

SCRs

(1 A to 70 A) RoHS

General Description

The Teccor line of thyristor SCR semi-conductors are half-wave, unidirectional, gate-controlled rectifiers which complement Teccor's line of sensitive SCRs. Teccor offers devices with ratings of 1 A to 70 A and 200 V to 1000 V, with gate sensitivities from 10 mA to 50 mA. If gate currents in the 12 μ A to 500 μ A ranges are required, see "Sensitive SCRs" section of this catalog.

Three packages are offered in electrically isolated construction where the case or tab is internally isolated to allow the use of low-cost assembly and convenient packaging techniques.

The Teccor line of SCRs features glass-passivated junctions to ensure long-term reliability and parameter stability. Teccor's glass offers a rugged, reliable barrier against junction contamination.

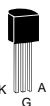
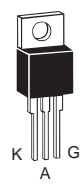
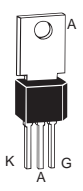
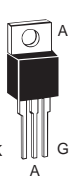
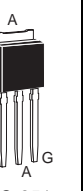
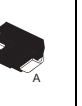
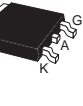
Variations of devices covered in this data sheet are available for custom design applications. Consult the factory for more information.

Features

- RoHS Compliant
- Electrically-isolated package
- High voltage capability — 200 V to 1000 V
- High surge capability — up to 950 A
- Glass-passivated chip

Compak SCR

- Surface mount package — 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

TYPE	Part Number						I_T		V_{DRM} & V_{RRM}		I_{GT}				
	 TO-92	Isolated		Non-isolated			(1) (2) (15)	Amps	Volts	mAmps					
		 TO-220	 TO-202	 TO-220	 TO-251 V-Pak	 Compak				 TO-252 D-Pak	$I_{T(RMS)}$ MAX	$I_{T(AV)}$ MAX	MIN	MIN	MAX
														See "Package Dimensions" section for variations. (11)	
1 A	S201E				S2N1		1	0.64	200	1	10				
	S401E				S4N1		1	0.64	400	1	10				
	S601E				S6N1		1	0.64	600	1	10				
6 A		S2006L	S2006F1		S2006V		S2006D	6	3.8	200	1	15			
		S4006L	S4006F1		S4006V		S4006D	6	3.8	400	1	15			
		S6006L	S6006F1		S6006V		S6006D	6	3.8	600	1	15			
		S8006L			S8006V		S8006D	6	3.8	800	1	15			
		SK006L			SK006V		SK006D	6	3.8	1000	1	15			
8 A		S2008L	S2008F1	S2008R	S2008V		S2008D	8	5.1	200	1	15			
		S4008L	S4008F1	S4008R	S4008V		S4008D	8	5.1	400	1	15			
		S6008L	S6008F1	S6008R	S6008V		S6008D	8	5.1	600	1	15			
		S8008L		S8008R	S8008V		S8008D	8	5.1	800	1	15			
		SK008L		SK008R	SK008V		SK008D	8	5.1	1000	1	15			
10 A		S2010L	S2010F1	S2010R	S2010V		S2010D	10	6.4	200	1	15			
		S4010L	S4010F1	S4010R	S4010V		S4010D	10	6.4	400	1	15			
		S6010L	S6010F1	S6010R	S6010V		S6010D	10	6.4	600	1	15			
		S8010L		S8010R	S8010V		S8010D	10	6.4	800	1	15			
		SK010L		SK010R	SK010V		SK010D	10	6.4	1000	1	15			
12 A				S2012R	S2012V		S2012D	12	7.6	200	1	20			
				S4012R	S4012V		S4012D	12	7.6	400	1	20			
				S6012R	S6012V		S6012D	12	7.6	600	1	20			
				S8012R	S8012V		S8012D	12	7.6	800	1	20			
				SK012R	SK012V		SK012D	12	7.6	1000	1	20			

Specific Test Conditions

- di/dt — Maximum rate-of-rise of on-state current; $I_{GT} = 150$ mA with ≤ 0.1 μ s rise time
- dv/dt — Critical rate of applied forward voltage
- I^2t — RMS surge (non-repetitive) on-state current for period of 8.3 ms for fusing
- I_{DRM} and I_{RRM} — Peak off-state forward and reverse current at V_{DRM} and V_{RRM}
- I_{gt} — dc gate trigger current; $V_D = 12$ V dc; $R_L = 60$ Ω for 1 to 16 A devices and 30 Ω for 20 to 70 A devices
- I_{GM} — Peak gate current
- I_H — dc holding current; gate open
- I_T — Maximum on-state current
- I_{TSM} — Peak one-cycle forward surge current
- $P_{G(AV)}$ — Average gate power dissipation
- P_{GM} — Peak gate power dissipation
- t_{gt} — Gate controlled turn-on time; gate pulse = 100 mA; minimum width = 15 μ s with rise time ≤ 0.1 μ s
- t_q — Circuit commutated turn-off time

- V_{DRM} and V_{RRM} — Repetitive peak off-state forward and reverse voltage
- V_{gt} — DC gate trigger voltage; $V_D = 12$ V dc; $R_L = 60$ Ω for 1 to 16 A devices and 30 Ω for 20 to 70 A devices
- V_{TM} — Peak on-state voltage at maximum rated RMS current

General Notes

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

I _{DRM} & I _{RRM}			V _{TM}	V _{GT}	I _H	I _{GM}	P _{GM}	P _{G(AV)}	I _{TSM}	dv/dt		I ² t	di/dt	t _{gt}	t _q
(14)			(3)	(8) (17)	(5) (13)	(12)	(12)		(6) (10)					(7)	(9) (10)
mAmps			Volts	Volts					Amps	Volts/μSec					
T _C = 25 °C	T _C = 100 °C	T _C = 125 °C	T _C = 25 °C	T _C = 25 °C	mAmps	Amps	Watts	Watts	60/50 Hz	T _C = 100 °C	T _C = 125 °C	Amps ² Sec	Amps/μSec	μSec	μSec
MAX			MAX	MAX	MAX					MIN	MIN			TYP	MAX
0.01	0.2	0.5	1.6	1.5	30	1.5	15	0.3	30/25	40	20	3.7	50	2	35
0.01	0.2	0.5	1.6	1.5	30	1.5	15	0.3	30/25	40	20	3.7	50	2	35
0.01	0.2	0.5	1.6	1.5	30	1.5	15	0.3	30/25	40	20	3.7	50	2	35
0.01	0.2	0.5	1.6	1.5	30	2	20	0.5	100/83	350	250	41	100	2	35
0.01	0.2	0.5	1.6	1.5	30	2	20	0.5	100/83	350	250	41	100	2	35
0.01	0.2	0.5	1.6	1.5	30	2	20	0.5	100/83	300	225	41	100	2	35
0.01	0.2	0.5	1.6	1.5	30	2	20	0.5	100/83	250	200	41	100	2	35
0.02	3		1.6	1.5	30	2	20	0.5	100/83	100		41	100	2	35
0.01	0.2	0.5	1.6	1.5	30	2	20	0.5	100/83	350	250	41	100	2	35
0.01	0.2	0.5	1.6	1.5	30	2	20	0.5	100/83	350	250	41	100	2	35
0.01	0.2	0.5	1.6	1.5	30	2	20	0.5	100/83	300	225	41	100	2	35
0.01	0.2	0.5	1.6	1.5	30	2	20	0.5	100/83	250	200	41	100	2	35
0.02	3		1.6	1.5	30	2	20	0.5	100/83	100		41	100	2	35
0.01	0.2	0.5	1.6	1.5	30	2	20	0.5	100/83	350	250	41	100	2	35
0.01	0.2	0.5	1.6	1.5	30	2	20	0.5	100/83	350	250	41	100	2	35
0.01	0.2	0.5	1.6	1.5	30	2	20	0.5	100/83	300	225	41	100	2	35
0.02	0.5	1	1.6	1.5	30	2	20	0.5	100/83	250	200	41	100	2	35
0.02	3		1.6	1.5	30	2	20	0.5	100/83	100		41	100	2	35
0.01	0.5	1	1.6	1.5	40	2	20	0.5	120/100	350	250	60	100	2	35
0.01	0.5	1	1.6	1.5	40	2	20	0.5	120/100	350	250	60	100	2	35
0.01	0.5	1	1.6	1.5	40	2	20	0.5	120/100	300	225	60	100	2	35
0.02	0.5	1	1.6	1.5	40	2	20	0.5	120/100	250	200	60	100	2	35
0.02	3		1.6	1.5	40	2	20	0.5	120/100	100		60	100	2	35

