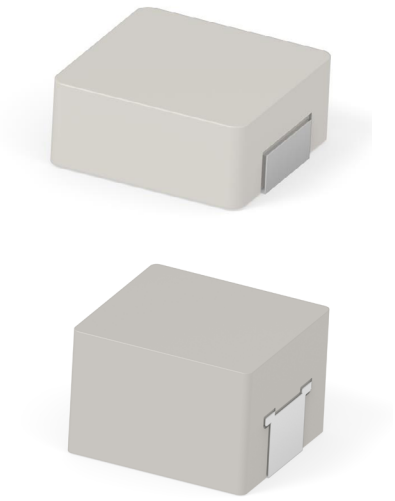
AUTOMOTIVE GRADE SMD POWER INDUCTOR

TYPE 3656 SERIES

INTRODUCTION

TE Connectivity (TE) introduces its automotive grade SMD (Surface Mount Devices) shielded power inductors which are AEC- Q200 qualified. They are small, ultra-thin inductors with high saturation current. The 3656 series inductors are suitable for surface mounting and are available in nine package sizes



FEATURES

- Shielded construction
- High saturation current
- Low DC resistance help achieve achieve high conversion efficiency and lower temperature rising
- Suitable for surface mounting
- High reliability
- AEC-Q200 qualified
- Moisture sensitivity level - MSL1

Note: *SMD (Surface mount devices) resistors and inductors should be kept in their original packaging to protect them from ESD (Electrostatic Discharge). The full reels can be broken into smaller quantities, without exposing them to ESD, as long as the components are still in the plastic or paper tape. These resistors and inductors should not be removed from the plastic or paper tape unless they are in an ESD protected environment.*

APPLICATIONS

- Mobile phone, DVD (Digital Versatile Disc), HDD (Hard Disk Drive), DSC (Digital Still Camera) and LCD (Liquid Crystal Display)
- New energy industry
- Thin-type power supply module
- DC/DC converter

CHARACTERISTICS

- All test data is referenced to 25°C ambient
- Operating temperature range: -55°C ~ 155°C

ELECTRICAL CHARACTERISTICS

Automotive Grade SMD Power Inductor Type 3656 0420 Series

Part No.	Inductance (uH)	Tolerance	Test Condition	DCR (mΩ) Max.	Isat (A) Typ.	Irms (A) Typ.
36560420MR10T	0.10	±20%	100KHz, 1V	4.0	22.0	13.0
36560420MR22T	0.22	±20%	100KHz, 1V	6.6	12.5	9.5
36560420MR33T	0.33	±20%	100KHz, 1V	11	12.0	10.0
36560420MR47T	0.47	±20%	100KHz, 1V	14	9.5	7.5
36560420MR56T	0.56	±20%	100KHz, 1V	16	9.0	7.0
36560420MR68T	0.68	±20%	100KHz, 1V	18	8.0	7.0
36560420M1R0T	1.0	±20%	100KHz, 1V	27	7.0	6.0
36560420M1R2T	1.2	±20%	100KHz, 1V	27	6.5	6.0
36560420M1R5T	1.5	±20%	100KHz, 1V	46	5.5	5.0
36560420M2R2T	2.2	±20%	100KHz, 1V	58	5.0	4.5
36560420M3R3T	3.3	±20%	100KHz, 1V	87	3.5	3.3
36560420M4R7T	4.7	±20%	100KHz, 1V	105	3.0	2.8
36560420M6R8T	6.8	±20%	100KHz, 1V	175	2.5	2.4
36560420M100T	10	±20%	100KHz, 1V	282	2.0	1.6

Automotive Grade SMD Power Inductor Type 3656 0530 Series

Part No.	Inductance (uH)	Tolerance	Test Condition	DCR (mΩ) Max.	Isat (A) Typ.	Irms (A) Typ.
36560530MR10T	0.10	±20%	100KHz, 1V	3.0	30.0	25.0
36560530MR20T	0.20	±20%	100KHz, 1V	3.9	20.0	14.0
36560530MR33T	0.33	±20%	100KHz, 1V	5.5	18.0	14.0
36560530MR47T	0.47	±20%	100KHz, 1V	8.5	15.0	11.0
36560530MR68T	0.68	±20%	100KHz, 1V	12	11.5	9.0
36560530M1R0T	1.0	±20%	100KHz, 1V	14	10.0	8.5
36560530M1R2T	1.2	±20%	100KHz, 1V	16	9.5	8.5
36560530M1R5T	1.5	±20%	100KHz, 1V	25	9.0	8.2
36560530M2R2T	2.2	±20%	100KHz, 1V	29	7.0	7.0
36560530M3R3T	3.3	±20%	100KHz, 1V	38	6.0	5.5
36560530M4R7T	4.7	±20%	100KHz, 1V	60	4.6	4.5
36560530M6R8T	6.8	±20%	100KHz, 1V	90	3.6	3.5
36560530M100T	10	±20%	100KHz, 1V	125	3.5	3.2

