

FMUN5211W-Q1 Thru FMUN5237W-Q1

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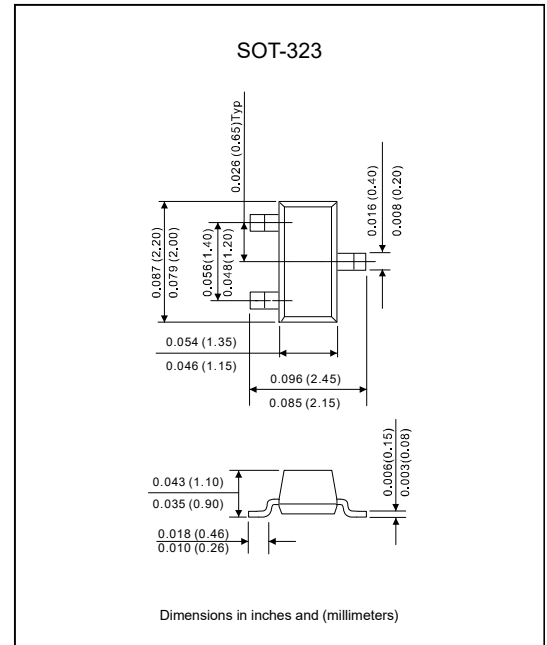
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FMUN5211W-Q1 Thru FMUN5237W-Q1**100mA 50V Digital Transistors
(Built-in Resistors) NPN Silicon****Features**

- The use of a BRT(bias resistor transistor) can reduce both system cost and board space.
- Qualified to AEC-Q101 standards for high reliability.
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates Halogen-free part, ex.FMUN5211W-Q1-H.

Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-323.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.
- Mounting Position : Any.

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 ($T_A=25^\circ\text{C}$) (Derate above 25°C)	P_D	202 (Note1)	mW
		310 (Note2)	
		1.6 (Note1)	mW/ $^\circ\text{C}$
		2.5 (Note2)	
Thermal resistance, junction to ambient	$R_{\theta JA}$	618 (Note1)	$^\circ\text{C/W}$
		403 (Note2)	
Thermal resistance, junction to lead	$R_{\theta JL}$	280 (Note1)	$^\circ\text{C/W}$
		332 (Note2)	
Junction temperature	T_J	+150	$^\circ\text{C}$
Storage temperature range	T_{STG}	-55 to +150	$^\circ\text{C}$

1.FR-4@minimum pad.

2.FR-4@1.0x1.0 inch pad.

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

Parameter		Conditions	Symbol	Min	Typ	Max	Unit
Off characteristics (Note 4)							
Collector-base cutoff current		$V_{CB} = 50\text{V}, I_E = 0$	I_{CBO}			100	nA
Collector-emitter cutoff current		$V_{CE} = 50\text{V}, I_B = 0$	I_{CEO}			500	nA
Collector-emitter cutoff current	FMUN5211W-Q1	$V_{EB} = 6\text{V}, I_C = 0$	I_{EBO}			0.5	mA
	FMUN5212W-Q1					0.2	
	FMUN5213W-Q1					0.1	
	FMUN5214W-Q1					0.2	
	FMUN5215W-Q1					0.9	
	FMUN5216W-Q1					1.9	
	FMUN5230W-Q1					4.3	
	FMUN5231W-Q1					2.3	
	FMUN5232W-Q1					1.5	
	FMUN5233W-Q1					0.18	
	FMUN5234W-Q1					0.13	
	FMUN5235W-Q1					0.2	
	FMUN5236W-Q1					0.05	
	FMUN5237W-Q1					0.13	

On characteristics (Note 3)

