	25		50	.02	0.5	1.0	1.6	0.2	2.5
	Q401E4				400	25	25	25		50	.02	0.5	1.0	1.6	0.2	2.5
	Q501E4				500	25	25	25		50	.02	0.5	1.0	1.6	0.2	2.5
	Q601E4				600	25	25	25		50	.02	0.5	1.0	1.6	0.2	2.5
4.0 Amps		Q2004L3	Q2004F31		200	10	10	10		25	.05	0.5	2.0	1.6	0.2	2.0
		Q4004L3	Q4004F31		400	10	10	10		25	.05	0.5	2.0	1.6	0.2	2.0
		Q5004L3	Q5004F31		500	10	10	10		25	.05	0.5	2.0	1.6	0.2	2.0
		Q6004L3	Q6004F31		600	10	10	10		25	.05	0.5	2.0	1.6	0.2	2.0
		Q2004L4	Q2004F41		200	25	25	25		50	.05	0.5	2.0	1.6	0.2	2.5
		Q4004L4	Q4004F41		400	25	25	25		50	.05	0.5	2.0	1.6	0.2	2.5
		Q5004L4	Q5004F41		500	25	25	25		50	.05	0.5	2.0	1.6	0.2	2.5
		Q6004L4	Q6004F41		600	25	25	25		50	.05	0.5	2.0	1.6	0.2	2.5
		Q7004L4			700	25	25	25		50	.05	0.5	2.0	1.6	0.2	2.5
		Q8004L4			800	25	25	25		50	.05	0.5	2.0	1.6	0.2	2.5
6.0 Amps		Q2006L4	Q2006F41	Q2006R4	200	25	25	25		50	.05	0.5	2.0	1.6	0.2	2.5
		Q4006L4	Q4006F41	Q4006R4	400	25	25	25		50	.05	0.5	2.0	1.6	0.2	2.5
		Q5006L4	Q5006F41	Q5006R4	500	25	25	25		50	.05	0.5	2.0	1.6	0.2	2.5
		Q6006L5	Q6006F51	Q6006R5	600	50	50	50		75	.05	0.5	2.0	1.6	0.2	2.5
		Q7006L5		Q7006R5	700	50	50	50		75	.05	0.5	2.0	1.6	0.2	2.5
		Q8006L5		Q8006R5	800	50	50	50		75	.05	0.5	2.0	1.6	0.2	2.5
8.0 Amps		Q2008L4	Q2008F41	Q2008R4	200	25	25	25		50	.05	0.5	2.0	1.6	0.2	2.5
		Q4008L4	Q4008F41	Q4008R4	400	25	25	25		50	.05	0.5	2.0	1.6	0.2	2.5
		Q5008L4	Q5008F41	Q5008R4	500	25	25	25		50	.05	0.5	2.0	1.6	0.2	2.5
		Q6008L5	Q6008F51	Q6008R5	600	50	50	50		75	.05	0.5	2.0	1.6	0.2	2.5
		Q7008L5		Q7008R5	700	50	50	50		75	.05	0.5	2.0	1.6	0.2	2.5
		Q8008L5		Q8008R5	800	50	50	50		75	.05	0.5	2.0	1.6	0.2	2.5

See General Notes and Electrical Specification Notes on page 2-4.

I_H	I_{GTM}	P_{GM}	$P_{G(AV)}$	I_{TSM}		dv/dt (c)	dv/dt		t_{gt}	I^2t	di/dt
Holding Current (DC) Gate Open (1) (8) (12)	Peak Gate Trigger Current (14)	Peak Gate Power Dissipation (14) $I_{GT} \leq I_{GTM}$	Average Gate Power Dissipation	Peak One Cycle Surge (9) (13)		Critical Rate-of-Rise of Commutation Voltage at Rated V_{DRM} and $I_{T(RMS)}$ Commutating di/dt = 0.54 Rated $I_{T(RMS)}$/ms Gate Unenergized (1) (4) (13)	Critical Rate-of-Rise of Off-State Voltage at Rated V_{DRM} Gate Open (1) Volts/µSec		Gate Controlled Turn-On Time I_{GT} = 200mA 0.1µs Rise Time (10)	RMS Surge (Non-Repetitive) On-State Current for Period of 8.3ms for Fusing	Maximum Rate-of-Change of On-State Current I_{GT} = 200mA with 0.1µs Rise Time
mAmps				Amps		Volts/µSec	T_C= 100°C	T_C= 125°C	µSec		
MAX	Amps	Watts	Watts	60Hz	50Hz	TYP	MIN		TYP	Amp^2Sec	Amps/µSec
15	1.0	10	0.2	10	8.3	1.0	40	30	2.5	0.41	20
15	1.0	10	0.2	10	8.3	1.0	35	25	2.5	0.41	20
15	1.0	10	0.2	10	8.3	1.0	30	20	2.5	0.41	20
15	1.0	10	0.2	10	8.3	1.0	25	15	2.5	0.41	20
25	1.0	10	0.2	10	8.3	2.0	50	40	3	0.41	20
25	1.0	10	0.2	10	8.3	2.0	45	35	3	0.41	20
25	1.0	10	0.2	10	8.3	2.0	40	30	3	0.41	20
25	1.0	10	0.2	10	8.3	2.0	35	25	3	0.41	20
15	1.0	10	0.2	20	16.7	1.0	40	30	2.5	1.6	30
15	1.0	10	0.2	20	16.7	1.0	40	30	2.5	1.6	30
15	1.0	10	0.2	20	16.7	1.0	30	20	2.5	1.6	30
15	1.0	10	0.2	20	16.7	1.0	30	20	2.5	1.6	30
25	1.0	10	0.2	20	16.7	1.0	50	40	3	1.6	30
25	1.0	10	0.2	20	16.7	1.0	50	40	3	1.6	30
25	1.0	10	0.2	20	16.7	1.0	40	30	3	1.6	30
25	1.0	10	0.2	20	16.7	1.0	40	30	3	1.6	30
20	1.2	15	0.3	55	46	2.0	50	40	2.5	12.5	50
20	1.2	15	0.3	55	46	2.0	50	40	2.5	12.5	50
20	1.2	15	0.3	55	46	2.0	40	30	2.5	12.5	50
20	1.2	15	0.3	55	46	2.0	40	30	2.5	12.5	50
30	1.2	15	0.3	55	46	2.0	100	75	3	12.5	50
30	1.2	15	0.3	55	46	2.0	100	75	3	12.5	50
30	1.2	15	0.3	55	46	2.0	75	50	3	12.5	50
30	1.2	15	0.3	55	46	2.0	75	50	3	12.5	50
30	1.2	15	0.3	55	46	2.0	60	40	3	12.5	50
30	1.2	15	0.3	55	46	2.0	60	40	3	12.5	50
50	1.6	18	0.5	80	65	4.0	200	120	3	26.5	70
50	1.6	18	0.5	80	65	4.0	200	120	3	26.5	70
50	1.6	18	0.5	80	65	4.0	150	100	3	26.5	70
50	1.6	18	0.5	80	65	4.0	150	100	3	26.5	70
50	1.6	18	0.5	80	65	4.0	125	85	3	26.5	70
50	1.6	18	0.5	80	65	4.0	125	85	3	26.5	70
50	1.8	20	0.5	100	83	4.0	250	150	3	41	70
50	1.8	20	0.5	100	83	4.0	250	150	3	41	70
50	1.8	20	0.5	100	83	4.0	220	125	3	41	70
50	1.8	20	0.5	100	83	4.0	220	125	3	41	70
50	1.8	20	0.5	100	83	4.0	150	100	3	41	70
50	1.8	20	0.5	100	83	4.0	150	100	3	41	70

