Green Power Solutions

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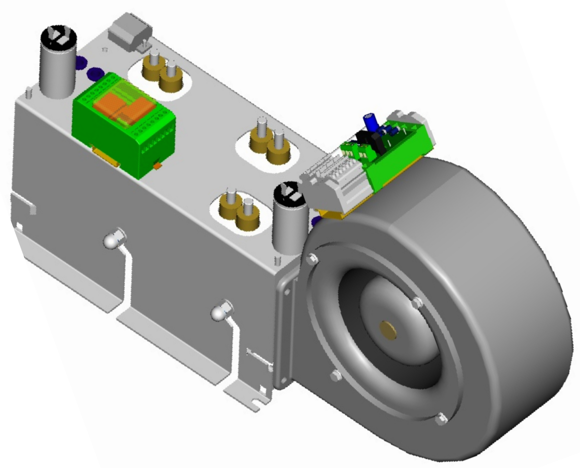

GEM_037, _043, _047, _049 FAMILY

Green Power Easy Module®

Features:

- ► Electrically insulated metal frame
- ► 3000 V_{RMS} Insulation
- ► High reliability
- ► Modular approach
- ► Broad choice of circuit configurations
- ► Fully customizable
- ► Cost effective solution
- ► Suitable for heavy duty applications
- ► Line voltage range up to 690V_{RMS}

Description

This new family of high power modules brings to the high power applications the same compactness, ease of use and scalability of the lower power semiconductor modules. In addition to these typical features (i.e. standard dimensions, electrical insulation, various circuit types, etc.) the new *Green Power Easy Module* (**GEM)** family includes many features that simplify their adoption allowing the end users to focus on their core business. These features include:

• embedded air cooling system (heatsink and fan)
• optimised snubber circuits
• pulse transformer modules
• ducted heat flow.

The GEM family can be used for most of the converter cicuits like single and three phase bridges, AC-switches, motor brakes, double wye rectifiers, current source inverters, etc.. Their application range covers all low and high line voltage applications (up to 690V_{RMS}) such as: electroplating, motor drive, induction heating, welding, temperature control, electrolysis, UPS, etc.

Maximum Ratings

Parameters	GEM_037	GEM_043	GEM_047	GEM_049		Conditions	Units
$I_{T(AV)}$	365	425	465	485		180° cond., half sine, T_A=40°C	A
$I_{T(RMS)}$	810	930	1025	1060		as AC-switch, T_A=40°C	A
I_{TSM}	8.5	11	12	15		50Hz, $T_J=T_{J(MAX)}$, V_R=0V	kA
I_{TSM}	8.95	11.65	12.7	15.9		60Hz, $T_J=T_{J(MAX)}$, V_R=0V	kA
I^2t	361	605	720	1125		50Hz, $T_J=T_{J(MAX)}$, V_R=0V	kA^2s
I^2t	329	551	656	1025		60Hz, $T_J=T_{J(MAX)}$, V_R=0V	kA^2s
V_{RRM} V_{DRM}	up to 1600	2200	up to 1600	up to 400		$T_J=T_{J(MAX)}$	V
$T_{J(MAX)}$	125	125	125	125			°C

GEM_037, _043, _047, _049 FAMILY

Voltage Ratings

Part Number	Voltage Code	V_{RRM} V_{DRM} maximum repetitive reverse and off–state blocking voltage V	I_{DRM} I_{RRM} max @125°C mA	$V_{L(RMS)}$ maximum suggested line RMS voltage V
GEM_049	04	400	50	110
GEM_037 GEM_047	12 16	1200 1600	50	400 500
GEM_043	22	2200	50	700

Voltage Ratings

Parameters	GEM_037	GEM_043	GEM_047	GEM_049		Conditions	Units
$V_{T(TO)}$ - Threshold voltage	0.9	1.1	0.933	0.87		$T_J=T_{JMAX}$	V
r_t - Slope resistance	0.65	0.552	0.302	0.238		$T_J=T_{JMAX}$	mΩ
I_H - Maximum holding current	600	300	150	600		T_J=25°C	mA
I_L - Typical latching current	1000	700	300	1000		T_J=25°C	mA
P_{MAX} - Maximum power losses	1080	1176	1176	1100		T_A=40°C	W

Triggering Characteristics

Parameters	GEM_037	GEM_043	GEM_047	GEM_049		Conditions	Units
V_{GT} - Gate trigger voltage	3	3.5	2.5	3.5		T_J=25°C, V_D=5V	V
I_{GT} - Gate trigger current	200	250	250	190		T_J=25°C, V_D=5V	mA
P_{GM} - Peak gate power	100	150	100	100		Pulse width= 100µs	W
$P_{G(AV)}$ - Avg. gate power dissip.	2	2	2	2			W
I_{FGM} - Peak gate current	3	10	10	3			A
V_{FGM} - Peak gate voltage (fwd.)	20	30	12	20			V
VRGM - Peak gate voltage (rev.)	5	5	3	5			V

Switching Characteristics

Parameters	GEM_037	GEM_043	GEM_047	GEM_049		Conditions	Units
di/dt - Crit. rate of rise of on-state current	200	200	200	200		$T_J=T_{JMAX}$	A/µs
dv/dt - Crit. rate of rise of off-state voltage	500	500	1000	500		$T_J=T_{JMAX}$	V/µs
t_q - Turn-off time	200	200	300	200		$T_J=T_{JMAX}$, I_T=1000A, di/dt=20A/µs, V_R=50V, V_D=67%V_{DRM}, dV/dt=20V/µs	µs

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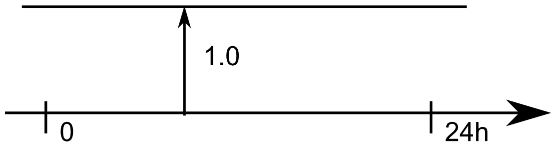
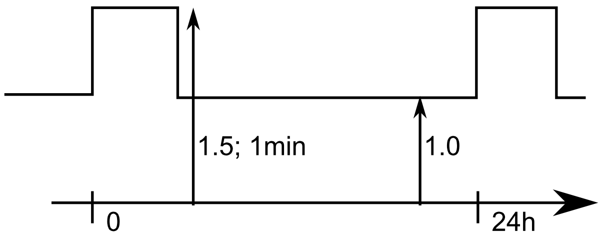


Maximum IEC class 1 currents for typical circuit types

Circuit Type	GEM_037	GEM_043	GEM_047	GEM_049		Conditions	Units
AC switch	810	930	1025	1060		dealy angle=0, T_A=40°C	A
Center Tap	725	835	920	955		dealy angle=0, T_A=40°C	A
Two pulse bridge	725	835	920	955		dealy angle=0, T_A=40°C	A
Six pulse bridge	1020	1190	1320	1375		dealy angle=0, T_A=40°C	A
Double star with I.P. transformer	2060	2395	2645	2750		dealy angle=0, T_A=40°C	A



Maximum IEC class 2 currents for typical circuit types

Circuit Type	GEM_037	GEM_043	GEM_047	GEM_049		Conditions	Units
AC switch	618	723	796	817		dealy angle=0, T_A=40°C	A
Center Tap	556	651	716	736		dealy angle=0, T_A=40°C	A
Two pulse bridge	556	651	716	736		dealy angle=0, T_A=40°C	A
Six pulse bridge	775	918	1017	1048		dealy angle=0, T_A=40°C	A
Double star with I.P. transformer	1576	1863	2060	2122		dealy angle=0, T_A=40°C	A

Mechanical Characteristics

Parameters	GEM_037	GEM_043	GEM_047	GEM_049		Conditions	Units
T_J - Junction operating temp.	125	125	125	125			°C
T_{STG} - Storage temperature	-40 - +70	-40 - +70	-40 - +70	-40 - +70			°C
R_{thJA} - Maximum thermal resistance junction to ambient	0.16	0.085	0.089	0.089		DC operation	°C/W
T Mounting torque ± 10% — GEM to panel	7	7	7	7		M6 mounting screws	Nm
T Mounting torque ± 10% — Busbar to GEM	14	14	14	14		M8 mounting screws	Nm
wt - approximate weight	13	13	13	13		with FAPC options	kg

