

Power metal film resistors

PPRR 1W/2W/3W

FEATURES

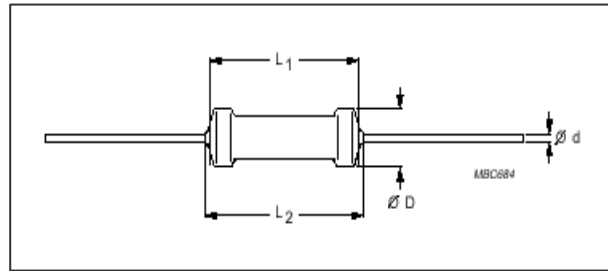
- High power in small packages
- Available wide range to automatic insertion machine.

APPLICATIONS

- All general purpose power applications.

DESCRIPTION

A homogeneous film of metal alloy is deposited on a high grade ceramic body. After a laser groove has been cut in the resistive layer, tined connecting leads of electrolytic copper are welded to the end-caps.



TYPE	Dimensions (mm)			
	D ±0.8	L1 ±0.8	L2 Max.	d (±0.05)
PPRR 1W	2.5	6.5	8.5	0.55
PPRR 2W	3.9	9.0	12	0.8
PPRR 3W	5.5	15	18	0.8

QUICK REFERENCE DATA

DESCRIPTION	VALUE		
	PPRR 1W	PPRR 2W	PPRR 3W
resistance range	0.22 Ω to 1 MΩ	0.1 Ω to 1 MΩ	0.47 Ω to 470 kΩ
resistance tolerance	±5%, ±2% (E24) ±1%, (E48, E96 series)		
temperature coefficient R ≤ 4.7 Ω R > 4.7 Ω	± 250 ppm / °C ± 200 ppm / °C	± 250 ppm / °C ± 200 ppm / °C	± 350 ppm / °C ± 200 ppm / °C
rated dissipation at T _{amb} = 70 °C	1 W	2 W	3 W
max. working voltage	350 V	500 V	750 V
max. overload voltage	700 V	1000 V	1000 V
basic specifications	IEC 60 115-1 and 60 115-2		
climatic category (IEC60)	55 / 155 / 56		
stability, ΔR/R _{max} after load : 1000 hours	± 5% +0.1 Ω	± 5% +0.1 Ω	± 5% +0.1 Ω
Damp heat steady state	± 3% +0.1 Ω	± 3% +0.1 Ω	± 3% +0.1 Ω
climatic tests	± 3% +0.1 Ω	± 3% +0.1 Ω	± 3% +0.1 Ω
soldering	± 1% +0.05 Ω	± 1% +0.05 Ω	± 1% +0.05 Ω

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ORDERING INFORMATION

Ordering code indicating resistor types and packing

Table 1

Type	Bandolier width	Packing	Quantity	Resistance range	Tol. \pm %	Ordering code
PPRR1W	52mm (ϕ 0.55)	ammo	1000	0.22 Ω to 1 M Ω	1	PPRR 193 7xxxx
		reel	5000		5	PPRR 193 15xxx
	R - shape		2000		1	PPRR 193 4xxxx
	T - shape		1500		5	PPRR 193 23xxx
	15.0mm (ϕ 0.6)	C/F	1000		1	PPRR 197 2xxxx
					5	PPRR 197 53xxx
					5	PPRR 293 53xxx
17.8mm (ϕ 0.6)			5	PPRR 193 03xxx		
20.0mm (ϕ 0.8)				PPRR 193 33xxx		
				PPRR 193 63xxx		

Note : 1% : R \geq 2 Ω

Table 2

Type	Bandolier width	Packing	Quantity	Resistance range	Tol. \pm %	Ordering code	
PPRR2W	52mm	ammo	1000	0.1 Ω to 1 M Ω	5	PPRR 194 53xxx	
	64mm		1000		1	PPRR 194 7xxxx	
					5	PPRR 194 15xxx	
	R - shape		1500		5	PPRR 194 26xxx	
	T - shape		1000		5	PPRR 294 26xxx	
	15.0mm	C/F	1000			5	PPRR 194 83xxx
	17.8mm					5	PPRR 194 33xxx
20.0mm					PPRR 194 63xxx		