Electrical Specification Notes

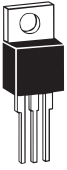
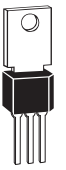
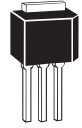

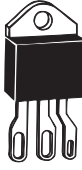
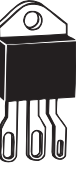
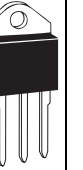


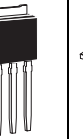

- (1) See Figure E6.5 through Figure E6.16 for current rating at specified operating case temperature.
- (2) See Figure E6.1 and Figure E6.2 for free air current rating.
- (3) See Figure E6.19 and Figure E6.20 for instantaneous on-state current versus on-state voltage (typical).
- (4) See Figure E6.18 for I_{GT} versus T_C.
- (5) See Figure E6.17 for I_H versus T_C.
- (6) For more than one full cycle rating, see Figure E6.23.
- (7) See Figure E6.22 for t_{gt} versus I_{GT}.
- (8) See Figure E6.21 for V_{GT} versus T_C.
- (9) Test conditions are as follows:
 - I_T = 1 A for 1 A devices and 2 A for all other devices
 - Pulse duration = 50 μs, dv/dt = 20 V/μs, di/dt = -10 A/μs for 1 A devices, and -30 A/μs for other devices
 - I_{GT} = 200 mA at turn-on
- (10) See Figure E6.5 through Figure E6.10 for maximum allowable case temperatures at maximum rated current.
- (11) See package outlines for lead form configuration. When ordering special lead forming, add type number as suffix to part number.
- (12) Pulse width ≤ 10 μs
- (13) Initial on-state current = 200 mA dc for 1 A through 16 A devices; 400 mA dc for 20 A through 70 A devices.
- (14) T_C = T_J for test conditions in off state.
- (15) The R, K, or M package rating is intended for high surge condition use only and not recommended for ≥ 50 A rms continuous current use since narrow pin lead temperature can exceed PCB solder melting temperature. Teccor's J package or W package is recommended for ≥ 50 A rms continuous current requirements.
- (16) For various durations of an exponentially decaying current waveform, see Figure E6.3 and Figure E6.4. (t_w is defined as 5 time constants.)
- (17) Minimum non-trigger V_{GT} at 125 °C is 0.2 V.

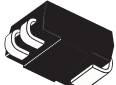
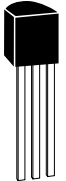
TYPE	Part Number						I_T		V_{DRM} & V_{RRM}	I_{GT}		I_{DRM} & I_{RRM}			
	Isolated			Non-isolated			(1) (15)			Volts	(4)		(14)		
									mAmps				mAmps		
	TO-220	TO-218X	TO-218	TO-220	TO-218X	TO-218	TO-263 D ² Pak	$I_{T(RMS)}$		$I_{T(AV)}$			$T_C = 25^\circ C$	$T_C = 100^\circ C$	$T_C = 125^\circ C$
See "Package Dimensions" section for variations. (11)						MAX		MIN	MIN	MAX	MAX				
15 A	S2015L						15	9.5	200	1	30	0.01	0.5	1	
	S4015L						15	9.5	400	1	30	0.01	0.5	1	
	S6015L						15	9.5	600	1	30	0.01	0.5	1	
	S8015L						15	9.5	800	1	30	0.02	1	2	
	SK015L						15	9.5	1000	1	30	0.02	3		
16 A				S2016R		S2016N	16	10	200	1	30	0.01	0.5	1	
				S4016R		S4016N	16	10	400	1	30	0.01	0.5	1	
				S6016R		S6016N	16	10	600	1	30	0.01	0.5	1	
				S8016R		S8016N	16	10	800	1	30	0.02	1	2	
				SK016R		SK016N	16	10	1000	1	30	0.02	3		
20 A	S2020L						20	12.8	200	1	30	0.01	0.5	1	
	S4020L						20	12.8	400	1	30	0.01	0.5	1	
	S6020L						20	12.8	600	1	30	0.01	0.5	1	
	S8020L						20	12.8	800	1	30	0.02	1.0	2	
	SK020L						20	12.8	1000	1	30	0.02	3		
25 A	S2025L			S2025R		S2025N	25	16	200	1	35	0.01	1	2	
	S4025L			S4025R		S4025N	25	16	400	1	35	0.01	1	2	
	S6025L			S6025R		S6025N	25	16	600	1	35	0.01	1	2	
	S8025L			S8025R		S8025N	25	16	800	1	35	0.02	1.5	3	
	SK025L			SK025R		SK025N	25	16	1000	1	35	0.02	3		
35 A		S2035J	S2035K				35	22	200	5	40	0.01	1	2	
		S4035J	S4035K				35	22	400	5	40	0.01	1	2	
		S6035J	S6035K				35	22	600	5	40	0.01	1	2	
		S8035J	S8035K				35	22	800	5	40	0.02	1.5	3	
			SK035K				35	22	1000	5	40	0.02	3		
40 A				S2040R		S2040N	40	25	200	5	40	0.01	1	2	
				S4040R		S4040N	40	25	400	5	40	0.01	1	2	
				S6040R		S6040N	40	25	600	5	40	0.01	1	2	
				S8040R		S8040N	40	25	800	5	40	0.02	1.5	3	
				SK040R		SK040N	40	25	1000	5	40	0.03	5		
55 A				S2055R	S2055W	S2055M	S2055N	55	35	200	5	40	0.01	1	2
				S4055R	S4055W	S4055M	S4055N	55	35	400	5	40	0.01	1	2
				S6055R	S6055W	S6055M	S6055N	55	35	600	5	40	0.01	1	2
				S8055R	S8055W	S8055M	S8055N	55	35	800	5	40	0.02	1.5	3
				SK055R		SK055M	SK055N	55	35	1000	5	40	0.03	5	
65 A		S2065J	S2065K				65	41	200	5	50	0.02	1.5	3	
		S4065J	S4065K				65	41	400	5	50	0.02	1.5	3	
		S6065J	S6065K				65	41	600	5	50	0.02	1.5	3	
		S8065J	S8065K				65	41	800	5	50	0.02	2	5	
			SK065K				65	41	1000	5	50	0.03	5		
70 A				S2070W			70	45	200	5	50	0.02	1.5	3	
				S4070W			70	45	400	5	50	0.02	1.5	3	
				S6070W			70	45	600	5	50	0.02	1.5	3	
				S8070W			70	45	800	5	50	0.02	2	5	

See "General Notes" on page E6 - 2 and "Electrical Specification Notes" on page E6 - 3.

