HB34, HF34 and HG34 Varistor Series



Agency Approvals

Agency	Agency Approval	Agency File Number
	UL1449	E320116
	22.2-1	91788

Absolute Maximum Ratings

• For ratings of individual members of a series, see Device Ratings and Specifications chart

Continuous	Hx34 Series	Units
Steady State Applied Voltage:		
AC Voltage Range ($V_{M(AC)RMS}$)	110 to 750	V
DC Voltage Range ($V_{M(DC)}$)	148 to 970	V
Transients:		
Peak Pulse Current (I_{TM})		
For 8/20μs Current Wave (See Figure 2)	40000	A
Single Pulse Energy Range		
For 2ms Current Wave (W_{TM})	220 to 1050	J
Operating Ambient Temperature Range (T_A)	-55 to +85	°C
Storage Temperature Range (T_{STG})	-55 to +125	°C
Temperature Coefficient (a^V) of Clamping Voltage (V_C) at Specified Test Current	<0.01	%/°C
Hi-Pot Encapsulation (COATING Isolation Voltage Capability) (Dielectric must withstand indicated DC voltage for one minute per MIL-STD 202, Method 301)	2500	V
COATING Insulation Resistance	1000	MΩ

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Description

The HB34, HF34, and HG34 Series of transient surge suppressors are industrial high-energy Metal-Oxide Varistors (MOVs). They are designed to provide surge suppression in the AC mains outdoor and service entrance environment (distribution panels) of buildings. Applications also include industrial heavy motors, controls, and power supplies such as used in the oil-drilling, mining, and transportation fields, including HVAC and motor/generator applications.

The HB34 Series provides rigid terminals for through-hole solder mounting on printed circuit boards, thereby eliminating the need for screw mounting. The HF34 Series has the same rigid through-hole terminals as the HB34 with the addition of mounting holes for bolt-down mounting and longer terminals to allow for additional mounting flexibility. The HG34 has formed feet with mounting holes for vertical bolt-down mounting.

See Ratings and Specifications table for part numbers.

Features

- Lead-Free, Halogen-Free and RoHS Compliant available
- Wide operating voltage range $V_{M(AC)RMS}$ 110V to 750V
- High energy absorption capability W_{TM} = 220J to 1050J
- High peak pulse current capability I_{TM} = 40,000A
- Rigid terminals for secure through-hole solder mounting
- No derating up to 85°C ambient

Additional Information

Datasheet HB34 | **Resources HB34** | **Samples HB34**
Datasheet HF34 | **Resources HF34** | **Samples HF34**
Datasheet HG34 | **Resources HG34** | **Samples HG34**

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HB34 Series Ratings & Specifications

Lead–free and RoHS Compliant Models	Model Size Disc Dia. (mm)	Maximum Rating (85°C)				Specifications (25°C)				
		Continuous		Transient		Varistor Voltage at 1mA DC Test Current			Maximum Clamping Voltage V_C at 200A Current (8/20μs)	Typical Capacitance
		V_{RMS}	V_{DC}	Energy (2ms)	Peak Current 8 x 20μs					
Part Number		$V_{M(AC)}$	$V_{M(DC)}$	W_{TM}	I_{TM}	Min	$V_{N(DC)}$	Max	V_C	f = 1MHz
		(V)	(V)	(J)	(A)	(V)	(V)	(V)	(V)	(pF)
V111HB34	34	110	148	220	40,000[1]	156	173	190	288	11,600
V131HB34	34	130	175	270	40,000[2]	184.5	205	225.5	345	10,000
V141HB34	34	140	188	291	40,000[3]	198	220	242	375	9,000
V151HB34	34	150	200	300	40,000[4]	216	240	264	405	8,000
V181HB34	34	180	240	330	40,000	254	282	310	468	6,800
V201HB34	34	200	265	350	40,000	283	314	345	533	6,350
V251HB34	34	250	330	370	40,000	351	390	429	650	5,000
V271HB34	34	275	370	400	40,000	387	430	473	730	4,500
V301HB34	34	300	410	430	40,000	423	470	517	780	4,100
V321HB34	34	320	420	460	40,000	459	510	561	830	3,800
V331HB34	34	330	435	475	40,000	467	518.5	570	843	3,750
V351HB34	34	350	460	500	40,000	495	549.5	604	894	3,600
V391HB34	34	385	510	550	40,000	545	604	663	1000	3,500
V421HB34	34	420	560	600	40,000	612	680	748	1,130	3,000
V441HB34	34	440	587	620	40,000	622	690	758	1,150	2,900
V481HB34	34	480	640	650	40,000	675	750	825	1,240	2,700
V511HB34	34	510	675	700	40,000	738	820	902	1,350	2,500
V551HB34	34	550	710	755	40,000	778	863.5	949	1,404	2,390
V571HB34	34	570	730	770	40,000	819	910	1001	1,480	2,200
V661HB34	34	660	850	900	40,000	945	1050	1155	1,720	2,000
V681HB34	34	680	875	925	40,000	962	1067.5	1173	1,777	1,900
V751HB34	34	750	970	1050	40,000	1080	1200	1320	2,000	1,800