Note : 1% : R \geq 3 Ω

Table 3

Type	Bandolier width	Packing	Quantity	Resistance range	Tol. \pm %	Ordering code
PPRR3W	52mm	ammo	500	0.47 Ω to 470 k Ω	2	PPRR 195 44xxx
					5	PPRR 195 43xxx
	64mm	ammo	500		2	PPRR 195 14xxx
					5	PPRR 195 23xxx
	T - shape		500		2	PPRR 295 55xxx
			5	PPRR 295 26xxx		

Table 4. Last digit of 12NC

Resistance decade	Last digit	Resistance decade	Last digit
1 to 9.76 Ω	8	10 to 97.6 k Ω	3
10 to 97.6 Ω	9	100 to 976 k Ω	4
100 to 976 Ω	1	1 to 9.76 M Ω	5
1 to 9.76 k Ω	2	10 M Ω	6

Ordering Example

The ordering code of a PPRR2W resistor, value 33 k Ω \pm 5%, R-shape of 1500 units in ammpack is: PPRR 194 26333.

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Limiting values

Table 5

TYPE	LIMITING VOLTAGE ⁽¹⁾ (V)	LIMITING POWER (W)
PPRR 1W	350	1
PPRR 2W	500	2
PPRR 3W	750	3

Note

1. the maximum voltage that may be continuously applied to the resistor element, see “IEC publication 60 115-1”

The maximum permissible hot – spot temperature is 155 °C.

DERATING

The power that the resistor can dissipate depends on the operating temperature : Fig. 1

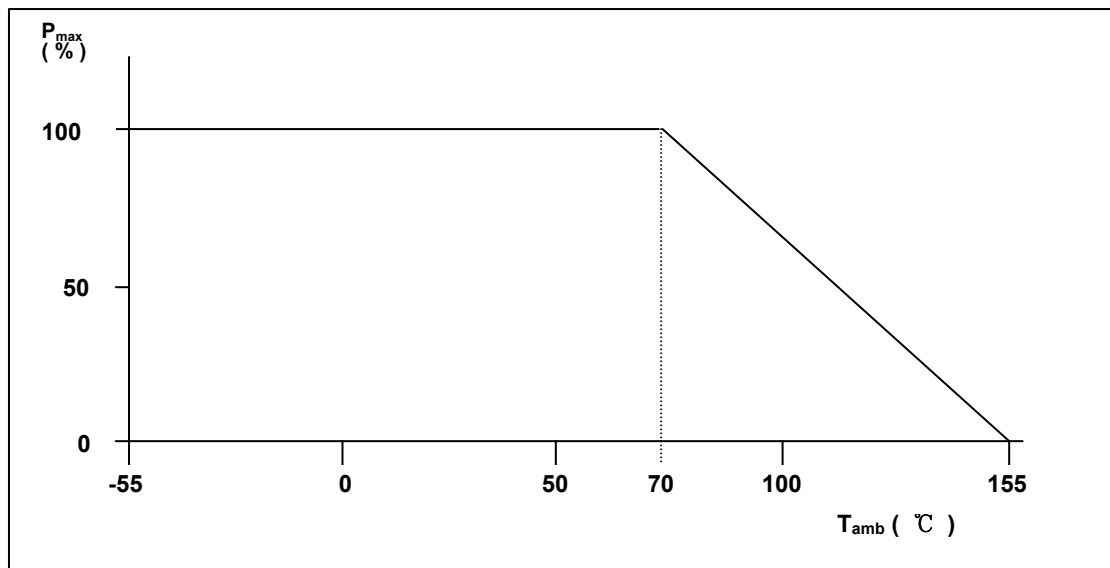


Fig. 1 Maximum dissipation (P_{max}) in percentage of rated power as a function of the ambient temperature (T_{amb})