V _{TM}	V _{GT}	I _H	I _{GM}	P _{GM}	P _{G(AV)}	I _{TSM}	dv/dt		I ² t	di/dt	t _{gt}	t _q
(3)	(8) (17)	(5) (13)	(12)	(12)		(6) (10) (16)					(7)	(9) (10)
Volts	Volts	mAmps	Amps	Watts	Watts	Amps	Volts/μSec		Amps ² Sec	Amps/μSec	μSec	μSec
T _C = 25 °C	T _C = 25 °C					60/50 Hz	T _C = 100 °C	T _C = 125 °C				
MAX	MAX	MAX					MIN	MIN			TYP	MAX
1.6	1.5	40	3	30	0.6	225/188	450	350	210	125	2	35
1.6	1.5	40	3	30	0.6	225/188	450	350	210	125	2	35
1.6	1.5	40	3	30	0.6	225/188	425	325	210	125	2	35
1.6	1.5	40	3	30	0.6	225/188	400	300	210	125	2	35
1.6	1.5	40	3	30	0.6	225/188	200		210	125	2	35
1.6	1.5	40	3	30	0.6	225/188	450	350	210	125	2	35
1.6	1.5	40	3	30	0.6	225/188	450	350	210	125	2	35
1.6	1.5	40	3	30	0.6	225/188	425	325	210	125	2	35
1.6	1.5	40	3	30	0.6	225/188	400	300	210	125	2	35
1.6	1.5	40	3	30	0.6	225/188	200		210	125	2	35
1.6	1.5	40	3	30	0.6	300/255	450	350	374	125	2	35
1.6	1.5	40	3	30	0.6	300/255	450	350	374	125	2	35
1.6	1.5	40	3	30	0.6	300/255	425	325	374	125	2	35
1.6	1.5	40	3	30	0.6	300/255	400	300	374	125	2	35
1.6	1.5	40	3	30	0.6	300/255	200		374	125	2	35
1.6	1.5	50	3.5	35	0.8	350/300	450	350	510	150	2	35
1.6	1.5	50	3.5	35	0.8	350/300	450	350	510	150	2	35
1.6	1.5	50	3.5	35	0.8	350/300	425	325	510	150	2	35
1.6	1.5	50	3.5	35	0.8	350/300	400	300	510	150	2	35
1.6	1.5	50	3.5	35	0.8	350/300	200		510	150	2	35
1.8	1.5	50	3.5	35	0.8	500/425	450	350	1035	150	2	35
1.8	1.5	50	3.5	35	0.8	500/425	450	350	1035	150	2	35
1.8	1.5	50	3.5	35	0.8	500/425	425	325	1035	150	2	35
1.8	1.5	50	3.5	35	0.8	500/425	400	300	1035	150	2	35
1.8	1.5	50	3.5	35	0.8	500/425	200		1035	150	2	35
1.8	1.5	60	3.5	35	0.8	520/430	650	550	1122	175	2.5	35
1.8	1.5	60	3.5	35	0.8	520/430	650	550	1122	175	2.5	35
1.8	1.5	60	3.5	35	0.8	520/430	600	500	1122	175	2.5	35
1.8	1.5	60	3.5	35	0.8	520/430	500	475	1122	175	2.5	35
1.8	1.5	60	3.5	35	0.8	520/430	250		1122	175	2.5	35
1.8	1.5	60	4	40	0.8	650/550	650	550	1750	175	2.5	35
1.8	1.5	60	4	40	0.8	650/550	650	550	1750	175	2.5	35
1.8	1.5	60	4	40	0.8	650/550	600	500	1750	175	2.5	35
1.8	1.5	60	4	40	0.8	650/550	500	475	1750	175	2.5	35
1.8	1.5	60	4	40	0.8	650/550	250		1750	175	2.5	35
1.8	2	80	5	50	1	950/800	650	550	3745	200	2.5	35
1.8	2	80	5	50	1	950/800	650	550	3745	200	2.5	35
1.8	2	80	5	50	1	950/800	600	500	3745	200	2.5	35
1.8	2	80	5	50	1	950/800	500	475	3745	200	2.5	35
1.8	2	80	5	50	1	950/800	250		3745	200	2.5	35
1.8	2	80	5	50	1	950/800	650	550	3745	200	2.5	35
1.8	2	80	5	50	1	950/800	650	550	3745	200	2.5	35
1.8	2	80	5	50	1	950/800	600	500	3745	200	2.5	35
1.8	2	80	5	50	1	950/800	500	475	3745	200	2.5	35

See "General Notes" on page E6 - 2 and "Electrical Specification Notes" on page E6 - 3.

Thermal Resistance (Steady State) R _{θJC} [R _{θJA}] °C/W (TYP.)											
Pkg. Code	L	F	F2	R	J	W	K	M	D	V	N
Type	 TO-220 Isolated	 TO-202 Type 1 Non-isolated	 TO-202 Type 2 Non-isolated	 TO-220 Non-isolated	 TO-218X Isolated	 TO-218X Non-isolated	 TO-218 Isolated	 TO-218 Non-isolated	 TO-252 D-Pak Surface Mount	 TO-251AA V-Pak Non-isolated	 TO-263 D²Pak Non-isolated
1 A	See below										
6 A	4.0 [50]	4.3 [45]	9.5 [70]						1.7	2.3 [70]	
8 A	3.4	3.9		1.8 [40]					1.5	2.0	
10 A	3.0	3.4		1.6					1.45	1.7	
12 A				1.5					1.4	1.6	
15 A	2.5										
16 A				1.3							1.3
20 A	2.4										
25 A	2.35			1.0							1.0
35 A					0.70		0.70				
40 A				0.6							0.6
55 A				0.5		0.53		0.53			0.5
65 A					0.86		0.86				
70 A						0.60					

Thermal Resistance (Steady State) R _{θJC} [R _{θJA}] °C/W (TYP.)		
Package Code	C	E
Type	 Compak	 TO-92
1 A	35 *	50 [145]

* Mounted on 1cm² copper foil surface; two-ounce copper foil

Electrical Isolation

Teccor's isolated SCR packages will 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 table shows standard and optional isolation ratings.