Automotive Grade SMD Power Inductor Type 3656 0630 Series

Part No.	Inductance (uH)	Tolerance	Test Condition	DCR (mΩ) Max.	Isat (A) Typ.	Irms (A) Typ.
36560630MR22T	0.22	±20%	100KHz, 1V	3.0	34	24.0
36560630MR33T	0.33	±20%	100KHz, 1V	3.5	25	21.0
36560630MR47T	0.47	±20%	100KHz, 1V	4.1	20	18.0
36560630MR56T	0.56	±20%	100KHz, 1V	4.5	18	16.5
36560630MR68T	0.68	±20%	100KHz, 1V	5.3	17	16.0
36560630MR82T	0.82	±20%	100KHz, 1V	6.0	16	14.0
36560630M1R0T	1.0	±20%	100KHz, 1V	7.4	15	12.0
36560630M1R5T	1.5	±20%	100KHz, 1V	12.1	12	12.0
36560630M2R2T	2.2	±20%	100KHz, 1V	15.0	10	9.5
36560630M3R3T	3.3	±20%	100KHz, 1V	22.0	9.5	8.5
36560630M4R7T	4.7	±20%	100KHz, 1V	33.0	9.0	6.0
36560630M5R6T	5.6	±20%	100KHz, 1V	42.0	6.5	5.5
36560630M6R8T	6.8	±20%	100KHz, 1V	48.0	6.0	5.0
36560630M8R2T	8.2	±20%	100KHz, 1V	60.0	5.5	5.0
36560630M100T	10	±20%	100KHz, 1V	68.0	5.5	4.5
36560630M150T	15	±20%	100KHz, 1V	113	4.0	3.0
36560630M220T	22	±20%	100KHz, 1V	170	3.0	2.5
36560630M330T	33	±20%	100KHz, 1V	270	2.5	2.0
36560630M470T	47	±20%	100KHz, 1V	385	2.0	1.5

Automotive Grade SMD Power Inductor Type 3656 0650 Series

Part No.	Inductance (uH)	Tolerance	Test Condition	DCR (mΩ) Max.	Isat (A) Typ.	Irms (A) Typ.
36560650MR47T	0.47	±20%	100KHz, 1V	3.9	21.0	20.0
36560650MR68T	0.68	±20%	100KHz, 1V	4.5	18.0	16.5
36560650M1R0T	1.0	±20%	100KHz, 1V	6.6	16.0	12.0
36560650M1R5T	1.5	±20%	100KHz, 1V	10.0	13.0	9.5
36560650M2R2T	2.2	±20%	100KHz, 1V	12.5	11.0	9.0
36560650M3R3T	3.3	±20%	100KHz, 1V	22	10.0	8.5
36560650M4R7T	4.7	±20%	100KHz, 1V	29	8.0	6.0
36560650M6R8T	6.8	±20%	100KHz, 1V	41	6.3	5.8
36560650M8R2T	8.2	±20%	100KHz, 1V	48	5.5	5.5
36560650M100T	10	±20%	100KHz, 1V	60	5.3	4.5
36560650M150T	15	±20%	100KHz, 1V	90	4.0	3.1
36560650M220T	22	±20%	100KHz, 1V	140	3.5	2.6
36560650M330T	33	±20%	100KHz, 1V	190	3.0	2.3
36560650M470T	47	±20%	100KHz, 1V	230	2.6	2.0

