

Formosa MS

FMUN2111-Q1 Thru FMUN2134-Q1

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FMUN2111-Q1 Thru FMUN2134-Q1

PNP Silicon Epitaxial Planar
Digital Transistor

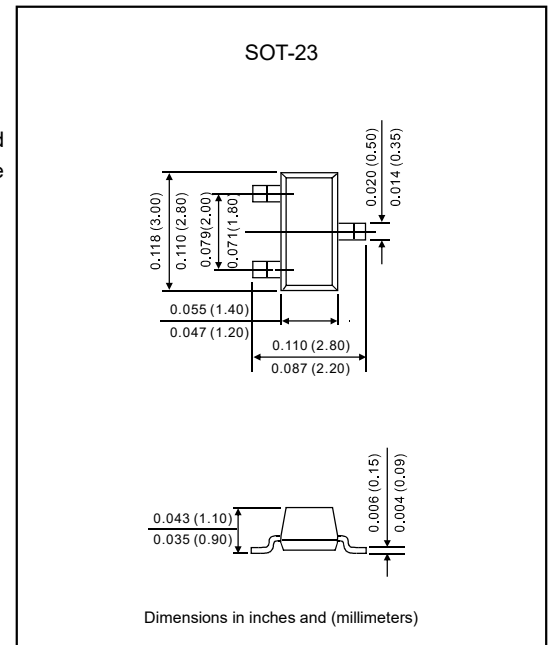
Features

- Simplifies circuit design.
- Reduces board space.
- Reduces component count.
- The SOT-23 package can be soldered using wave or reflow, the modified gull-winged leads absorb thermal stress during soldering eliminating the possibility of damage to the die.
- Qualified to AEC-Q101 standard for high reliability
- For switching and interface circuit and drive circuit applications.
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates Halogen-free part, ex.FMUN2111-Q1-H.

Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-23.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.
- Mounting Position : Any.
- Weight : Approximated 0.008 gram.

Package outline

Maximum ratings (At $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Ratings	Unit
Collector-base voltage	V_{CBO}	-50	V
Collector-emitter voltage	V_{CEO}	-50	V
Collector current	I_C	-100	mA
Total power dissipation	P_{tot}	200	mW
Operating junction temperature range	T_J	150	$^\circ\text{C}$
Storage temperature range	T_{STG}	-55 to +150	$^\circ\text{C}$

Electrical characteristics (At $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Conditions	Device	Symbol	Min.	Typ.	Max.	Unit
DC Current Gain	$-V_{CE}=10\text{V}, -I_C=5\text{mA}$	FMUN2111-Q1	h_{FE}	35			-
		FMUN2112-Q1		60			
		FMUN2113-Q1		80			
		FMUN2114-Q1		80			
		FMUN2115-Q1		160			
		FMUN2116-Q1		160			
		FMUN2130-Q1		3			
		FMUN2131-Q1		8			
		FMUN2132-Q1		15			
		FMUN2133-Q1		80			
		FMUN2134-Q1		80			

FMUN2111-Q1 Thru FMUN2134-Q1

Electrical characteristics (At $T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Conditions	Device	Symbol	Min.	Typ.	Max.	Unit
Collector-Base cutoff current	$-V_{CB}=50\text{V}$		$-I_{CBO}$			100	nA
Collector-Emitter cutoff current	$-V_{CE}=50\text{V}$		$-I_{CEO}$			500	nA
Emitter base cutoff current	$-V_{EB}=6\text{V}$	FMUN2111-Q1	$-I_{EBO}$			0.5	mA
		FMUN2112-Q1				0.2	
		FMUN2113-Q1				0.1	
		FMUN2114-Q1				0.2	
		FMUN2115-Q1				0.9	
		FMUN2116-Q1				1.9	
		FMUN2130-Q1				4.3	
		FMUN2131-Q1				2.3	
		FMUN2132-Q1				1.5	
		FMUN2133-Q1				0.18	
		FMUN2134-Q1				0.13	
Collector Base Breakdown Voltage	$-I_C=10\mu\text{A}$		$-V_{(BR)CBO}$	50			V
Collector Emitter Breakdown Voltage	$-I_C=2\text{mA}$		$-V_{(BR)CEO}$	50			V
Collector Emitter Saturation Voltage	$-I_C=10\text{mA}, -I_B=0.3\text{mA}$		$-V_{(CE)sat}$			0.25	V
	$-I_C=10\text{mA}, -I_B=5\text{mA}$	FMUN2130-Q1					
		FMUN2131-Q1					
	$-I_C=10\text{mA}, -I_B=1\text{mA}$	FMUN2115-Q1					
		FMUN2116-Q1					
		FMUN2132-Q1					
		FMUN2133-Q1					
Output voltage(on)	$-V_{CC}=5\text{V}, -V_B=2.5\text{V}, R_L=1\text{K}\Omega$	FMUN2111-Q1	$-V_{OL}$			0.2	V
		FMUN2112-Q1					
		FMUN2114-Q1					
		FMUN2115-Q1					
		FMUN2116-Q1					
		FMUN2130-Q1					
		FMUN2131-Q1					
		FMUN2132-Q1					
		FMUN2133-Q1					
		FMUN2134-Q1					
	$-V_{CC}=5\text{V}, -V_B=3.5\text{V}, R_L=1\text{K}\Omega$	FMUN2113-Q1					