DC current gain	FMUN5211W-Q1	$V_{CE} = 10\text{V}, I_C = 5\text{mA}$	h_{FE}	35	60	220	
	FMUN5212W-Q1			60	100	-	
	FMUN5213W-Q1			80	140	320	
	FMUN5214W-Q1			80	140	-	
	FMUN5215W-Q1			160	350	-	
	FMUN5216W-Q1			160	350	-	
	FMUN5230W-Q1			3	5	-	
	FMUN5231W-Q1			8	15	-	
	FMUN5232W-Q1			15	30	-	
	FMUN5233W-Q1			80	200	-	
	FMUN5234W-Q1			80	150	-	
	FMUN5235W-Q1			80	140	-	
	FMUN5236W-Q1			80	150	-	
	FMUN5237W-Q1			80	140	-	

FMUN5211W-Q1 Thru FMUN5237W-Q1

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

Parameter		Conditions	Symbol	Min	Typ	Max	Unit
Collector-emitter saturation voltage		I _B = 0.3mA, I _C = 10mA	V _{CE(sat)}			0.25	V
	FMUN5230W-Q1/ FMUN5231W-Q1	I _B = 5mA, I _C = 10mA					
	FMUN5215W-Q1 FMUN5216W-Q1	I _B = 1mA, I _C = 10mA					
	FMUN5232W-Q1 FMUN5233W-Q1						
	FMUN5234W-Q1						

Off characteristics (Note 4)

Collector-base breakdown voltage		$I_C=10\mu\text{A}, I_E=0$	$V_{(BR)CBO}$	50			V
Collector-emitter breakdown voltage (note3)		$I_C=2\text{mA}, I_B=0$	$V_{(BR)CEO}$	50			V
Output voltage (ON)	FMUN5211W-Q1	$V_{CC}=5\text{V}, V_B=2.5\text{V}, R_L=1\text{k}\Omega$	V_{OL}	-	-	0.2	V
	FMUN5212W-Q1						
	FMUN5213W-Q1						
	FMUN5214W-Q1						
	FMUN5215W-Q1						
	FMUN5216W-Q1						
	FMUN5230W-Q1						
	FMUN5231W-Q1						
	FMUN5232W-Q1						
	FMUN5233W-Q1						
	FMUN5234W-Q1						
	FMUN5235W-Q1	$V_{CC}=5\text{V}, V_B=3.5\text{V}, R_L=1\text{k}\Omega$					
	FMUN5236W-Q1	$V_{CC}=5\text{V}, V_B=5.5\text{V}, R_L=1\text{k}\Omega$					
	FMUN5237W-Q1	$V_{CC}=5\text{V}, V_B=4\text{V}, R_L=1\text{k}\Omega$					