Automotive Grade SMD Power Inductor Type 3656 0754 Series

Part No.	Inductance (uH)	Tolerance	Test Condition	DCR (mΩ) Max.	Isat (A) Typ.	Irms (A) Typ.
36560754M1R5T	1.5	±20%	100KHz, 1V	7.3	16.3	11.4
36560754M2R2T	2.2	±20%	100KHz, 1V	11.4	14.8	9.7
36560754M3R3T	3.3	±20%	100KHz, 1V	15.4	13.5	8.0
36560754M4R7T	4.7	±20%	100KHz, 1V	20.9	13.1	7.0
36560754M5R6T	5.6	±20%	100KHz, 1V	24.0	10.6	6.5
36560754M6R8T	6.8	±20%	100KHz, 1V	26.6	10.2	6.1
36560754M8R2T	8.2	±20%	100KHz, 1V	31.9	9.0	5.6
36560754M100T	10	±20%	100KHz, 1V	38.0	8.0	5.2
36560754M150T	15	±20%	100KHz, 1V	66.0	6.9	3.8
36560754M220T	22	±20%	100KHz, 1V	93.5	6.3	3.3
36560754M330T	33	±20%	100KHz, 1V	127.6	4.9	3.2
36560754M470T	47	±20%	100KHz, 1V	171.6	4.1	2.4
36560754M560T	56	±20%	100KHz, 1V	209.3	3.3	2.2
36560754M680T	68	±20%	100KHz, 1V	255.0	2.8	2.0
36560754M101T	100	±20%	100KHz, 1V	348.0	2.4	1.8

Automotive Grade SMD Power Inductor Type 3656 1040 Series

Part No.	Inductance (uH)	Tolerance	Test Condition	DCR (mΩ) Max.	Isat (A) Typ.	Irms (A) Typ.
36561040MR15T	0.15	±20%	100KHz, 1V	0.65	75	45.0
36561040MR22T	0.22	±20%	100KHz, 1V	1.0	60	35.0
36561040MR33T	0.33	±20%	100KHz, 1V	1.1	45	35.0
36561040MR36T	0.36	±20%	100KHz, 1V	1.2	45	30.0
36561040MR47T	0.47	±20%	100KHz, 1V	1.7	40	30.0
36561040MR56T	0.56	±20%	100KHz, 1V	1.8	33	25.0
36561040MR68T	0.68	±20%	100KHz, 1V	2.4	30	23.0
36561040MR80T	0.80	±20%	100KHz, 1V	2.7	29	23.0
36561040M1R0T	1.0	±20%	100KHz, 1V	3.3	28	19.0
36561040M1R5T	1.5	±20%	100KHz, 1V	4.2	24	16.0
36561040M2R2T	2.2	±20%	100KHz, 1V	7.0	16.5	12.0
36561040M3R3T	3.3	±20%	100KHz, 1V	11.8	16.0	11.0
36561040M4R7T	4.7	±20%	100KHz, 1V	20	13.0	9.00
36561040M6R8T	6.8	±20%	100KHz, 1V	25	12.0	8.5
36561040M8R2T	8.2	±20%	100KHz, 1V	27	9.0	8.0
36561040M100T	10	±20%	100KHz, 1V	30	8.5	7.8
36561040M150T	15	±20%	100KHz, 1V	45	7.0	6.5
36561040M220T	22	±20%	100KHz, 1V	66	5.5	5.0

Automotive Grade SMD Power Inductor

Type 3656 Series

Part No.	Inductance (uH)	Tolerance	Test Condition	DCR (mΩ) Max.	Isat (A) Typ.	Irms (A) Typ.
36561040M330T	33	±20%	100KHz, 1V	92	4.8	4.4
36561040M470T	47	±20%	100KHz, 1V	145	3.5	3.3
36561040M680T	68	±20%	100KHz, 1V	195	3.0	2.5
36561040M101T	100	±20%	100KHz, 1V	340	2.3	2.0

Automotive Grade SMD Power Inductor Type 3656 1054 Series

Part No.	Inductance (uH)	Tolerance	Test Condition	DCR (mΩ) Max.	Isat (A) Typ.	Irms (A) Typ.
36561054MR68T	0.68	±20%	100KHz, 1V	2.22	46.0	32.0
36561054M1R0T	1.0	±20%	100KHz, 1V	2.76	37.0	30.0
36561054M1R5T	1.5	±20%	100KHz, 1V	4.20	26.8	24.8
36561054M2R2T	2.2	±20%	100KHz, 1V	4.90	25.0	23.0
36561054M3R3T	3.3	±20%	100KHz, 1V	7.40	19.0	18.7
36561054M4R7T	4.7	±20%	100KHz, 1V	10.00	15.7	14.5
36561054M6R8T	6.8	±20%	100KHz, 1V	14.00	13.3	12.0
36561054M8R2T	8.2	±20%	100KHz, 1V	20.70	13.0	10.6
36561054M100T	10	±20%	100KHz, 1V	24.20	12.7	8.7
36561054M150T	15	±20%	100KHz, 1V	31.30	9.2	7.6
36561054M220T	22	±20%	100KHz, 1V	50.00	8.8	6.0
36561054M330T	33	±20%	100KHz, 1V	75.30	7.6	4.8
36561054M470T	47	±20%	100KHz, 1V	103.0	4.9	4.1
36561054M680T	68	±20%	100KHz, 1V	152.0	4.2	3.3
36561054M101T	100	±20%	100KHz, 1V	234.0	3.5	2.8

