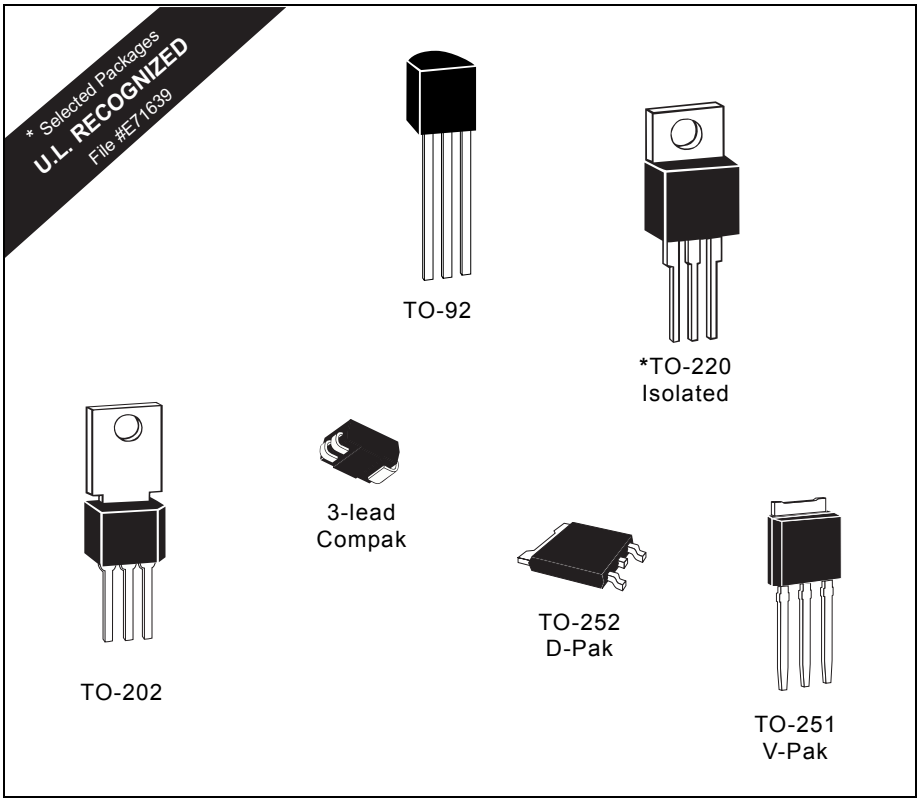
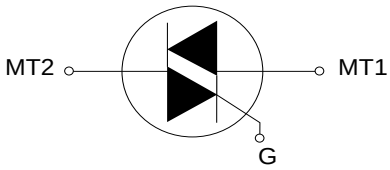


E1



Sensitive Triacs

(0.8 A to 8 A) RoHS

General Description

Teccor's line of sensitive gate triacs includes devices with current capabilities through 8 A. Voltage ranges are available from 200 V to 600 V. This line features devices with guaranteed gate control in Quadrants II and IV as well as control in the commonly used Quadrants I and III. Four-quadrant control devices require sensitive gate triacs. They can be controlled by digital circuitry where positive-only or negative-only pulses must control AC current in both directions through the device. Note that triacs with low I_{GT} values in Quadrants II and IV will have lower dv/dt characteristics.

The sensitive gate triac is a bidirectional AC switch and is gate controlled for either polarity of main terminal voltage. It is used primarily for AC switching and phase control applications such as motor speed controls, temperature modulation controls, and lighting controls.

The epoxy TO-92 and TO-220 configurations feature Teccor's electrically-isolated construction where the case or mounting tab is internally isolated from the semiconductor chip and lead attachments. Non-isolated epoxy TO-202 packages are available as well as TO-251 and surface mount TO-252 (D-Pak). Tape-and-reel capability and tube packing also are available. See “Packing Options” section of this catalog.

All Teccor triacs have glass-passivated junctions. This glassing process prevents migration of contaminants and ensures long-term device reliability with parameter stability.

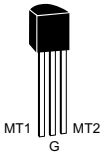
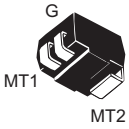
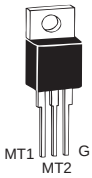
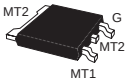
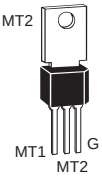
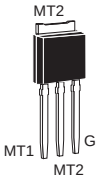
Variations of devices covered in this data sheet are available for custom design applications. Consult factory for more information.

Features

- **RoHS Compliant**
- **Electrically-isolated packages**
- **Glass-passivated junctions ensure long device reliability and parameter stability**
- **Voltage capability — up to 600 V**
- **Surge capability — up to 80 A**
- **Four-quadrant gating guaranteed**

Compak Sensitive Gate Triac

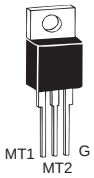
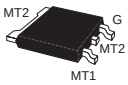
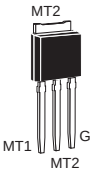
- **Surface mount package — 0.8 A and 1 A series**
- **New small profile three-leaded Compak package**
- **Packaged in embossed carrier tape with 2,500 devices per reel**
- **Can replace SOT-223**

