




SPECIFICATION SHEET

SPECIFICATION SHEET NO.	R0608- MMBT4401S20S2X	
DATE	June 8, 2024	
REVISION	A2	Updated With Most Recent Data
DESCRIPTION AND MAIN PARAMETRICS	<p>SMD Plastic-Encapsulate Transistors, 3 Pads, Case SOT-23</p> <p>MMBT Series, Transistor Type NPN</p> <p>hFE Rank Range 100~300</p> <p>Collector-Base Voltage 60V Max. Collector Current 600mA Max.</p> <p>Operating Temp. Range -55°C ~+150°C</p> <p>Package in Tape/Reel, 3000pcs/Reel</p> <p>RoHS III/REACH Compliant and Halogen Free (HF)</p>	
CUSTOMER		
CUSTOMER PART NO.		
CROSS REF. PART NO.		
ORIGINAL MFG/PART NO.	MDD Diodes/MMBT4401	
PART CODE	MMBT4401S20S2X	

VENDOR APPROVE			
Issued/Checked/Approved			
DATE: June 8, 2024			

CUSTOMER APPROVE	
DATE:	

SMD TRANSISTORS MMBT SERIES CASE SOT-23

MAIN FEATURE

- Epoxy Meets UL-94 V-0 Flammability Rating
- Epitaxial Planar Die Construction
- Switching Transistor
- Complementary PNP Type Available (Part Code: MMBT4403S20S2T)
- Surface Mount Package Ideally Suited for Automatic Insertion
- REACH/RoHS III Complaint and Halogen Free
- Cross Main Competitor Parts in Market



APPLICATION

- For SMD application

ELECTRICAL CHARACTERISTICS

- See Page 4~ Page 5

HOW TO ORDER

- Please Follow Up Part Code Guide And Indicate Pat Code When You Order Or RFQ For Custom Specification

PART CODE GUIDE

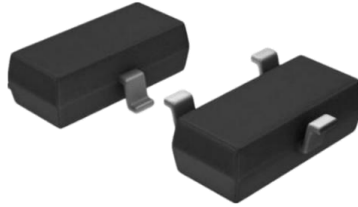
RFQ
[Request For Quotation](#)

CODE	NAME	KEY SPECIFICATION OPTION
MMBT	Product Series Code	SMD Plastic-Encapsulate Transistors MMBT series
4401	Specification Code	For Original Part Number MMBT4401
S2	Case Code	S2: Case SOT-23
0S	Internal Control Code	Custom letter A~Z, a-z or Digits (0-9)
2X	Marking Code	Custom letter A~Z, a-z or Digits (0-9)

SMD TRANSISTORS MMBT SERIES CASE SOT-23

DIMENSION (Unit: Inch/mm)

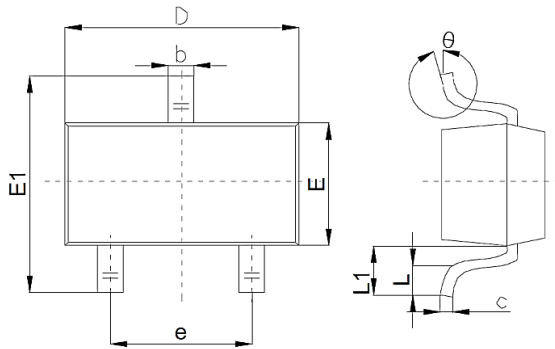
Image for reference



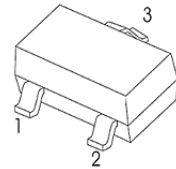
Marking:

2X

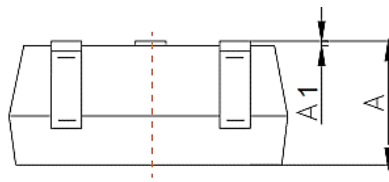
SOT-23



Pin Function

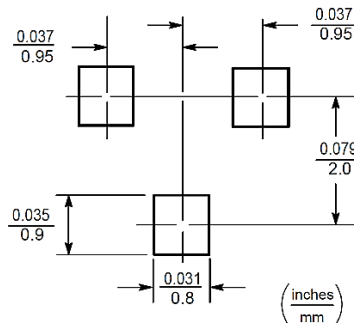


- 1. Base
- 2. Emitter
- 3. Collector



Symbol	Value (mm)		
	Min.	Typ.	Max.
A	0.9		1.4
A1			0.10
b	0.30		0.50
c	0.08		0.20
D	2.80	2.90	3.10
E	1.20		1.60
E1	2.25		2.80
e	1.8	1.9	2.00
L	0.10		0.50
L1	0.40		
θ	0°		10°