See General Notes and Electrical Specification Notes on page 2-4.

Electrical Specifications

$I_{T(RMS)}$	Part Number			V_{DRM}	I_{GT}					I_{DRM}			V_{GT}	
	Isolated	Non-Isolated			DC Gate Trigger Current In Specific Operating Quadrants V_D = 12VDC (3) (7) (15)					Peak Off-State Current Gate Open V_{DRM} = Max Rated Value (1) (16)			DC Gate Trigger Voltage V_D = 12VDC (2) (6) (15) (18)	
RMS On-State Current Conduction Angle of 360° (4) (16)				Repetitive Peak Blocking Voltage (1)	mAmps					mAmps			Volts	
	THERMOTAB TO-220AB	TO-202AB	TO-220AB	Volts	QI	QII	QIII	QIV	QIV	T_C = 25°C	T_C = 100°C	T_C = 125°C	T_C = 125°C	T_C = 25°C
MAX	See "Package Dimensions" section for variations.			MIN	MAX				TYP	MAX			MIN	MAX
10.0 Amps	**Q2010L5**	**Q2010F51**	**Q2010R5**	**200**	**50**	**50**	**50**		**75**	**.05**	**0.5**	**2.0**	**0.2**	**2.5**
	Q4010L5	**Q4010F51**	**Q4010R5**	**400**	**50**	**50**	**50**		**75**	**.05**	**0.5**	**2.0**	**0.2**	**2.5**
	Q5010L5	**Q5010F51**	**Q5010R5**	**500**	**50**	**50**	**50**		**75**	**.05**	**0.5**	**2.0**	**0.2**	**2.5**
	Q6010L5	**Q6010F51**	**Q6010R5**	**600**	**50**	**50**	**50**		**75**	**.05**	**0.5**	**2.0**	**0.2**	**2.5**
	Q7010L5		**Q7010R5**	**700**	**50**	**50**	**50**		**75**	**.05**	**0.5**	**2.0**	**0.2**	**2.5**
	Q8010L5		**Q8010R5**	**800**	**50**	**50**	**50**		**75**	**0.1**	**0.5**	**2.0**	**0.2**	**2.5**
15.0 Amps	Q2015L5		Q2015R5	200	50	50	50			.05	0.5	2.0	0.2	2.5
	Q4015L5		Q4015R5	400	50	50	50			.05	0.5	2.0	0.2	2.5
	Q5015L5		Q5015R5	500	50	50	50			.05	0.5	2.0	0.2	2.5
	Q6015L5		Q6015R5	600	50	50	50			.05	0.5	2.0	0.2	2.5
	Q7015L5		Q7015R5	700	50	50	50			0.1	1.0	3.0	0.2	2.5
	Q8015L5		Q8015R5	800	50	50	50			0.1	1.0	3.0	0.2	2.5
25.0 Amps			**Q2025R5**	**200**	**50**	**50**	**50**			**0.1**	**1.0**	**3.0**	**0.2**	**2.5**
			Q4025R5	**400**	**50**	**50**	**50**			**0.1**	**1.0**	**3.0**	**0.2**	**2.5**
			Q5025R5	**500**	**50**	**50**	**50**			**0.1**	**1.0**	**3.0**	**0.2**	**2.5**
			Q6025R5	**600**	**50**	**50**	**50**			**0.1**	**1.0**	**3.0**	**0.2**	**2.5**
			Q7025R5	**700**	**50**	**50**	**50**			**0.1**	**1.0**	**3.0**	**0.2**	**2.5**
			Q8025R5	**800**	**50**	**50**	**50**			**0.1**	**1.0**	**3.0**	**0.2**	**2.5**

General Notes

- All measurements are made at 60 Hz with a resistive load at an ambient temperature of +25°C unless specified otherwise.
- Operating temperature range (T_J) is -65°C to +125°C for TO-92, and -40°C to +125°C for all other devices
- Storage temperature range (T_S) is -65°C to +150°C for TO-92, and -40°C to +150°C for TO-202 devices, and -40°C to +125°C for all other devices.
- Lead solder temperature is a maximum of 230°C for 10 seconds, maximum; ≥ 1/16" (1.59mm) from case
- The case temperature (T_C) is measured as shown on the dimensional outline drawings. See "Package Dimensions" section of this catalog.