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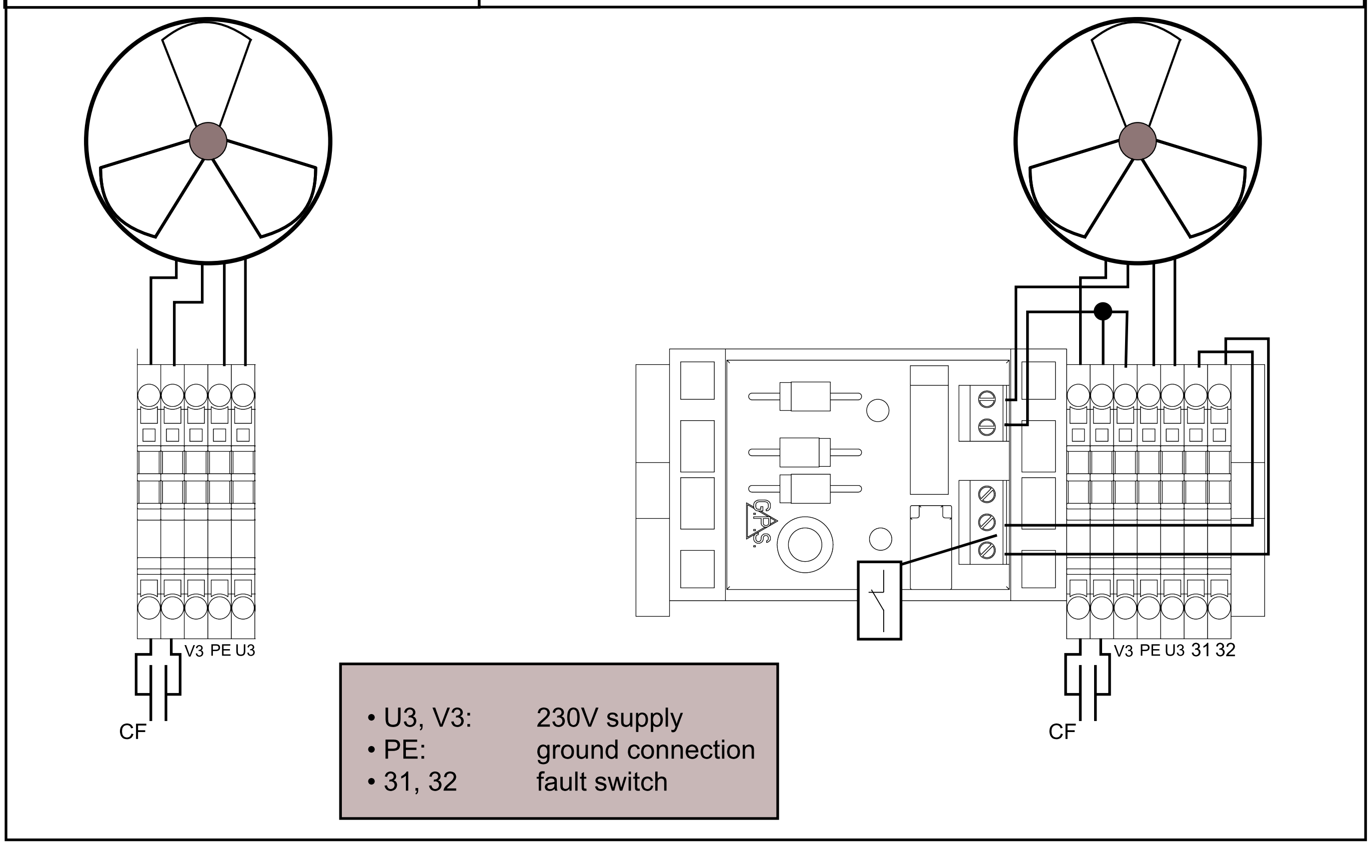
Ordering Information

						OPTIONS						
GEM	T	080	-	12	-	V	F	B	L	P	C	S	2
	1	2		3		4	5	6	7	8	9	10	11

1. Circuit configuration
2. GEM average current / 10
3. GEM bloking voltage/ 100
4. 0= No Fan; V= With fan
5. 0= No fuses; F= With fuse protection
6. 0= No busbar; B= With standard copper busbars (see drawings)
7. 0= No anti-parallel busbar; L= L-shaped anti-parallel busbar; U= U-shaped anti-parallel busbar
8. 0= No pulse transformer; P=With pulse transformer*
9. 0= No cooling alarm; C=With cooling alarm
10. 0= No device short alarm; 1=With device short alarm
11. 0= No snubber, 1= One snubber, 2= Two snubbers

* Pulse transformer GT001(dual) or GT0002(single) depending on the circuit configuration for pulse transformer charateristics see dtheir respective datashheet

Fan circuit without C option	Fan circuit with C option



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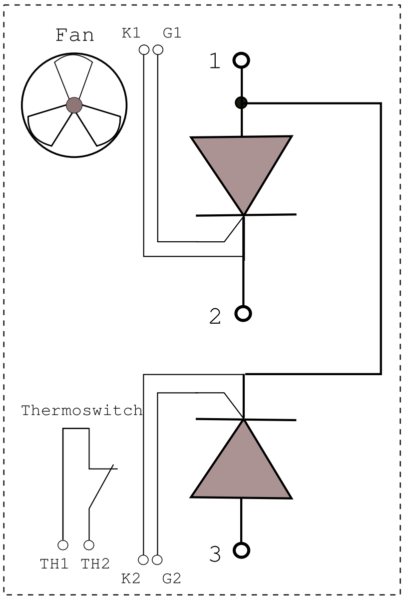
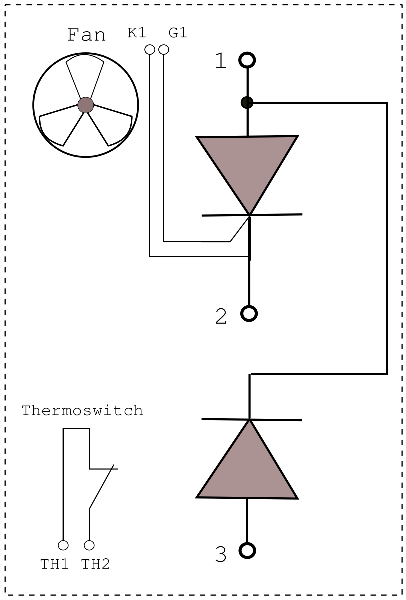
Circuit Configurations

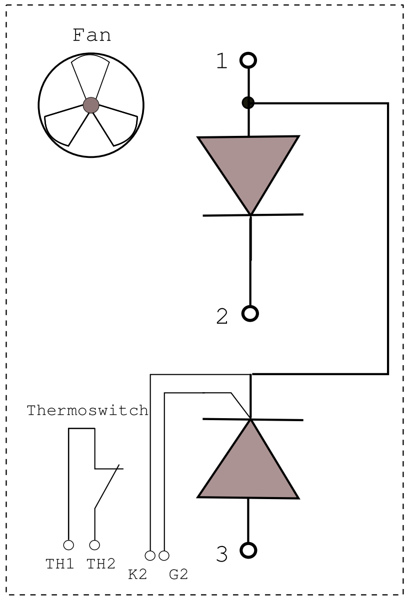
GEMT...



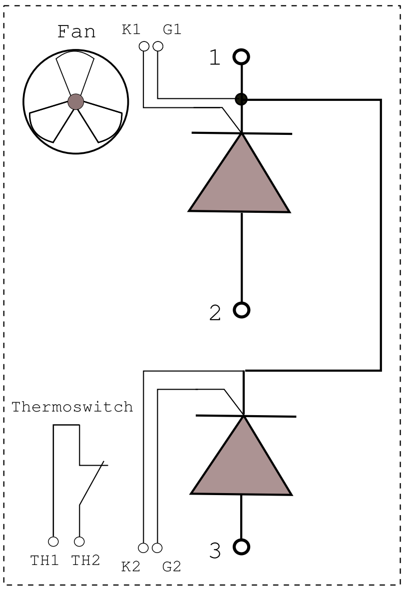
GEMH...



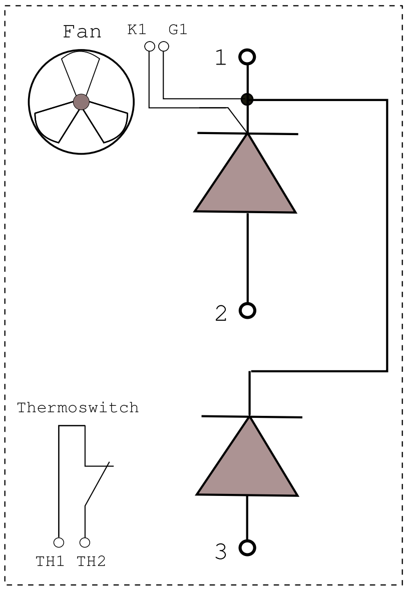
GEML...



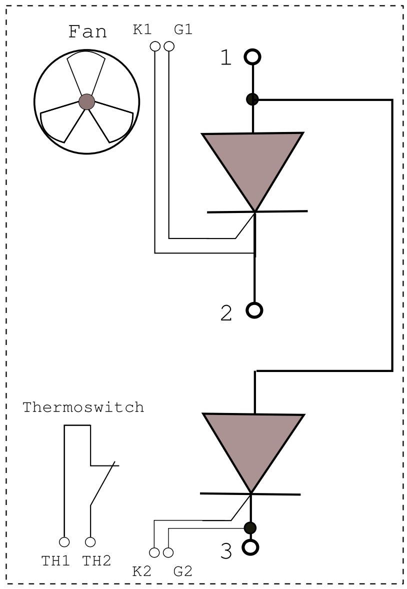
GEMU...



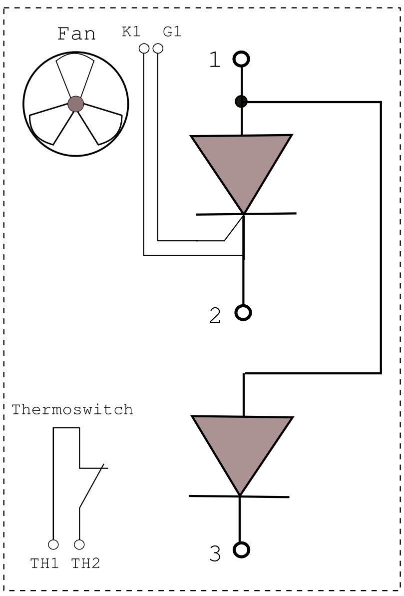
GEMK...