$I_{T(RMS)}$	Part No.						V_{DRM}	I_{GT}				I_{DRM}	
	Isolated			Non-isolated									
(11)							(1)	(3) (6) (9)				(1) (14)	
	TO-92	Compak	TO-220	TO-252 D-Pak	TO-202	TO-251 V-Pak	Volts	mAmps QI	QII	QIII	QIV	mAmps T_C = 25 °C	T_C = 110 °C
MAX	See “Package Dimensions” section for variations. (12)						MIN	MAX				MAX	
0.8 A	**L2X8E3**	**L2X3**					**200**	**3**	**3**	**3**	**3**	**0.01**	**0.1**
	L4X8E3	**L4X3**					**400**	**3**	**3**	**3**	**3**	**0.01**	**0.1**
	L6X8E3	**L6X3**					**600**	**3**	**3**	**3**	**3**	**0.01**	**0.1**
	L2X8E5	**L2X5**					**200**	**5**	**5**	**5**	**5**	**0.01**	**0.1**
	L4X8E5	**L4X5**					**400**	**5**	**5**	**5**	**5**	**0.01**	**0.1**
	L6X8E5	**L6X5**					**600**	**5**	**5**	**5**	**5**	**0.01**	**0.1**
	L2X8E6						**200**	**5**	**5**	**5**	**10**	**0.01**	**0.1**
	L4X8E6						**400**	**5**	**5**	**5**	**10**	**0.01**	**0.1**
	L6X8E6						**600**	**5**	**5**	**5**	**10**	**0.01**	**0.1**
	L2X8E8						**200**	**10**	**10**	**10**	**20**	**0.01**	**0.1**
	L4X8E8						**400**	**10**	**10**	**10**	**20**	**0.01**	**0.1**
	L6X8E8						**600**	**10**	**10**	**10**	**20**	**0.01**	**0.1**
1 A	**L201E3**	**L2N3**					**200**	**3**	**3**	**3**	**3**	**0.01**	**0.1**
	L401E3	**L4N3**					**400**	**3**	**3**	**3**	**3**	**0.01**	**0.1**
	L601E3	**L6N3**					**600**	**3**	**3**	**3**	**3**	**0.01**	**0.1**
	L201E5	**L2N5**					**200**	**5**	**5**	**5**	**5**	**0.01**	**0.1**
	L401E5	**L4N5**					**400**	**5**	**5**	**5**	**5**	**0.01**	**0.1**
	L601E5	**L6N5**					**600**	**5**	**5**	**5**	**5**	**0.01**	**0.1**
	L201E6						**200**	**5**	**5**	**5**	**10**	**0.01**	**0.1**
	L401E6						**400**	**5**	**5**	**5**	**10**	**0.01**	**0.1**
	L601E6						**600**	**5**	**5**	**5**	**10**	**0.01**	**0.1**
	L201E8						**200**	**10**	**10**	**10**	**20**	**0.01**	**0.1**
	L401E8						**400**	**10**	**10**	**10**	**20**	**0.01**	**0.1**
	L601E8						**600**	**10**	**10**	**10**	**20**	**0.01**	**0.1**
4 A			**L2004L3**	**L2004D3**	**L2004F31**	**L2004V3**	**200**	**3**	**3**	**3**	**3**	**0.01**	**0.2**
			L4004L3	**L4004D3**	**L4004F31**	**L4004V3**	**400**	**3**	**3**	**3**	**3**	**0.01**	**0.2**
			L6004L3	**L6004D3**	**L6004F31**	**L6004V3**	**600**	**3**	**3**	**3**	**3**	**0.01**	**0.2**
			L2004L5	**L2004D5**	**L2004F51**	**L2004V5**	**200**	**5**	**5**	**5**	**5**	**0.01**	**0.2**
			L4004L5	**L4004D5**	**L4004F51**	**L4004V5**	**400**	**5**	**5**	**5**	**5**	**0.01**	**0.2**
			L6004L5	**L6004D5**	**L6004F51**	**L6004V5**	**600**	**5**	**5**	**5**	**5**	**0.01**	**0.2**
			L2004L6	**L2004D6**	**L2004F61**	**L2004V6**	**200**	**5**	**5**	**5**	**10**	**0.01**	**0.2**
			L4004L6	**L4004D6**	**L4004F61**	**L4004V6**	**400**	**5**	**5**	**5**	**10**	**0.01**	**0.2**
			L6004L6	**L6004D6**	**L6004F61**	**L6004V6**	**600**	**5**	**5**	**5**	**10**	**0.01**	**0.2**
			L2004L8	**L2004D8**	**L2004F81**	**L2004V8**	**200**	**10**	**10**	**10**	**20**	**0.01**	**0.2**
			L4004L8	**L4004D8**	**L4004F81**	**L4004V8**	**400**	**10**	**10**	**10**	**20**	**0.01**	**0.2**
			L6004L8	**L6004D8**	**L6004F81**	**L6004V8**	**600**	**10**	**10**	**10**	**20**	**0.01**	**0.2**

See “General Notes” on page E1 - 4 and “Electrical Specification Notes” on page E1 - 5.