Electrical Isolation * from Leads to Mounting Tab			
V AC RMS	TO-220 Isolated	TO-218X Isolated	TO-218 Isolated
2500	Standard	Standard	Standard
4000	Optional **	N/A	N/A

* UL Recognized File #E71639

** For 4000 V isolation, use "V" suffix in part number.

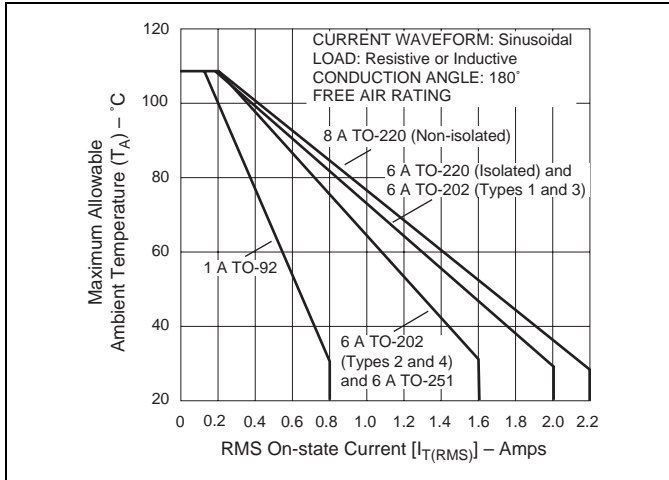


Figure E6.1 Maximum Allowable Ambient Temperature versus RMS On-state Current

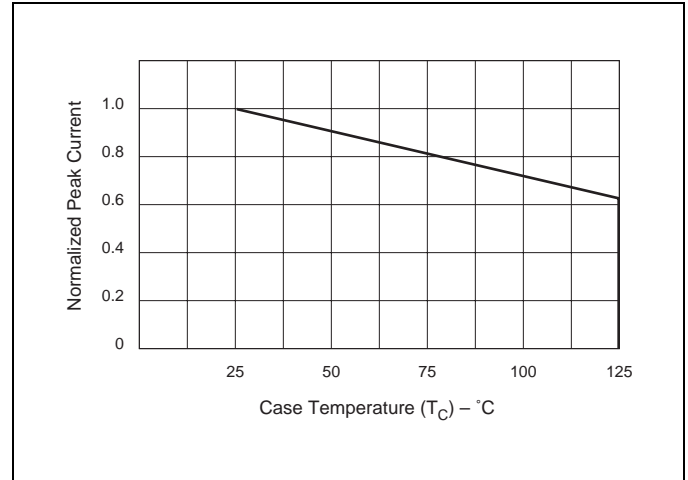


Figure E6.4 Peak Capacitor Discharge Current Derating (6 A through 55 A)

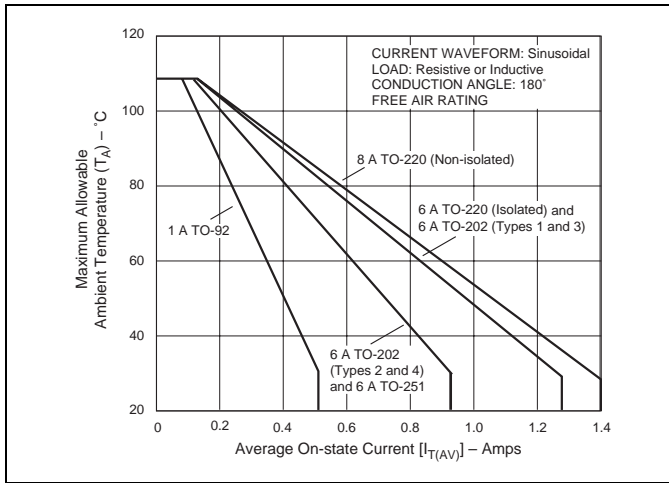


Figure E6.2 Maximum Allowable Ambient Temperature versus Average On-state Current

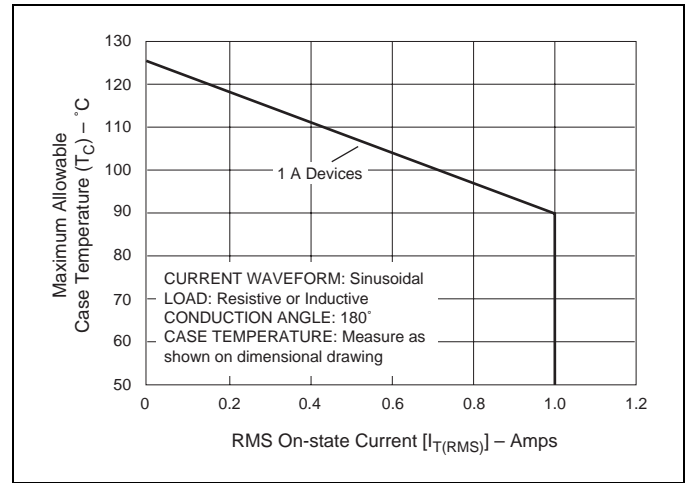


Figure E6.5 Maximum Allowable Case Temperature versus RMS On-state Current (1 A)

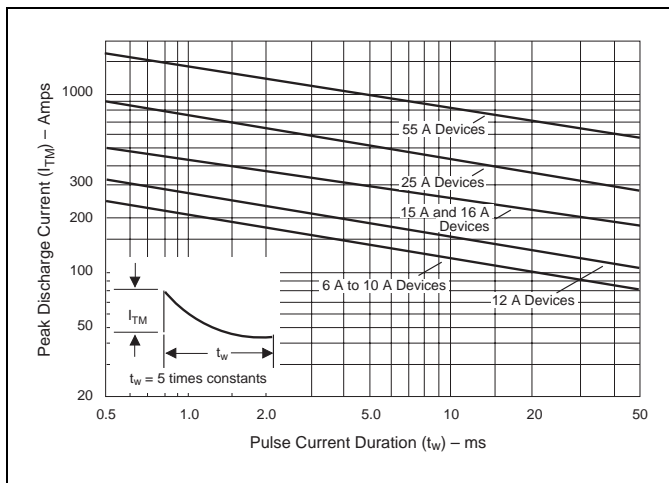


Figure E6.3 Peak Capacitor Discharge Current (6 A through 55 A)

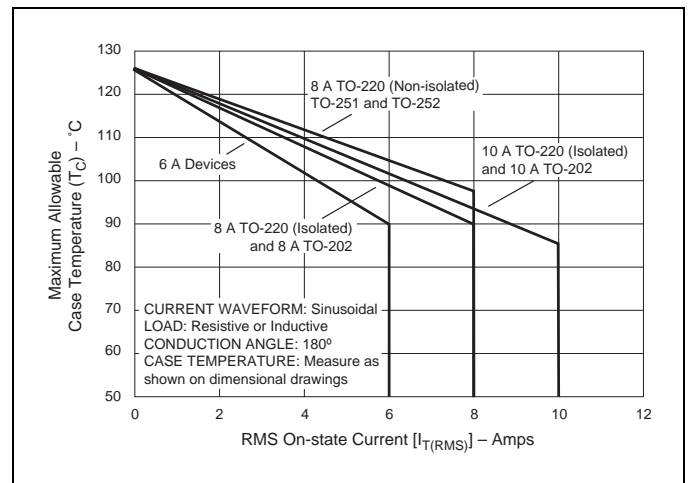


Figure E6.6 Maximum Allowable Case Temperature versus RMS On-state Current (6 A, 8 A, and 10 A)