GEMV...



GEMN...



Cooling unit characteristics

Supply voltage:	230V
Supply freq.:	50-60 Hz
Supply current:	0.67 A
Noise:	61dB

Thermoswitch characteristics

Contact type:	normally closed
Switch temp.:	90°C
Insulation:	2500 V_{DC}

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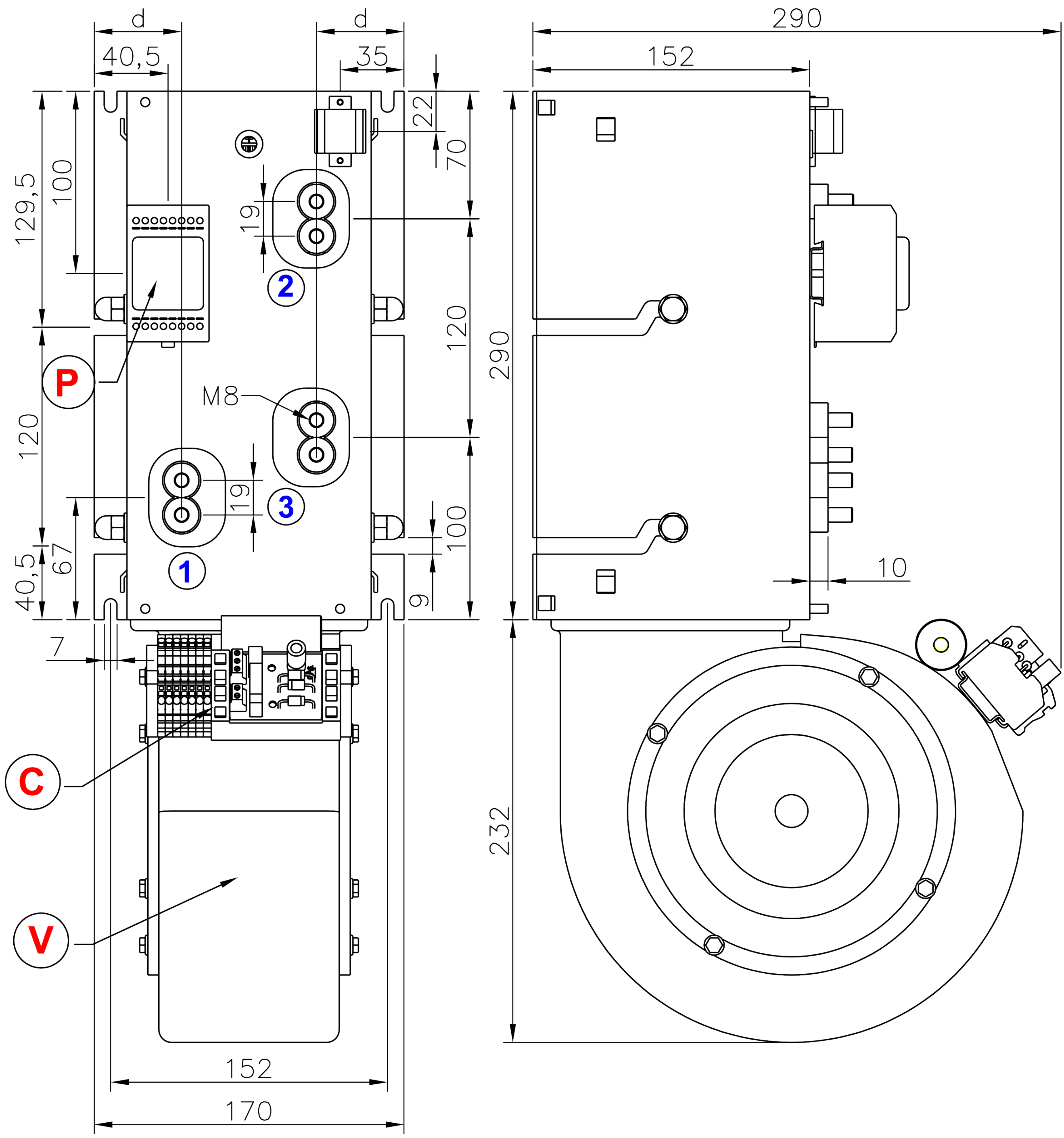
Mechanical Drawings

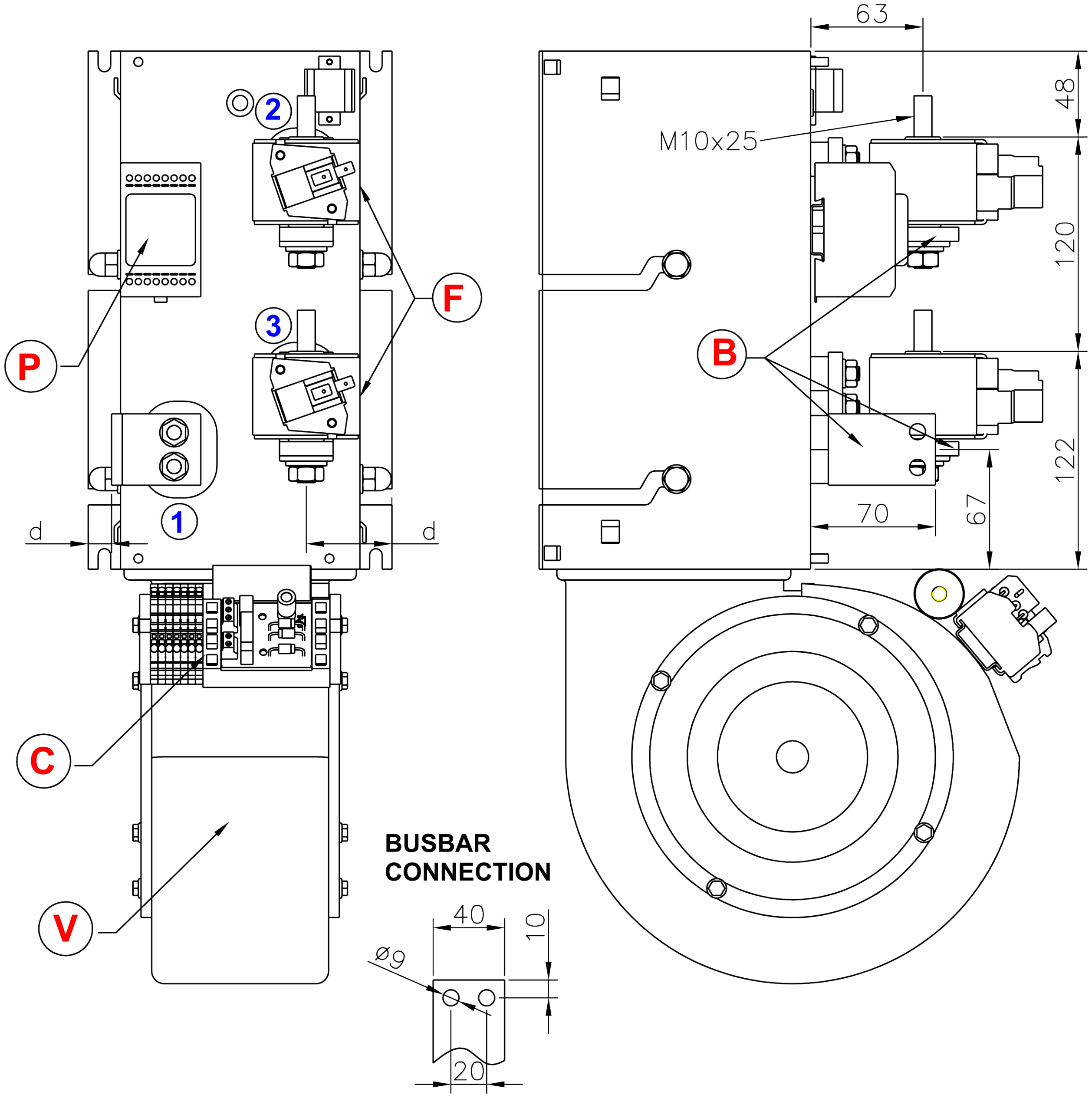
The drawing shows the version without optional busbars and fuses. In the drawing are present options P (pulse transformer) V (fan) and C (cooling alarm)



All dimensions are in mm.