Recommend Pad Layout



SMD TRANSISTORS MMBT SERIES CASE SOT-23

MAXIMUM RATINGS - @ 25 °C

PARAMETER	SYMBOLS	VALUE	UNITS
Collector-Base Voltage	V _{CB0}	60	Volts
Collector-Emitter Voltage	V _{CEO}	40	Volts
Emitter-Base Voltage	V _{EB0}	6	Volts
Collector Current -Continuous	I _C	600	mA
Collector Power Dissipation	P _C	300	mW
Thermal Resistance From Junction To Ambient	R _{θJA}	357	°C/W
Junction Temperature	T _J	+150	°C
Storage Temperature Range	T _{STG}	-55 ~ +150	°C

SMD TRANSISTORS MMBT SERIES CASE SOT-23
ELECTRICAL CHARACTERISTICS- @ 25 °C

PARAMETER	SYMBOLS	VALUE			UNIT	TEST CONDITION
		MIN.	TYP.	MAX.		
Collector-base Breakdown Voltage	$V_{(BR)CBO}$	40			V	$I_C = 100\mu A, I_E = 0$
Collector-emitter Breakdown Voltage	$V_{(BR)CEO}$	40			V	$I_C = 1mA, I_B = 0$
Emitter-base Breakdown Voltage	$V_{(BR)EBO}$	6			V	$I_E = 100\mu A, I_C = 0$
Collector Base Cut-off Current	I_{CBO}			0.1	μA	$V_{CB} = 50V, I_E = 0$
Collector Cut-off Current	I_{CEO}			0.1	μA	$V_{CE} = 30V, I_B = 0$
Emitter Base Cut-off Current	I_{EBO}			0.1	μA	$V_{EB} = 5V, I_C = 0$
DC Current Gain	$h_{FE(1)}$	100		300		$V_{CE} = 1V, I_C = 150mA$
	$h_{FE(2)}$	60				$V_{CE} = 1V, I_C = 1mA$
	$h_{FE(3)}$	30				$V_{CE} = 1V, I_C = 0.1mA$
Collector-emitter Saturation Voltage	$V_{CE(sat)}$			0.4	V	$I_C = 150mA, I_B = 15mA$
Base-emitter Saturation Voltage	$V_{BE(sat)}$			0.95	V	$I_C = 150mA, I_B = 15mA$
Transition Frequency	f_T	250			MHz	$V_{CE} = 10V, I_C = 20mA, f = 100MHz$
Delay Time	t_d			15	ns	$V_{CC} = 30V, V_{BE(off)} = -0.5V, I_C = 150mA, I_{B1} = 15mA$
Rise Time	t_r			20	ns	
Storage Time	t_s			225	ns	$V_{CC} = 30V, I_C = 150mA, I_{B1} = -I_{B2} = 15mA$
Fall Time	t_f			60	ns	

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TYPICAL CHARACTERISTIC CURVES - For Reference Only