V_{TM}	V_{GT}	I_H	I_{GTM}	P_{GM}	$P_{G(AV)}$	I_{TSM}	dv/dt(c)	dv/dt	t_{gt}	I^2t	di/dt
(1) (4)	(2) (5) (15)	(1) (7)	(13)	(13)		(8) (10)	(1) (10)	(1)	(9)		
Volts	Volts					Amps		Volts/µSec			
T_C = 25 °C	T_C = 25 °C	mAmps	Amps	Watts	Watts	60/50 Hz	Volts/µSec	T_C = 100 °C	µSec	$Amps^2Sec$	Amps/µSec
MAX	MAX	MAX					TYP	TYP	TYP		
1.6	**2**	**5**	**1**	**10**	**0.2**	**10/8.3**	**0.5**	**20**	**2.8**	**0.41**	**20**
1.6	**2**	**5**	**1**	**10**	**0.2**	**10/8.3**	**0.5**	**15**	**2.8**	**0.41**	**20**
1.6	**2**	**5**	**1**	**10**	**0.2**	**10/8.3**	**0.5**	**10**	**2.8**	**0.41**	**20**
1.6	**2**	**10**	**1**	**10**	**0.2**	**10/8.3**	**1**	**20**	**3**	**0.41**	**20**
1.6	**2**	**10**	**1**	**10**	**0.2**	**10/8.3**	**1**	**15**	**3**	**0.41**	**20**
1.6	**2**	**10**	**1**	**10**	**0.2**	**10/8.3**	**1**	**10**	**3**	**0.41**	**20**
1.6	**2**	**10**	**1**	**10**	**0.2**	**10/8.3**	**1**	**30**	**3**	**0.41**	**20**
1.6	**2**	**10**	**1**	**10**	**0.2**	**10/8.3**	**1**	**25**	**3**	**0.41**	**20**
1.6	**2**	**10**	**1**	**10**	**0.2**	**10/8.3**	**1**	**20**	**3**	**0.41**	**20**
1.6	**2**	**15**	**1**	**10**	**0.2**	**10/8.3**	**2**	**35**	**3.2**	**0.41**	**20**
1.6	**2**	**15**	**1**	**10**	**0.2**	**10/8.3**	**2**	**30**	**3.2**	**0.41**	**20**
1.6	**2**	**15**	**1**	**10**	**0.2**	**10/8.3**	**2**	**25**	**3.2**	**0.41**	**20**
1.6	**2**	**5**	**1**	**10**	**0.2**	**20/16.7**	**0.5**	**20**	**2.8**	**1.6**	**20**
1.6	**2**	**5**	**1**	**10**	**0.2**	**20/16.7**	**0.5**	**20**	**2.8**	**1.6**	**20**
1.6	**2**	**5**	**1**	**10**	**0.2**	**20/16.7**	**0.5**	**10**	**2.8**	**1.6**	**20**
1.6	**2**	**10**	**1**	**10**	**0.2**	**20/16.7**	**1**	**20**	**3**	**1.6**	**20**
1.6	**2**	**10**	**1**	**10**	**0.2**	**20/16.7**	**1**	**20**	**3**	**1.6**	**20**
1.6	**2**	**10**	**1**	**10**	**0.2**	**20/16.7**	**1**	**10**	**3**	**1.6**	**20**
1.6	**2**	**10**	**1**	**10**	**0.2**	**20/16.7**	**1**	**30**	**3**	**1.6**	**20**
1.6	**2**	**10**	**1**	**10**	**0.2**	**20/16.7**	**1**	**30**	**3**	**1.6**	**20**
1.6	**2**	**10**	**1**	**10**	**0.2**	**20/16.7**	**1**	**20**	**3**	**1.6**	**20**
1.6	**2**	**15**	**1**	**10**	**0.2**	**20/16.7**	**1**	**35**	**3.2**	**1.6**	**20**
1.6	**2**	**15**	**1**	**10**	**0.2**	**20/16.7**	**1**	**35**	**3.2**	**1.6**	**20**
1.6	**2**	**15**	**1**	**10**	**0.2**	**20/16.7**	**1**	**25**	**3.2**	**1.6**	**20**
1.6	**2**	**5**	**1.2**	**15**	**0.3**	**40/33**	**0.5**	**25**	**2.8**	**6.6**	**50**
1.6	**2**	**5**	**1.2**	**15**	**0.3**	**40/33**	**0.5**	**25**	**2.8**	**6.6**	**50**
1.6	**2**	**5**	**1.2**	**15**	**0.3**	**40/33**	**0.5**	**15**	**2.8**	**6.6**	**50**
1.6	**2**	**10**	**1.2**	**15**	**0.3**	**40/33**	**1**	**25**	**3**	**6.6**	**50**
1.6	**2**	**10**	**1.2**	**15**	**0.3**	**40/33**	**1**	**25**	**3**	**6.6**	**50**
1.6	**2**	**10**	**1.2**	**15**	**0.3**	**40/33**	**1**	**15**	**3**	**6.6**	**50**
1.6	**2**	**10**	**1.2**	**15**	**0.3**	**40/33**	**1**	**30**	**3**	**6.6**	**50**
1.6	**2**	**10**	**1.2**	**15**	**0.3**	**40/33**	**1**	**30**	**3**	**6.6**	**50**
1.6	**2**	**10**	**1.2**	**15**	**0.3**	**40/33**	**1**	**20**	**3**	**6.6**	**50**
1.6	**2**	**15**	**1.2**	**15**	**0.3**	**40/33**	**2**	**35**	**3.2**	**6.6**	**50**
1.6	**2**	**15**	**1.2**	**15**	**0.3**	**40/33**	**2**	**35**	**3.2**	**6.6**	**50**
1.6	**2**	**15**	**1.2**	**15**	**0.3**	**40/33**	**2**	**25**	**3.2**	**6.6**	**50**

See “General Notes” on page E1 - 4 and “Electrical Specification Notes” on page E1 - 5.