Electrical Specification Notes

(1) For either polarity of MT2 with reference to MT1 terminal.
(2) For either polarity of gate voltage (V_{GT}) with reference to MT1 terminal.
(3) See Definition of Quadrants.
(4) See Figures 2.1 through 2.7 for current rating at specific operating temperature.
(5) See Figures 2.8 through 2.10 for i_T vs v_T.
(6) See Figure 2.12 for V_{GT} vs T_C.
(7) See Figure 2.11 for I_{GT} vs T_C.
(8) See Figure 2.14 for I_H vs T_C.
(9) See Figure 2.13 for surge rating with specific durations.
(10) See Figure 2.15 for t_{gt} vs I_{GT}.
(11) See package outlines for lead form configurations. When ordering special lead forming, add type number as suffix to part number.
(12) Initial on-state current = 200mA(DC) for 1-10 amp devices, 400 mA(DC) for 15 amp to 25 amp devices.
(13) See Figures 2.1 through 2.6 for maximum allowable case temperature at maximum rated current.
(14) Pulse width ≤ 10µs.
(15) R_L = 60Ω for 0.8-10 amp triacs; R_L = 30Ω for 15-25 amp triacs.
(16) T_C= T_J for test conditions in off-state.
(17) I_{GT}=500 mA for 25 amp devices.
(18) Quadrants I, II, and III only.

V_{TM}	I_H	I_{GTM}	P_{GM}	$P_{G(AV)}$	I_{TSM}		dv/dt(c)	dv/dt		tgt	I^2t	di/dt
Peak On-State Voltage at Maximum Rated RMS Current T_C = 25°C (1) (5)	Holding Current (DC) Gate Open (1) (8) (12)	Peak Gate Trigger Current (14)	Peak Gate Power Dissipation (14) $I_{GT} \le I_{GTM}$	Average Gate Power Dissipation	Peak One-Cycle Surge (9) (13) Amps		Critical Rate-of-Rise of Commutation Voltage at Rated V_{DRM} & $I_{T(RMS)}$ Commutating di/dt = 0.54 Rated $I_{T(RMS)}$/ms Gate Unenergized (1) (4) (13)	Critical Rate-of-Rise of Off-State Voltage at Rated V_{DRM} Gate Open (1) Volts/µSec		Gate Controlled Turn-On Time I_{GT} = 200mA 0.1µs Rise Time (10) (17)	RMS Surge (Non-Repetitive) On-State for Period of 8.3ms For Fusing	Maximum Rate-of-Change of On-State Current I_{GT} = 200mA with 0.1µs Rise Time
Volts	mAmps	Amps	Watts	Watts	60Hz	50Hz	Volts/µSec	T_C = 100°C	T_C = 125°C	µSec	$Amps^2Sec$	Amps/µSec
MAX	MAX						TYP	MIN		TYP		
1.6	**50**	**1.8**	**20**	**0.5**	**120**	**100**	**4**	**350**	**225**	**3**	**60**	**70**
1.6	**50**	**1.8**	**20**	**0.5**	**120**	**100**	**4**	**350**	**225**	**3**	**60**	**70**
1.6	**50**	**1.8**	**20**	**0.5**	**120**	**100**	**4**	**300**	**200**	**3**	**60**	**70**
1.6	**50**	**1.8**	**20**	**0.5**	**120**	**100**	**4**	**300**	**200**	**3**	**60**	**70**
1.6	**50**	**1.8**	**20**	**0.5**	**120**	**100**	**4**	**250**	**175**	**3**	**60**	**70**
1.6	**50**	**1.8**	**20**	**0.5**	**120**	**100**	**4**	**250**	**175**	**3**	**60**	**70**
1.6	70	2.0	20	0.5	200	167	4	400	275	4	166	100
1.6	70	2.0	20	0.5	200	167	4	400	275	4	166	100
1.6	70	2.0	20	0.5	200	167	4	350	225	4	166	100
1.6	70	2.0	20	0.5	200	167	4	350	225	4	166	100
1.6	70	2.0	20	0.5	200	167	4	300	200	4	166	100
1.6	70	2.0	20	0.5	200	167	4	300	200	4	166	100
1.8	**100**	**2.0**	**20**	**0.5**	**200**	**167**	**5**	**400**	**275**	**4**	**220**	**100**
1.8	**100**	**2.0**	**20**	**0.5**	**200**	**167**	**5**	**400**	**275**	**4**	**220**	**100**
1.8	**100**	**2.0**	**20**	**0.5**	**200**	**167**	**5**	**350**	**225**	**4**	**220**	**100**
1.8	**100**	**2.0**	**20**	**0.5**	**200**	**167**	**5**	**350**	**225**	**4**	**220**	**100**
1.8	**100**	**2.0**	**20**	**0.5**	**200**	**167**	**5**	**300**	**200**	**4**	**220**	**100**
1.8	**100**	**2.0**	**20**	**0.5**	**200**	**167**	**5**	**300**	**200**	**4**	**220**	**100**

Electrical Specifications

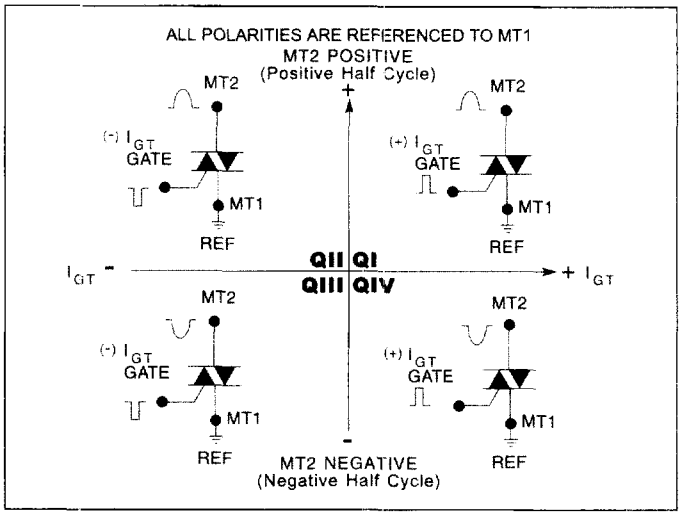
Gate Characteristics

Teccor triacs may be turned on between gate and MT1 terminals in the following ways:

- With in-phase signals (using standard AC line) Quadrants I and III are used.
- By applying unipolar pulses (gate always positive or negative)—with negative gate pulses Quadrants II and III are used and with positive gate pulses Quadrants I and IV are used.