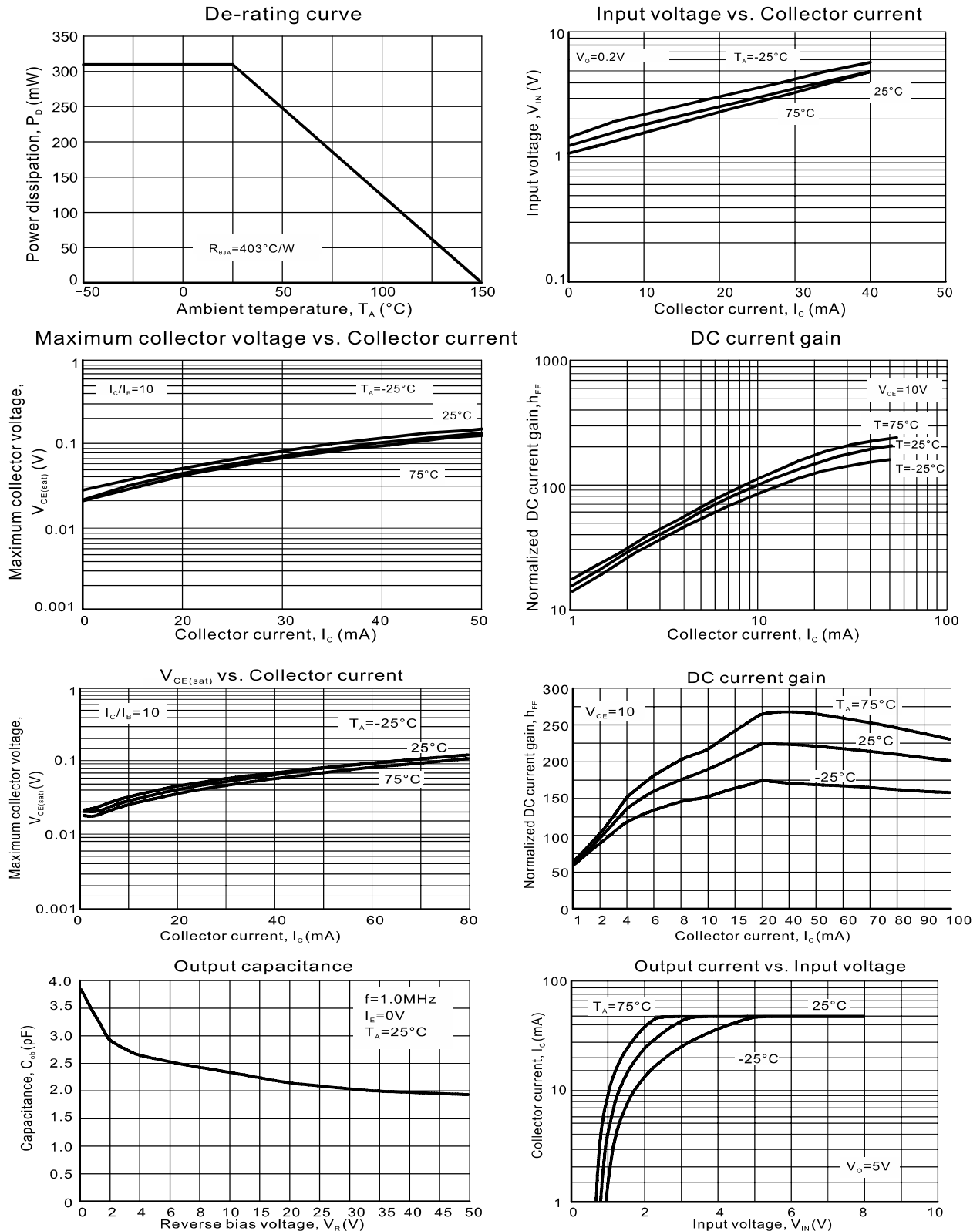
On characteristics (Note4) (continued)

Output voltage (off)		$V_{CC}=5V, V_B=0.5V, R_L=1k\Omega$	V_{OH}	4.9			V
	FMUN5230W-Q1	$V_{CC}=5V, V_B=0.05V, R_L=1k\Omega$					
	FMUN5215W-Q1	$V_{CC}=5V, V_B=0.25V, R_L=1k\Omega$					
	FMUN5216W-Q1						
	FMUN5233W-Q1						

3.Pulse test: pulse width < 300 μs , duty cycle<2.0%.4.Pulse test: pulse width < 300 μs , duty cycle<2.0%.