NOTE: Average power dissipation of transients not to exceed 2.0W.

1. Peak current applies to applications rated up to 97V_{RMS}. Peak current is 30kA for applications greater than 97V.
2. Peak current applies to applications rated up to 115V_{RMS}. Peak current is 30kA for applications greater than 115V
3. Peak current applies to applications rated up to 123V_{RMS}. Peak current is 30kA for applications greater than 123V.
4. Peak current applies to applications rated up to 132V_{RMS}. Peak current is 30kA for applications greater than 132V.

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HF34 Series Ratings & Specifications

Lead–free and RoHS Compliant Models	Model Size Disc Dia. (mm)	Maximum Rating (85°C)				Specifications (25°C)				
		Continuous		Transient		Varistor Voltage at 1mA DC Test Current			Maximum Clamping Voltage V_C at 200A Current (8/20μs)	Typical Capacitance
		V_{RMS}	V_{DC}	Energy (2ms)	Peak Current 8 x 20 μs					
Part Number		$V_{M(AC)}$	$V_{M(DC)}$	W_{TM}	I_{TM}	Min	$V_{N(DC)}$	Max	V_C	f = 1MHz
		(V)	(V)	(J)	(A)	(V)	(V)	(V)	(V)	(pF)
V111HF34	34	110	148	220	40,000[1]	156	173	190	288	11,600
V131HF34	34	130	175	270	40,000[2]	184.5	205	225.5	345	10,000
V141HF34	34	140	188	291	40,000[3]	198	220	242	375	9,000
V151HF34	34	150	200	300	40,000[4]	216	240	264	405	8,000
V181HF34	34	180	240	330	40,000	254	282	310	468	6,800
V201HF34	34	200	265	350	40,000	283	314	345	533	6,350
V251HF34	34	250	330	370	40,000	351	390	429	650	5,000
V271HF34	34	275	370	400	40,000	387	430	473	730	4,500
V301HF34	34	300	410	430	40,000	423	470	517	780	4,100
V321HF34	34	320	420	460	40,000	459	510	561	830	3,800
V331HF34	34	330	435	475	40,000	467	518.5	570	843	3,750
V351HF34	34	350	460	500	40,000	495	549.5	604	894	3,600
V391HF34	34	385	510	550	40,000	545	604	663	1,000	3,500
V421HF34	34	420	560	600	40,000	612	680	748	1,130	3,000
V441HF34	34	440	587	620	40,000	622	690	758	1,150	2,900
V481HF34	34	480	640	650	40,000	675	750	825	1,240	2,700
V511HF34	34	510	675	700	40,000	738	820	902	1,350	2,500
V551HF34	34	550	710	755	40,000	778	863.5	949	1,404	2,390
V571HF34	34	570	730	770	40,000	819	910	1001	1,480	2,200
V661HF34	34	660	850	900	40,000	945	1050	1155	1,720	2,000
V681HF34	34	680	875	925	40,000	962	1067.5	1173	1777	1,900
V751HF34	34	750	970	1050	40,000	1080	1200	1320	2,000	1,800

Note:
1. Peak current applies to applications rated up to 97V_{RMS}. Peak current is 30kA for applications greater than 97V.
2. Peak current applies to applications rated up to V_{RMS}. Peak current is 30kA for applications greater than 115V.
3. Peak current applies to applications rated up to V_{RMS}. Peak current is 30kA for applications greater than 123V.
4. Peak current applies to applications rated up to V_{RMS}. Peak current is 30kA for applications greater than 132V.