  However, due to higher gate requirements for Quadrant IV, it is recommended that only negative pulses be applied. If positive pulses are required, see sensitive triac sections of catalog or contact factory.

In all cases, if maximum surge capability is required, pulses should be a minimum of one magnitude above I_{GT} rating with a steep rising waveform (≤ 1 µsec rise time).



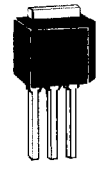
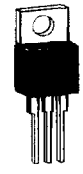
Definition of Quadrants

Electrical Isolation

Teccor's isolated triac packages will withstand a minimum high potential test of 2500VAC (RMS) from leads to mounting tab, over the operating temperature range of the device. See isolation table below for standard and optional isolation ratings.

ELECTRICAL ISOLATION FROM LEADS TO MOUNTING TAB	
VAC (RMS)	Isolated ** TO-220AB
2500	Standard
4000	Optional *

* For 4000V isolation, use V suffix in part number.
** UL Recognized File E71639

THERMAL RESISTANCE (STEADY STATE) $R_{\theta JC}$ ($R_{\theta JA}$) (TYP) °C/W					
Type	 TO-92	 TYPE 1 TO-202AB	 TYPE 2 TO-202AB	 THERMOTAB TO-220AB	 NON-ISOLATED TO-220AB
0.8 Amp	60 [135]				
1.0 Amp	50 [95]				
4.0 Amps		3.5 [45]	6 [70]	3.6 [60]	
6.0 Amps		3.8		3.3	2.1 [45]
8.0 Amps		3.3		2.8	1.8
10.0 Amps		3.5		2.6	1.5
15.0 Amps				2.1	1.3
25.0 Amps					1.1

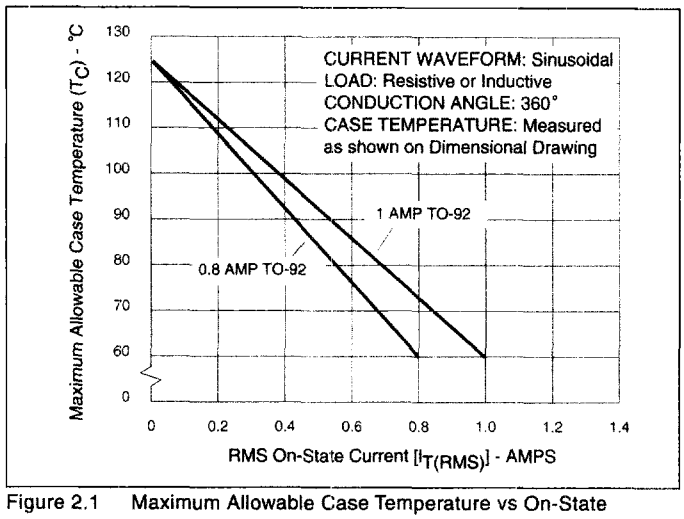


Figure 2.1 Maximum Allowable Case Temperature vs On-State Current (0.8 and 1.0 Amp)

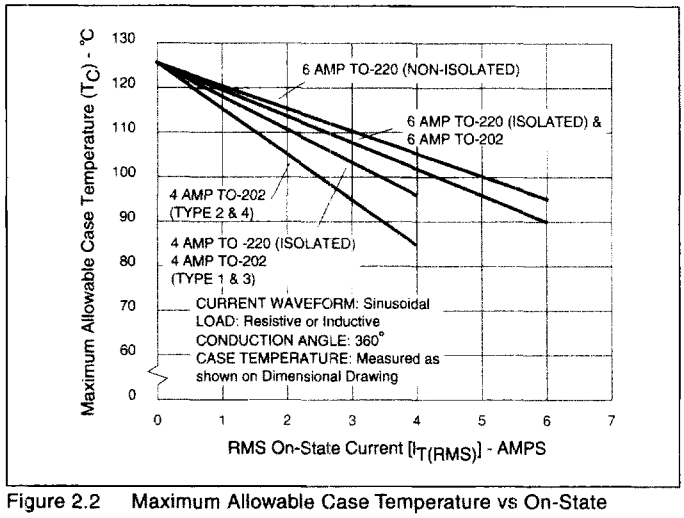


Figure 2.2 Maximum Allowable Case Temperature vs On-State Current (4 and 6 Amp)

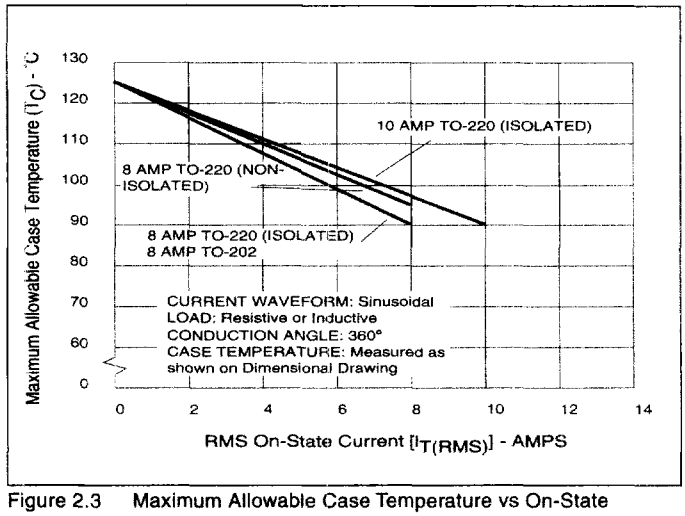


Figure 2.3 Maximum Allowable Case Temperature vs On-State Current (8 and 10 Amp)