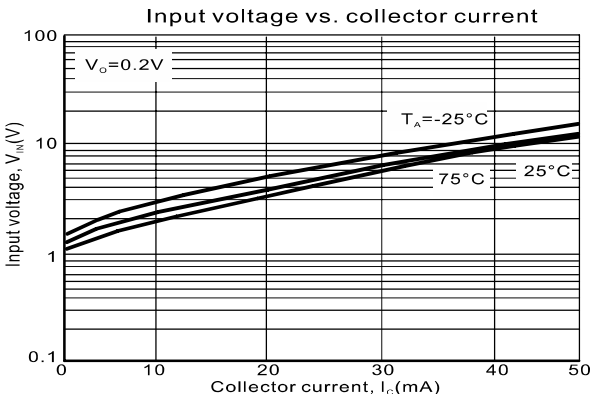
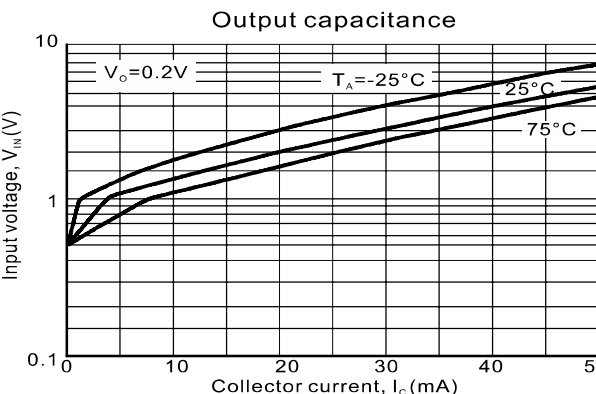
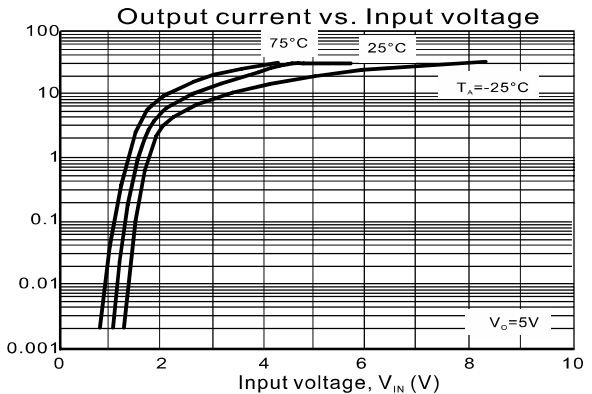
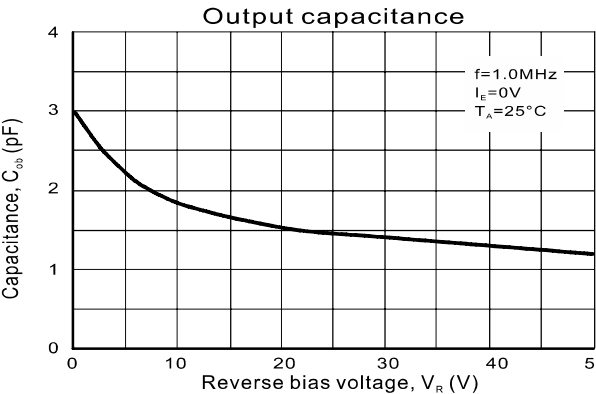