$I_{T(RMS)}$	Part No. Isolated	Part No. Non-isolated		V_{DRM}	I_{GT}				I_{DRM}	
(11)	 TO-220	 TO-252 D-Pak	 TO-251 V-Pak	(1) Volts	(3) (6) mAmps QI	QII	QIII	QIV	(1) (14) mAmps T_C = 25 °C	T_C = 110 °C
MAX	See "Package Dimensions" section for variations. (12)			MIN	MAX				MAX	
6 A	**L2006L5**	**L2006D5**	**L2006V5**	**200**	**5**	**5**	**5**	**5**	**0.02**	**0.5**
	L4006L5	**L4006D5**	**L4006V5**	**400**	**5**	**5**	**5**	**5**	**0.02**	**0.5**
	L6006L5	**L6006D5**	**L6006V5**	**600**	**5**	**5**	**5**	**5**	**0.02**	**0.5**
	L2006L6	**L2006D6**	**L2006V6**	**200**	**5**	**5**	**5**	**10**	**0.02**	**0.5**
	L4006L6	**L4006D6**	**L4006V6**	**400**	**5**	**5**	**5**	**10**	**0.02**	**0.5**
	L6006L6	**L6006D6**	**L6006V6**	**600**	**5**	**5**	**5**	**10**	**0.02**	**0.5**
	L2006L8	**L2006D8**	**L2006V8**	**200**	**10**	**10**	**10**	**20**	**0.02**	**0.5**
	L4006L8	**L4006D8**	**L4006V8**	**400**	**10**	**10**	**10**	**20**	**0.02**	**0.5**
	L6006L8	**L6006D8**	**L6006V8**	**600**	**10**	**10**	**10**	**20**	**0.02**	**0.5**
8 A	**L2008L6**	**L2008D6**	**L2008V6**	**200**	**5**	**5**	**5**	**10**	**0.02**	**0.5**
	L4008L6	**L4008D6**	**L4008V6**	**400**	**5**	**5**	**5**	**10**	**0.02**	**0.5**
	L6008L6	**L6008D6**	**L6008V6**	**600**	**5**	**5**	**5**	**10**	**0.02**	**0.5**
	L2008L8	**L2008D8**	**L2008V8**	**200**	**10**	**10**	**10**	**20**	**0.02**	**0.5**
	L4008L8	**L4008D8**	**L4008V8**	**400**	**10**	**10**	**10**	**20**	**0.02**	**0.5**
	L6008L8	**L6008D8**	**L6008V8**	**600**	**10**	**10**	**10**	**20**	**0.02**	**0.5**

Specified Test Conditions

di/dt — Maximum rate-of-change of on-state current; I_{GT} = 50 mA with 0.1 µs rise time

dv/dt — Critical rate-of-rise of off-state voltage at rated V_{DRM} gate open

dv/dt(c) — 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

I^2t — RMS surge (non-repetitive) on-state current for period of 8.3 ms for fusing

I_{DRM} — Peak off-state current, gate open; V_{DRM} = max rated value

I_{GT} — DC gate trigger current in specific operating quadrants; V_D = 12 V dc; R_L = 60 Ω

I_{GTM} — Peak gate trigger current

I_H — Holding current gate open; initial on-state current = 100 mA dc

$I_{T(RMS)}$ — RMS on-state current conduction angle of 360°

I_{TSM} — Peak one-cycle surge

$P_{G(AV)}$ — Average gate power dissipation

P_{GM} — Peak gate power dissipation; $I_{GT} \leq I_{GTM}$

t_{gt} — Gate controlled turn-on time; I_{GT} = 50 mA with 0.1 µs rise time

V_{DRM} — Repetitive peak off-state/blocking voltage

V_{GT} — DC gate trigger voltage; V_D = 12 V dc; R_L = 60 Ω

V_{TM} — Peak on-state voltage at max rated RMS current

General Notes

- All measurements are made with 60 Hz resistive load and at an ambient temperature of +25 °C unless otherwise specified.
- Operating temperature range (T_J) is -65 °C to +110 °C for TO-92 devices and -40 °C to +110 °C for all other devices.
- Storage temperature range (T_S) is -65 °C to +150 °C for TO-92 devices, -40 °C to +150 °C for TO-202 devices, and -40 °C to +125 °C for TO-220 devices.
- Lead solder temperature is a maximum of 230 °C for 10 seconds maximum at a minimum of 1/16" (1.59 mm) from case.
- The case or lead temperature (T_C or T_L) is measured as shown on dimensional outline drawings. See "Package Dimensions" section of this catalog.