Mechanical Drawings

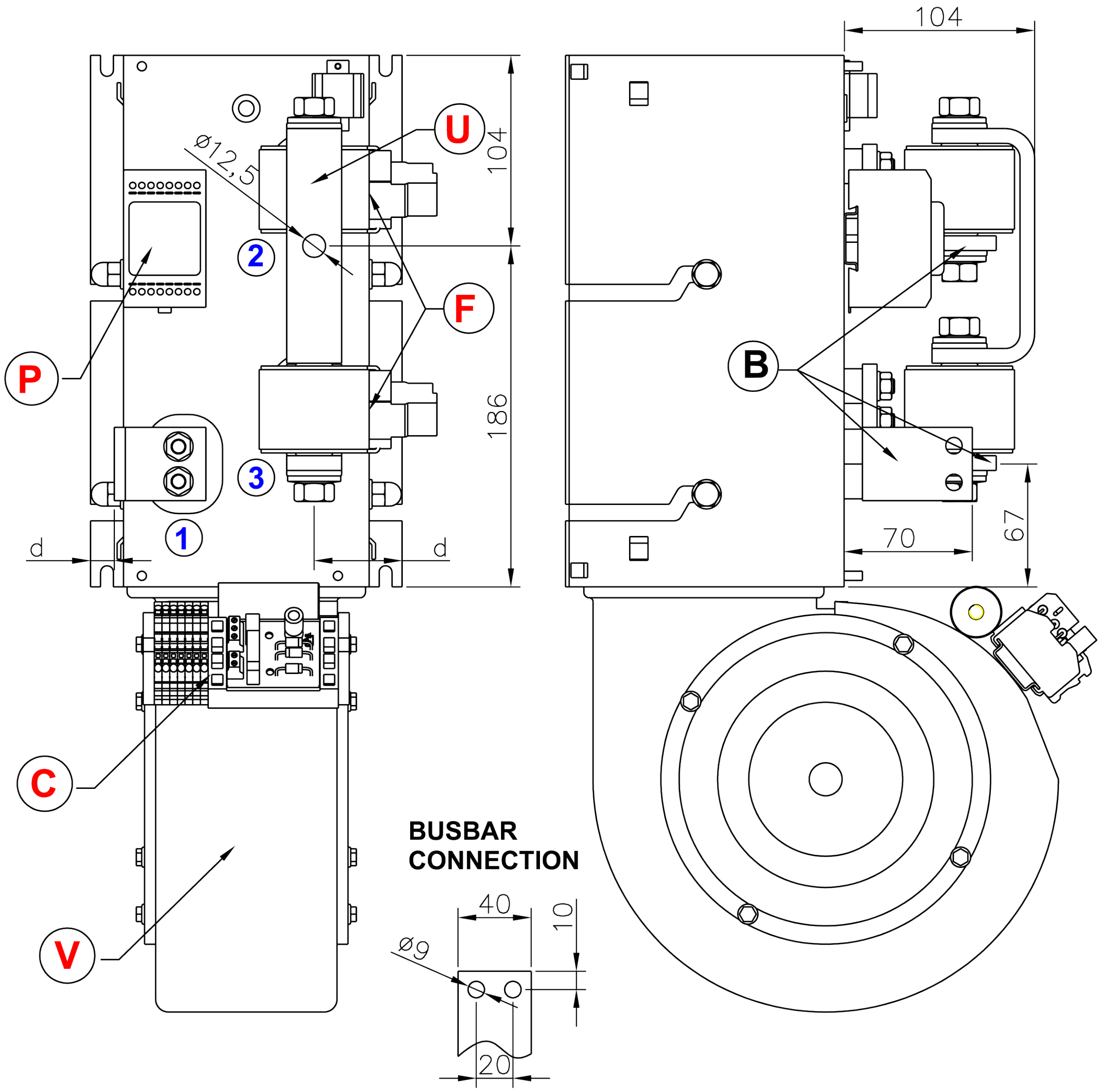
The drawing shows the version with optional busbars (B option) and fuses (F option). In the drawing are also present options P (pulse transformer) V (fan) and C (cooling alarm).



All dimensions are in mm.

Mechanical Drawings

The drawing shows the version with optional busbars (B option), fuses (F option) and anti-parallel busbar (U option). In the drawing are also present options P (pulse transformer) V (fan) and C (cooling alarm)



All dimensions are in mm.

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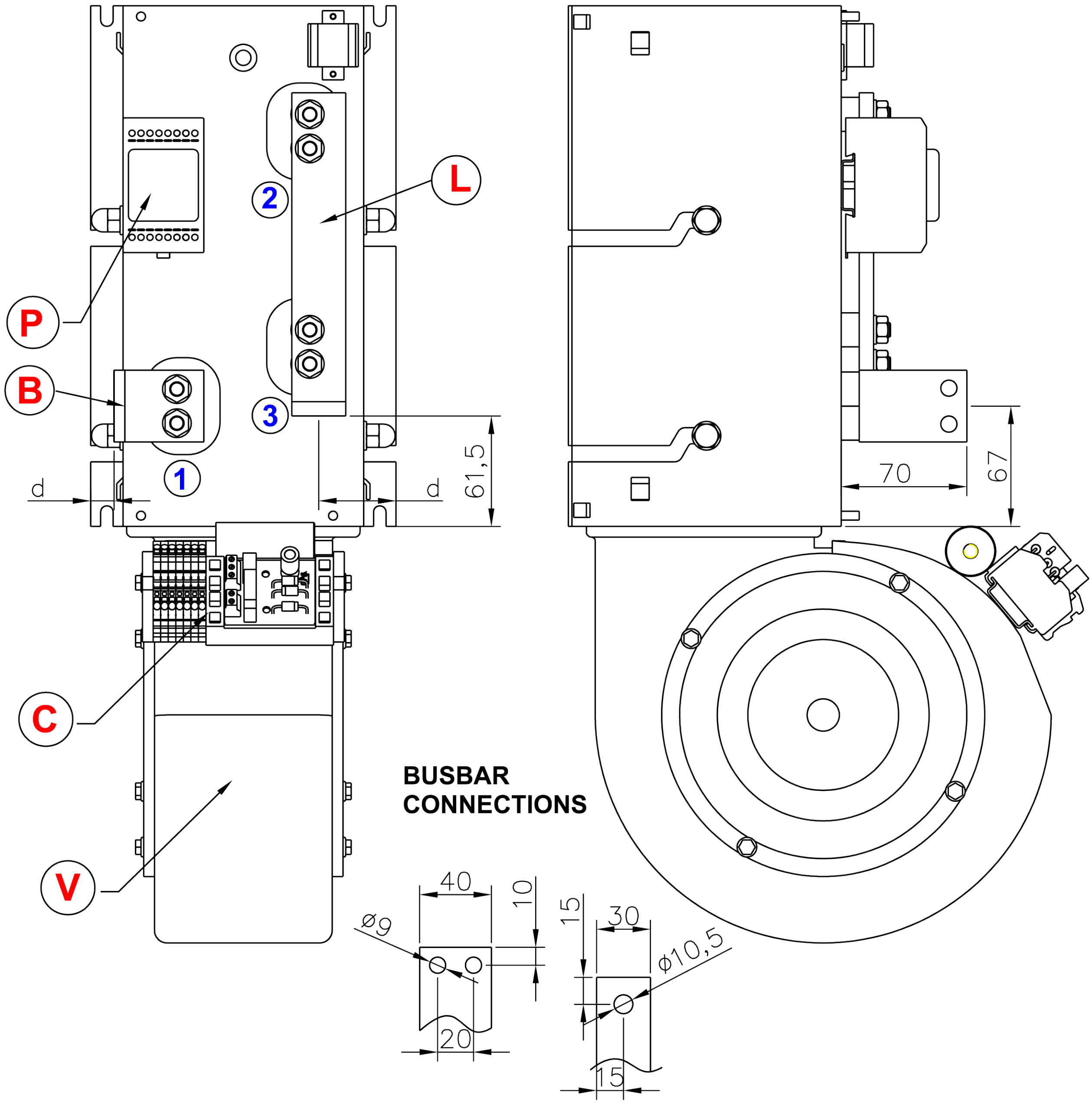
Mechanical Drawings
The drawing shows the version with optional busbars (B option) and anti-parallel busbar (L option) . The L option is only suited for applications where no fuse protection (option F) is required. In the drawing are also present options P (pulse transformer) V (fan) and C (cooling alarm)



All dimensions are in mm.

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Maximum Output Current vs. Ambient temperature Curves

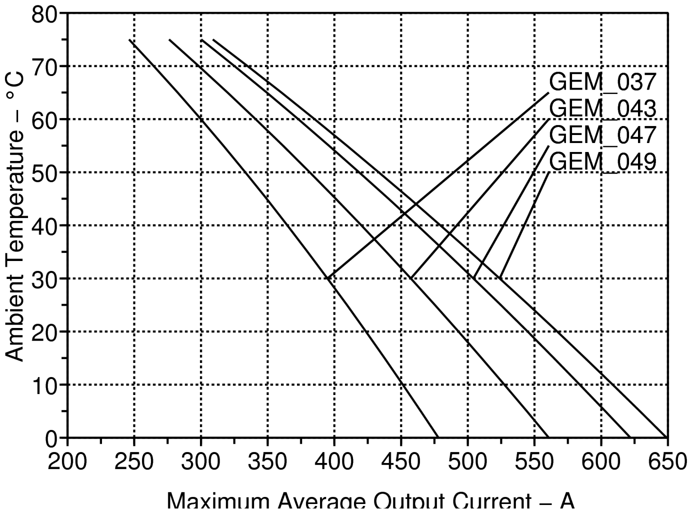


Fig.1: Maximum module output vs. ambient temperature half sine 180° conduction.