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PULSE LOADING CAPABILITIES

PPRR 1W

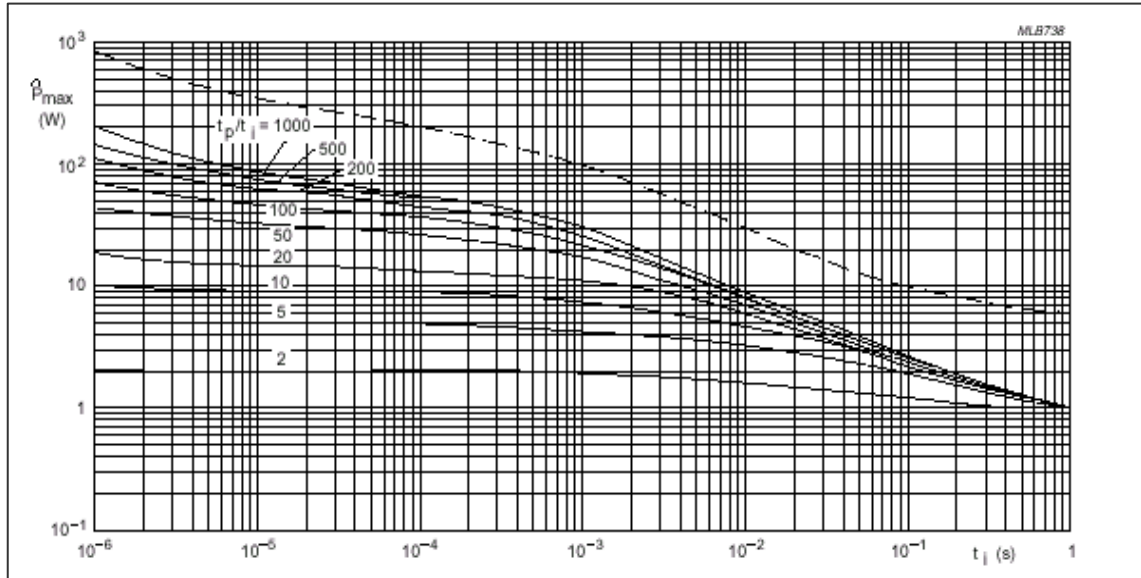


Fig. 2 Pulse on a regular basis: maximum permissible peak pulse power (P_{max}) as a function of pulse duration (t_i).

PPRR 2W

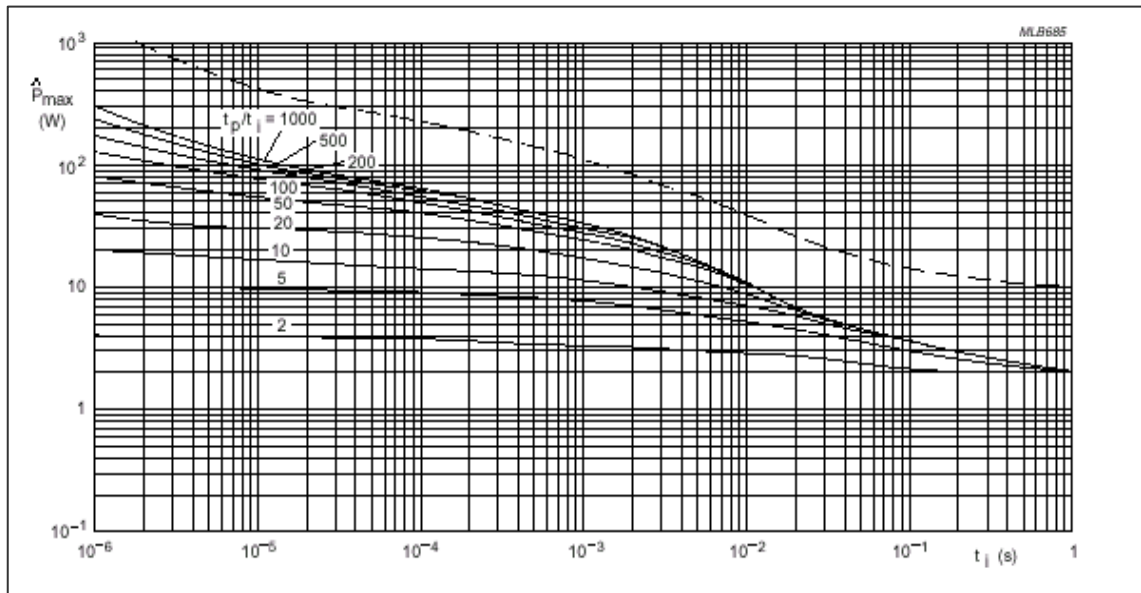


Fig. 3 Pulse on a regular basis: maximum permissible peak pulse power (P_{max}) as a function of pulse duration (t_i).