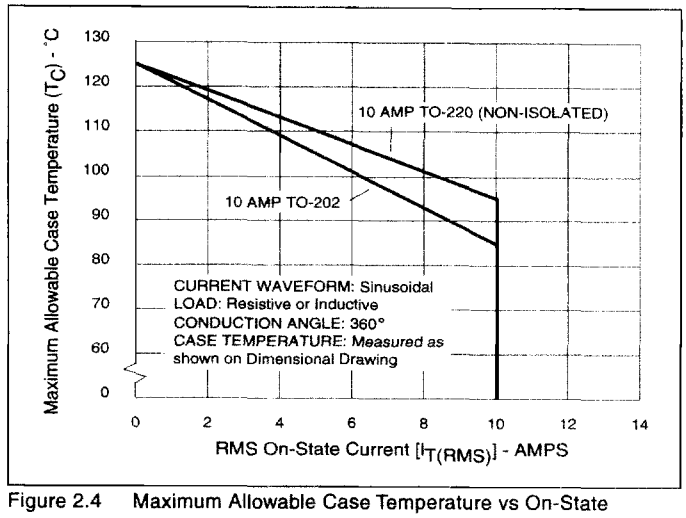


Figure 2.4 Maximum Allowable Case Temperature vs On-State Current (10 Amp)

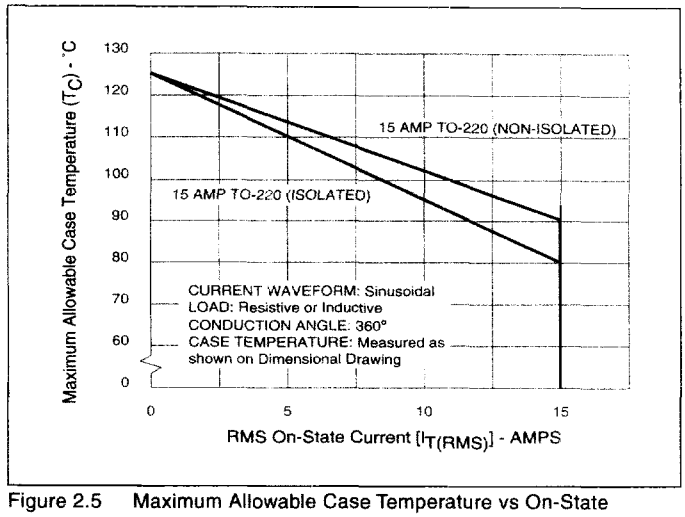


Figure 2.5 Maximum Allowable Case Temperature vs On-State Current (15 Amp)

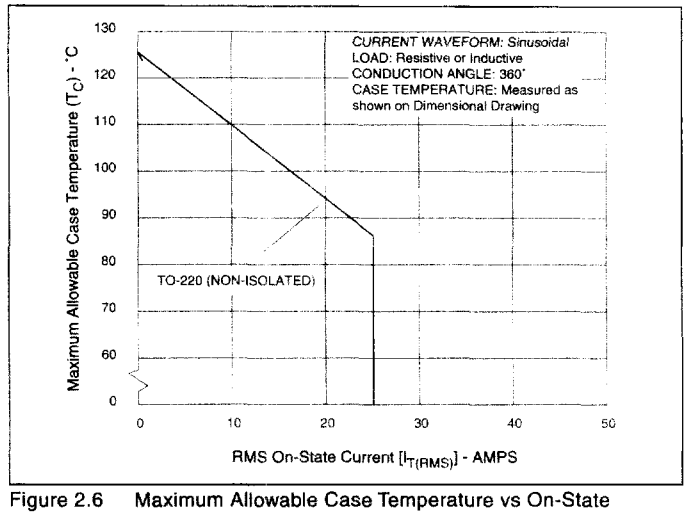


Figure 2.6 Maximum Allowable Case Temperature vs On-State Current (25 Amp)