Automotive Grade SMD Power Inductor Type 3656 1265 Series

Part No.	Inductance (uH)	Tolerance	Test Condition	DCR (mΩ) Max.	Isat (A) Typ.	Irms (A) Typ.
36561265M4R7T	4.7	±20%	100KHz, 1V	8.5	24.0	16.0
36561265M5R6T	5.6	±20%	100KHz, 1V	10.5	22.5	14.0
36561265M6R8T	6.8	±20%	100KHz, 1V	12	19.0	13.0
36561265M8R2T	8.2	±20%	100KHz, 1V	14	16.0	12.0
36561265M100T	10	±20%	100KHz, 1V	16.5	15.0	11.0
36561265M150T	15	±20%	100KHz, 1V	26	11.0	9.5
36561265M220T	22	±20%	100KHz, 1V	36	9.0	8.0
36561265M330T	33	±20%	100KHz, 1V	65	8.0	6.5
36561265M470T	47	±20%	100KHz, 1V	70	6.8	5.5
36561265M680T	68	±20%	100KHz, 1V	120	5.2	4.8
36561265M820T	82	±20%	100KHz, 1V	135	4.5	4.0
36561265M101T	100	±20%	100KHz, 1V	170	4.0	3.5

Automotive Grade SMD Power Inductor Type 3656 1770 Series

Part No.	Inductance (uH)	Tolerance	Test Condition	DCR (mΩ) Max.	Isat (A) Typ.	Irms (A) Typ.
36561770M2R2T	2.2	±20%	100KHz, 1V	2.5	34	29
36561770M3R3T	3.3	±20%	100KHz, 1V	3.95	30	24
36561770M4R7T	4.7	±20%	100KHz, 1V	4.75	24	21
36561770M6R8T	6.8	±20%	100KHz, 1V	7.5	22	17
36561770M8R2T	8.2	±20%	100KHz, 1V	8.7	20	13
36561770M100T	10	±20%	100KHz, 1V	9.9	19	12
36561770M150T	15	±20%	100KHz, 1V	17	14.5	11
36561770M220T	22	±20%	100KHz, 1V	23	11.5	8.5
36561770M330T	33	±20%	100KHz, 1V	37	10	8.0
36561770M470T	47	±20%	100KHz, 1V	47	7.5	6.0
36561770M680T	68	±20%	100KHz, 1V	85	6.5	5.2
36561770M101T	100	±20%	100KHz, 1V	130	5.0	3.7

ENVIRONMENTAL CHARACTERISTICS

Item	Requirement	Test Method
Solderability	No visible mechanical damage New solder coverage more than 95%	Preheat:155±5°C,60S±2S Tin: lead-free. Temperature:240±5°C flux:3.0S±0.5S.
Mechanical shock	No visible mechanical damage Inductance change: Within ±10%	Acceleration:100G Pulse time:6ms 3 times in each positive and negative direction of 3 mutual perpendicular directions
Mechanical vibration	No visible mechanical damage Inductance change: Within ±10%	Frequency: 10HZ~2000HZ/ 20min cycles amplitude: 1.52 mm Directions: X,Y,Z Time: 12 cycle / direction
Thermal Shock	No visible mechanical damage Inductance change: Within ±10%	First -55°C for 30 minutes, last 155°C for 30 minutes as 1 cycle. Go through 1000 cycles. Max transfer time is 3 minutes. Measured at room temperature after placing for 24±2 hours
Humidity Resistance	No visible mechanical damage Inductance change: Within ±10%	85°C,85%RH,1000 hours Measured at room temperature after placing for 24±2 hours
Low temperature storage	No visible mechanical damage Inductance change: Within ±10%	Temperature:-55 ± 2°C Time:1000 hours Measured at room temperature after placing for 24±2 hours
High temperature storage	No visible mechanical damage Inductance change: Within ±10%	Temperature:+155 ± 2°C Time:1000 hours Measured at room temperature after placing for 24±2 hours