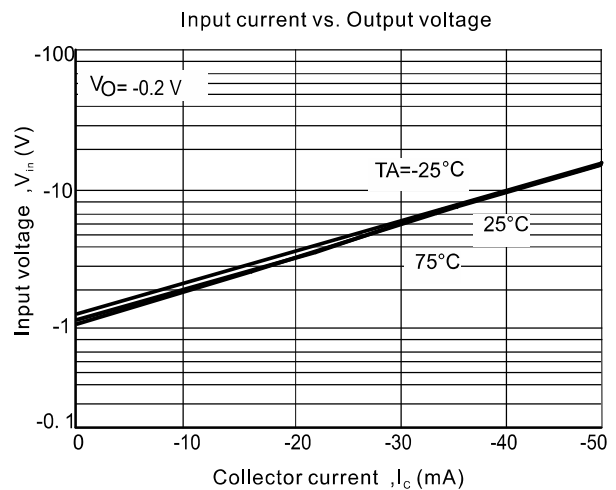
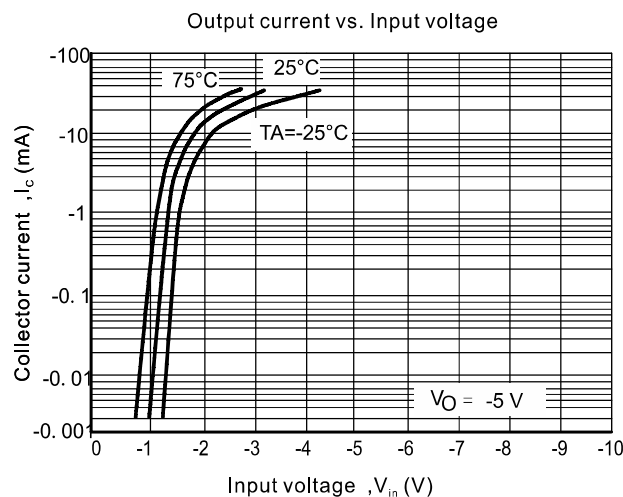
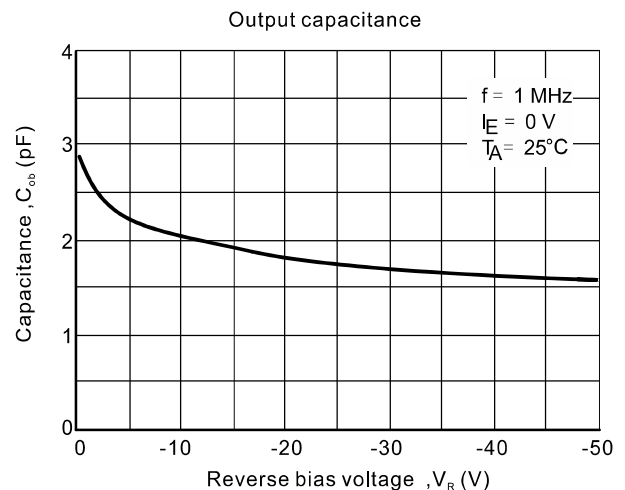
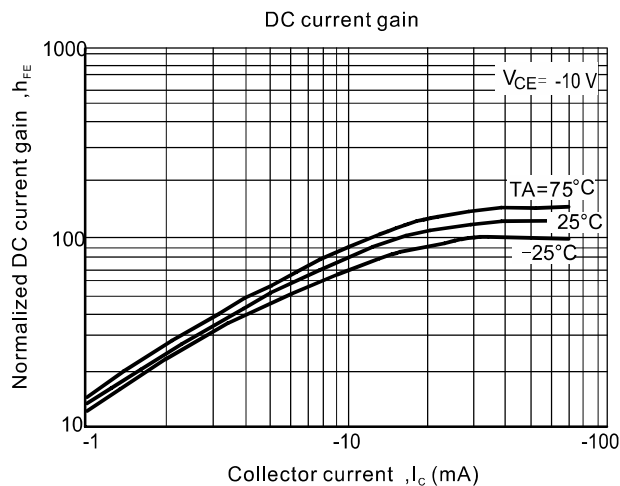
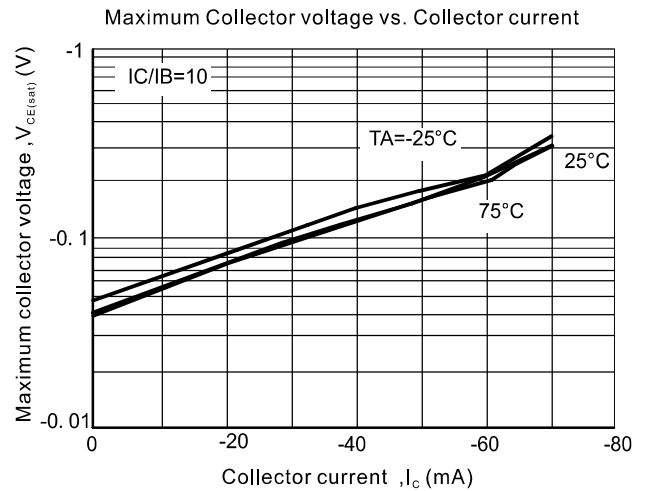
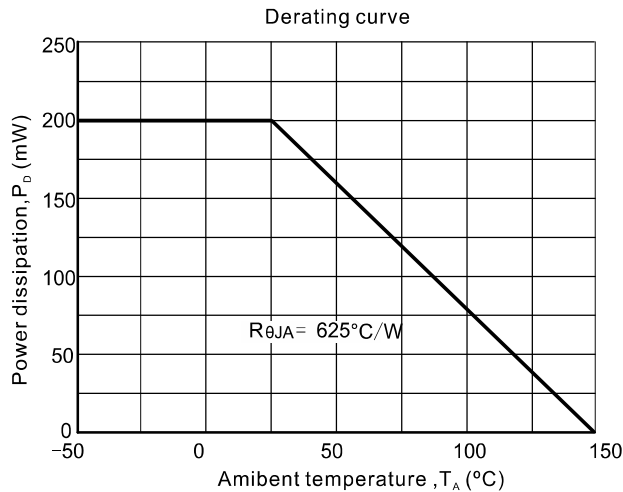
FMUN2111-Q1 Thru FMUN2134-Q1

Electrical characteristics (At $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Conditions	Device	Symbol	Min.	Typ.	Max.	Unit
Output voltage(off)	$-V_{cc}=5V, -V_b=0.5V, R_L=1K\Omega$	FMUN2130-Q1	$-V_{OH}$	4.9			V
	$-V_{cc}=5V, -V_b=0.05V, R_L=1K\Omega$	FMUN2115-Q1					
	$-V_{cc}=5V, -V_b=0.25V, R_L=1K\Omega$	FMUN2116-Q1					
		FMUN2131-Q1					
		FMUN2132-Q1					
Output resistor		FMUN2111-Q1	R_i	7		13	K Ω
		FMUN2112-Q1		15.4		28.6	
		FMUN2113-Q1		32.9		61.1	
		FMUN2114-Q1		7		13	
		FMUN2115-Q1		7		13	
		FMUN2116-Q1		3.3		6.1	
		FMUN2130-Q1		0.7		1.3	
		FMUN2131-Q1		1.5		2.9	
		FMUN2132-Q1		3.3		6.1	
		FMUN2133-Q1		3.3		6.1	
		FMUN2134-Q1		15.4		28.6	
		Resistor ratio			FMUN2111-Q1	R_1/R_2	
FMUN2112-Q1							
FMUN2113-Q1	0.17				0.25		
FMUN2114-Q1							
FMUN2115-Q1	-		-		-		
FMUN2116-Q1							
FMUN2130-Q1	0.8				1.2		
FMUN2131-Q1							
FMUN2132-Q1							
			FMUN2133-Q1				0.055

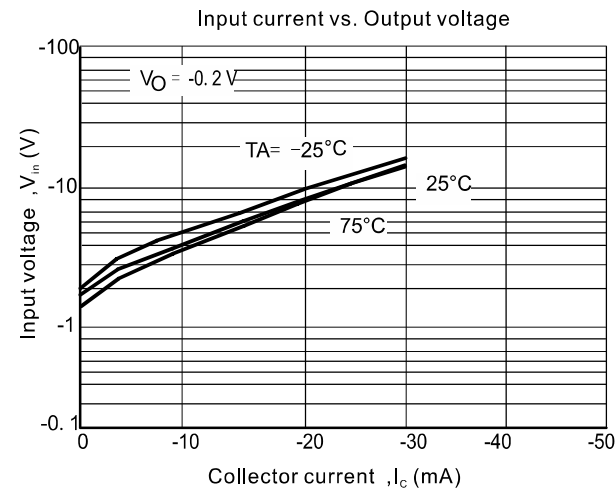
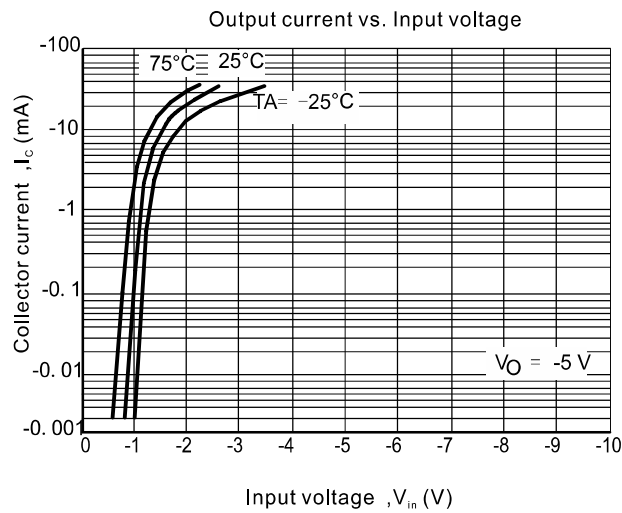
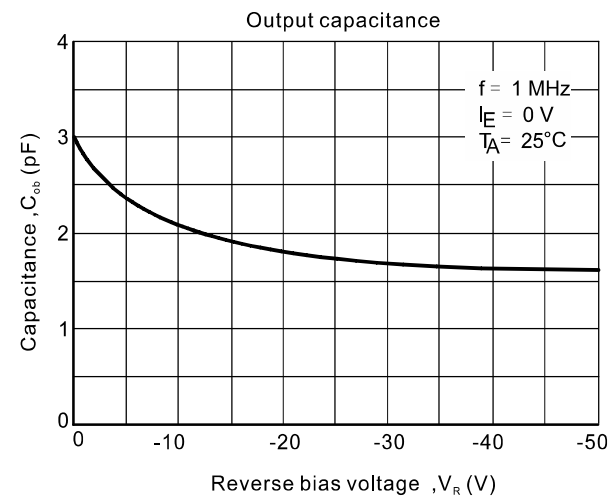
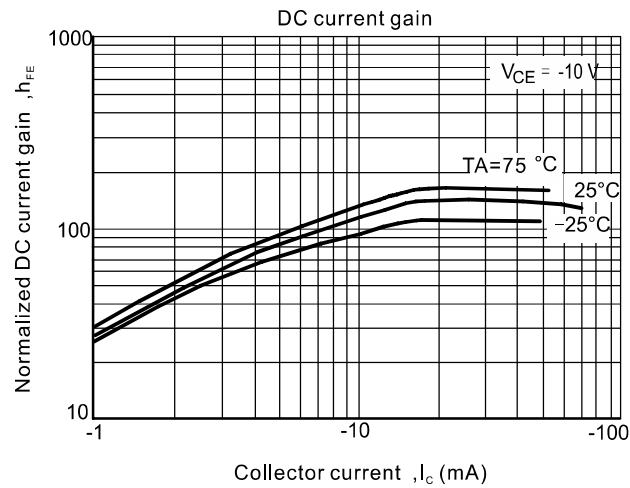
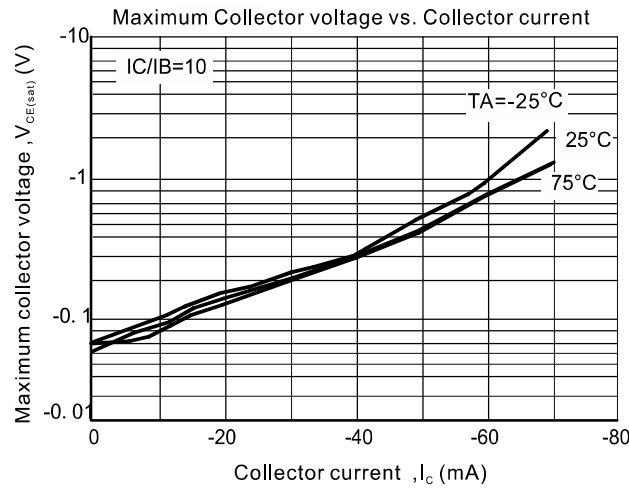
FMUN2111-Q1 Thru FMUN2134-Q1