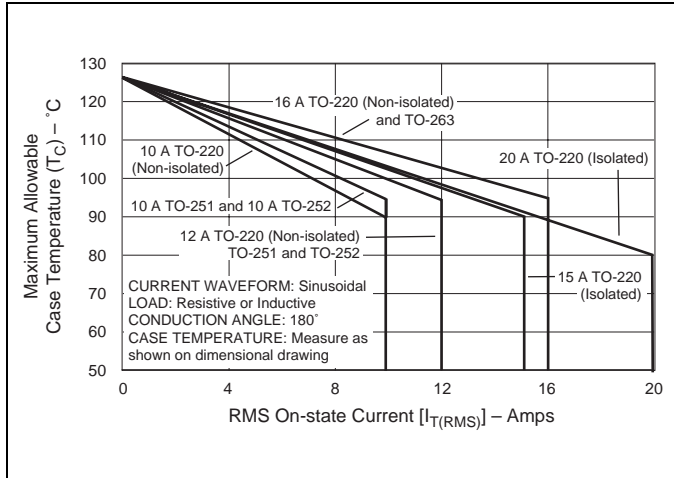


Figure E6.7 Maximum Allowable Case Temperature versus RMS On-state Current (10 A, 12 A, 16 A, and 20 A)

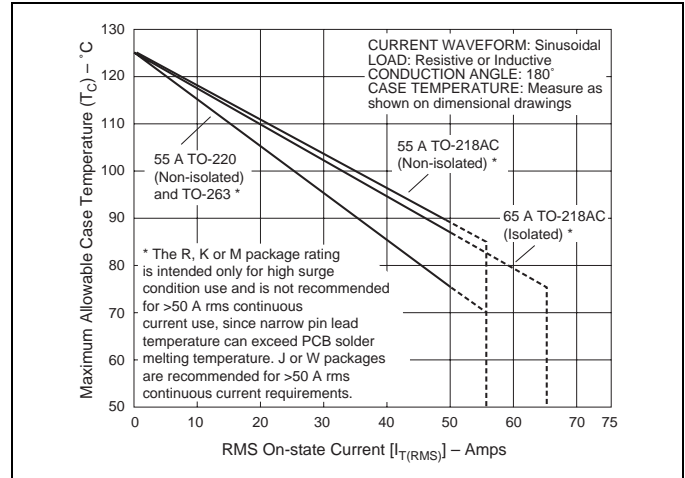


Figure E6.10 Maximum Allowable Case Temperature versus RMS On-state Current (55 A and 65 A)

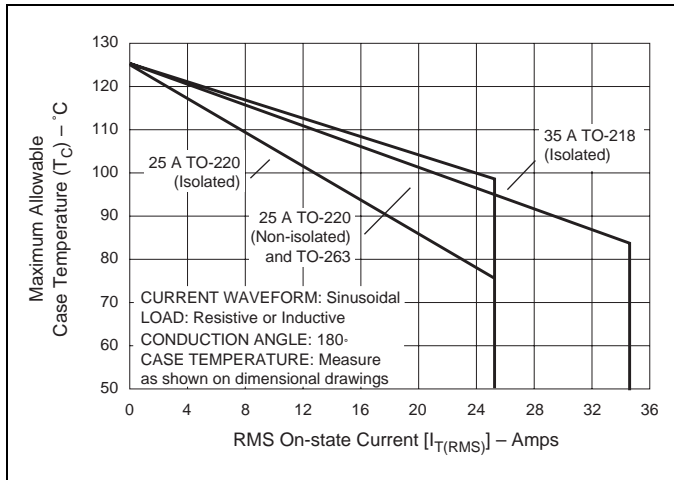


Figure E6.8 Maximum Allowable Case Temperature versus RMS On-state Current (25 A and 35 A)

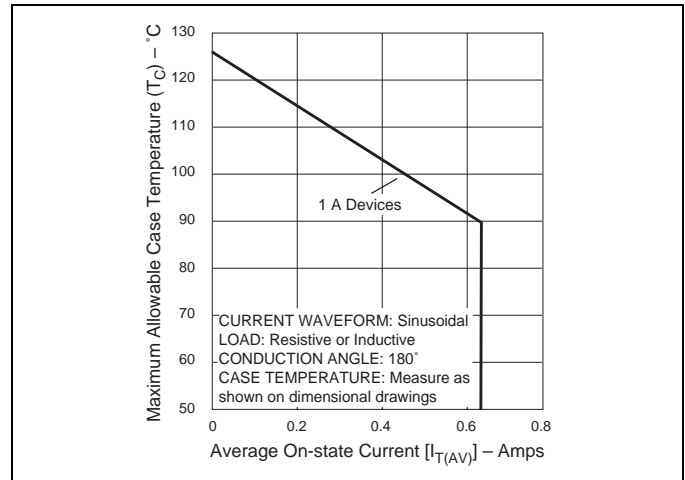


Figure E6.11 Maximum Allowable Case Temperature versus Average On-state Current (1 A)

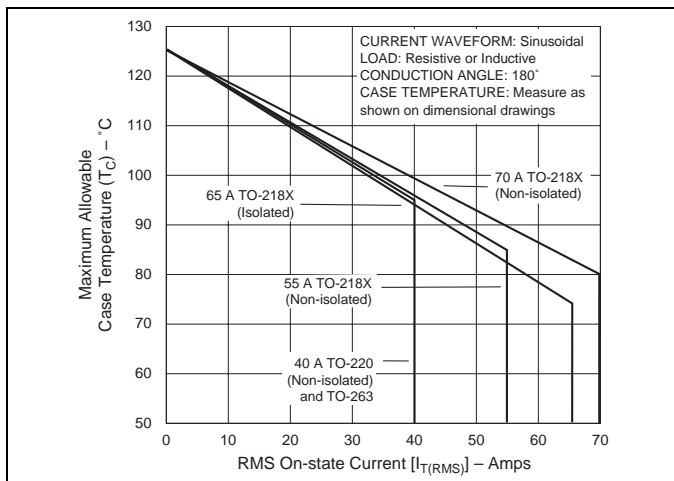


Figure E6.9 Maximum Allowable Case Temperature versus RMS On-state Current (40 A through 70 A)

