

# Electronic Energy Meter

---

## Table of Contents

Communication Interface, IR data I/O.....	3
Communication Interface, Status Indicator.....	4
Main Circuit, feedback.....	5
Main Circuit, voltage stabilization.....	6
Measuring Unit, shunt resistor.....	7
Measuring Unit, voltage detection.....	8
Power Supply, current rectification.....	9
Power Supply, EMI/RFI filter and capacitive coupling.....	10
Power Supply, energy buffering.....	11
Power Supply, overvoltage protection.....	12
Power Supply, Surge Current Limiter.....	13

# Electronic Energy Meter

---

## VISHAY components used for electronic energy meters include:

- Film Capacitors
- Ceramic Capacitors, Multilayer
- Al Electrolytic Capacitors
- Varistors
- Rectifier Diodes
- Zener Diodes
- Optocouplers
- LEDs
- IR detectors
- IR emitters
- Thick Film Chip Resistors
- Thin Film Chip Resistors

---

## Application Overview

Modern solid-state electronic energy meters (also known as kilowatt-hour meters, etc.) employ recently developed electronic components to measure electrical energy. Basic electronic meters are not just more cost-effective than mechanical meters, but offer further benefits: measurement accuracy of the electronic meter is about an order of magnitude better than that of a mechanical meter, while power consumption is lower by about two orders of magnitude. The electronic energy meter is also better protected against tampering than its mechanical predecessor, and units for prepaid operation (e.g., card readers) and remote meter reading (e.g., wireless, telephone line, or internet) can easily be included.

## Electronic Energy Meter : Communication Interface, IR data I/O

---

### IR detector

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">BPV10</a>		leaded IR detector; PIN photodiode	940 nm	TH / Radial D: 5 mm (T-1 3/4)	

### IR emitter

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">TSAL 4400</a>		leaded IR emitter with high radiant power	940 nm	TH / Radial D: 3 mm (T-1)	
<a href="#">TSAL 6100</a>		leaded IR emitter with high radiant power	940 nm	TH / Radial D: 5 mm (T-1 3/4)	

## Electronic Energy Meter : Communication Interface, Status Indicator

---

### LED

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">TLHx4200</a>		leaded LED, green, orange, red	green, orange, red tinted clear package	TH / Radial D: 3 mm	
<a href="#">TLHx4400</a>		leaded LED, green, orange, red	green, orange, red tinted diffused package	TH / Radial D: 3 mm	
<a href="#">TLMx1100</a>		SMD LED, green, orange, red	green, orange, red small SMD package with exceptional brightness	SMD size 0603 CHIP	
<a href="#">TLUx240x</a>		leaded LED, green, orange, red	green, orange, red tinted diffused package	TH / Radial D: 1.8 mm	

## Electronic Energy Meter : Main Circuit, feedback

---

### Optocoupler

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">SFH610x</a>		SMD or leaded optocoupler phototransistor output; high reliability	VISO = 5300 VRMS; Tamb: -55 to +100°C CTR: 40% to 320%	SMD / TH-DIP SMD-4 or DIP-4	DIN EN (V UL/CSA BSI

## Electronic Energy Meter : Main Circuit, voltage stabilization

### Resistor

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">CRCW...e3</a>		thick film chip resistor, SMD	1 Ohm to 10 Mohms E24-, E96-series; excellent stability	SMD 0201 to 2512 CHIP	
<a href="#">MCx</a>		thin film chip resistor, SMD	1 Ohm to 10 MOhms; low tol.; low TC; excellent stability	SMD 0402 to 1206 CHIP	

### Zener Diode

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">BZG04-M</a>		SMD diode	Zener and surge current specification	SMD DO-214AC (SMA)	
<a href="#">BZM55</a>		SMD diode	Vz = 2.4 V to 75V; max.Tj = 175°C Very high stability	SMD MicroMELF glass case	
<a href="#">BZT55</a>		SMD diode	Vz = 2.4V to 75V; max.Tj = 175°C Very high stability	SMD QuadroMELF, SOD8 glass case	
<a href="#">TZM</a>		SMD diode	Vz = 2.4V to 75V; max.Tj = 175°C Very high stability	SMD MiniMELF, SOD80 glass case	

# Electronic Energy Meter : Measuring Unit, shunt resistor

---

Shunt resistor

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">WSMS5515</a>	NEW	Power Metal Strip, Meter Shunt Resistor Very Low Ohmic Value; 5-Terminal Connection Design	R0001 - R0005; 5% Very Low TCR 3-W power rating;		