V_{TM}	V_{GT}	I_H	I_{GTM}	P_{GM}	$P_{G(AV)}$	I_{TSM}	dv/dt(c)	dv/dt	t_{gt}	I^2t	di/dt
(1) (4)	(2) (5) (15)	(1) (7)	(13)	(13)		(8) (10)	(1) (10)	(1)	(9)		
Volts	Volts					Amps		Volts/µSec			
T_C = 25 °C	T_C = 25 °C	mAmps	Amps	Watts	Watts	60/50 Hz	Volts/µSec	T_C = 100 °C	µSec	Amps^{2}Sec	Amps/µSec
MAX	MAX	MAX					TYP	TYP	TYP		
1.6	**2**	**10**	**1.6**	**18**	**0.4**	**60/50**	**1**	**40**	**3**	**15**	**70**
1.6	**2**	**10**	**1.6**	**18**	**0.4**	**60/50**	**1**	**30**	**3**	**15**	**70**
1.6	**2**	**10**	**1.6**	**18**	**0.4**	**60/50**	**1**	**20**	**3**	**15**	**70**
1.6	**2**	**10**	**1.6**	**18**	**0.4**	**60/50**	**2**	**40**	**3**	**15**	**70**
1.6	**2**	**10**	**1.6**	**18**	**0.4**	**60/50**	**2**	**30**	**3**	**15**	**70**
1.6	**2**	**10**	**1.6**	**18**	**0.4**	**60/50**	**2**	**20**	**3**	**15**	**70**
1.6	**2**	**20**	**1.6**	**18**	**0.4**	**60/50**	**2**	**45**	**3.2**	**15**	**70**
1.6	**2**	**20**	**1.6**	**18**	**0.4**	**60/50**	**2**	**40**	**3.2**	**15**	**70**
1.6	**2**	**20**	**1.6**	**18**	**0.4**	**60/50**	**2**	**30**	**3.2**	**15**	**70**
1.6	**2**	**10**	**1.6**	**18**	**0.4**	**80/65**	**2**	**40**	**3**	**26.5**	**70**
1.6	**2**	**10**	**1.6**	**18**	**0.4**	**80/65**	**2**	**30**	**3**	**26.5**	**70**
1.6	**2**	**10**	**1.6**	**18**	**0.4**	**80/65**	**2**	**20**	**3**	**26.5**	**70**
1.6	**2**	**20**	**1.6**	**18**	**0.4**	**80/65**	**2**	**45**	**3.2**	**26.5**	**70**
1.6	**2**	**20**	**1.6**	**18**	**0.4**	**80/65**	**2**	**40**	**3.2**	**26.5**	**70**
1.6	**2**	**20**	**1.6**	**18**	**0.4**	**80/65**	**2**	**30**	**3.2**	**26.5**	**70**

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 Gate Characteristics and Definition of Quadrants.

(4) See Figure E1.4 for i_T versus v_T.

(5) See Figure E1.6 for V_{GT} versus T_C.

(6) See Figure E1.7 for I_{GT} versus T_C.

(7) See Figure E1.5 for I_H versus T_C.

(8) See Figure E1.9 for surge rating and specific duration.

(9) See Figure E1.8 for t_{gt} versus I_{GT}.

(10) See Figure E1.2 and Figure E1.3 for maximum allowable case temperature at maximum rated current.

(11) See Figure E1.1, Figure E1.2, and Figure E1.3 for T_A or T_C versus $I_{T(RMS)}$.

(12) See package outlines for lead form configurations. When ordering special lead forming, add type number as suffix to part number.

(13) Pulse width ≤10 µs

(14) T_C or T_L = T_J for test conditions in off state

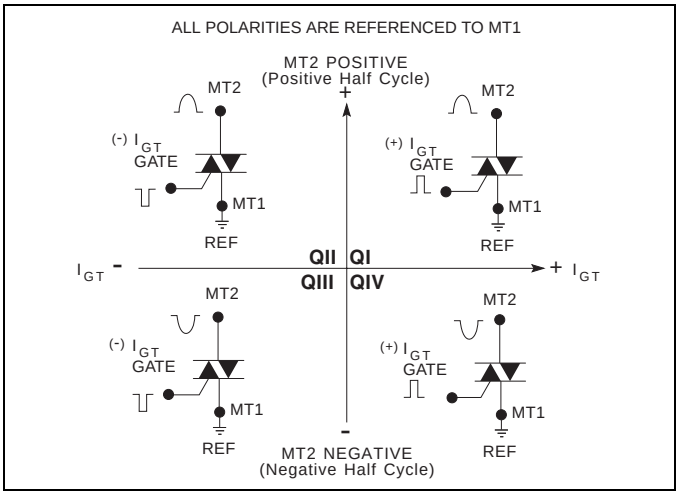
(15) Minimum non-trigger V_{GT} at 110 °C is 0.2 V.

Gate Characteristics

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

- In-phase signals (with standard AC line) using Quadrants I and III
- Application of unipolar pulses (gate always positive or negative), using Quadrants II and III with negative gate pulses and Quadrants I and IV with positive gate pulses

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



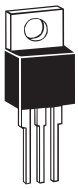
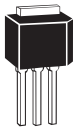
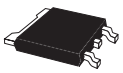
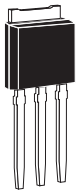
Definition of Quadrants

Electrical Isolation

Teccor's isolated triac packages withstand a minimum high potential test of 2500 V ac rms from leads to mounting tab over the device's operating temperature range. The following isolation table shows standard isolation ratings.