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HG34 Series Ratings & Specifications

Lead–free and RoHS Compliant Models	Model Size Disc Dia. (mm)	Maximum Rating (85°C)				Specifications (25°C)				
		Continuous		Transient		Varistor Voltage at 1mA DC Test Current			Maximum Clamping Voltage V_C at 200A Current (8/20μs)	Typical Capacitance
		V_{RMS}	V_{DC}	Energy (2ms)	Peak Current 8 x 20 μs					
Part Number		$V_{M(AC)}$	$V_{M(DC)}$	W_{TM}	I_{TM}	Min	$V_{N(DC)}$	Max	V_C	f = 1MHz
		(V)	(V)	(J)	(A)	(V)	(V)	(V)	(V)	(pF)
V111HG34	34	110	148	220	40,000[1]	156	173	190	288	11,600
V131HG34	34	140	175	270	40,000[2]	184.5	205	225.5	345	10,000
V141HG34	34	130	188	291	40,000[3]	198	220	242	375	9,000
V151HG34	34	150	200	300	40,000[4]	216	240	264	405	8,000
V181HG34	34	180	240	330	40,000	254	282	310	468	6,800
V201HG34	34	200	265	350	40,000	283	314	345	533	6,350
V251HG34	34	250	330	370	40,000	351	390	429	650	5,000
V271HG34	34	275	370	400	40,000	387	430	473	730	4,500
V301HG34	34	300	410	430	40,000	423	470	517	780	4,100
V321HG34	34	320	420	460	40,000	459	510	561	830	3,800
V331HG34	34	330	435	475	40,000	467	518.5	570	843	3,750
V351HG34	34	350	460	500	40,000	495	549.5	604	894	3,600
V331HG34	34	385	510	550	40,000	545	604	663	1,000	3,500
V421HG34	34	420	560	600	40,000	612	680	748	1,130	3,000
V441HG34	34	440	587	620	40,000	622	690	758	1,150	2,900
V481HG34	34	480	640	650	40,000	675	750	825	1,240	2,700
V511HG34	34	510	675	700	40,000	738	820	902	1,350	2,500
V551HG34	34	550	710	755	40,000	778	863.5	949	1,404	2,390
V571HG34	34	570	730	770	40,000	819	910	1001	1,480	2,200
V661HG34	34	660	850	900	40,000	945	1050	1155	1,720	2,000
V681HG34	34	680	875	925	40,000	962	1067.5	1173	1,777	1,900
V751HG34	34	750	970	1050	40,000	1080	1200	1320	2,000	1,800

Note :
1. Peak current applies to applications rated up to 97V_{RMS}. Peak current is 30kA for applications greater than 97V.
2. Peak current applies to applications rated up to 115V_{RMS}. Peak current is 30kA for applications greater than 115V.
3. Peak current applies to applications rated up to 123V_{RMS}. Peak current is 30kA for applications greater than 123V.
4. Peak current applies to applications rated up to 132V_{RMS}. Peak current is 30kA for applications greater than 132V.

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Power Dissipation Ratings

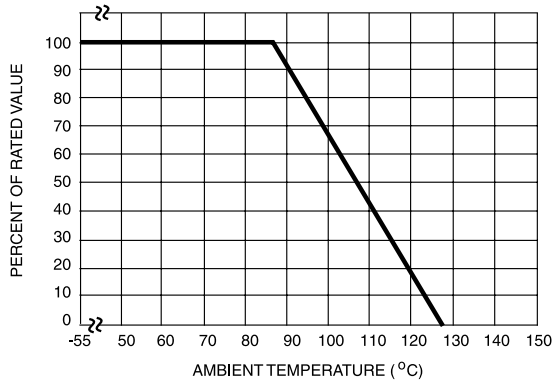


Figure 1

Should transients occur in rapid succession, the average power dissipation result is simply the energy (watt-seconds) per pulse times the number of pulses per second. The power so developed must be within the specifications shown on the Device Ratings and Specifications Table for the specific device. The operating values must be derated as shown in above.