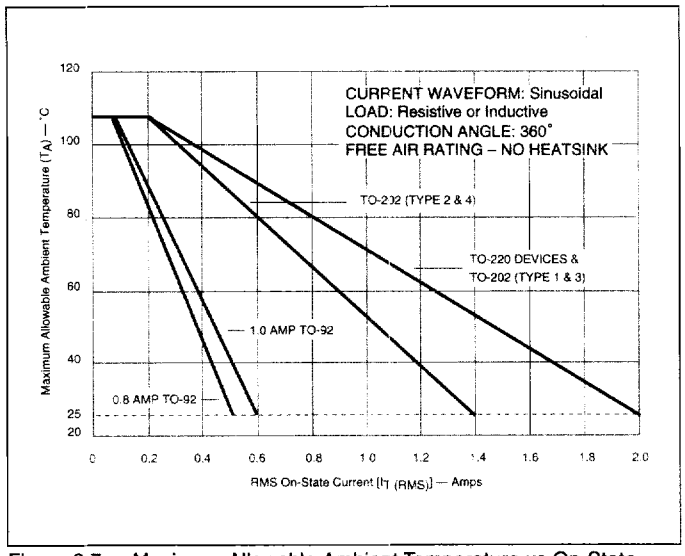


Figure 2.7 Maximum Allowable Ambient Temperature vs On-State Current

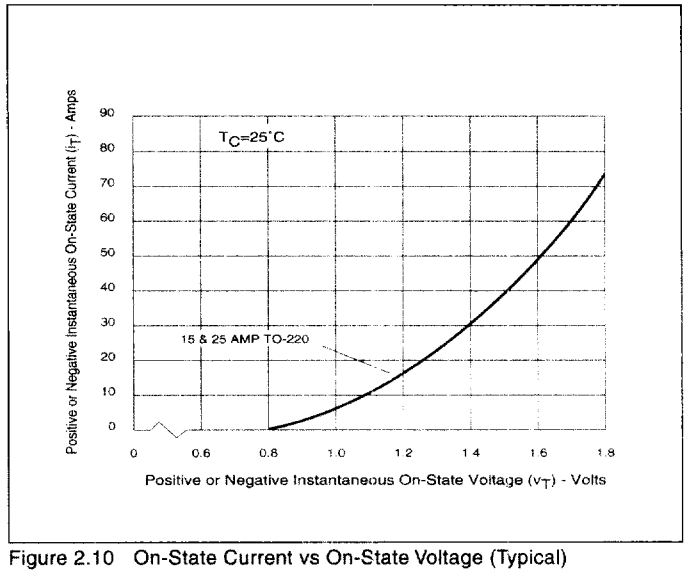


Figure 2.10 On-State Current vs On-State Voltage (Typical) (15 and 25 Amp)

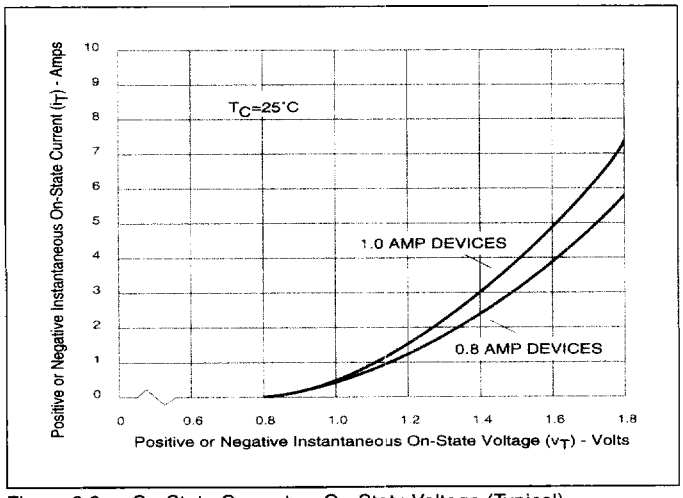


Figure 2.8 On-State Current vs On-State Voltage (Typical) (0.8 and 1.0 Amp)

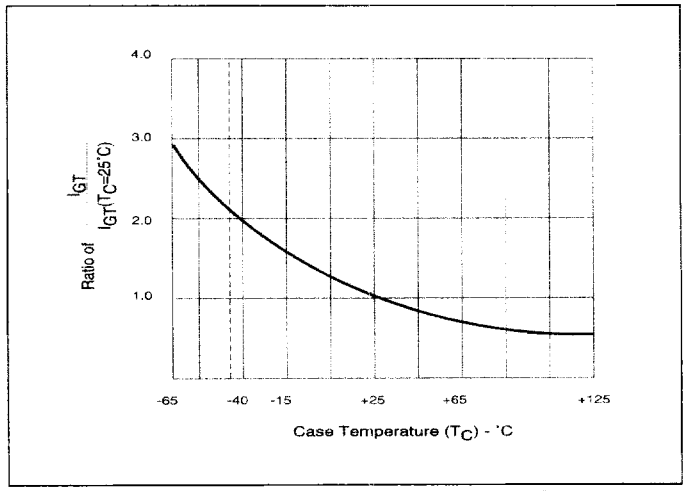


Figure 2.11 Normalized DC Gate Trigger Current for All Quadrants vs Case Temperature

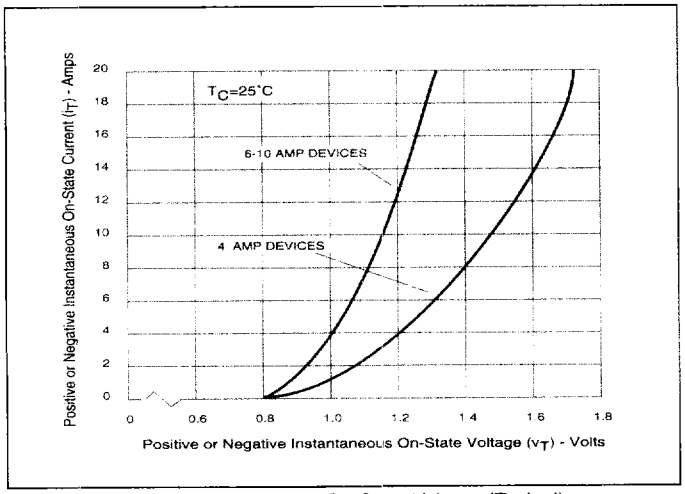


Figure 2.9 On-State Current vs On-State Voltage (Typical) (4, 6, 8, and 10 Amp)

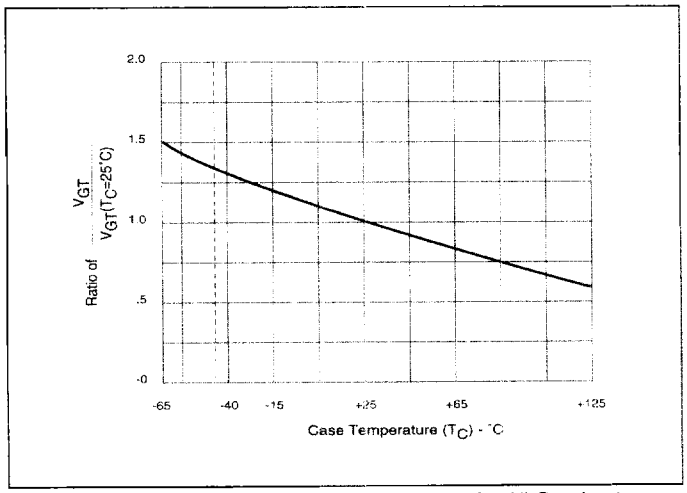


Figure 2.12 Normalized DC Gate Trigger Voltage for All Quadrants vs Case Temperature

