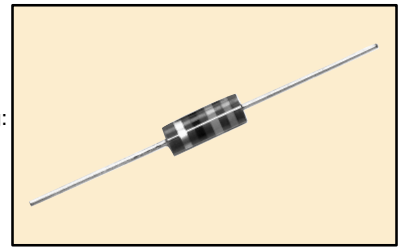
1/2 WATT CARBON COMPOSITION

Features:

- Low inductance / High Frequency Performance
- High Surge / High Pulse Capability
- Rugged Construction



Carbon Composition resistors are commonly used in high frequency, fusing, or pulse applications including:

- Snubbers
- Lightening Surge Protection Circuits
- Grounding Resistors
- RFI Suppression

Value in Ohms	NTE Stock Number	Value in Ohms	NTE Stock Number	Value in Ohms	NTE Stock Number	Value in Ohms	NTE Stock Number	Value in Ohms	NTE Stock Number
10	HWCC010	150	HWCC115	2.2K	HWCC222	33K	HWCC333	470K	HWCC447
12	HWCC012	180	HWCC118	2.7K	HWCC227	39K	HWCC339	560K	HWCC456
15	HWCC015	220	HWCC122	3.3K	HWCC233	47K	HWCC347	680K	HWCC468
18	HWCC018	270	HWCC127	3.9K	HWCC239	56K	HWCC356	820K	HWCC482
22	HWCC022	330	HWCC133	4.7K	HWCC247	68K	HWCC368	1M	HWCC510
27	HWCC027	390	HWCC139	5.6K	HWCC256	82K	HWCC382		
33	HWCC033	470	HWCC147	6.8K	HWCC268	100K	HWCC410		
39	HWCC039	560	HWCC156	8.2K	HWCC282	120K	HWCC412		
47	HWCC047	680	HWCC168	10K	HWCC310	150K	HWCC415		
56	HWCC056	820	HWCC182	12K	HWCC312	180K	HWCC418		
68	HWCC068	1K	HWCC210	15K	HWCC315	220K	HWCC422		
82	HWCC082	1.2K	HWCC212	18K	HWCC318	270K	HWCC427		
100	HWCC110	1.5K	HWCC215	22K	HWCC322	330K	HWCC433		
120	HWCC112	1.8K	HWCC218	27K	HWCC327	390K	HWCC439		

SPECIFICATIONS

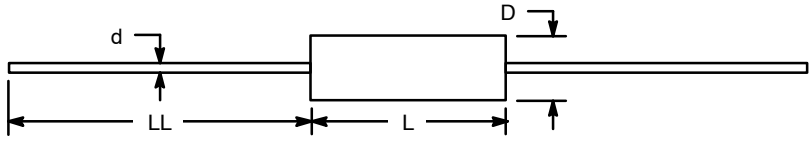
Electrical Characteristics @ 70°C

NTE Number	Resistance Range (Ohms)	Tolerance (%)	Voltage (Volts)	Operating Temperature (T_{opr})	Temperature Coefficient (PPM/°C)
HWCC010 thru HWCC382	10 to 82K	10	350	–55° to +150°C	±0.15%
HWCC410 thru HWCC510	100K to 1M	10	350	–55° to +150°C	±0.15%

Mechanical* (Typical, inches/mm)

NTE Number	Body Length (L)	Body Diameter (D)	Lead Diameter (d)	Lead Length (LL)
HWCC010 thru HWCC510	0.375 (9.53)	0.140 (3.56)	0.028 (0.71)	1.000 (25.4)

* These dimensions are for reference only, please consult the factory for actual size.



GENERAL INFORMATION

Pros and Cons of Carbon Composition Resistors

Carbon Composition resistors offer excellent surge and high–frequency performance due to the bulk nature of the resistance element. Unlike wirewound and film resistors, there are no windings of resistance wire, nor any film depositions to open under overload pulses. Since the resistance element is a hot–molded solid core comprised of resin and a carbon slug, without helical turns of resistance wire or film, the inductance is extremely low, essentially the same as a straight piece of wire. The trade–off for the excellent surge and high–frequency capability is a rather unstable environmental performance, particularly in humid environments, a condition well known by most circuit designers. Carbon composition resistors therefore should not be utilized in precision applications, which are generally better suited by other resistor families such as NTE's standard Metal Film types.

There is no single resistor family, however, that offers the unique specialty performance levels of the composition construction, but depending on circuit requirements, other models will often provide a suitable replacement.

1/2 WATT CARBON COMPOSITION

GENERAL INFORMATION (Cont'd)

Moisture / Humidity Considerations

Carbon Composition resistors are not as stable as other types of resistors, especially in higher humidity conditions and therefore not suitable for precision applications. For example, carbon comps may shift up to 10% during endurance testing. Most general purpose chip resistors have a maximum shift under the same conditions of less than 3%.

Carbon comps are also highly susceptible to moisture penetration. Damp heat testing may cause carbon comps to shift up to 10%. For that reason, carbon comps are recommended to be used soon after purchase, especially once the bag is opened. However, even in a sealed poly–bag, carbon comps may shift up to 5% in a year. Resistance changes due to humidity/ moisture can be positive or negative (mostly positive) and is usually reversible by conditioning the resistors at 100°–105°C or by dry storage.

Before being considered failures, out–of–tolerance resistors should be conditioned in a dry oven at a temperature of 100°C +5°C for 96 ±4 hours prior to conducting resistance measurements, although some customers have had satisfactory results by baking 12–24 hrs at 110°–120°C. Regardless of the amount of baking, some units may not return to the original value.

Typical levels of shift due to the absorption of moisture is generally less than 10% after 10 days of cycled humidity at 80–100% RH levels. Low and medium–value composition resistors typically exhibit less change due to humidity than high–value resistors. Parts should be stored in low humidity conditions (45% RH max). Conditioned (dry) resistors are the most sensitive to humidity.

In operation, moisture absorption is minimized by operating the resistors with as little as 1/8th rated wattage load (the self–heating effect causes parts to dehumidify).