PPRR 3W

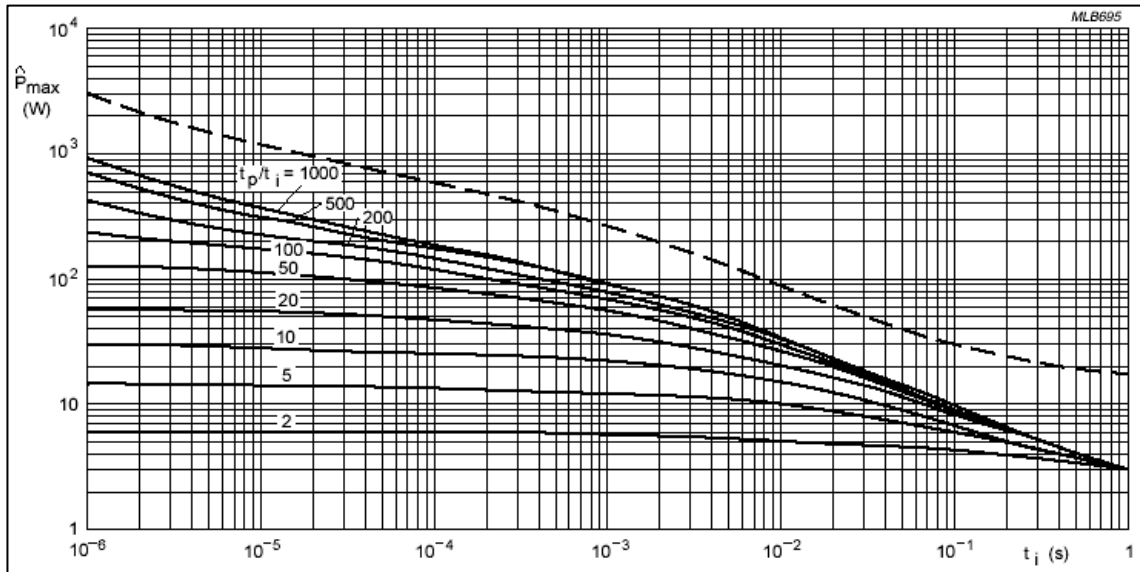


Fig. 4 Pulse on a regular basis: maximum permissible peak pulse power (\hat{P}_{max}) as a function of pulse duration (t_i).

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Application information

PPRR 1W

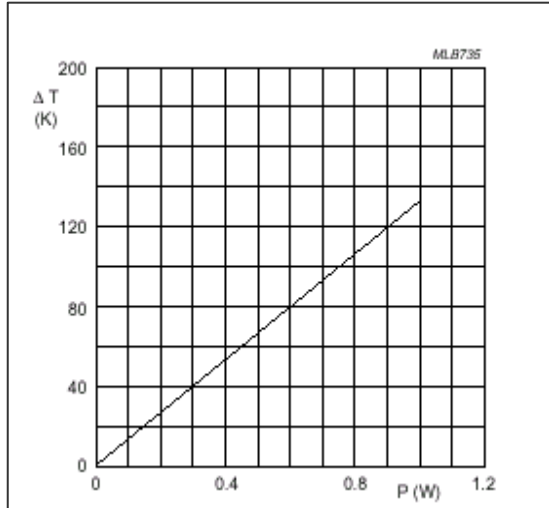


Fig. 5 Hot – spot temperature rise (ΔT) as a function of dissipated power

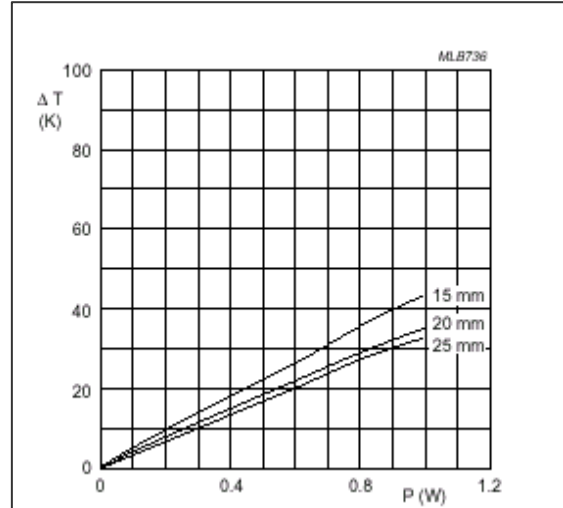


Fig. 6 Temperature rise (ΔT) at the lead end of the lead (soldering point) as a function of dissipated power at various lead lengths after mounting