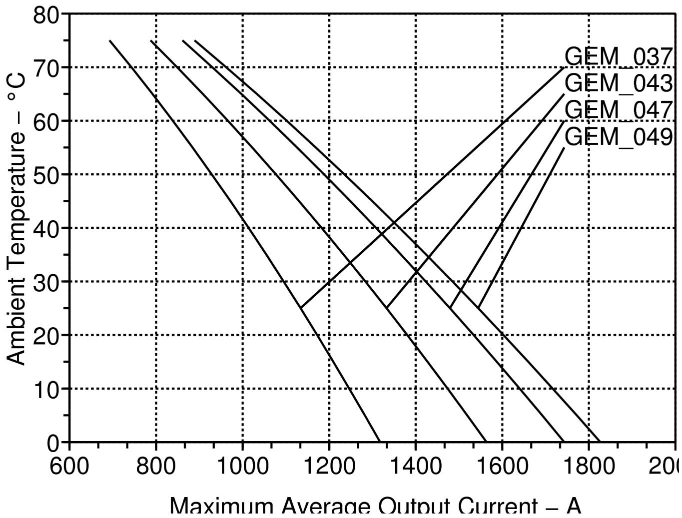


Fig.2: Maximum output vs. ambient temperature for three phase bridge circuit.

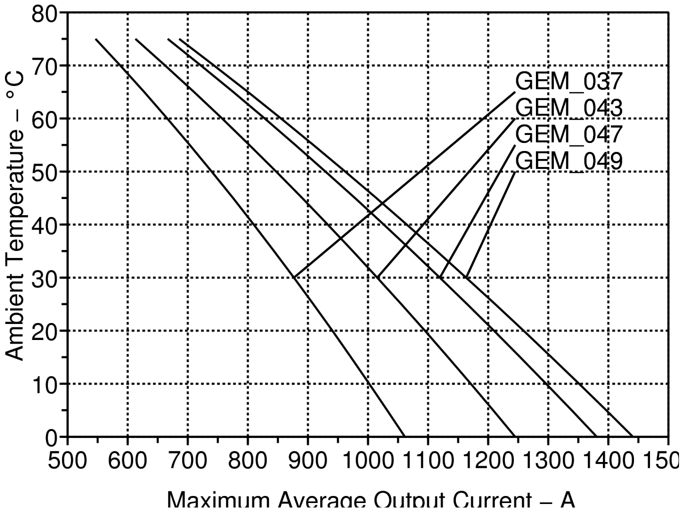


Fig.3: Maximum output vs. ambient temperature for AC-switch circuit.

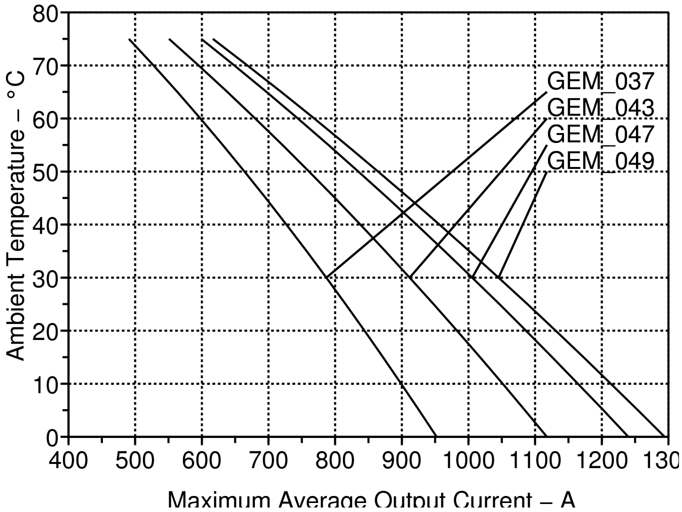
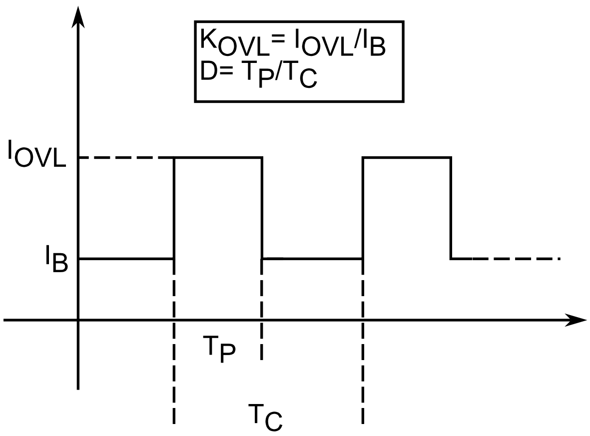


Fig.4: Maximum output vs. ambient temperature for two pulse bridge and center tap circuit.

Six Pulse Bridge Connection Overload Capability Curves

I_{OUT_DC} vs. Duty Cycle with K_{OVL}=1.5



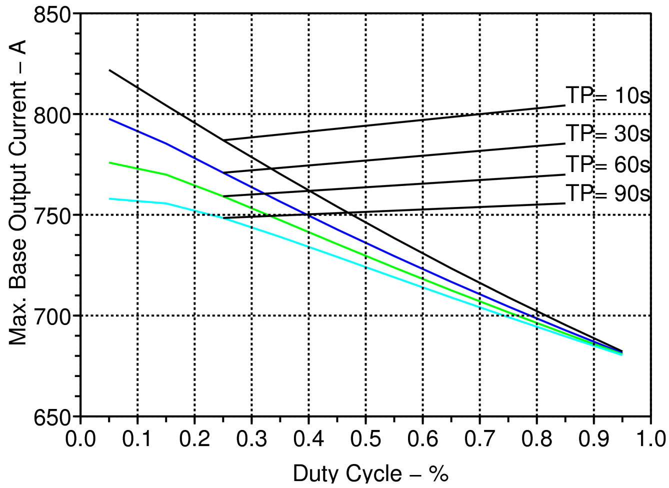


Fig.5: Overload capability curves for GEM_037 (T_A = 40°C).

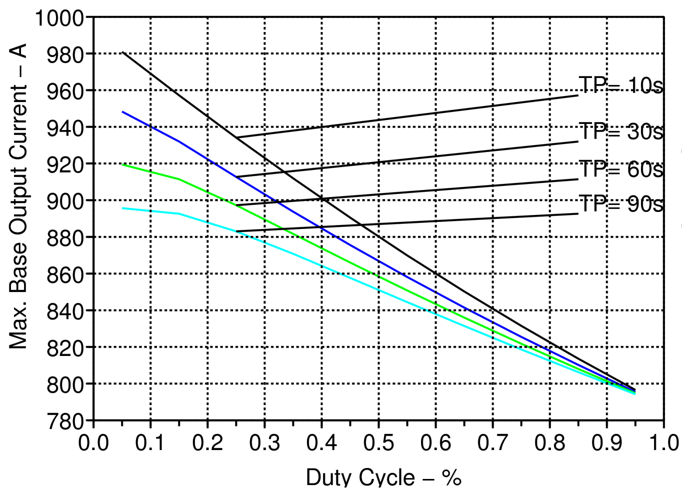


Fig.6: Overload capability curves for GEM_043 (T_A = 40°C).

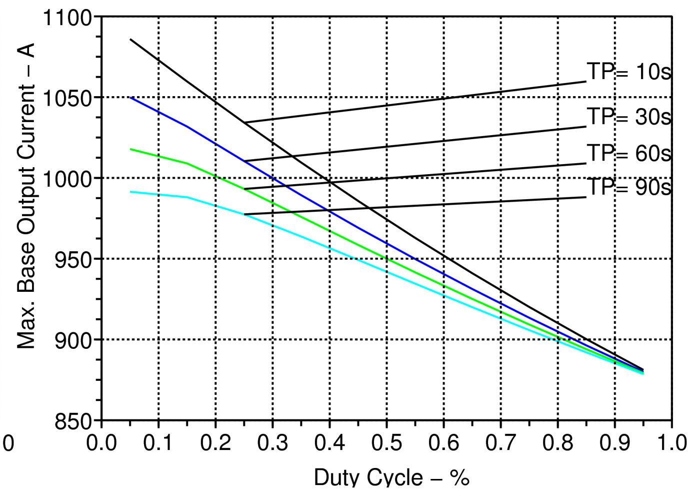


Fig.7: Overload capability curves for GEM_047 (T_A = 40°C).

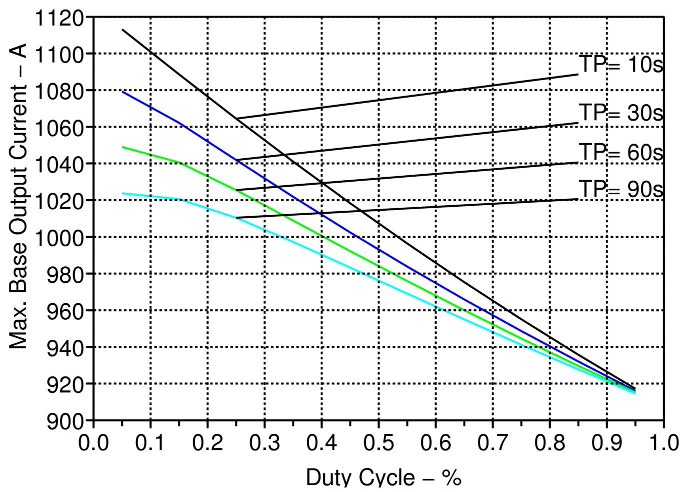
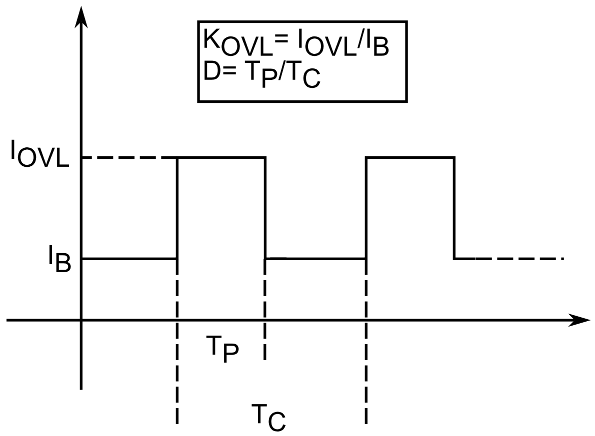


Fig.8: Overload capability curves for GEM_049 (T_A = 40°C).