Storage temperature and humidity range:
Safe storage life: 0~+40°C, RH10%~70%, 12 months

SOLDERING REFLOW PROFILE

Preheat condition: 150°C ~200°C /60~120sec

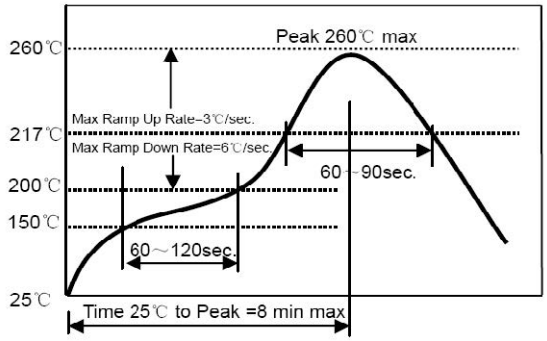
Allowed time above 217°C : 60~90sec

Max temp: 260°C

Max time at max temp: 10 sec.

Solder paste: Sn / 3.0Ag / 0.5Cu

Max allowed reflow times : 2



IRON SOLDERING PROFILE

Iron soldering power: Max. 30W

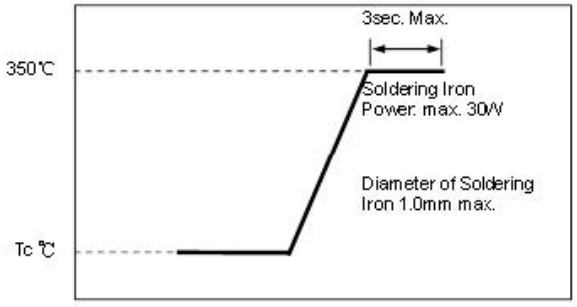
Pre heating: 150 °C/60 sec.

Soldering Tip temperature: 350 °C Max.

Soldering time: 3sec. Max.

Solder paste: Sn/3.0Ag/0.5Cu

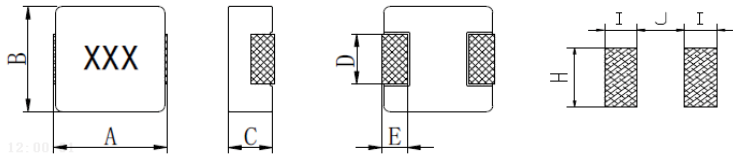
Max.1 times for iron soldering



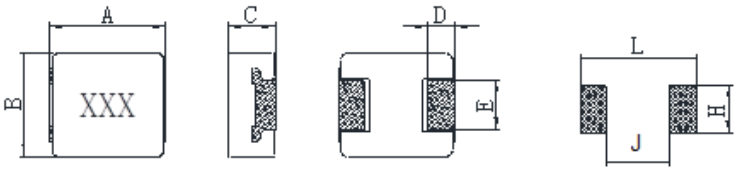
The recommended reflow conditions as above graph, is set according to our soldering equipment. Due to various manufactures may have different reflow soldering equipment, products, process conditions, set methods, and so on, when setting the reflow conditions, Please adjust and confirm according to users' environment/equipment.

DIMENSIONS (Unit:mm)

36560420 / 0530 / 0630 / 0650 / 1040 / 1265 / 1770



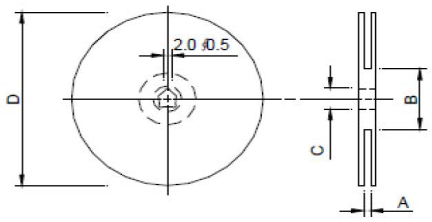
36560754 / 1054



Type	A	B	C	D	E	H	I	J	L
36560420	4.4±0.35	4.2±0.25	1.8±0.2	2.0±0.3	0.8±0.3	2.5	1.5	2.2	-
36560530	5.4±0.35	5.2±0.25	2.8±0.2	2.2±0.3	1.2±0.3	2.8	1.9	2.2	-
36560630	7.0±0.3	6.6±0.2	2.8±0.2	3.0±0.3	1.6±0.3	3.5	2.4	3.7	-
36560650	7.0±0.3	6.6±0.2	4.8±0.2	3.0±0.3	1.6±0.3	3.5	2.4	3.7	-
36560754	7.7±0.35	7.2±0.3	5.2±0.2	2.0ref	3.0ref	3.5	-	2.55	9.2
36561040	11.5max	10.0±0.3	3.8±0.2	3.0±0.5	2.0±0.5	4.1	4.1	5.4	-
36561054	11.5±0.5	10.0±0.3	5.2±0.2	2.2±0.5	4.5±0.5	5.0	-	4.9	12.88
36561265	13.45±0.35	12.6±0.3	6.5max	5.0±0.5	2.0±0.5	5.5	3.8	7.0	-
36561770	18.8max	17.3max	7.0max	12.0±0.5	2.0±0.5	12.8	3.8	11.2	-