## Electronic Energy Meter : Measuring Unit, voltage detection

---

### precision resistor

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">MMA 0204 Precision</a>		MELF precision resistor	10 Ohm to 511 kOhm low tol.; low TC superior stability;	SMD 0204 MELF	

### Voltage Divider

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">MMA 0204 HV</a> <a href="#">MMB 0207 HV</a>	NEW	Profession High Voltage Thin Film MELF Resistor	OP Voltage up to 1KV Pulsload Stability up to 3KV (1,2/50 surge)	MELF 0204 MELF 0207	
<a href="#">RCV e3</a>	NEW	High Voltage Thickfilm Chip Resistor	OP Voltage up to 500V Tolerance 1% Resistance 100k - 10M	0805 1206	
<a href="#">TNPV 1206 e3</a> <a href="#">TNPV 1210 e3</a>	NEW	Precision High Voltage Thinfilm Chip Resistor	Umax up to 1000V TCR down to 10ppm/ K Stability <=0,05%	1206 1210	AECQ200



## Electronic Energy Meter : Power Supply, current rectification

---

### Rectifier Diode

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">1N400x</a>		leaded rectifier diode	IF = 1 A; IFSM = 45 A; Vf = 1.1V; max.Tj = 150°C	TH / Axial DO-204AL (DO-41)	
<a href="#">1N400xGP</a>		leaded rectifier diode	IF = 1 A; IFSM = 30 A; Vf = 1.1V; max.Tj = 175°C	TH / Axial DO-204AL (DO-41)	
<a href="#">MSE1Px</a>	NEW	SMD rectifier diode	IF = 1.5 A; IFSM = 30 A; Vf = 1.4V; max.Tj = 150°C trr = 25 ns; Er = 20 mJ	SMD (uSMP)	
<a href="#">S1Px</a>	NEW	SMD rectifier diode	IF = 1.5 A; IFSM = 30 A; Vf = 1.15V; max.Tj = 175° Er = 20 mJ	SMD DO-220AA (SMP)	

## Electronic Energy Meter : Power Supply, EMI/RFI filter and capacitive coupling

---

### Filter and coupling capacitors

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">F1772SX2</a>		310Vac X2 film capacitor Across the lines and series with mains Robustness Under High Humidity	10nF - 2.2uF High capacitance stability 85% R.H. 240Vac 1000h	TH / Radial	EN/IEC
<a href="#">F339X1 480Vac</a>		480Vac X1 film capacitor 3-phase, Across the lines and series with mains	1nF - 1uF Internal Series Constructio Robustness under humidit	TH / Radial	EN/IEC

## Electronic Energy Meter : Power Supply, energy buffering

---

### Buffer Capacitor

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">136 RVI</a>		Radial Very low impedance	10 V to 100 V; 22 $\mu$ F to 10000 $\mu$ F Life@105°C=4000-10000h	TH / Radial 10x12 to 18x35	
<a href="#">150 RMI</a>		Radial Very low impedance	10 V to 100 V Life@105°C=4000-10000h	TH / Radial 8x12 to 18x31	AEC Q200

## Electronic Energy Meter : Power Supply, overvoltage protection

---

### Varistor

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">VDRH - - .E 2381 58....</a>		leaded varistor	max. Vrms = 680 V; max. trans. curr. = 10 kA	TH / Radial	
<a href="#">VDRS - - .E 2381 59....</a>		leaded varistor	max. Vrms = 680 V; max. trans. curr. = 6.5 k	TH / Radial	

### Voltage regulating power diode

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">PTVx</a>	NEW	SMD voltage regulator diode	Clamps at 3.9 V to 36 V; epoxy meets UL94V-0 flammability rating	SMD DO-220AA (SMP)	

## Electronic Energy Meter : Power Supply, Surge Current Limiter

---

### Power Resistor

Product Name	Status	Description	Features	Package	Q-Level
<a href="#">CMB 0207</a>		carbon film resistor	2.2 Ohms to 1.5 Mohms superior power rating; high pulse capability	SMD 0207 MELF	
<a href="#">MMx</a>		thin film MELF resistor, SMD	0.22 Ohms to 10 Mohms low tol.; low TC; high P; excellent stability;	SMD 0102 to 0207 MELF	
<a href="#">SMM0207</a>		thin film MELF resistor, SMD	0.16 Ohms to 10 MOhms; high power rating; excellent stability;	SMD 0207 MELF	
<a href="#">Z300</a>		Axial Cemented Wirewound Resistor Non flammable	0.3 Ohms to 8.2k Ohms, 1W to 10W power rating; high pulse capability	TH / Axial	