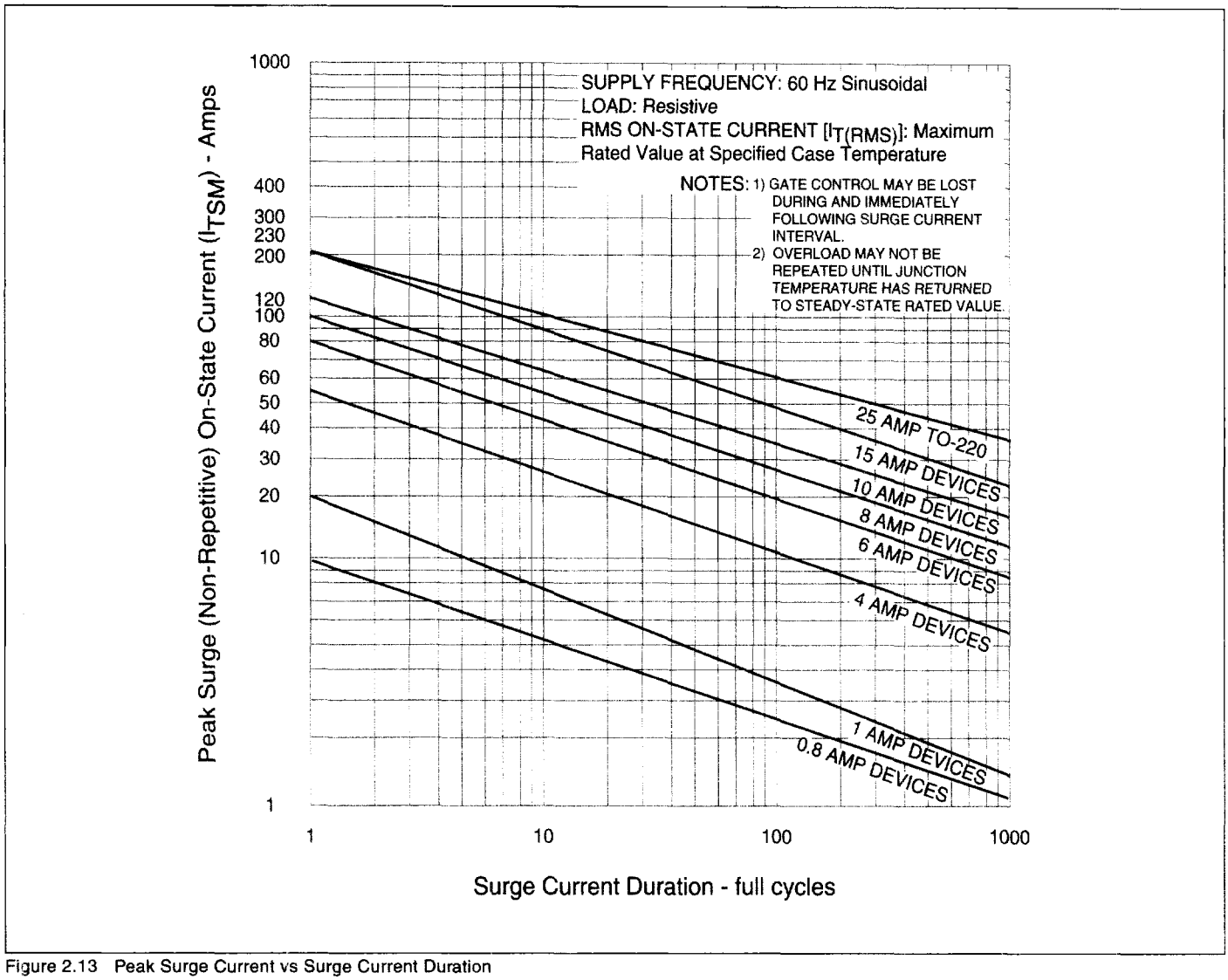


Figure 2.13 Peak Surge Current vs Surge Current Duration

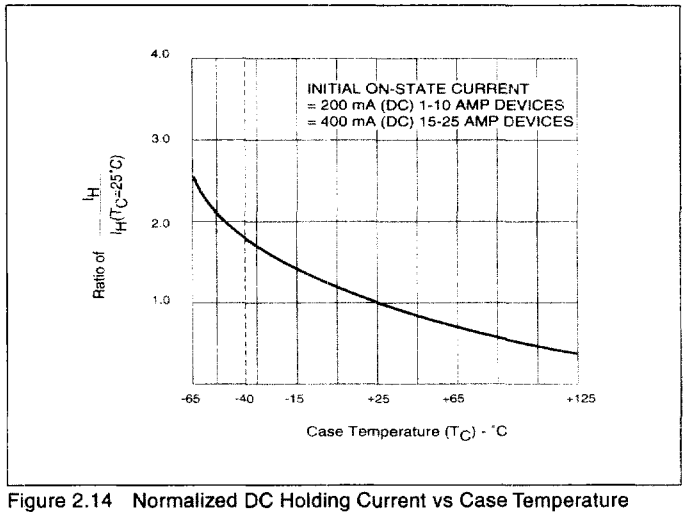


Figure 2.14 Normalized DC Holding Current vs Case Temperature

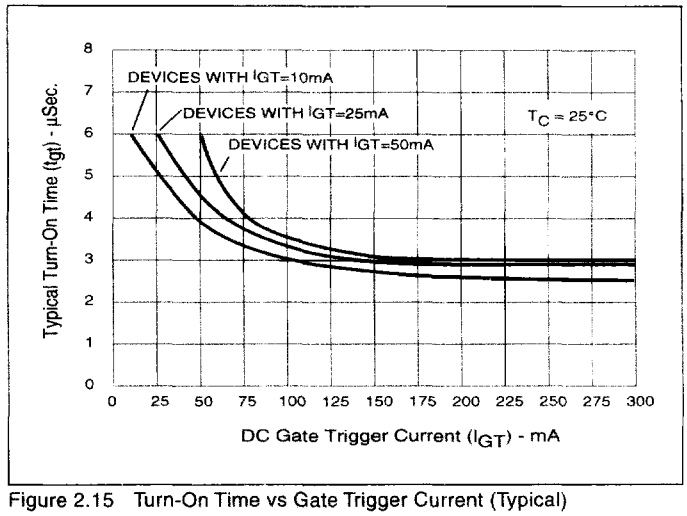


Figure 2.15 Turn-On Time vs Gate Trigger Current (Typical)

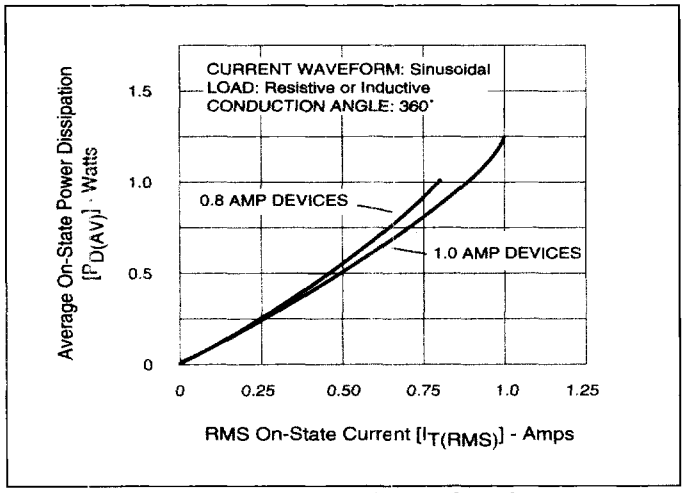