Rating and characteristic curves (FMUN2111-Q1)



FMUN2111-Q1 Thru FMUN2134-Q1

Rating and characteristic curves (FMUN2112-Q1)

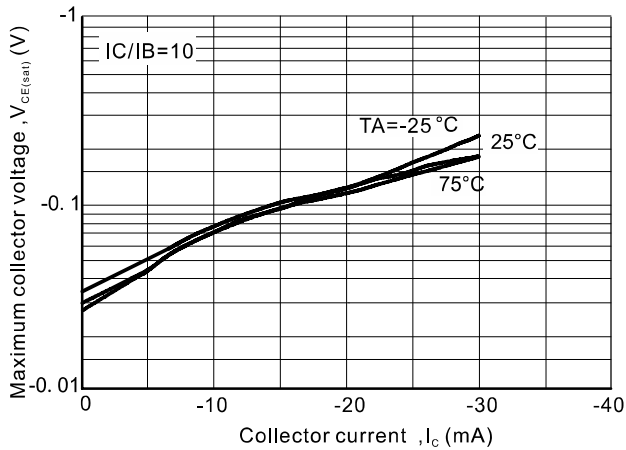


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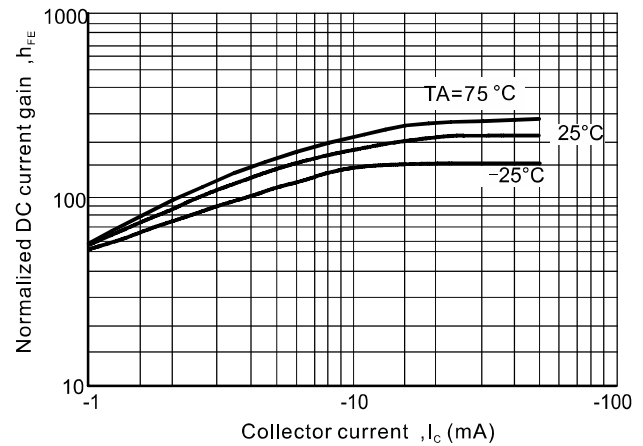
FMUN2111-Q1 Thru FMUN2134-Q1

Rating and characteristic curves (FMUN2113-Q1)

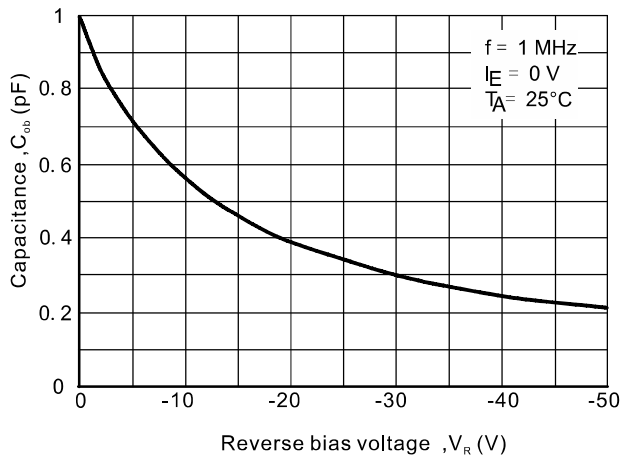
Maximum Collector voltage vs. Collector current