PPRR 2W

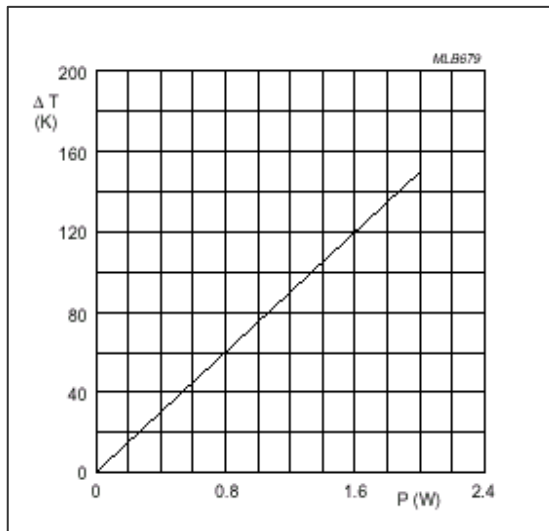


Fig. 7 Hot – spot temperature rise (ΔT) as a function of dissipated power

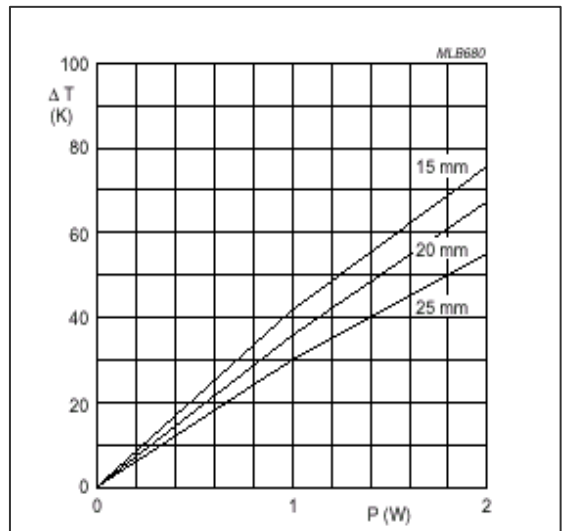


Fig.8 Temperature rise (ΔT) at the lead end of the lead soldering point as a function of dissipated power at various lead lengths after mounting

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PPRR 3W

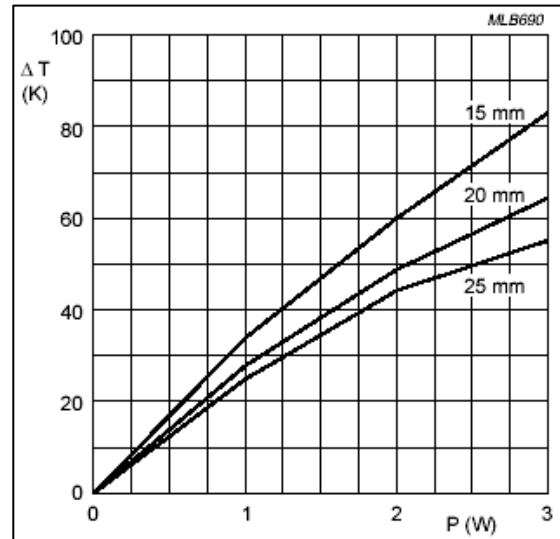
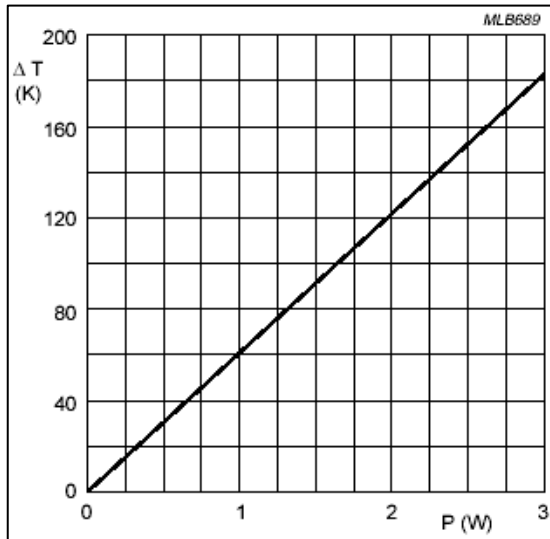