Fig. 1 Max Power Dissipation vs Ambient Temperature

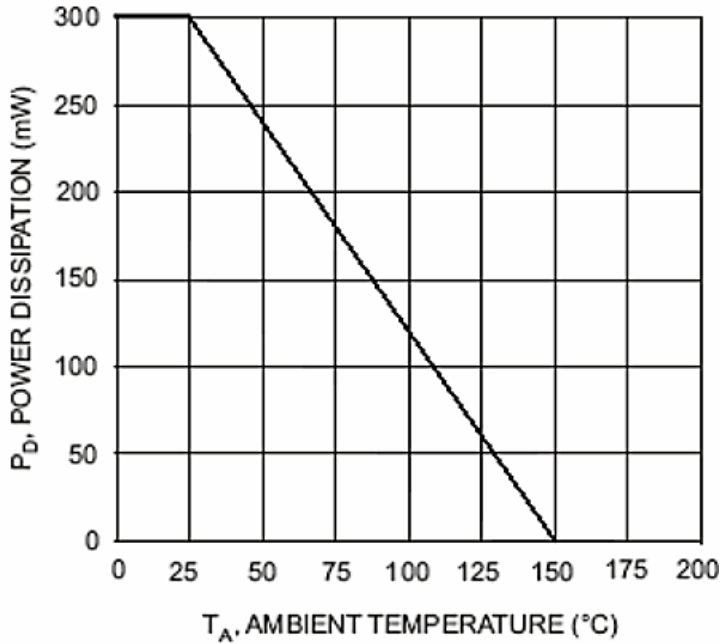
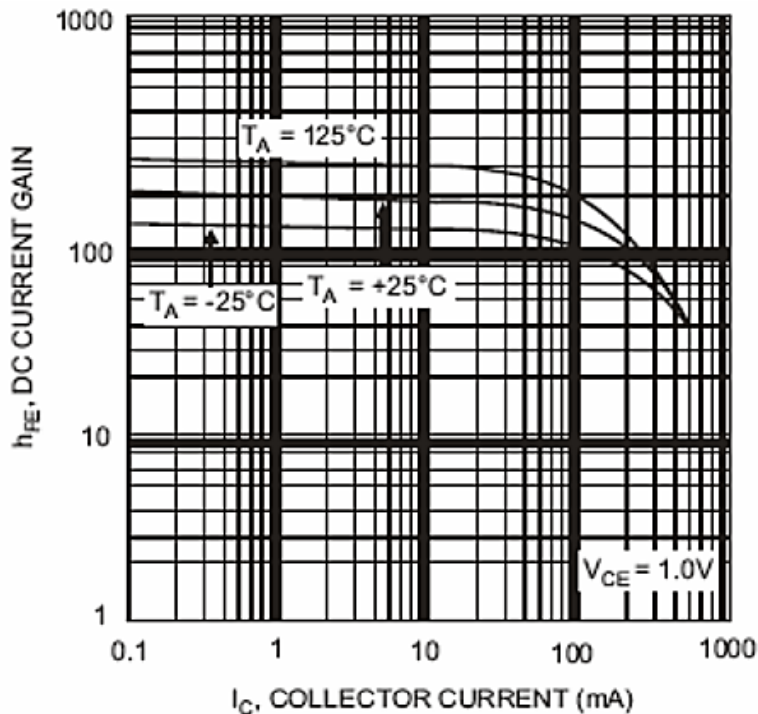


Fig. 2 Typical DC Current Gain vs Collector Current



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TYPICAL CHARACTERISTIC CURVES - For Reference Only