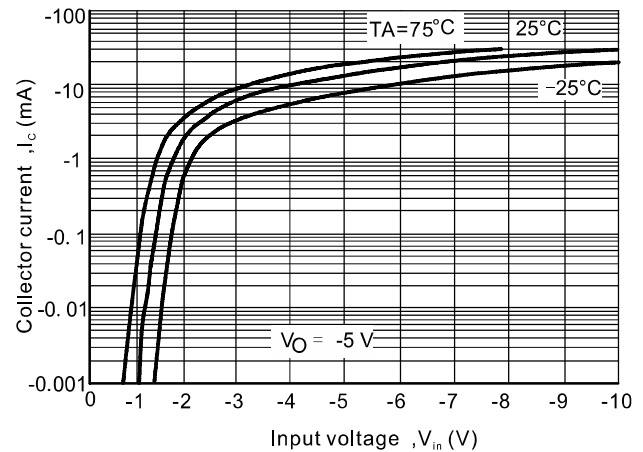
DC current gain



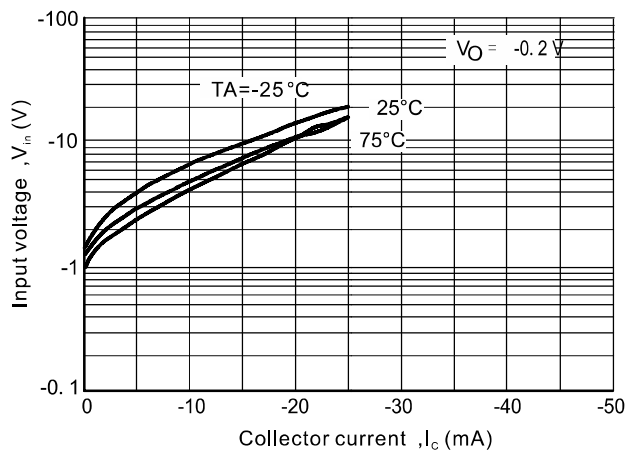
Output capacitance



Output current vs. Input voltage

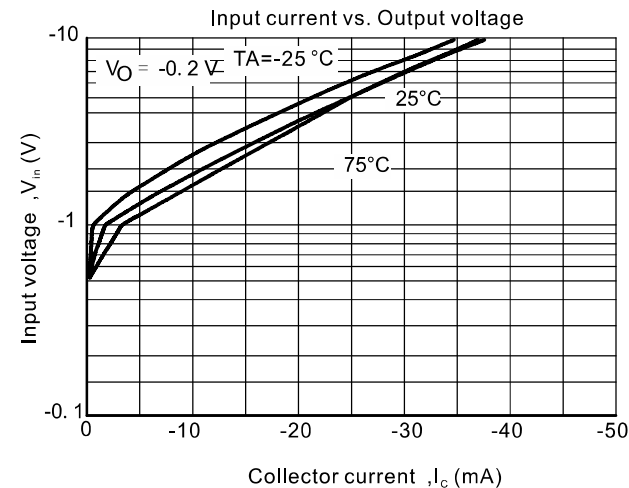
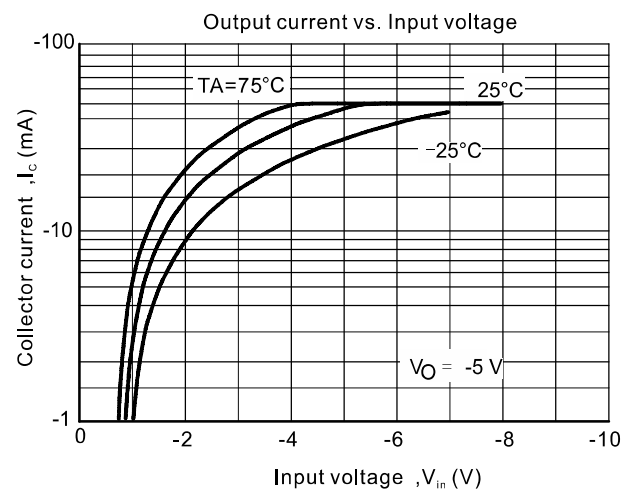
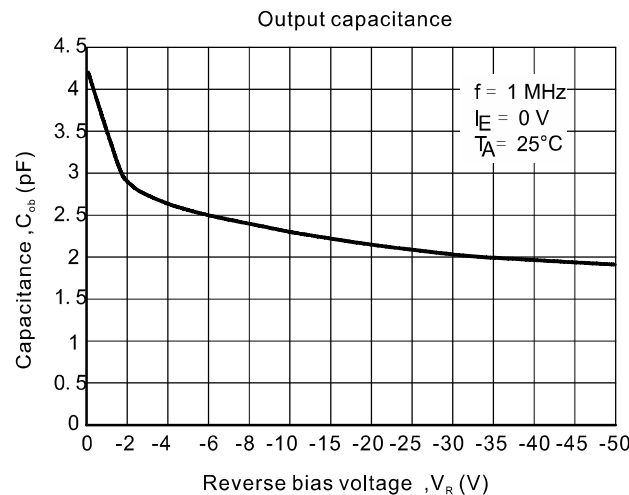
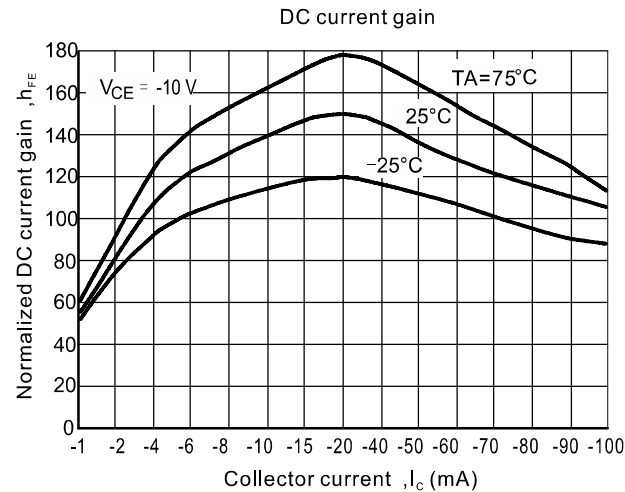
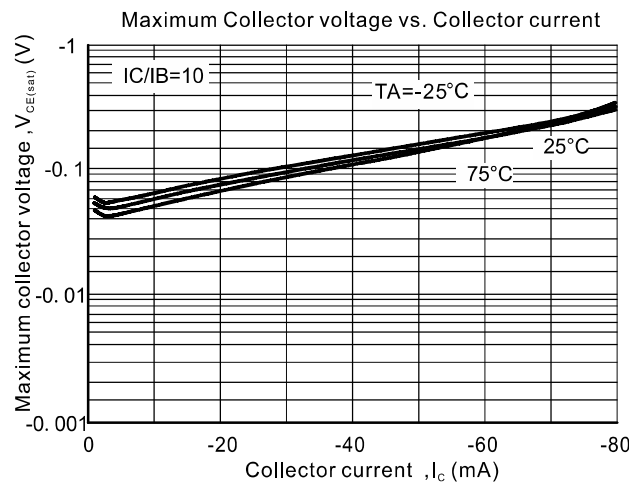


Input current vs. Output voltage



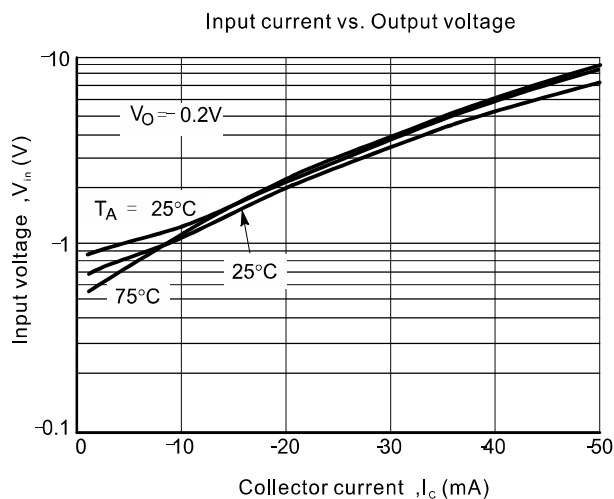
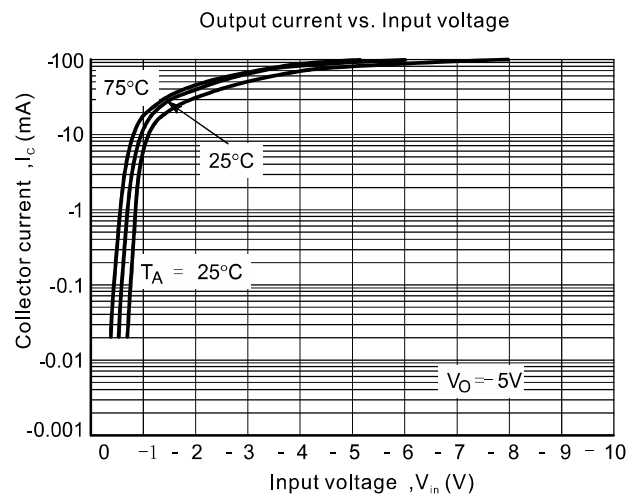
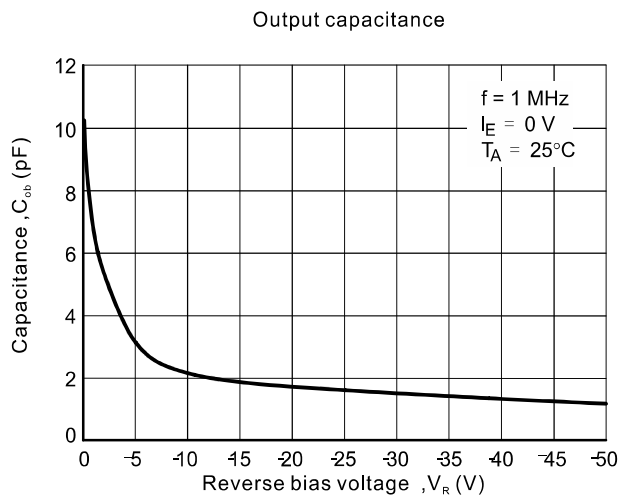
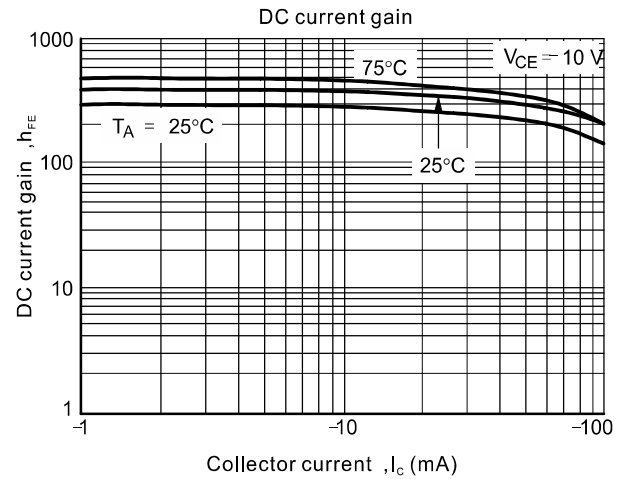
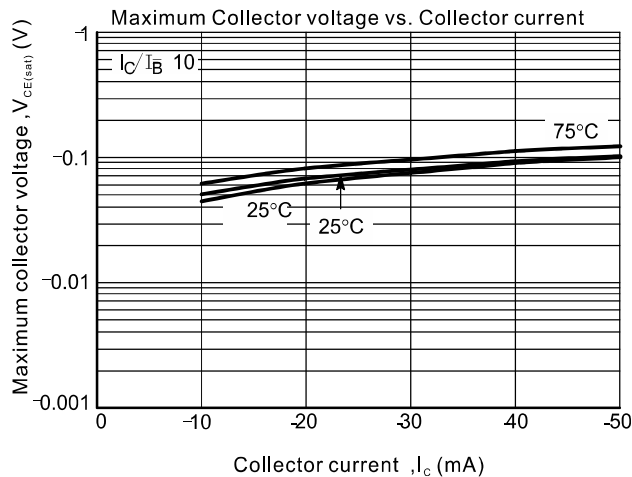
FMUN2111-Q1 Thru FMUN2134-Q1