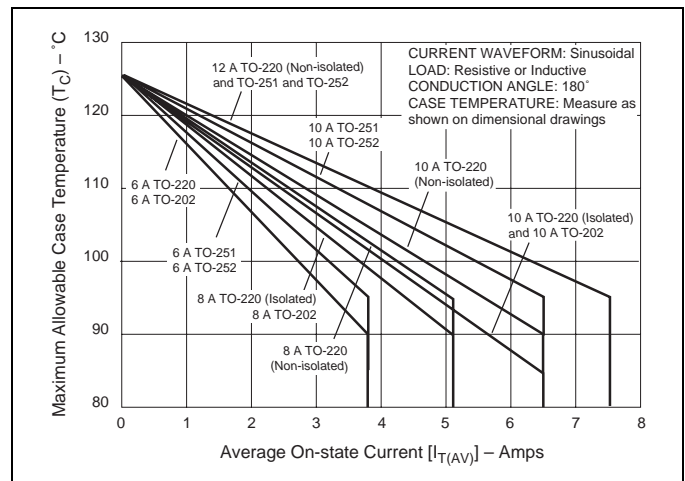
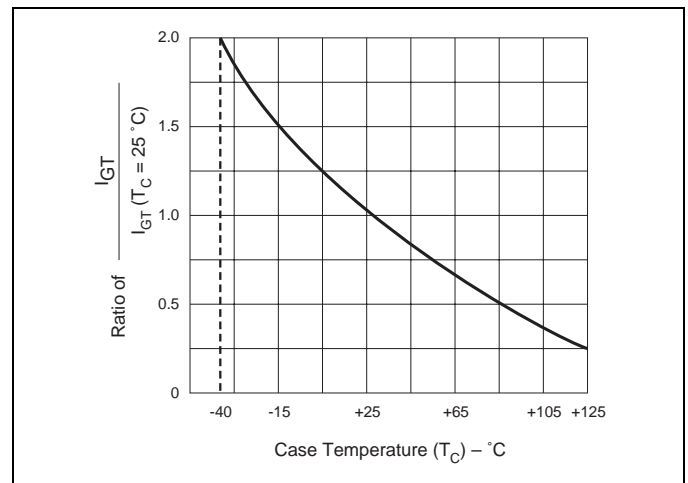
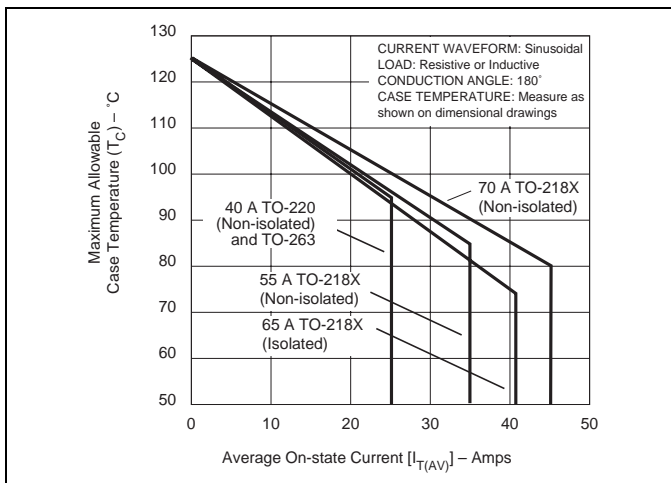
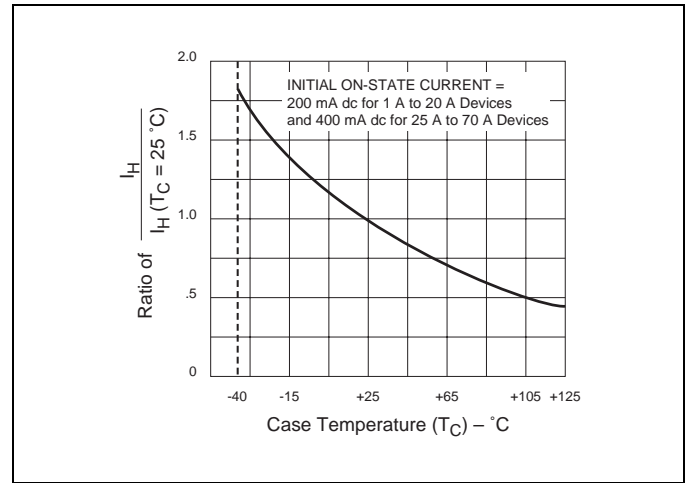
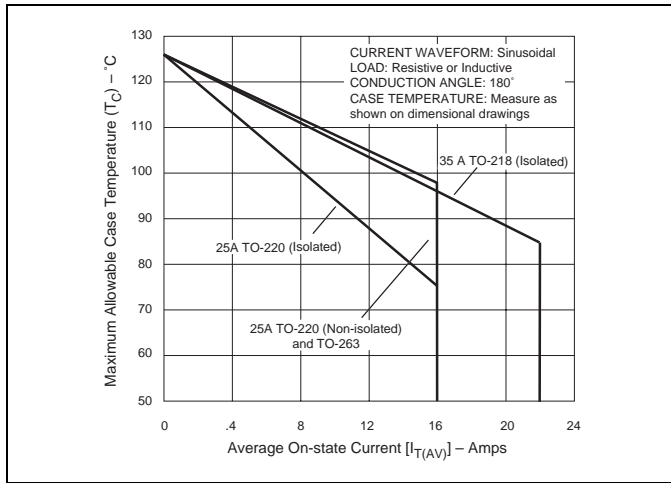
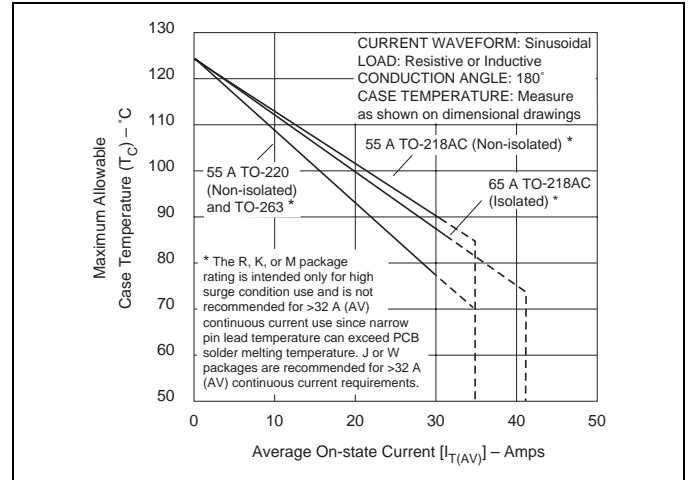
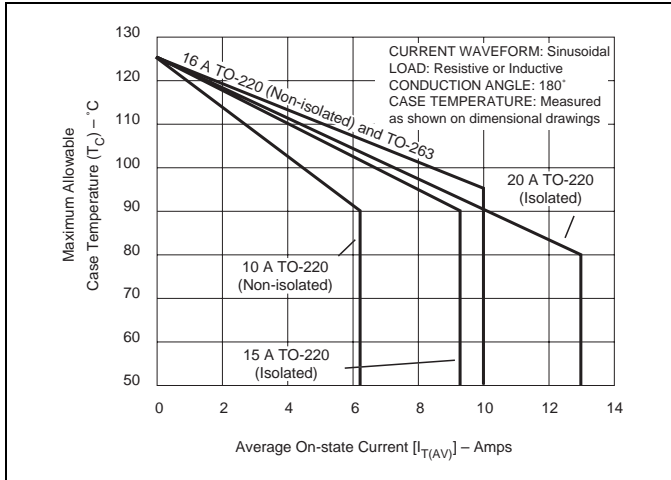