Fig. 3 Typical Capacitance

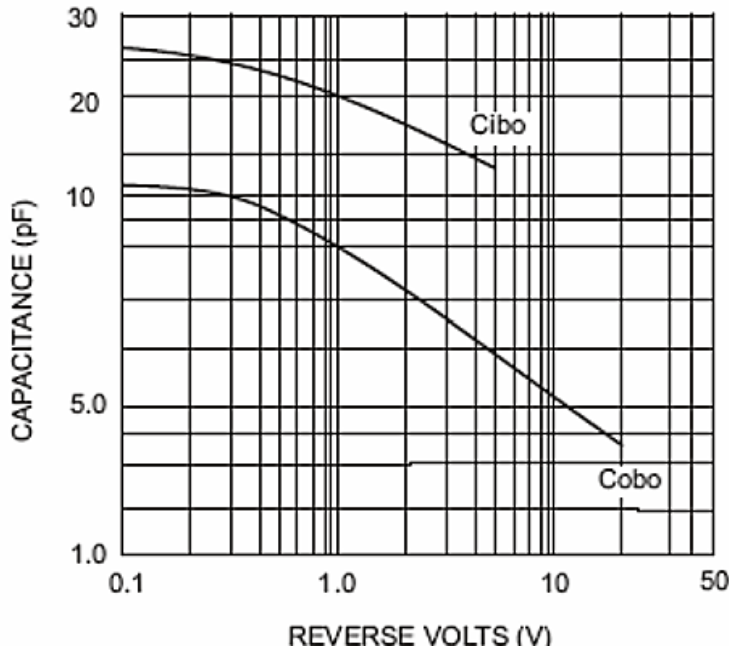
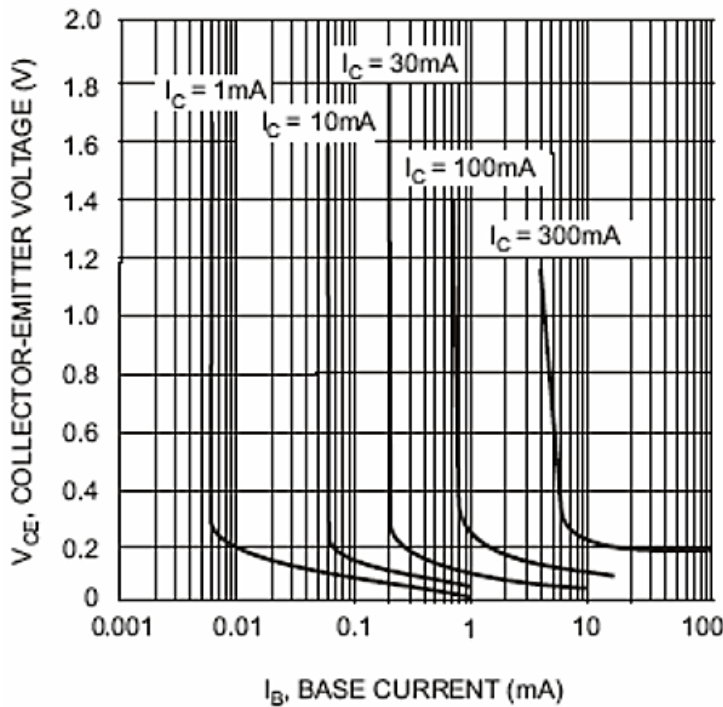


Fig. 4 Typical Collector Saturation Region



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TYPICAL CHARACTERISTIC CURVES - For Reference Only

Fig. 5 Collector Emitter Saturation Voltage vs. Collector Current

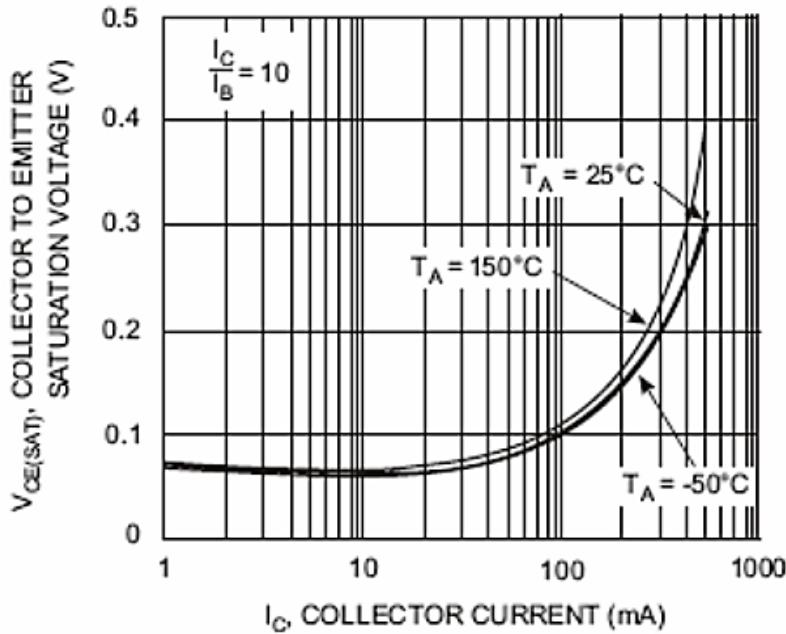
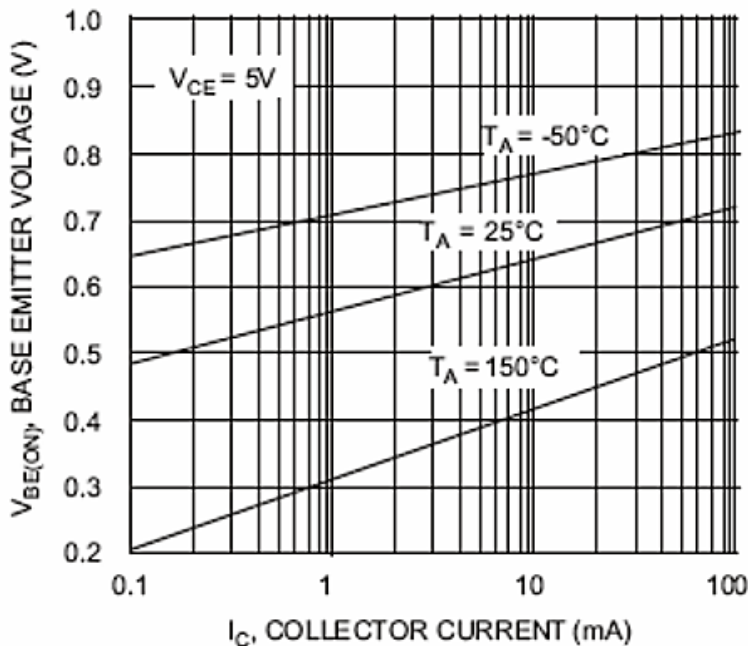