Peak Pulse Current Test Waveform

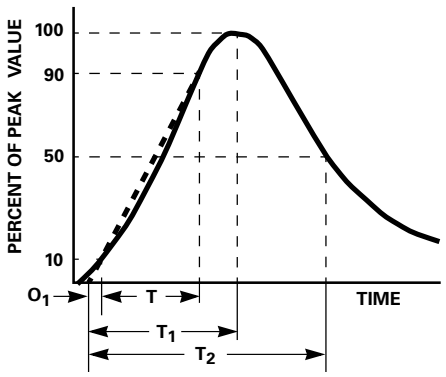


Figure 2

0_1 = Virtual Origin of Wave
T = Time from 10% to 90% of Peak
T_1 = Rise Time = 1.25 x T
T_2 = Decay Time

Example - For an 8/20 μs Current Waveform:
8μs = T_1 = Rise Time
20μs = T_2 = Decay Time

Clamping Voltage for HB34, HF34 and HG34 Series

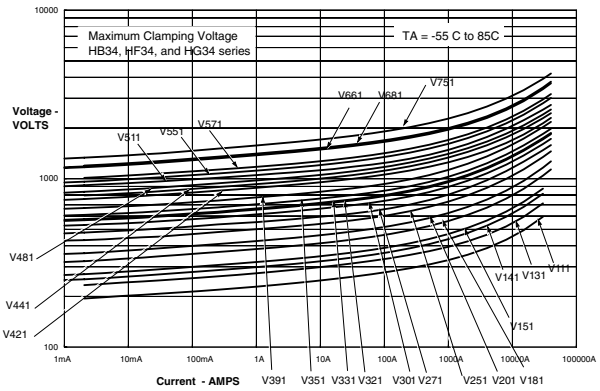


Figure 3

Surge Current Rating Curves for HB34, HF34 and HG34 Series

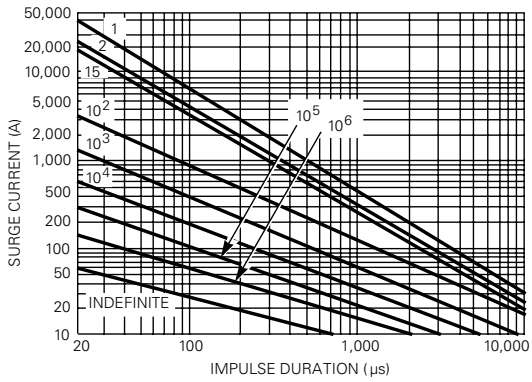


Figure 4

NOTE: If pulse ratings are exceeded, a shift of $V_{N(DC)}$ (at specified current) of more than +/-10% could result. This type of shift, which normally results in a decrease of $V_{N(DC)}$, may result in the device not meeting the original published specifications, but it does not prevent the device from continuing to function, and to provide ample protection.

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Wave Solder Profile

Non Lead–free Profile

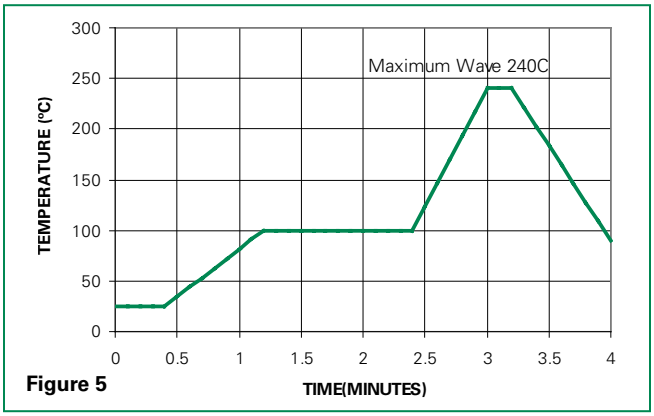


Figure 5

Lead–free Profile



Figure 6

Physical Specifications

Lead Material	Tin-plated Copper
Soldering Characteristics	Solderability per MIL–STD–202, Method 208
Insulating Material	Cured, flame retardant epoxy polymer meets UL94V–0 requirements.
Device Labeling	LF, Part Number and date code