Rating and characteristic curves (FMUN2114-Q1)



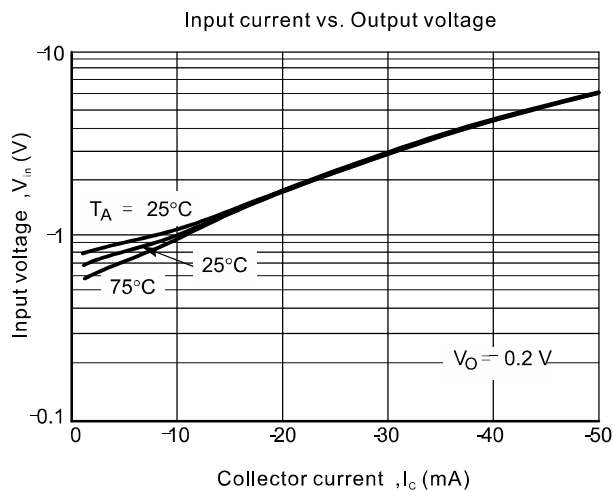
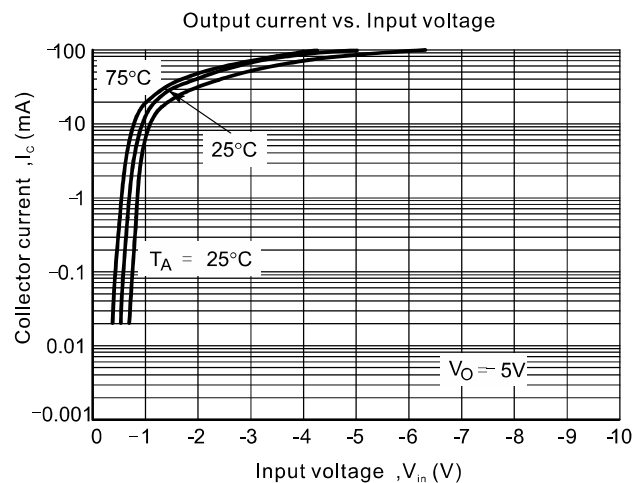
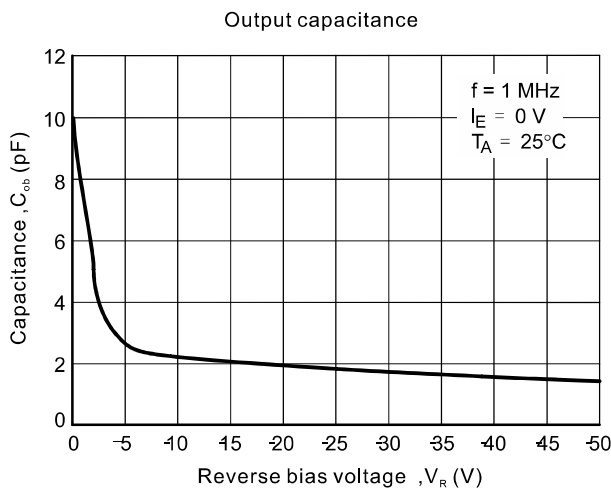
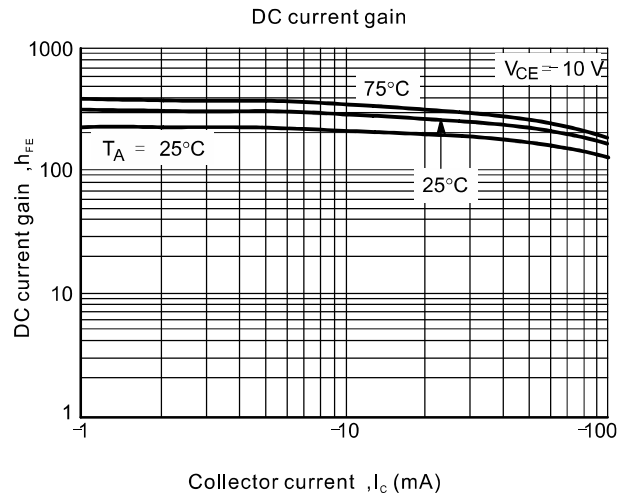
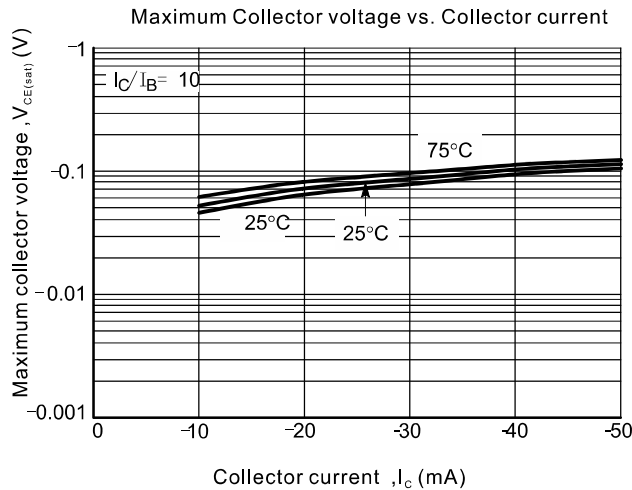
FMUN2111-Q1 Thru FMUN2134-Q1

Rating and characteristic curves (FMUN2115-Q1)