Six Pulse Bridge Connection Overload Capability Curves

I_{OUT_DC} vs. Duty Cycle with K_{OVL}=2



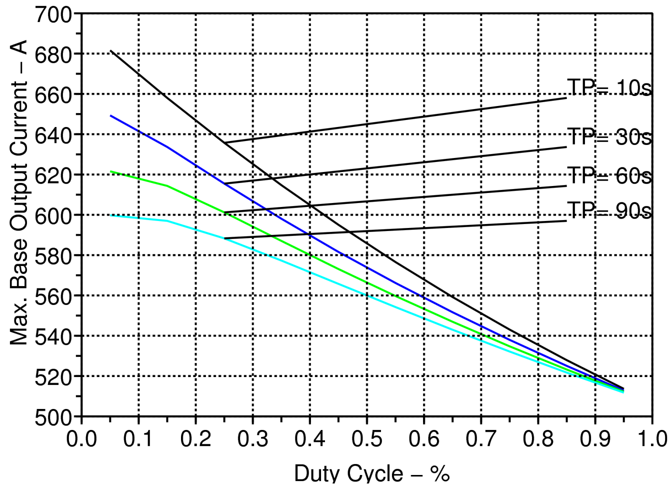


Fig.9: Overload capability curves for GEM_037 (T_A = 40°C).

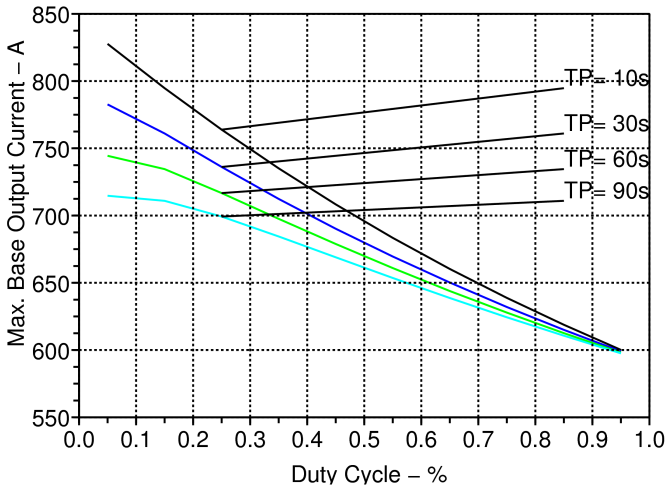


Fig.10: Overload capability curves for GEM_043 (T_A = 40°C).

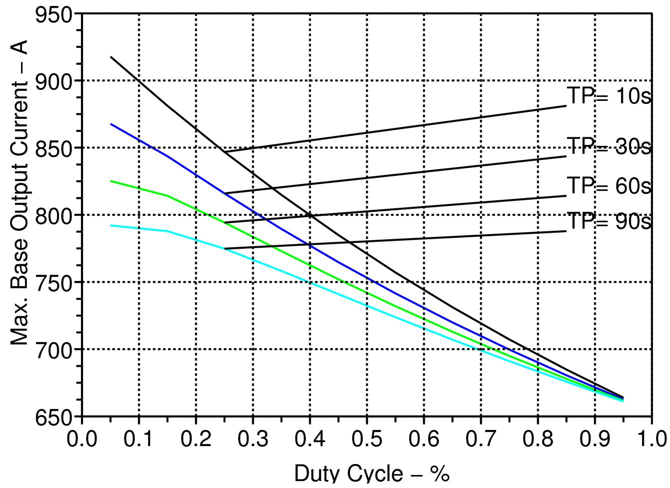


Fig.11: Overload capability curves for GEM_047 (T_A = 40°C).

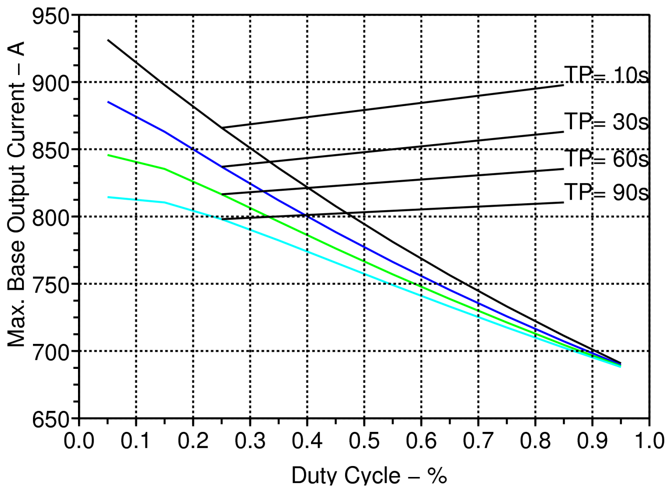
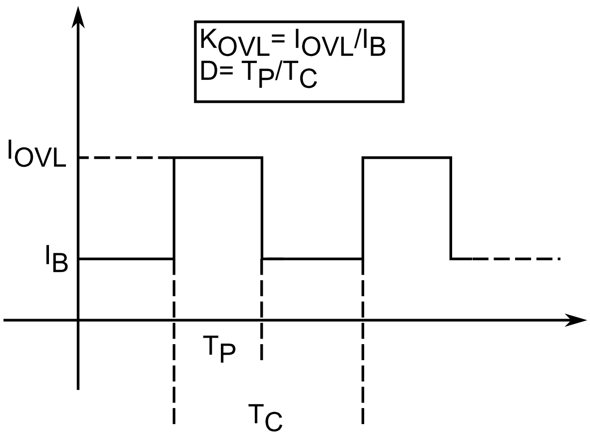


Fig.12: Overload capability curves for GEM_049 (T_A = 40°C).

Six Pulse Bridge Connection Overload Capability Curves

I_{OUT_DC} vs. Duty Cycle with K_{OVL}=2.5



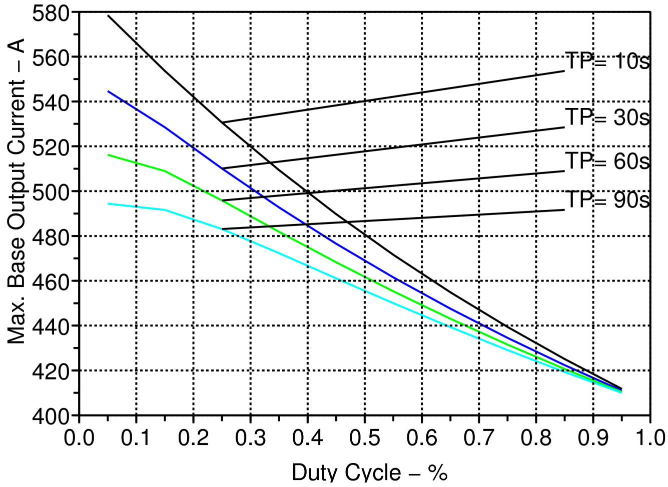


Fig.13: Overload capability curves for GEM_037 (T_A = 40°C).

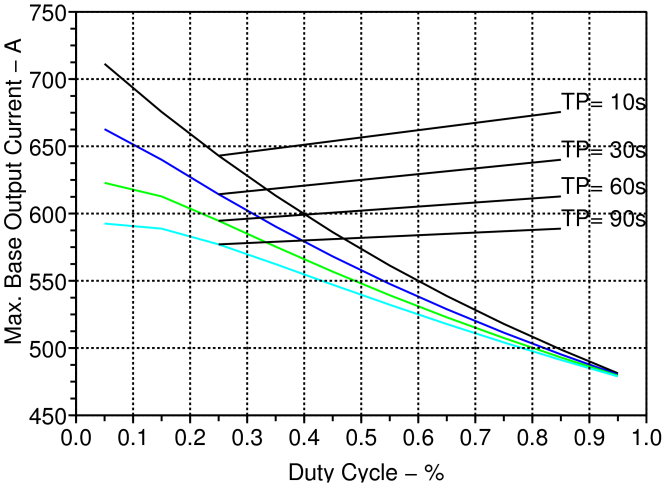


Fig.14: Overload capability curves for GEM_043 (T_A = 40°C).