Fig. 9 Hot – spot temperature rise (ΔT) as a function of dissipated power

Fig.10 Temperature rise (ΔT) at the lead end of the lead soldering point as a function of dissipated power at various lead lengths after mounting

MECHANICAL DATA

Table 6. Mass per 100 units

TYPE	MASS (g)
PPRR 1W	29
PPRR 2W	40
PPRR 3W	140

MARKING

The nominal resistance and tolerance are marked on the resistor using four or five colored bands in accordance with IEC publication 60 062 “color codes for fixed resistors”

Table 7. BODY COLORS

TYPE	COLORS
PPRR 1W	Red
PPRR 2W	Red
PPRR 3W	Green

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TEST AND REQUIREMENTS

Table 8. Test procedures and requirements

TEST	PROCEDURE	REQUIREMENTS		
		PPRR 1W	PPRR 2W	PPRR 3W
robustness of terminations: tensile all samples	ϕ 0.60 mm: load 10N:10s ϕ 0.80 mm: load 10N:10s	number of failures < 10 ppm		
bending half number of samples	ϕ 0.60 mm: load 5N: 4x90° ϕ 0.80 mm: load 5N: 4x90°	number of failures < 10 ppm		
torsion other half number samples	3x360°in opposite directions	no damage $\pm 0.5\% + 0.05 \Omega$		
solderability	2 s ; 235 °C flux 600	good tinning; no damage		
soldering heat	Thermal shock: 3 s; 350 °C 6mm from body	$\pm 1\% + 0.05 \Omega$		
rapid change of temperature	30 minutes at -55 °C and 30 minutes at +155 °C; 5cycles	$\pm 1\% + 0.05 \Omega$		
vibration	frequency 10 to 500 Hz; displacement 1.5mm or acceleration 10g; 3 directions total 6 hours(3x2 hours)	no damage $\pm 0.5\% + 0.05 \Omega$		
Climatic sequence dry heat damp heat (accelerated) 1 st cycle cold low air pressure damp heat (accelerated) remaining cycles	16 hours; 155 °C 24 hours; 55 °C; 90 to 100% RH 2 hours; - 55 °C 2 hours; 8.5 Kpa; 15 to 35 °C 5 days; 55 °C; 95 to 100% RH	$R_{ins \text{ min}}; 1000 M\Omega$ $\pm 3\% + 0.1 \Omega$		
damp heat	56 days; 40 °C; 90 to 95% RH dissipation 0.01 P_n	$\pm 3\% + 0.1 \Omega$		
endurance	1000 hours at 70 °C; P_n or V_{max}	$\pm 5\% + 0.1 \Omega$		
temperature coefficient	between -55 °C and +155 °C	$R \leq 4.7 \Omega : \pm 250 \text{ ppm}/^\circ\text{C}$ $R > 4.7 \Omega : \pm 200 \text{ ppm}/^\circ\text{C}$		
dielectric withstanding voltage	500V _{RMS} during 1min. V- block method	no breakdown		
insulation resistance	500V _{DC} during 1 minute ; V – block method	min. : $10^4 M\Omega$		
short time overload	rated voltage x2.5 5 s on 45 s off ($V \leq 2 \times V_{max}$) 10 cycles	$\pm 2\% + 0.05 \Omega$		

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TEST AND REQUIREMENTS

TEST	PROCEDURE	REQUIREMENTS		
		PPRR 1W	PPRR 2W	PPRR 3W
intermittent overload	rated voltage x 3 1 s on 25 s off (V_{max}) 10000 \pm 200 cycles	$\pm 1\% + 0.05\Omega$		
pulse load		see Fig. 2.3.4 and 5		