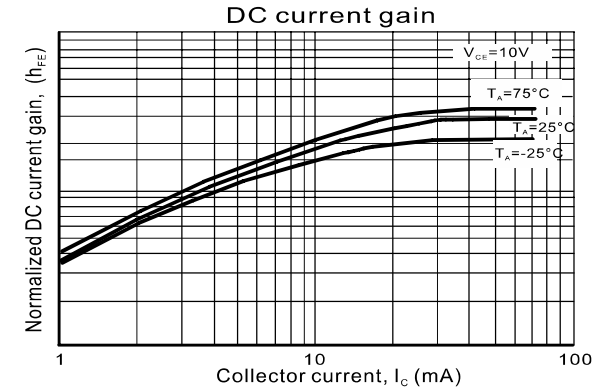
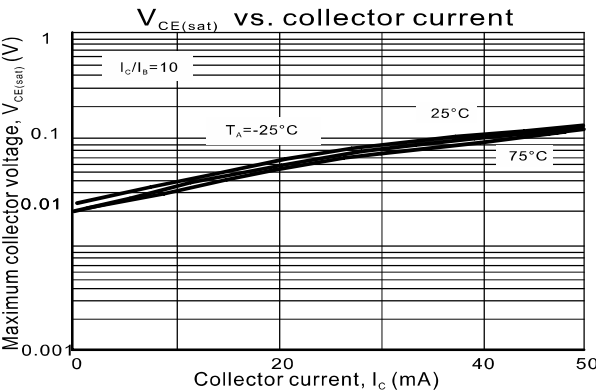
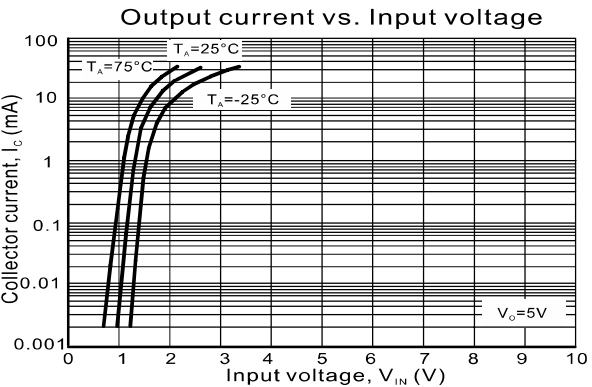
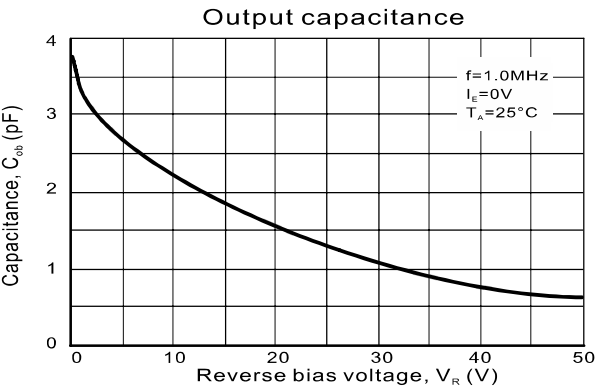
FMUN5211W-Q1 Thru FMUN5237W-Q1