Figure E6.12 Maximum Allowable Case Temperature versus Average On-state Current (8 A, 10 A, and 12 A)



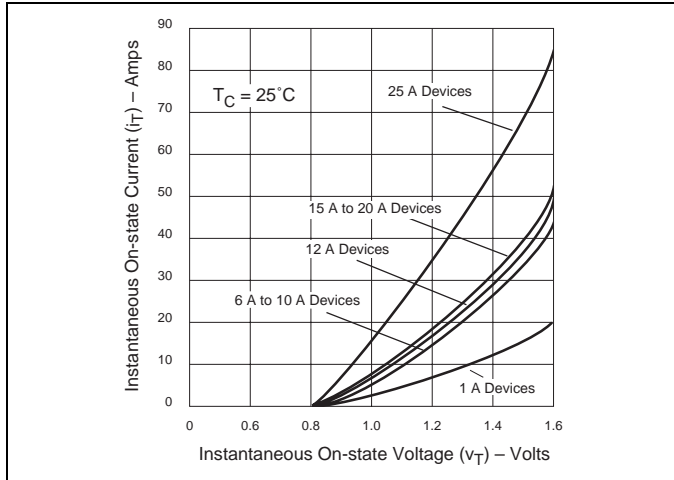


Figure E6.19 Instantaneous On-state Current versus On-state Voltage (Typical) (6 A through 25 A)

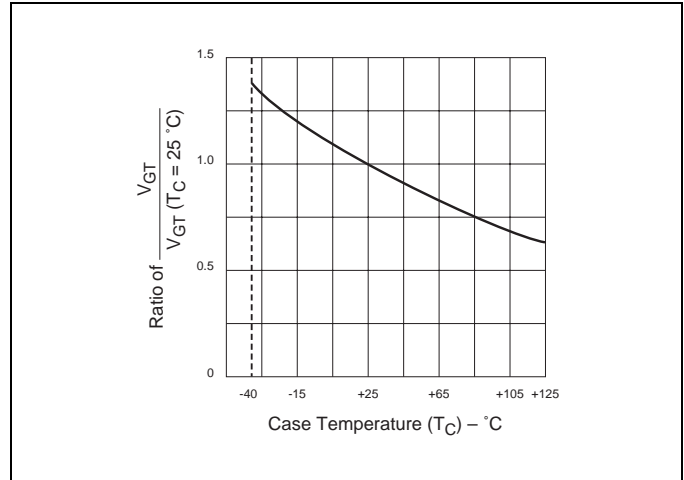


Figure E6.21 Normalized DC Gate-trigger Voltage versus Case Temperature

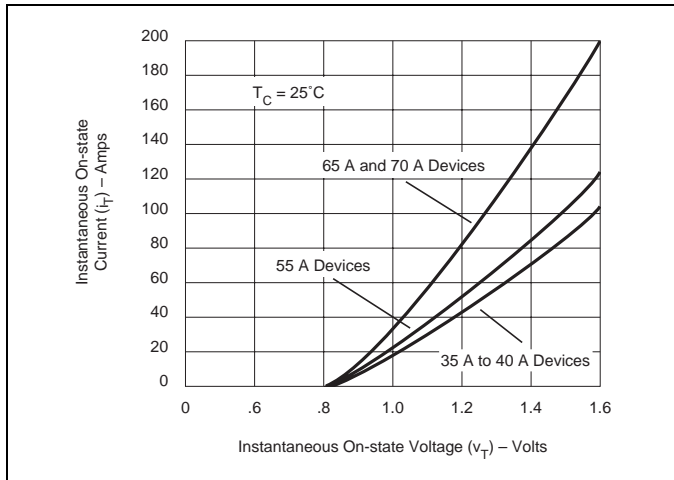


Figure E6.20 Instantaneous On-state Current versus On-state Voltage (Typical) (35 A through 70 A)