Electrical Isolation from Leads to Mounting Tab	
V AC RMS	**TO-220 ***
2500	**Standard**

*UL Recognized File #E71639

Thermal Resistance (Steady State) Junction to Mounting Tab and Junction to Ambient $R_{\theta JC}$ [$R_{\theta JA}$] °C/W (TYP)							
Package Code	E	C	F	L	F2	D	V
Type	TO-92 Plastic	Compak	TO-202 Type 1	 TO-220 Isolated	 TO-202 Type 2	 TO-252 D-Pak	 TO-251 V-Pak
0.8 A	**60 [135]**	**60 ***					
1 A	**50 [95]**	**40 ***					
4 A			**3.5 [45]**	**3.6 [50]**	**6.0 [70]**	**3.5**	**6.0 [70]**
6 A				**3.3**		**3.2**	**3.2**
8 A				**2.8**		**2.7**	**2.7**

* Mounted on 1 cm^2 copper foil surface; two-ounce copper foil

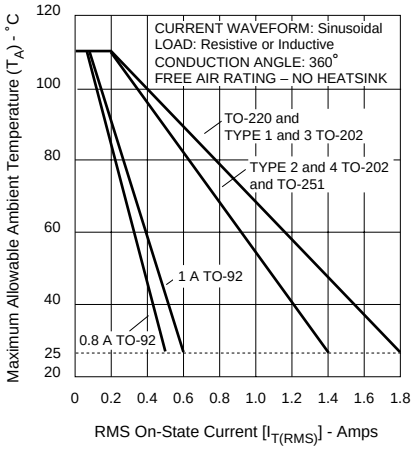


Figure E1.1 Maximum Allowable Ambient Temperature versus On-state Current

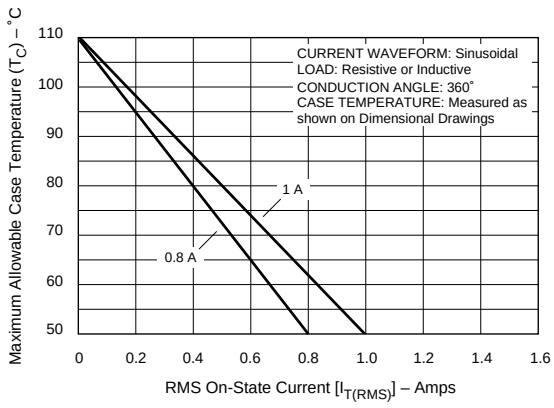


Figure E1.2 Maximum Allowable Case Temperature versus On-state Current (0.8 A and 1 A)

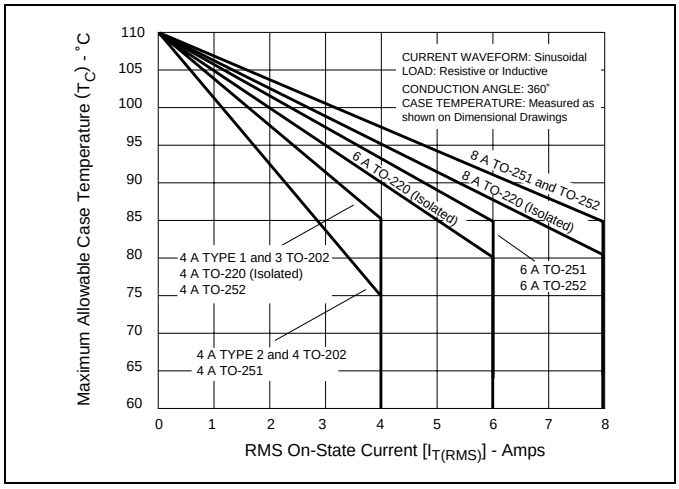


Figure E1.3 Maximum Allowable Case Temperature versus On-state Current (4 A, 6 A, and 8 A)

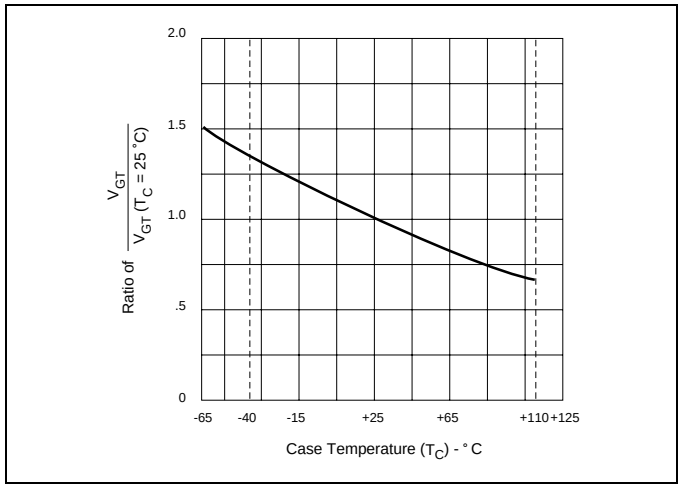


Figure E1.6 Normalized DC Gate Trigger Voltage for All Quadrants versus Case Temperature

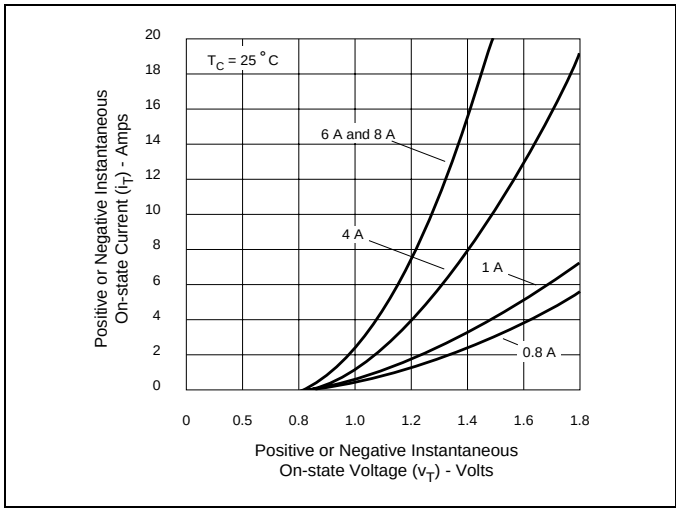


Figure E1.4 On-state Current versus On-state Voltage (Typical)