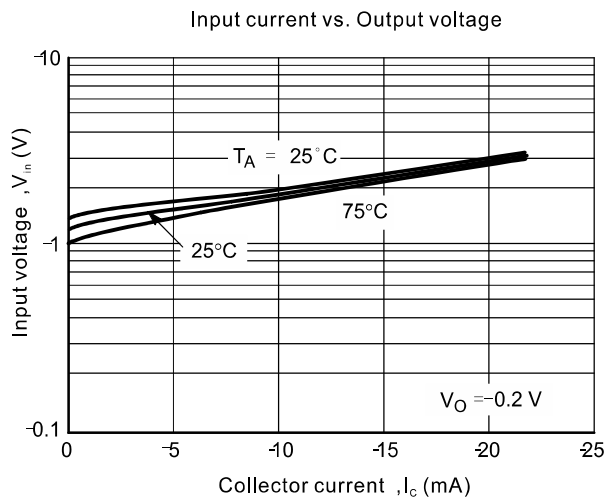
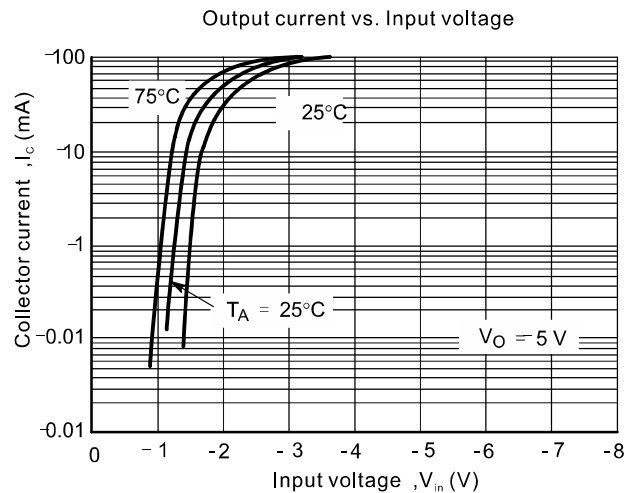
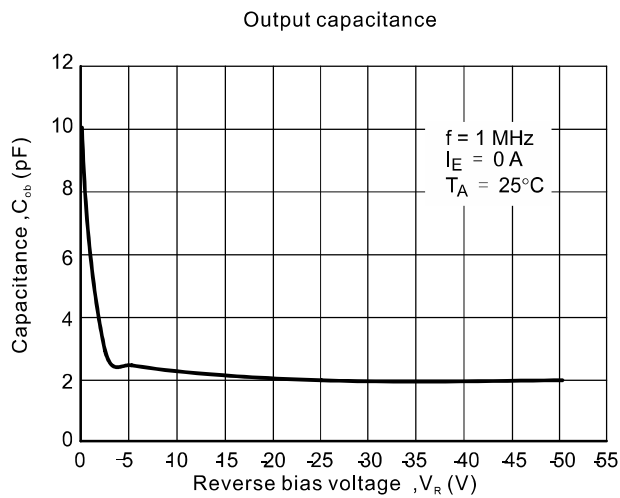
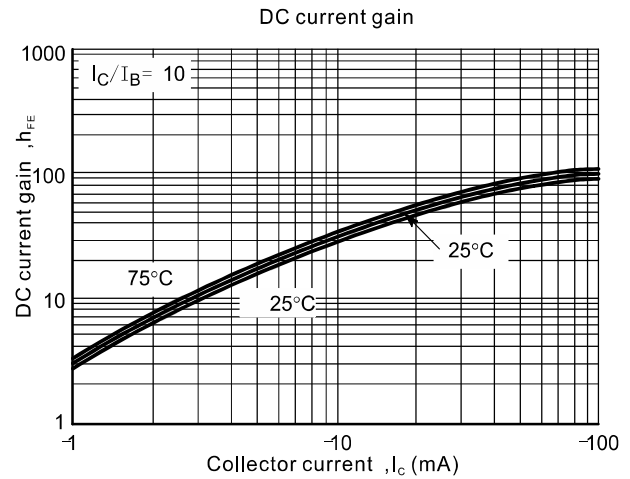
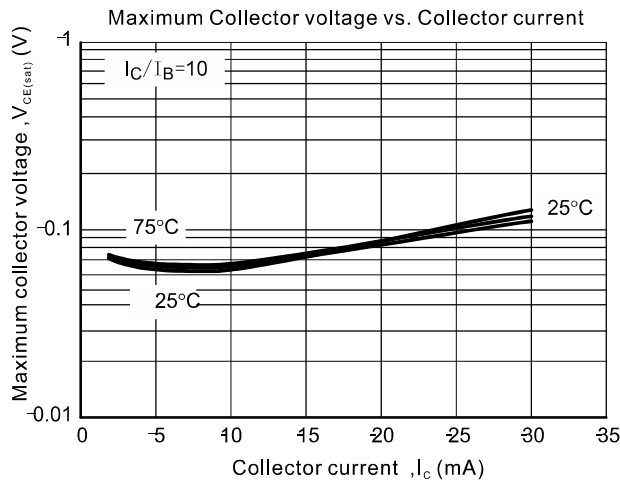
FMUN2111-Q1 Thru FMUN2134-Q1

Rating and characteristic curves (FMUN2116-Q1)



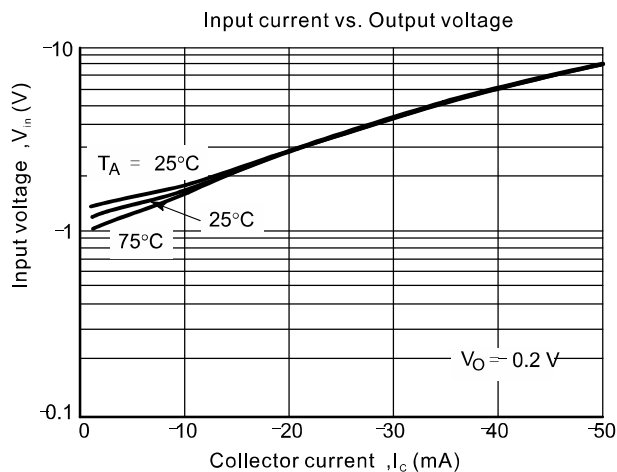
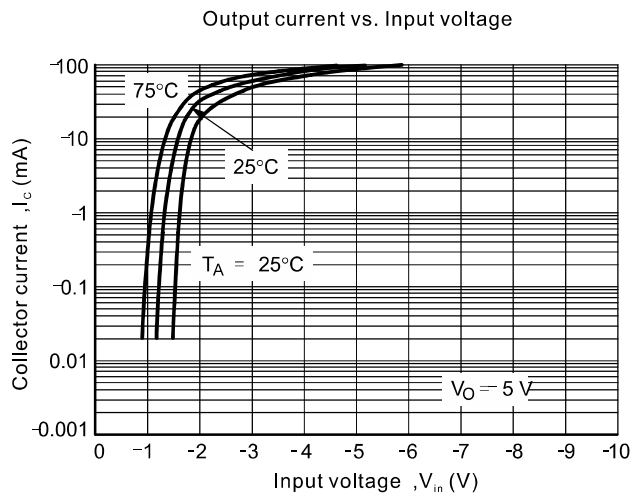
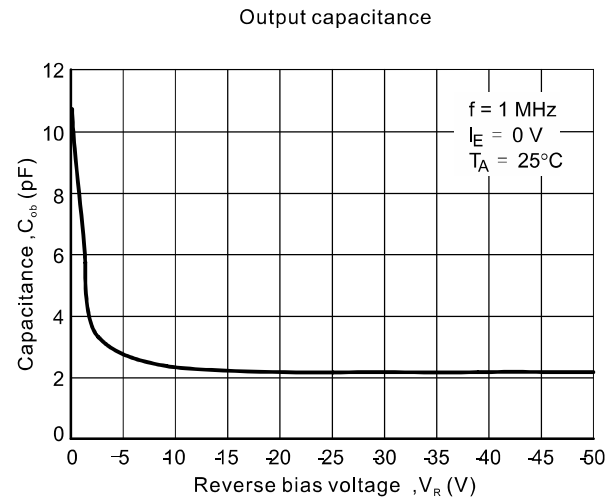
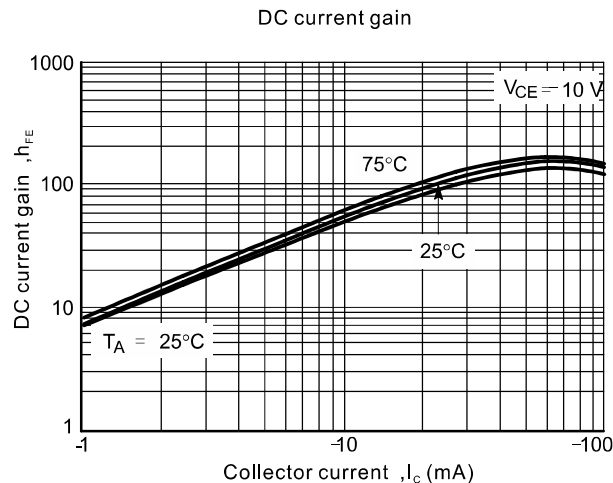
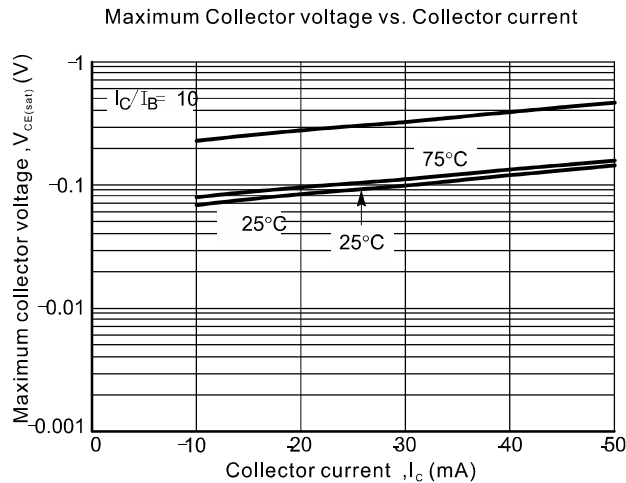
FMUN2111-Q1 Thru FMUN2134-Q1