Figure 2.16 Power Dissipation (Typical) vs On-State Current (0.8 and 1.0 Amp)

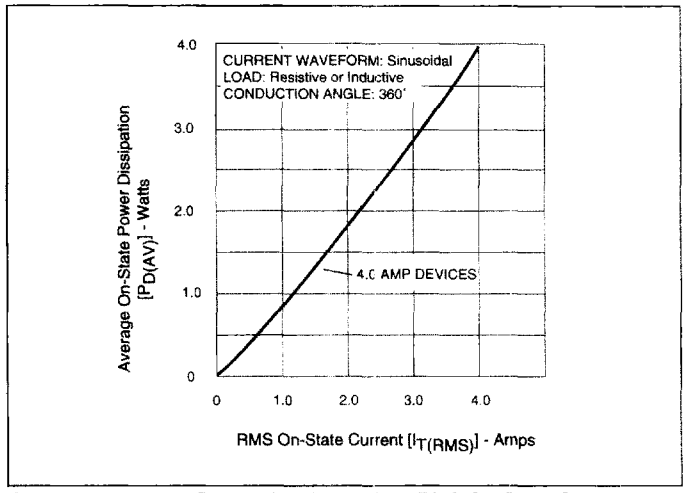


Figure 2.19 Power Dissipation (Typical) vs RMS On-State Current (4 Amp)

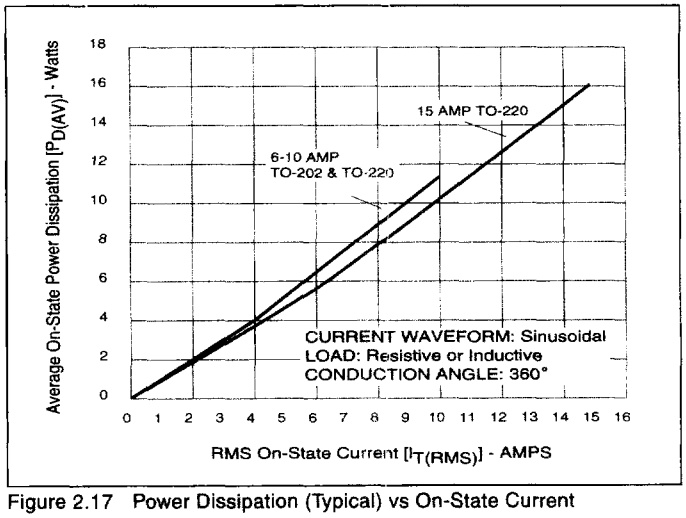


Figure 2.17 Power Dissipation (Typical) vs On-State Current (6-10 and 15 Amp)

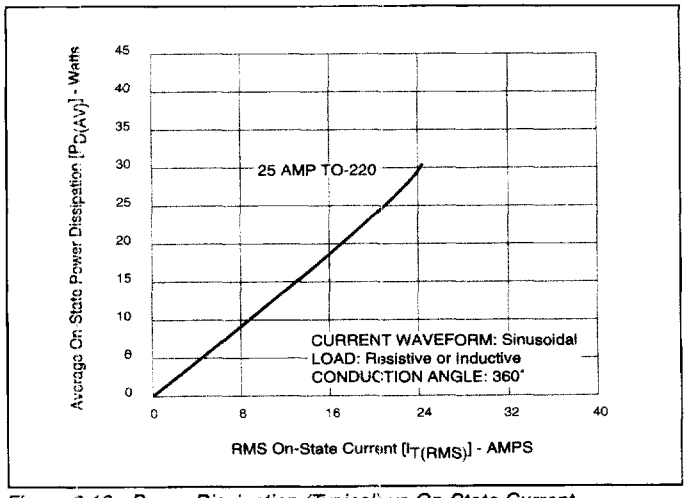


Figure 2.18 Power Dissipation (Typical) vs On-State Current (25 Amp)