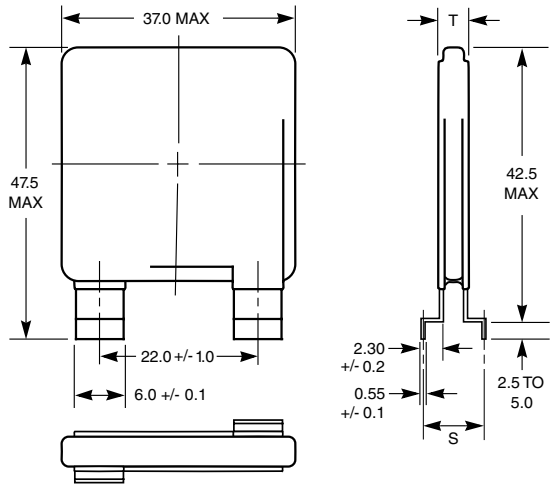
Environmental Specifications

Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +125°C
Humidity Aging	+85°C, 85% RH, 1000 hours +/-10% Voltage
Thermal Shock	+85°C to -40°C 5 times +/-10% Voltage
Solvent Resistance	MIL–STD–202, Method 215
Moisture Sensitivity	Level 1, J-STD-020

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Dimensions (mm)

HB34 Series

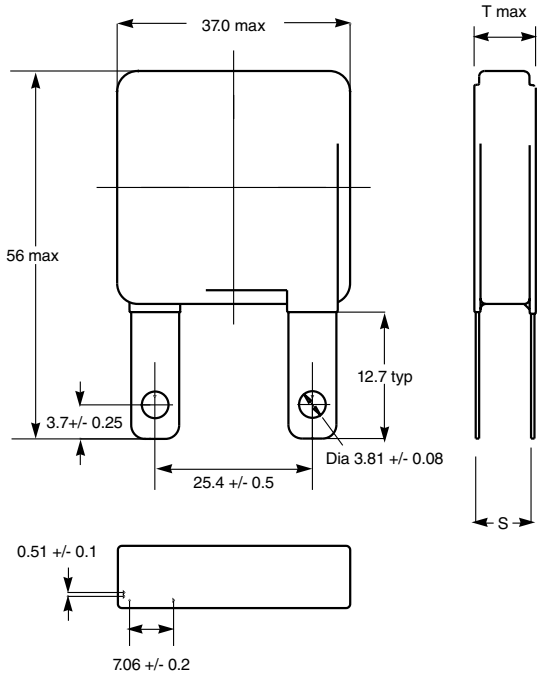


NOTE: Dimension in mm is typical, unless otherwise specified.

HB34 Series Thickness and Terminal Offset Dimensions

Part Type	T Body Thickness (Max)	S Mounting Terminal Offset
V111HB34	5.5	5.30 -/+ 0.65
V131HB34	5.7	5.50 -/+ 0.65
V141HB34	5.8	5.70 -/+ 0.65
V151HB34	5.9	5.90 -/+ 0.65
V181HB34	6.0	6.10 -/+ 0.65
V201HB34	6.0	6.10 -/+ 0.65
V251HB34	6.1	6.25 -/+ 0.65
V271HB34	6.4	6.50 -/+ 0.65
V301HB34	6.7	6.70 -/+ 0.65
V321HB34	6.9	6.90 -/+ 0.65
V331HB34	7.0	6.95 -/+ 0.65
V351HB34	7.3	7.20 -/+ 0.85
V391HB34	7.6	7.50 -/+ 0.85
V421HB34	7.8	7.85 -/+ 0.85
V441HB34	8.0	7.95 -/+ 1.00
V481HB34	8.3	8.25 -/+ 1.00
V511HB34	8.8	8.60 -/+ 1.00
V551HB34	9.1	8.55 -/+ 1.5
V571HB34	9.4	8.85 -/+ 1.5
V661HB34	10.2	9.65 -/+ 1.5
V681HB34	10.4	10.35 -/+ 1.5
V751HB34	10.7	10.65 -/+ 1.5