Rating and characteristic curves (FMUN2131-Q1)



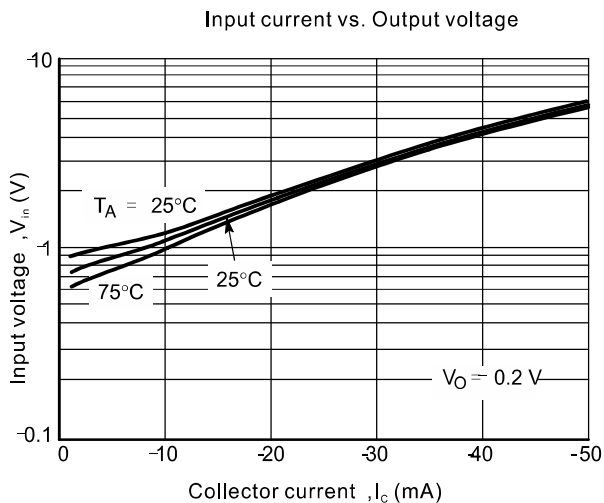
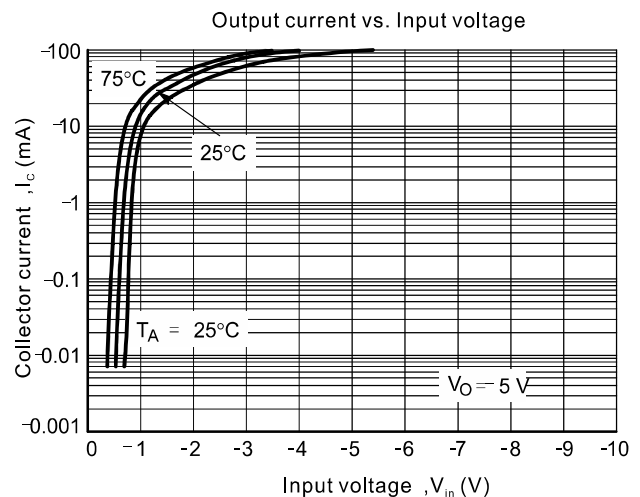
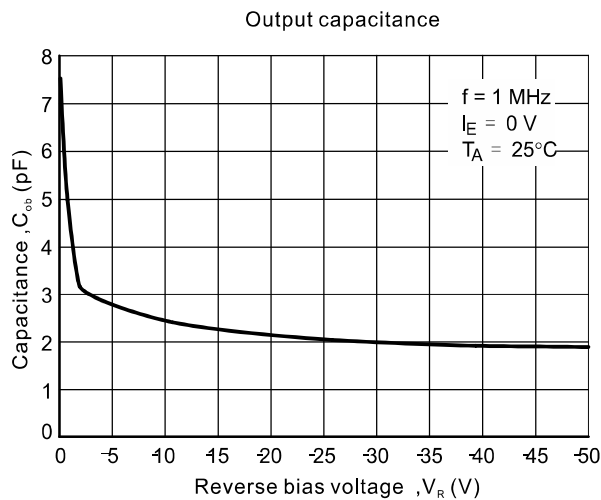
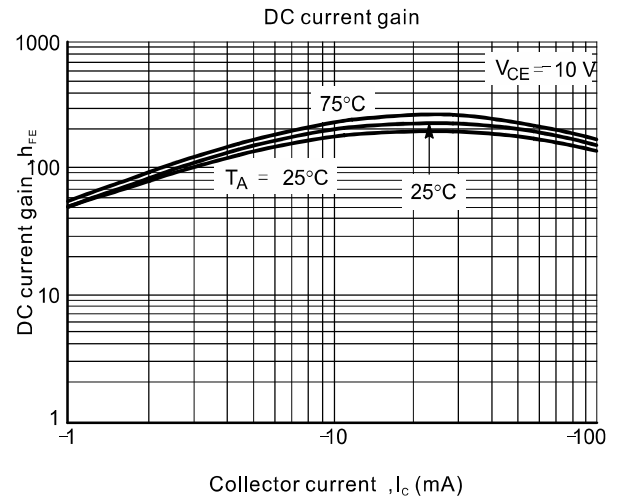
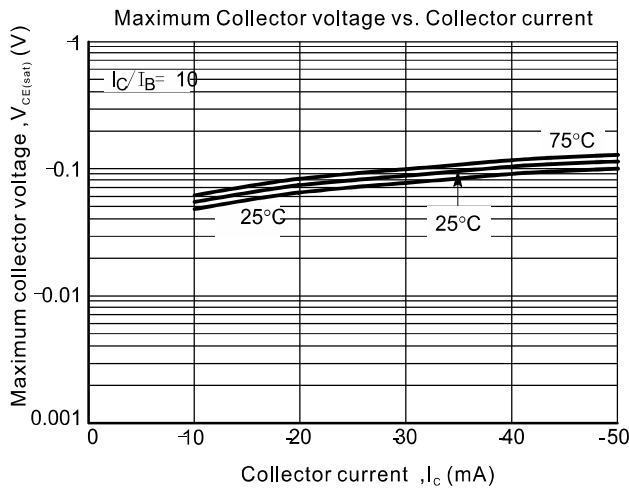
FMUN2111-Q1 Thru FMUN2134-Q1

Rating and characteristic curves (FMUN2132-Q1)



FMUN2111-Q1 Thru FMUN2134-Q1

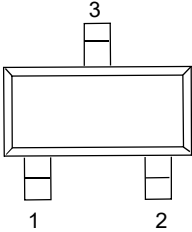
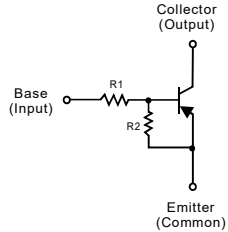
Rating and characteristic curves (FMUN2133-Q1)



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FMUN2111-Q1 Thru FMUN2134-Q1

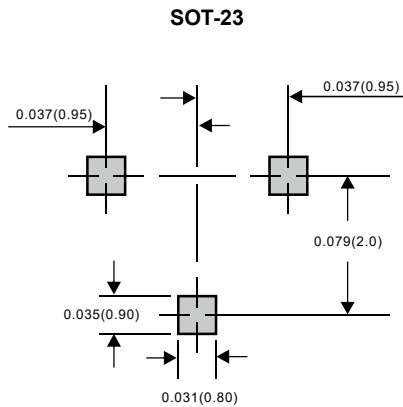
Pinning information

Pin	Simplified outline	Symbol
Pin 1 Base Pin 2 Emitter Pin 3 Collector		

Marking and Resistor values

Type number	Marking code	R1(K Ω)	R2(K Ω)
FMUN2111-Q1	A6A	10	10
FMUN2112-Q1	A6B	22	22
FMUN2113-Q1	A6C	47	47
FMUN2114-Q1	A6D	10	47
FMUN2115-Q1	A6E	10	-
FMUN2116-Q1	A6F	4.7	-
FMUN2130-Q1	A6G	1	1
FMUN2131-Q1	A6H	2.2	2.2
FMUN2132-Q1	A6J	4.7	4.7
FMUN2133-Q1	A6K	4.7	47
FMUN2134-Q1	A6L	22	47