Rating and characteristic curves



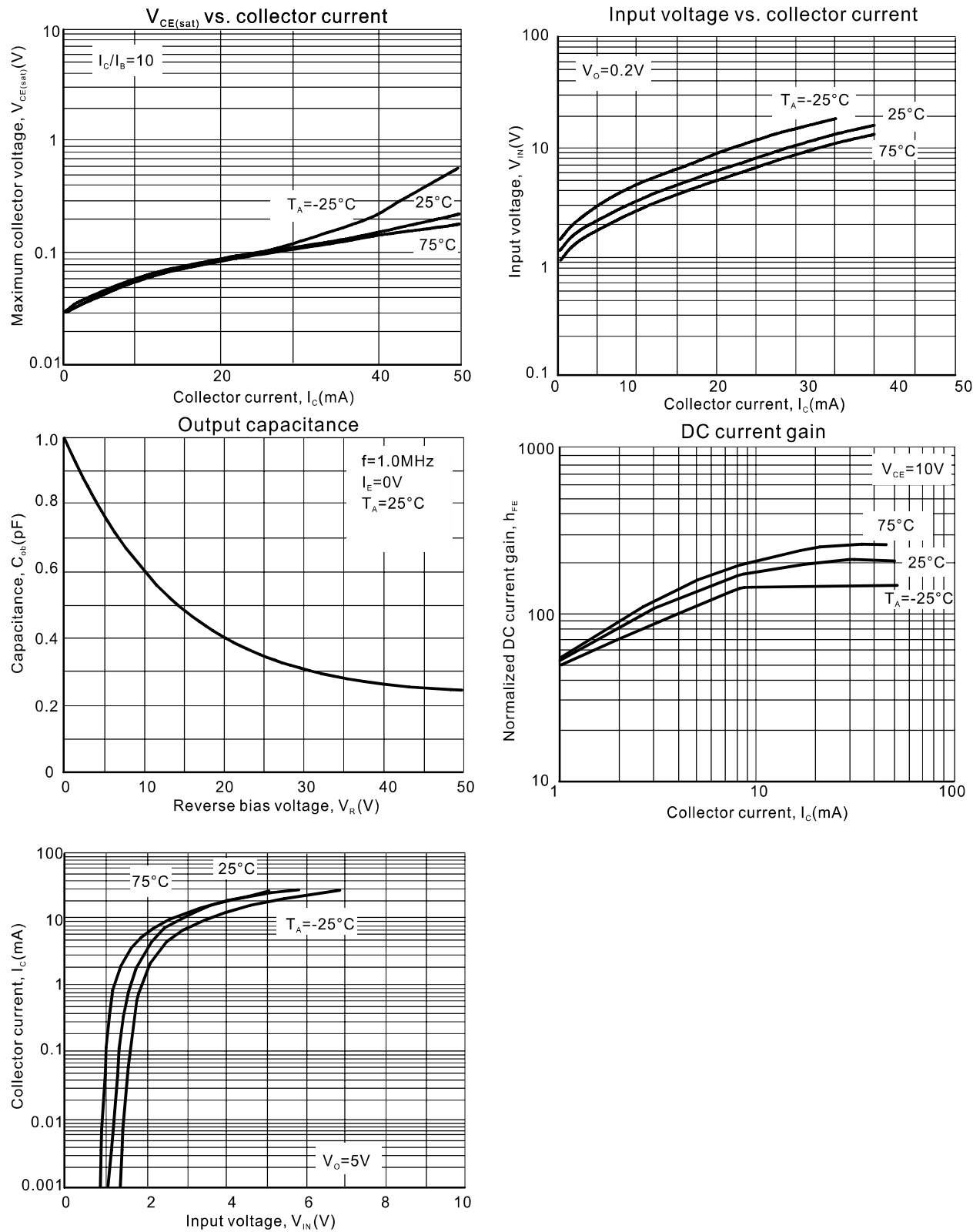
FMUN5211W-Q1 Thru FMUN5237W-Q1

Rating and characteristic curves



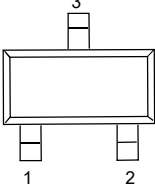
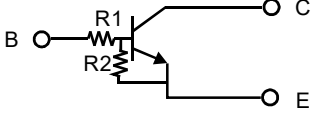
FMUN5211W-Q1 Thru FMUN5237W-Q1

Rating and characteristic curves



FMUN5211W-Q1 Thru FMUN5237W-Q1

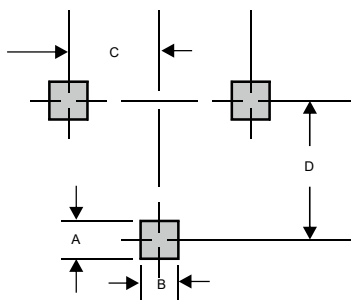
Pinning information

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

Marking and resistor values

Device	Marking	Input resistor R_1 (K Ω)			R_2 (K Ω)	Resistor ratio R_1 / R_2		
		Min	Normal	Max		Min	Normal	Max
FMUN5211W_Q1	8A	7.0	10	13	10	0.8	1.0	1.2
FMUN5212W_Q1	8B	15.4	22	28.6	22	0.8	1.0	1.2
FMUN5213W_Q1	8C	32.9	47	61.1	47	0.8	1.0	1.2
FMUN5214W_Q1	8D	7.0	10	13	47	0.17	0.21	0.25
FMUN5215W_Q1	8E	7.0	10	13	—	—	—	—
FMUN5216W_Q1	8F	3.3	4.7	6.1	—	—	—	—
FMUN5230W_Q1	8G	0.7	1.0	1.3	1	0.8	1.0	1.2
FMUN5231W_Q1	8H	1.5	2.2	2.9	2.2	0.8	1.0	1.2
FMUN5232W_Q1	8J	3.3	4.7	6.1	4.7	0.8	1.0	1.2
FMUN5233W_Q1	8K	3.3	4.7	6.1	47	0.055	0.1	0.185
FMUN5234W_Q1	8L	15.4	22	28.6	47	0.38	0.47	0.56
FMUN5235W_Q1	8M	1.54	2.2	2.86	47	0.038	0.047	0.056
FMUN5236W_Q1	8N	70	100	130	100	0.8	1.0	1.2
FMUN5237W_Q1	8P	32.9	47	61.1	22	1.7	2.1	2.6