HF34 Series



Note: Terminal Material Tin–plated Cover

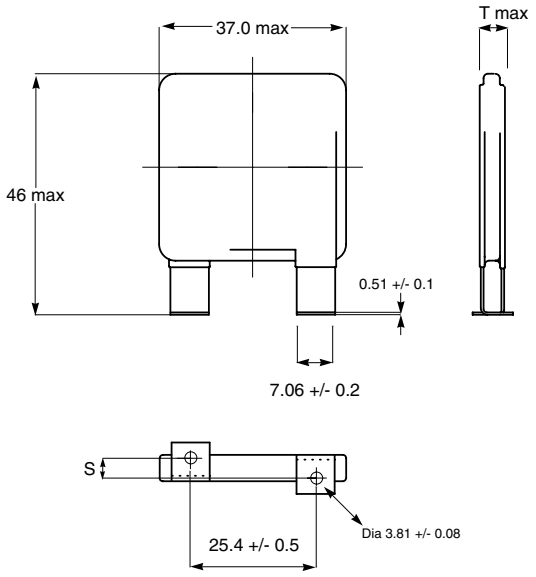
HF34 Series Thickness and Terminal Offset Dimensions

Part Type	T Body Thickness (Max)	S Mounting Terminal Offset
V111HF34	5.5	2.0 -/+ 0.65
V131HF34	5.7	2.1 -/+ 0.65
V141HF34	5.8	2.2 -/+ 0.65
V151HF34	5.9	2.4 -/+ 0.65
V181HF34	6.0	2.5 -/+ 0.65
V201HF34	6.0	2.6 -/+ 0.65
V251HF34	6.1	2.7 -/+ 0.85
V271HF34	6.4	2.9 -/+ 0.85
V301HF34	6.7	3.2 -/+ 0.85
V321HF34	6.9	3.4 -/+ 0.85
V331HF34	7.0	3.5 -/+ 0.85
V351HF34	7.3	3.9 -/+ 0.85
V391HF34	7.6	4.2 -/+ 0.85
V421HF34	7.8	4.4 -/+ 0.85
V441HF34	8.0	4.5 -/+ 0.85
V481HF34	8.3	4.8 -/+ 1.0
V511HF34	8.8	5.2 -/+ 1.0
V551HF34	9.1	5.5 -/+ 1.0
V571HF34	9.4	5.7 -/+ 1.5
V661HF34	10.2	6.5 -/+ 1.5
V681HF34	10.4	6.7 -/+ 1.5
V751HF34	10.7	7.3 -/+ 1.5

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Dimensions (mm)

HG34 Series



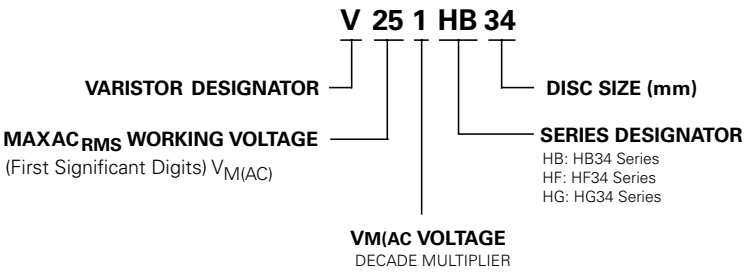
Note: Terminal Material Tin–plated Cover

HG34 Series Thickness and Terminal Offset Dimensions

Part Type	T Body Thickness (Max)	S Mounting Terminal Offset
V111HG34	5.5	6.0 -/+ 0.65
V131HG34	5.7	5.8 -/+ 0.65
V141HG34	5.8	5.6 -/+ 0.65
V151HG34	5.9	5.5 -/+ 0.65
V181HG34	6.0	5.4 -/+ 0.65
V201HG34	6.0	5.4 -/+ 0.65
V251HG34	6.1	5.2 -/+ 0.65
V271HG34	6.4	4.9 -/+ 0.65
V301HG34	6.7	4.7 -/+ 0.85
V321HG34	6.9	4.5 -/+ 0.85
V331HG34	7.0	4.4 -/+ 0.85
V351HG34	7.3	4.1 -/+ 0.85
V391HG34	7.6	3.8-/+ 0.85
V421HG34	7.8	3.5 -/+ 0.85
V441HG34	8.0	3.3 -/+ 0.85
V481HG34	8.3	3.1 -/+ 1.0
V511HG34	8.8	2.7 -/+ 1.0
V551HG34	9.1	2.4 -/+ 1.0
V571HG34	9.4	2.2 -/+ 1.5
V661HG34	10.2	1.4 -/+ 1.5
V681HG34	10.4	1.2 -/+ 1.5
V751HG34	10.7	0.6 -/+ 1.5

*Dimensions in mm.

Part Numbering System



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