Fig. 6 Base Emitter Voltage vs. Collector Current



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RELIABILITY

Number	Experiment Items	Experiment Method And Conditions	Reference Documents
1	Solder Resistance Test	Test 260°C± 5°C for 10 ± 2 sec. Immerse body into solder 1/16" ± 1/32"	MIL-STD-750D METHOD-2031.2
2	Solderability Test	230°C ±5°C for 5 sec.	MIL-STD-750D METHOD-2026.1 0
3	Pull Test	1 kg in axial lead direction for 10 sec.	MIL-STD-750D METHOD-2036.4
4	Bend Test	0.5Kg Weight Applied To Each Lead, Bending Arcs 90 °C ± 5 °C For 3 Times	MIL-STD-750D METHOD-2036.4
5	High Temperature Reverse Bias Test	TA=100°C for 1000 Hours at VR=80% Rated VR	MIL-STD-750D METHOD-1038.4
6	Forward Operation Life Test	TA=25°C Rated Average Rectified Current	MIL-STD-750D METHOD-1027.3
7	Intermittent Operation Life Test	On state: 5 min with rated IRMS Power Off state: 5 min with Cool Forced Air. On and off for 1000 cycles.	MIL-STD-750D METHOD-1036.3
8	Pressure Cooker Test	15 PSIG, TA=121°C, 4 hours	MIL-S-19500 APPENOIXC
9	Temperature Cycling Test	-55°C~+125°C; 30 Minutes For Dwelled Time 5 minutes for transferred time. Total: 10 cycles.	MIL-STD-750D METHOD-1051.7
10	Thermal Shock Test	0°C for 5 minutes., 100°C for 5minutes, Total: 10 cycles	MIL-STD-750D METHOD-1056.7
11	Forward Surge Test	8.3ms Single Sale Sine-wave One Surge.	MIL-STD-750D METHOD-4066.4
12	Humidity Test	TA=65°C, RH=98% for 1000 hours.	MIL-STD-750D METHOD-1021.3
13	High Temperature Storage life Test	150°C for 1000 Hours	MIL-STD-750D METHOD-1031.5

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SUGGESTED REFLOW PROFILE - For Reference Only