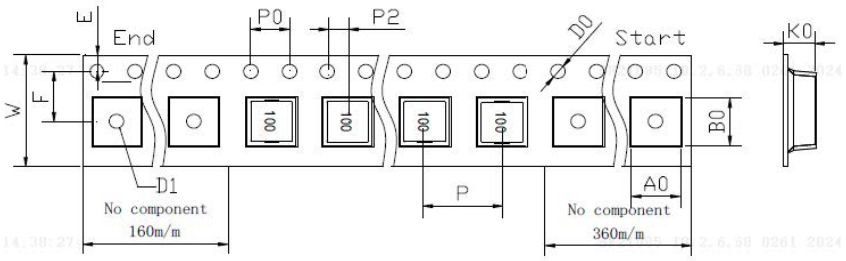
PACKAGING

Packing Quantity & Reel Specifications (mm)



Type	Packaging Quantity	Tape Width	Reel Diameter	A	B	C	D
36560420	3000	12mm	13 inch	12.5	100	13.0	330
36560530	2000	12mm		12.5			
36560630	1500	16mm		16.5			
36560650	1000	16mm		16.5			
36560754	500	16mm		16.8			
36561040	500	24mm		24.5			
36561054	500	24mm		24.8			
36561265	500	24mm		24.5			
36561770	200	32mm		32.5			

Embossed Plastic Tape Dimensions (mm)



Type	A0 (mm)	B0 (mm)	K0 (mm)	W (mm)	P (mm)	P_0 (mm)	P_2 (mm)	F (mm)	E (mm)	D0 (mm)	D1 (mm)
36560420	4.4	4.9	2.3	12.0	8.0	4.0	2.0	5.5	1.75	1.5	1.5
36560530	5.4	5.9	3.3	12.0	8.0	4.0	2.0	5.5	1.75	1.5	1.5
36560630	6.9	7.5	3.2	16.0	12.0	4.0	2.0	7.5	1.75	1.5	1.5
36560650	6.9	7.5	5.2	16.0	12.0	4.0	2.0	7.5	1.75	1.5	1.5
36560754	7.7	8.2	5.7	16.0	12.0	4.0	2.0	7.5	1.75	1.55	1.55
36561040	10.4	11.5	4.3	24.0	16.0	4.0	2.0	11.5	1.75	1.5	1.5
36561054	10.4	11.6	5.7	24.0	16.0	4.0	2.0	11.5	1.75	1.5	1.5
36561265	13.0	14.0	6.8	24.0	16.0	4.0	2.0	11.5	1.75	1.5	1.5
36561770	17.5	18.1	7.3	32.0	24.0	4.0	2.0	11.5	1.75	1.5	1.5

ORDERING INFORMATION

Part Number

3656 0402 M R10 T

Series

3656	SMD Power Inductor

Packaging size (LxWxT)

0402	4.4mm X 4.2mm X 1.8mm
0530	5.4mm X 5.2mm X 2.8mm
0630	7.0mm X 6.6mm X 2.8mm
0650	7.0mm X 6.6mm X 4.8mm
0754	7.7mm X 7.2mm X 5.2mm
1040	11.5mm X 10.0mm X 3.8mm
1054	11.5mm X 10.0mm X 5.2mm
1265	13.45mm X 12.6mm X 6.5mm
1770	18.8mm X 17.3mm X 7.0mm

Inductor Tolerance

M	±20%

Pack Style

T	Taped & Reeled (0402 size - 3000 pieces/reel, 0530 size - 2000 pieces/reel 0630 size - 1500 pieces/reel 0650 size - 1000 pieces/reel, 0754, 1040, 1054 & 1265 size - 500 pieces/reel, 1770 size - 200 pieces/reel)

Inductance value

R10	0.1uH
R22	0.22uH
R47	0.47UH
R56	0.56UH

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