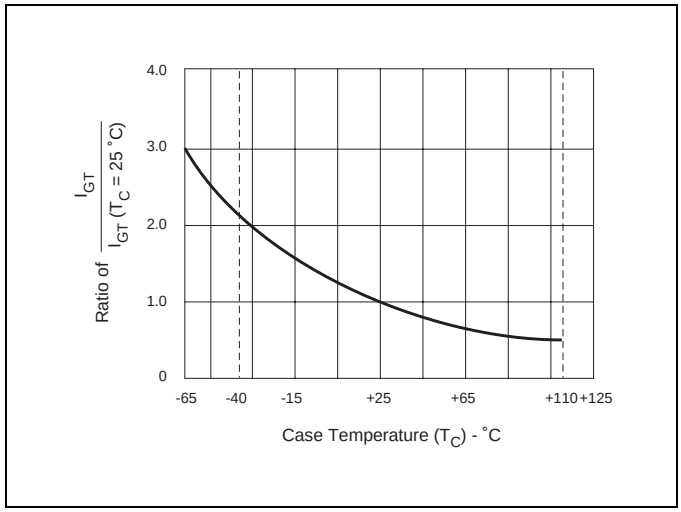


Figure E1.7 Normalized DC Gate Trigger Current for All Quadrants versus Case Temperature

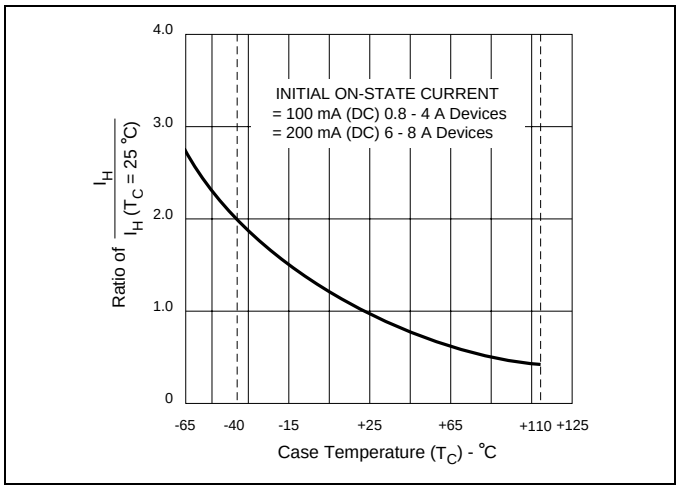


Figure E1.5 Normalized DC Holding Current versus Case Temperature

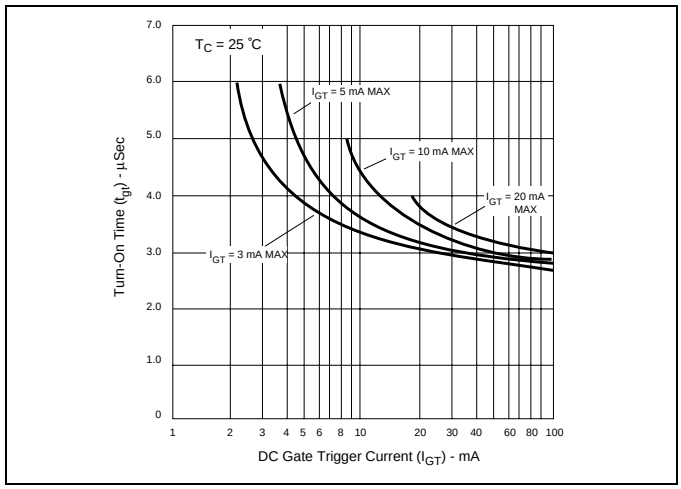


Figure E1.8 Turn-on Time versus Gate Trigger Current (Typical)