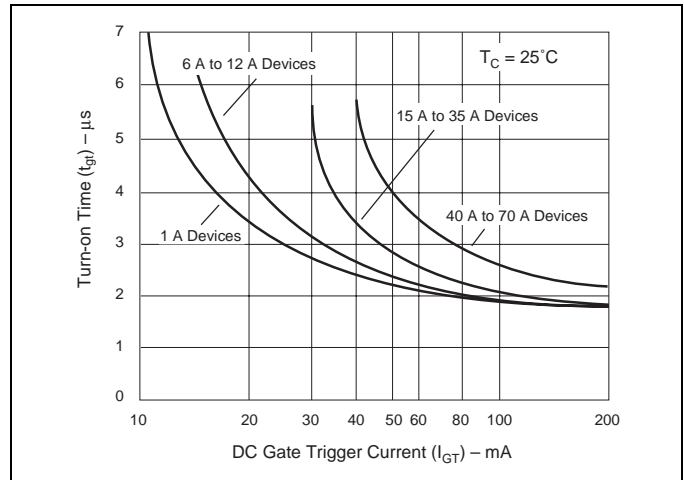


Figure E6.22 Typical Turn-on Time versus Gate-trigger Current

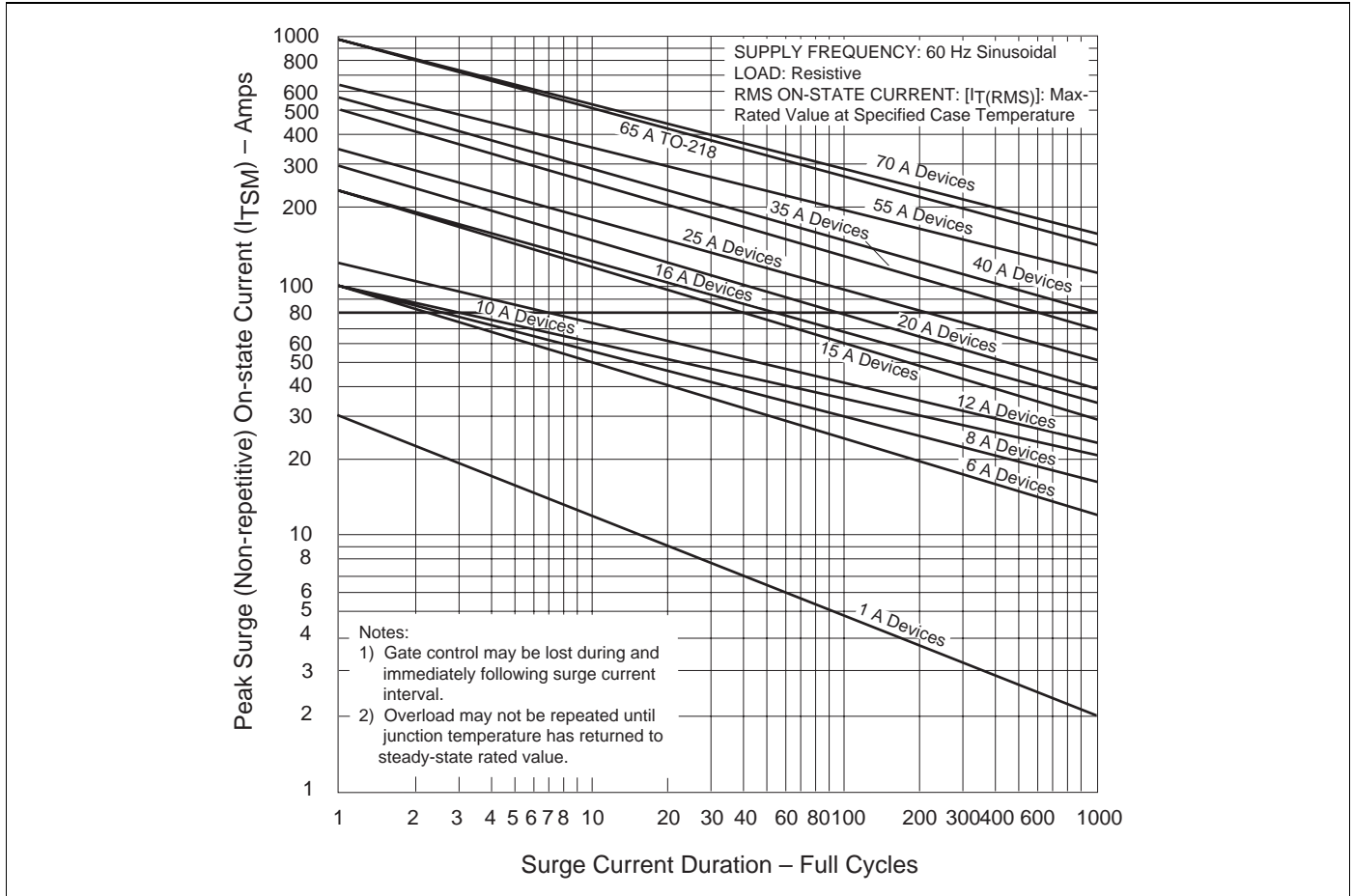


Figure E6.23 Peak Surge Current versus Surge Current Duration

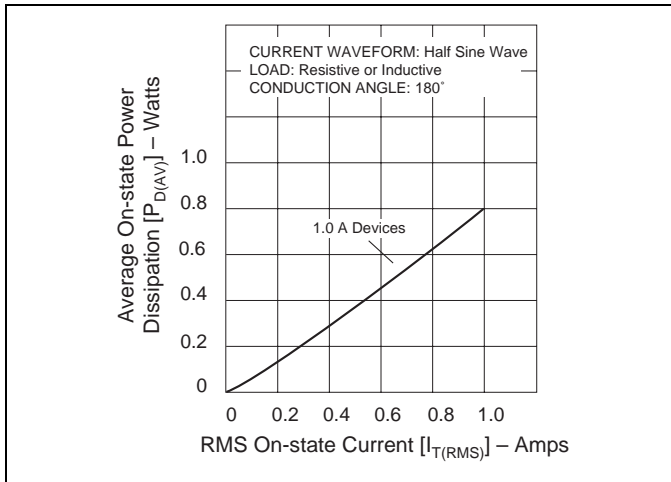


Figure E6.24 Power Dissipation (Typical) versus RMS On-state Current (1 A)

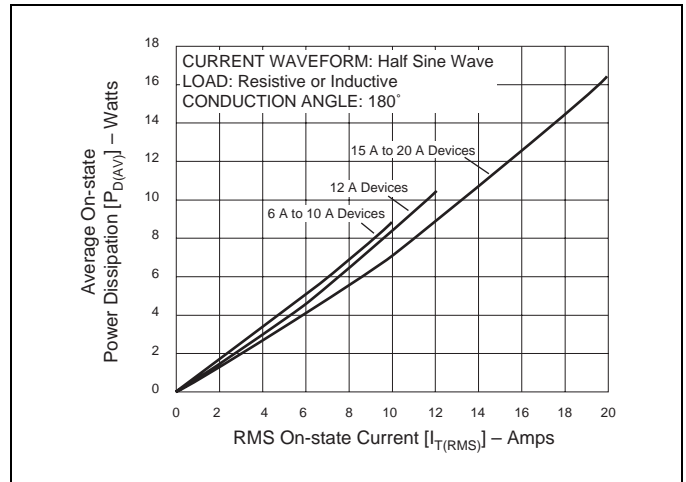


Figure E6.25 Power Dissipation (Typical) versus RMS On-state Current (6 A through 20 A)

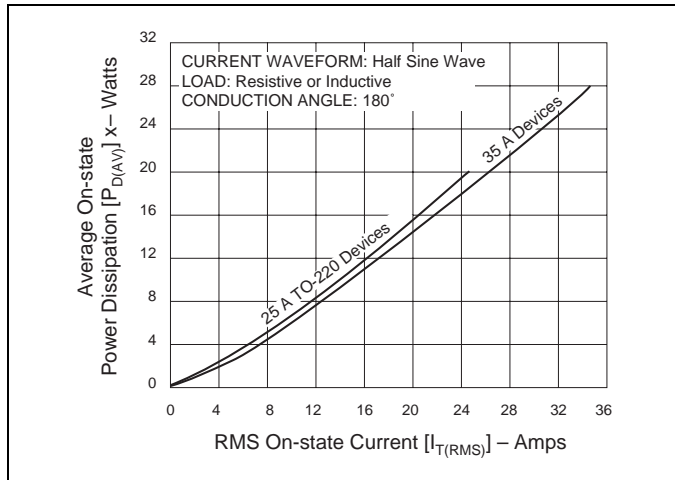


Figure E6.26 Power Dissipation (Typical) versus RMS On-state Current (25 A and 35 A)

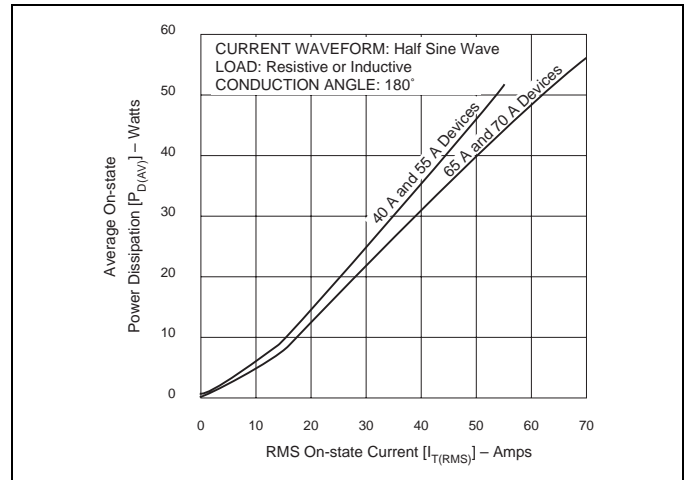


Figure E6.27 Power Dissipation (Typical) versus RMS On-state Current (40 A through 70 A)