Suggested solder pad layout

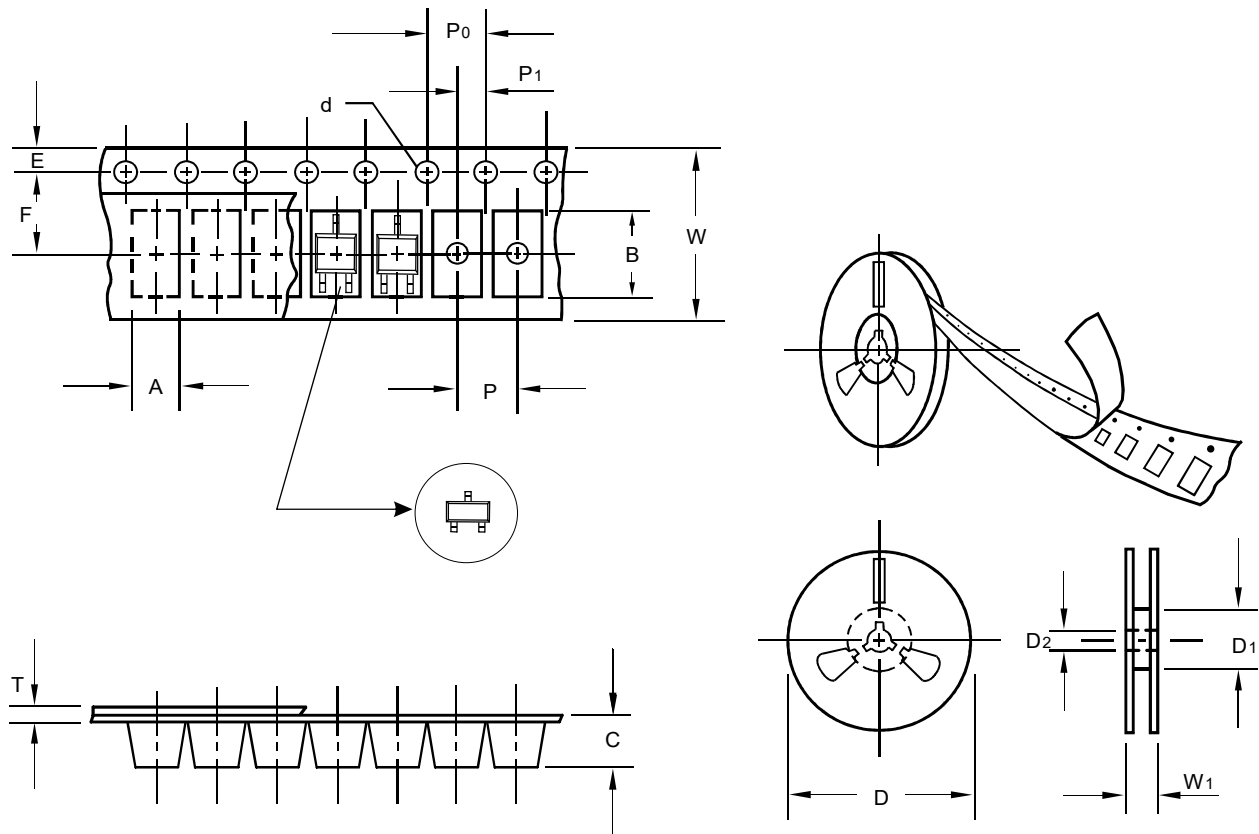


Dimensions in inches and (millimeters)

Package	A	B	C	D
SOT-323	0.032(0.80)	0.020(0.50)	0.025(0.65)	0.087(2.20)

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Packing information



unit:mm

Item	Symbol	Tolerance	SOT-323
Carrier width	A	0.1	2.25
Carrier length	B	0.1	2.55
Carrier depth	C	0.1	1.19
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	11.4