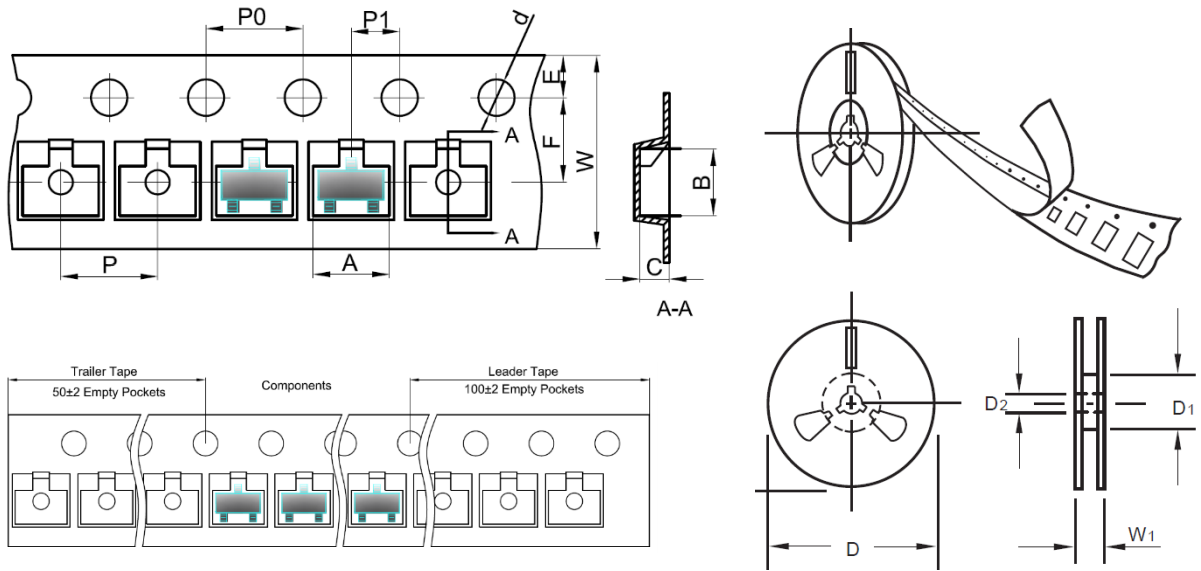


PROFILE FEATURE		PB-FREE ASSEMBLY
Average Ramp-up Rate (Ts Max to Tp)		3°C/second Max
Preheat	Temperature Min (Ts Min.)	150°C
	Temperature Max (Ts Max.)	200°C
	Time (ts Min. to ts Max.)	60 ~ 180 seconds
Time maintained above	Temperature (Tl)	217°C
	Time (tl)	60 ~ 150 seconds
Peak/Classification Temperature (Tp)		260 °C
Time within 5°C of actual Peak Temperature (tp)		20 ~ 40 seconds
Ramp-down rate		6 °C /Second Max.
Time 25 °C to Peak Temperature		8 minutes Max.
Suggest reflow times		3 Times Max.

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TAPE/REEL - Unit: mm

All Devices are packed in accordance with EIA standard RS-481-A and specifications.



ITEM	SYMBOL	TOLERANCE	SOT-23
Carrier width	A	0.1	3.15
Carrier Length	B	0.1	2.77
Carrier Depth	C	0.1	1.22
Sprocket hole	d	0.05	1.55
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D1	Min.	54.4
Feed hole diameter	D2	0.5	13.00
Sprocket hole position	E	0.1	1.75
Punch hole position	F	0.1	3.50
Punch hole pitch	P	0.1	4.00
Sprocket hole pitch	P0	0.1	4.00
Embossment center	P1	0.1	2.00
Overall tape thickness	T	0.1	0.25
Tape width	W	0.3	8.00
Reel width	W1	1.0	19.50
MPQ/Reel	3000pcs/Reel		

SMD TRANSISTORS MMBT SERIES CASE SOT-23

IMPORTANT NOTES AND DISCLAIMER

1. **ROHS COMPLIANCE:** The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU RoHS Directive (EU) 2015/863 EC (RoHS3). RoHS Test Report for this product can be obtained at Download Center.
2. **REACH COMPLIANCE:** REACH substances of high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, REACH Test Report for this product can be obtained at Download Center.
3. All Product parametric performance is indicated in the Electrical Characteristics for the listed herein test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.
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8. *NextGen* requires that customers first obtain an RMA (Returned Merchandise Authorization) number prior to returning any products. Returns must be made within 30 days of the date of invoice, be in the original packaging, unused and like-new condition. At the time of quoting or purchasing, a product may say that it is Non-Cancelable/ Non-Returnable (NCNR). These products are not returnable and not refundable.