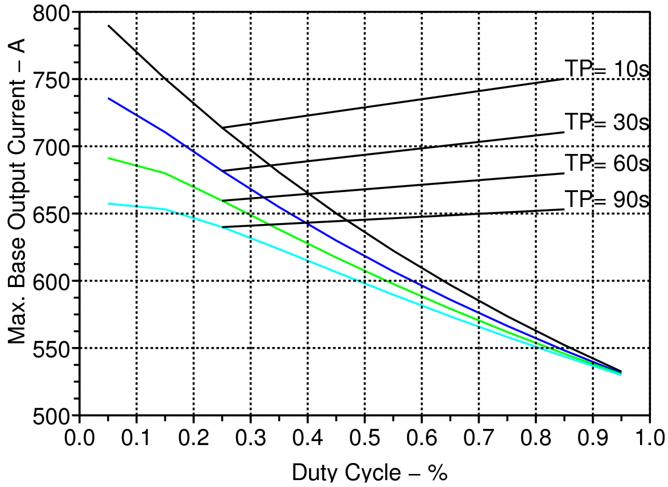


Fig.15: Overload capability curves for GEM_047 (T_A = 40°C).

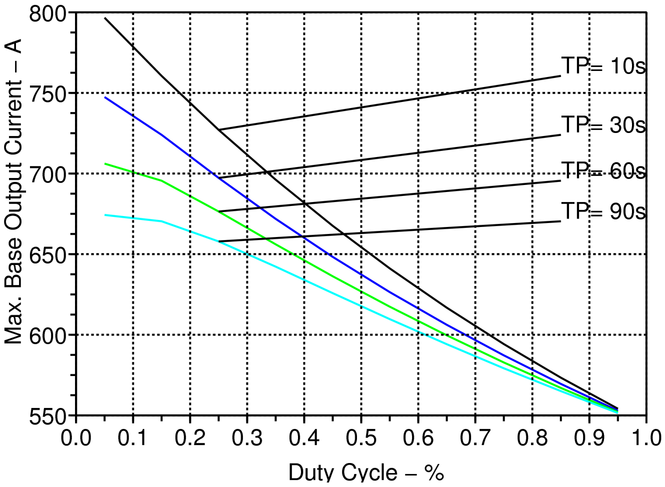
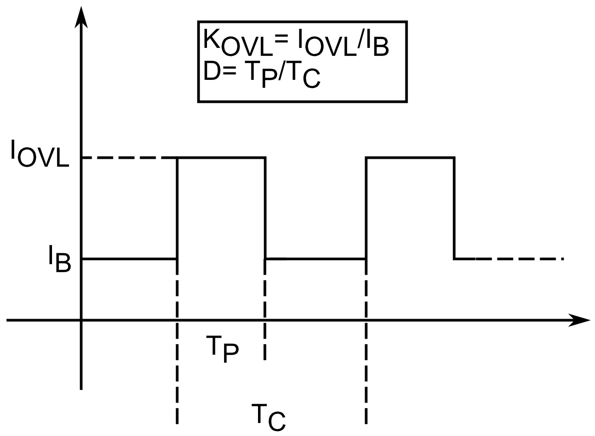


Fig.16: Overload capability curves for GEM_049 (T_A = 40°C).

AC-Switch Connection Overload Capability Curves

I_{OUT_RMS} vs. Duty Cycle with K_{OVL}=2



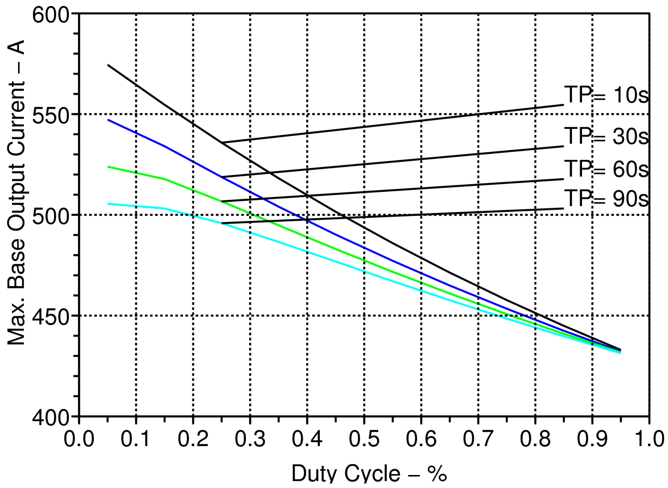


Fig.17: Overload capability curves for GEM_037 (T_A = 40°C).

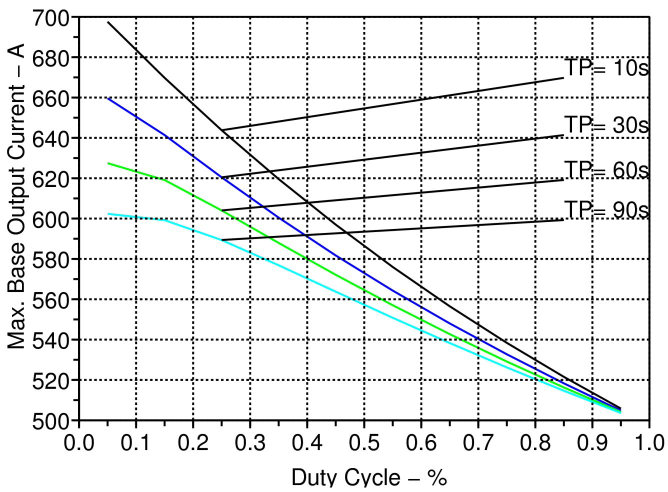


Fig.18: Overload capability curves for GEM_043 (T_A = 40°C).

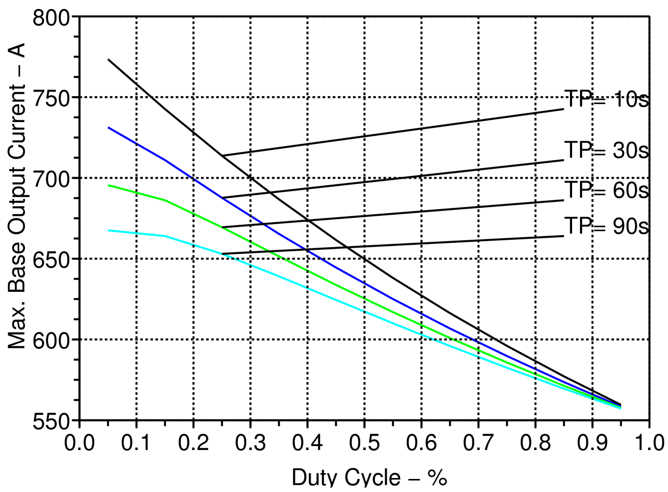


Fig.19: Overload capability curves for GEM_047 (T_A = 40°C).

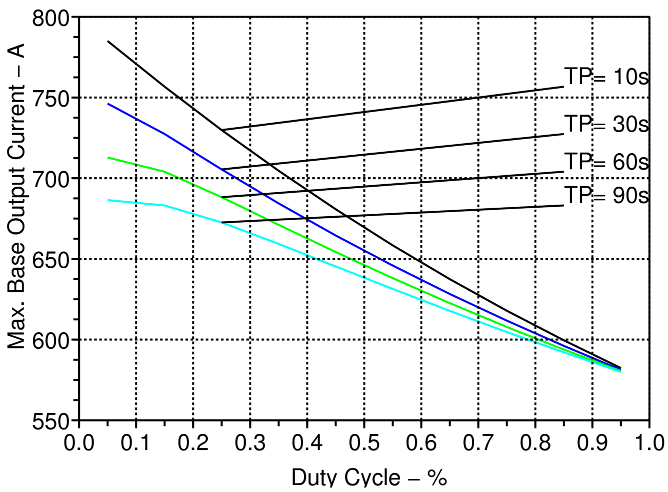
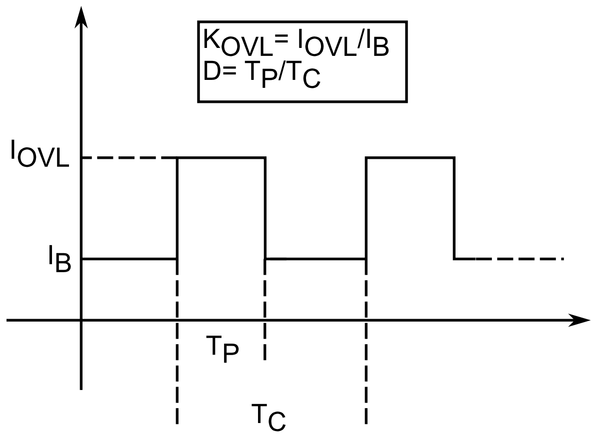


Fig.20: Overload capability curves for GEM_049 (T_A = 40°C).

AC-Switch Connection Overload Capability Curves

I_{OUT_RMS} vs. Duty Cycle with K_{OVL}=3



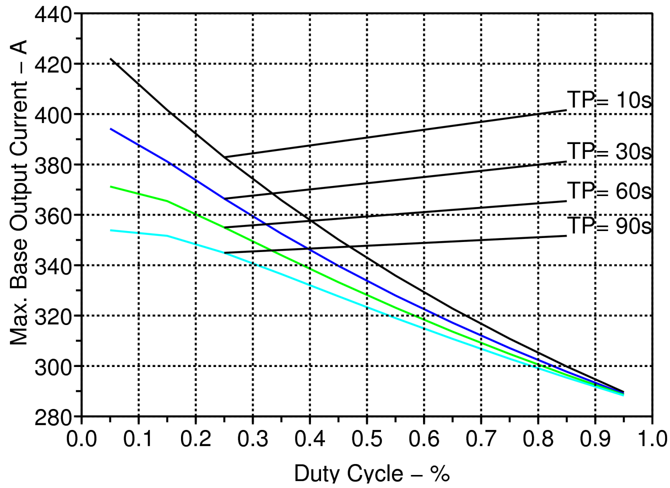


Fig.21: Overload capability curves for GEM_037 (T_A = 40°C).