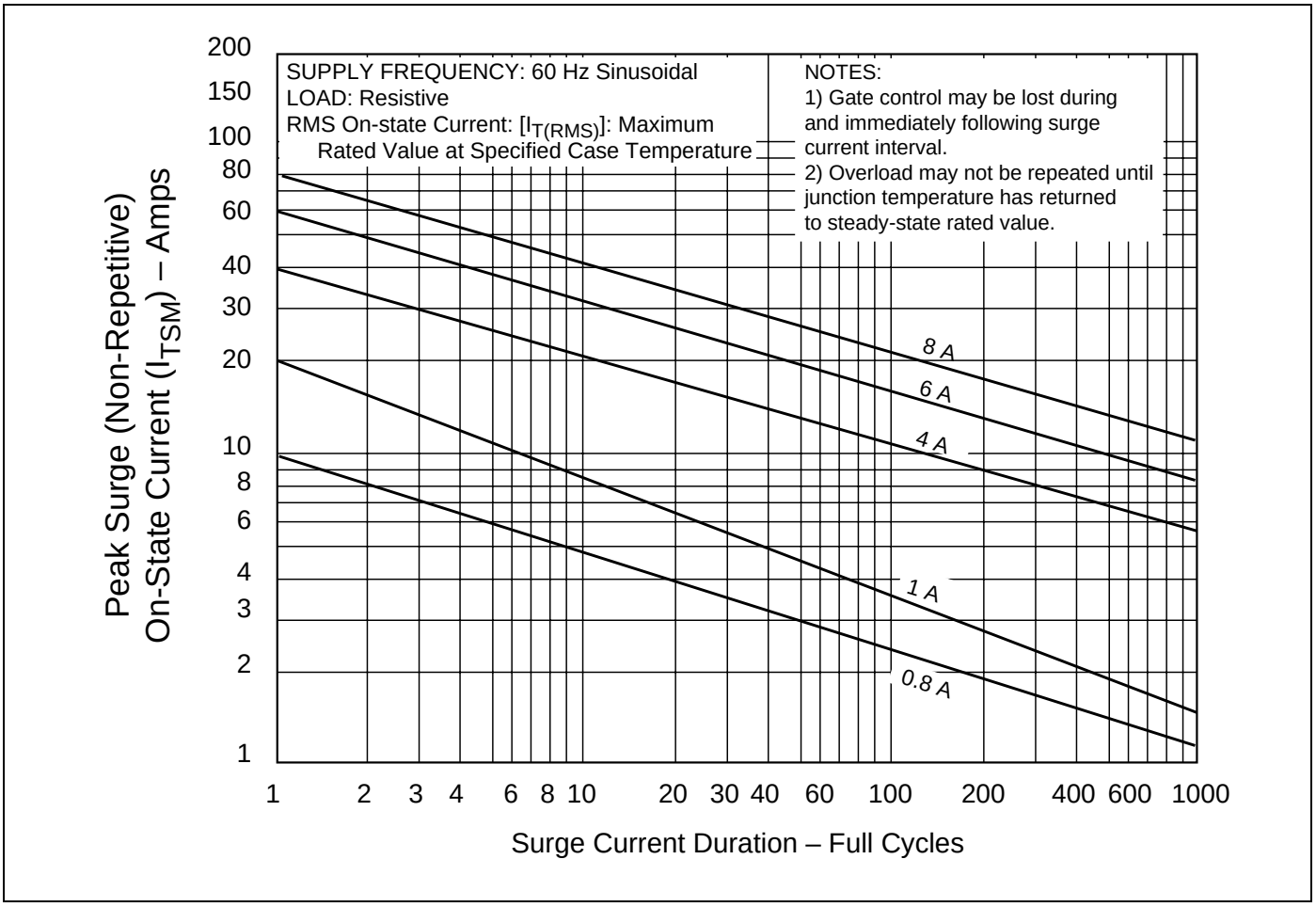


Figure E1.9 Peak Surge Current versus Surge Current Duration

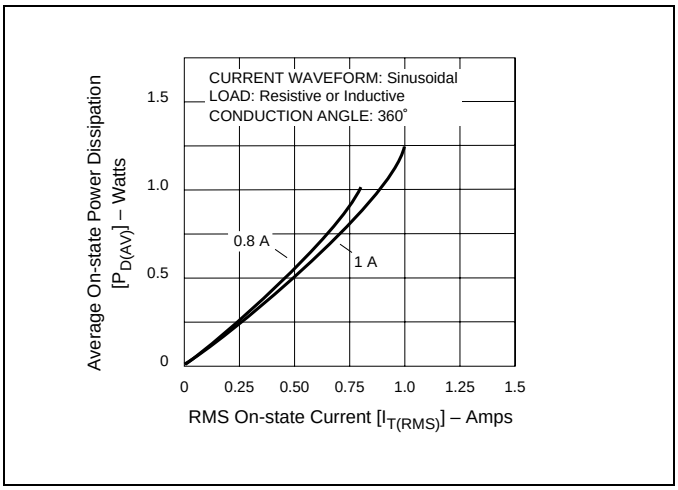


Figure E1.10 Power Dissipation (Typical) versus RMS On-state Current (0.8 A and 1 A)

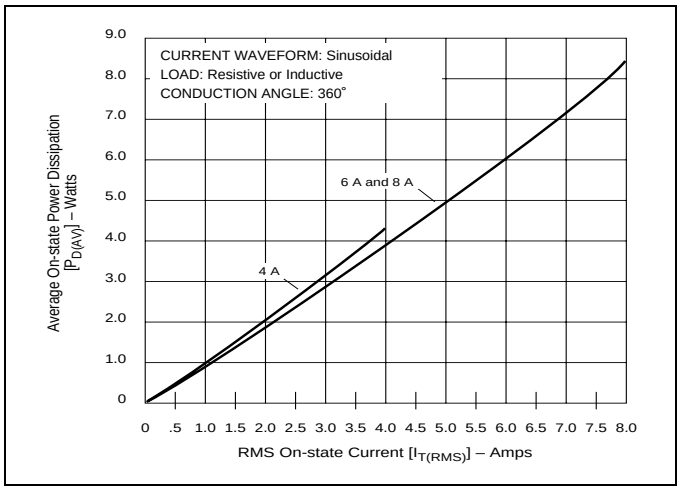


Figure E1.11 Power Dissipation (Typical) versus RMS On-state Current (4 A, 6 A, and 8 A)

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