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

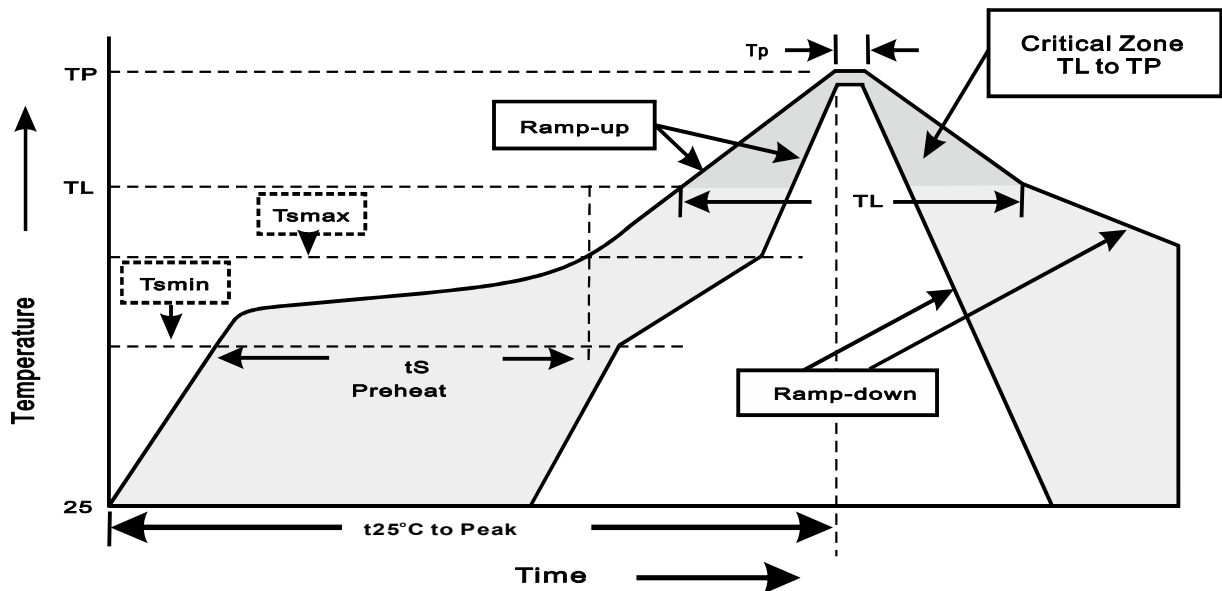
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Reel packing

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)
SOT-323	7"	3,000	4.0	30,000	183*123*183	178	382*257*387	240,000

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

FMUN5211W-Q1 Thru FMUN5237W-Q1**High reliability test capabilities**

Item Test	Conditions	Reference
1. MSL Preconditioning	24hr bake@125°C+168hrs@85°C /85%RH+3xIR@260°C+1flux immersion+alcohol+DI H2O rinse	JESD22-A113
2. Intermittent Operating Life	Ta=25°C, $\Delta T_j \geq 100^\circ\text{C}$ On/Off=2min Test Duration:1000hrs	MIL-STD-750E METHOD 1037
3. High Temperature Reverse Bias	VCE=80%B _{VCE0} (T _J =T _J max.)Test Duration:1000hrs	JESD22-A108
4. High Temperature Storage Life	Ta=150°C Test Duration:1000hrs	JESD22 A-103
5. Temperature Cycle	-55°C(15min) to 150°C(15min)Test Cycles:1000cycles	JESD22 A-104
6. Autoclave	P=2atm Ta=121°C RH=100% Test Duration:96hrs	JESD22 A-102
7. Solderability	245±5°C for 5sec	J-STD-002
8. Moisture Resistance	Ta=85°C/85%Relative humidity Test Duration:1000hrs	MIL-STD-750E METHOD 1021.2
9. Resistance To Solder Heat	260±5°C for 10sec	JESD22 B-106
10. High Temperature High Humidity Reverse Bias	Ta=85°C, 85%RH, VCE=80%B _{VCE0} Test Duration: 1000hrs	JESD22-A101