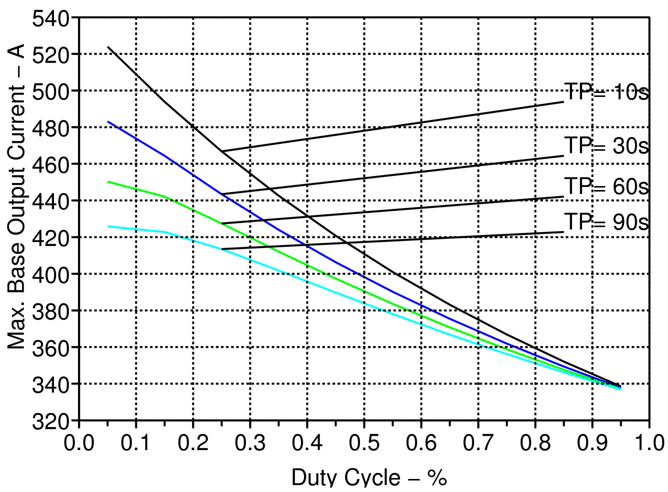


Fig.22: Overload capability curves for GEM_043 (T_A = 40°C).

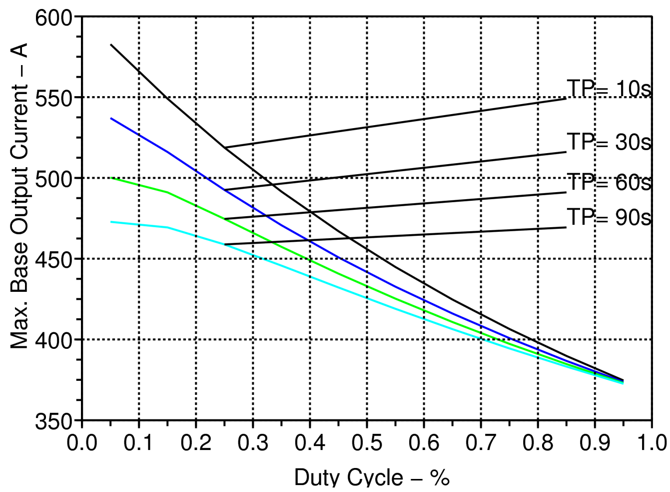


Fig.23: Overload capability curves for GEM_047 (T_A = 40°C).

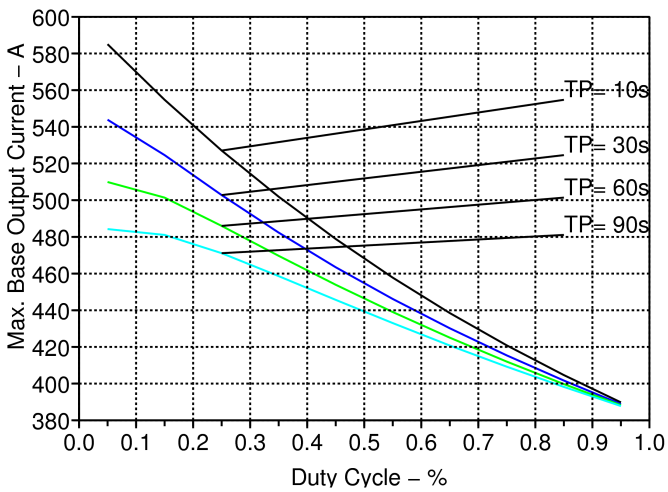
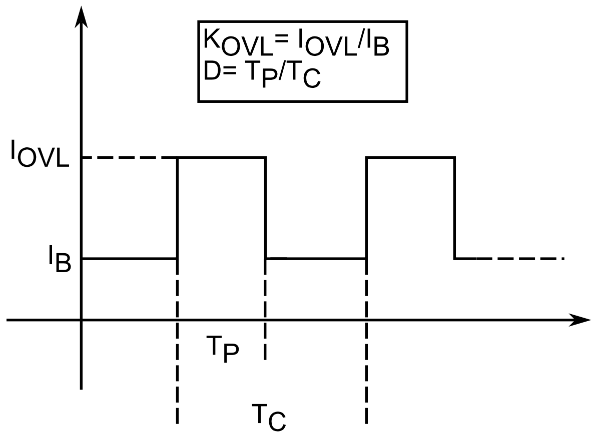


Fig.24: Overload capability curves for GEM_049 (T_A = 40°C).

AC-Switch Connection Overload Capability Curves

I_{OUT_RMS} vs. Duty Cycle with K_{OVL}=4



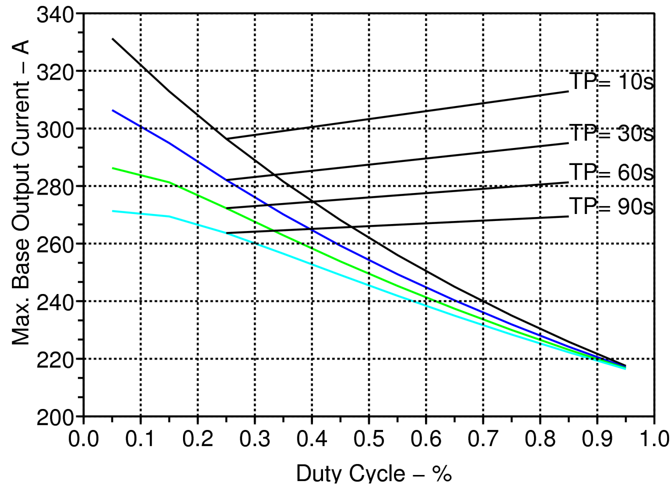


Fig.29: Overload capability curves for GEM_059 (T_A = 40°C).

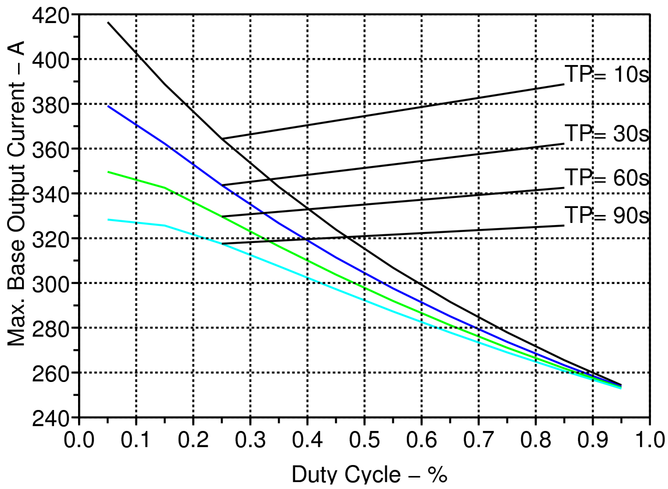


Fig.30: Overload capability curves for GEM_067 (T_A = 40°C).

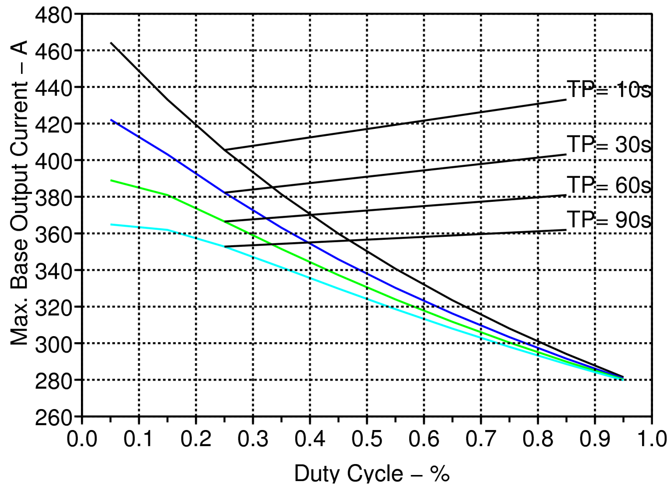


Fig.31: Overload capability curves for GEM_071 (T_A = 40°C).

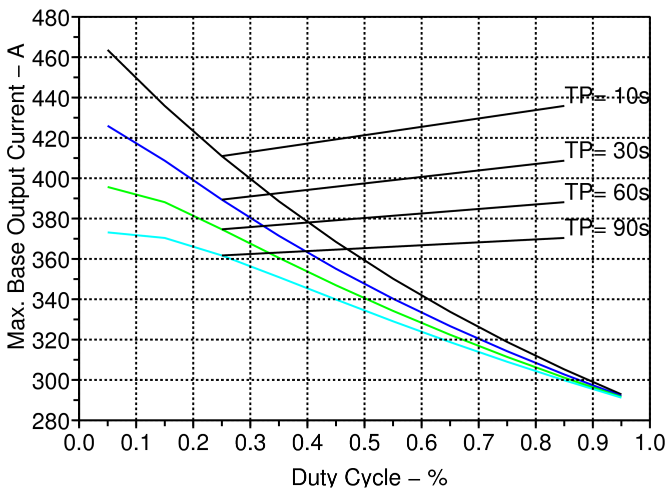


Fig.32: Overload capability curves for GEM_076 (T_A = 40°C).