Suggested solder pad layout

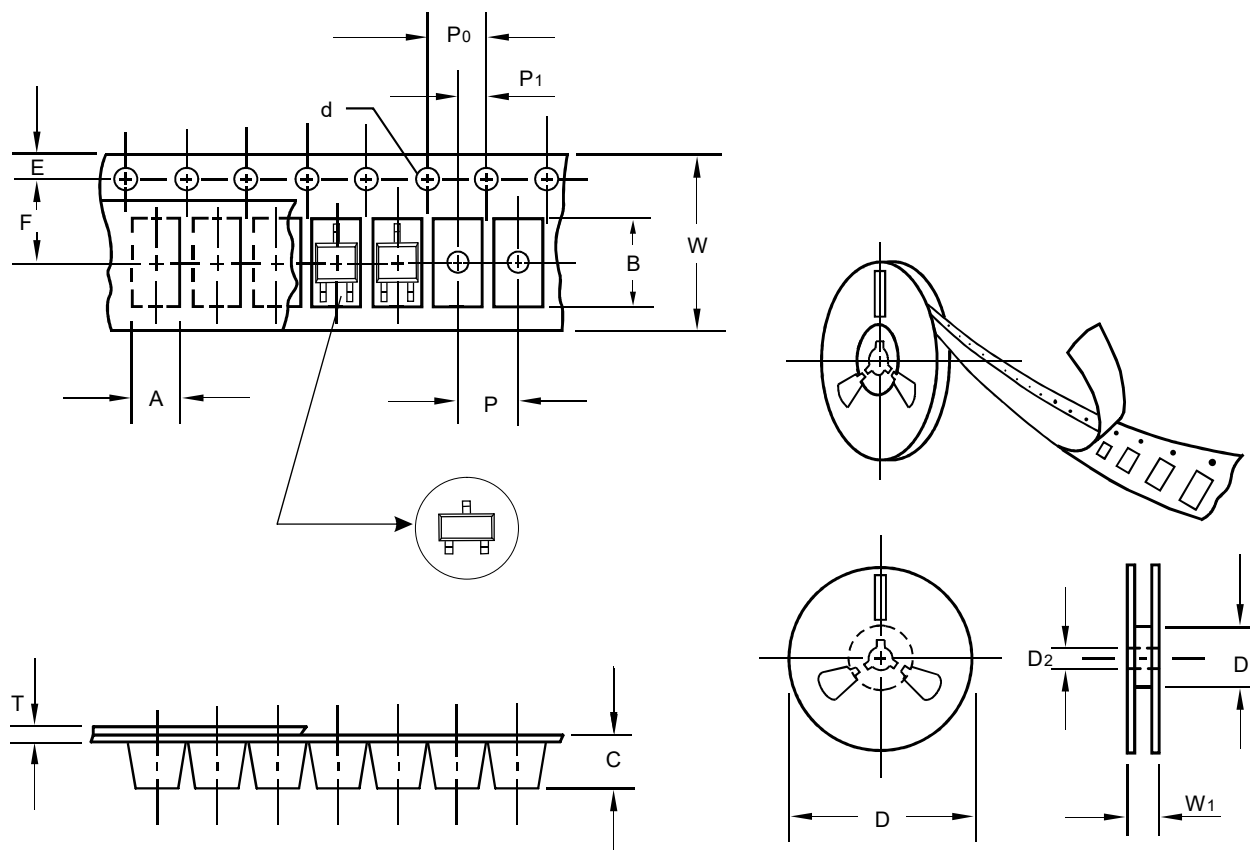


Dimensions in inches and (millimeters)

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FMUN2111-Q1 Thru FMUN2134-Q1

Packing information



unit:mm

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	0.1	1.50
13" Reel outside diameter	D	2.0	-
13" Reel inner diameter	D1	min	-
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D1	min	54.40
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	0.23
Tape width	W	0.3	8.00
Reel width	W1	1.0	12.0

Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

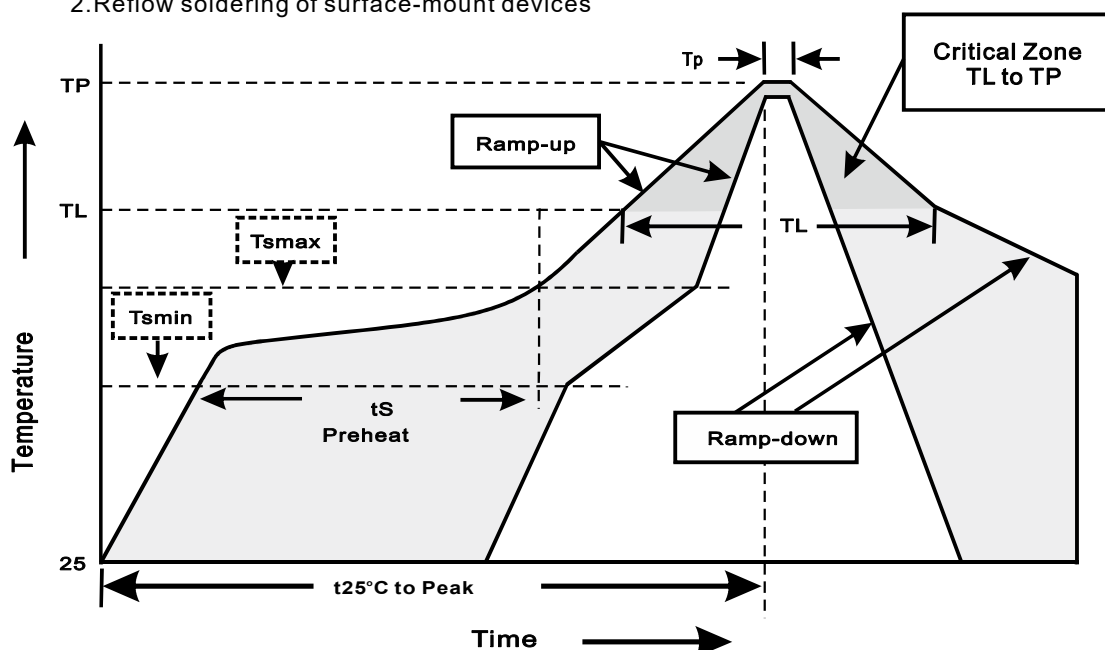
FMUN2111-Q1 Thru FMUN2134-Q1

Reel packing

PACKAGE	REEL SIZE	REEL (pcs)	COMPONENT SPACING (m/m)	BOX (pcs)	INNER BOX (m/m)	REEL DIA, (m/m)	CARTON SIZE (m/m)	CARTON (pcs)	APPROX. GROSS WEIGHT (kg)
SOT-23	7"	3,000	4.0	30,000	183*123*183	178	382*257*387	240,000	11.6

Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%
- 2.Reflow soldering of surface-mount devices



3.Reflow soldering

Profile Feature	Soldering Condition
Average ramp-up rate(T _L to T _P)	<3°C/sec
Preheat -Temperature Min(T _{smin}) -Temperature Max(T _{smax}) -Time(min to max)(t _s)	150°C 200°C 60~120sec
T _{smax} to T _L -Ramp-upRate	<3°C/sec
Time maintained above: -Temperature(T _L) -Time(t _L)	217°C 60~260sec
Peak Temperature(T _P)	255°C-0/+5°C
Time within 5°C of actual Peak Temperature(t _P)	10~30sec
Ramp-down Rate	<6°C/sec
Time 25°C to Peak Temperature	<6minutes

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High reliability test capabilities

Item Test	Conditions
1. Steady State Operating Life	$P_D=246\text{mW}$ Test Duration:1000hrs
2. High Temperature Reverse Bias	$T_j=150^\circ\text{C}$, $V_{CE}=80\%$ related volage, 1000hrs
3. Temperature Cycle	$-55^\circ\text{C}(15\text{min})$ to $150^\circ\text{C}(15\text{min})$ Air to Air Transition Time<20sec Test Cycles: 1000cycle
4. Autoclave	$P=2\text{atm}$ $T_a=121^\circ\text{C}$ $RH=100\%$ Test Duration: 96hrs
5. High Temperature Storage Life	$T_a=150^\circ\text{C}$ Test Duration: 1000hrs
6. Solderability	$245^\circ\text{C}, 5\text{sec}$
7. High Temperature High Humidity Reverse Bias	$T_a=85^\circ\text{C}$, 85%RH, $V_{CE}=80\%$ related volage, 1000hrs
8. Resistance to Soldering Heat	$260^\circ\text{C}, 10\text{sec}$
10. Solvent Resistance	