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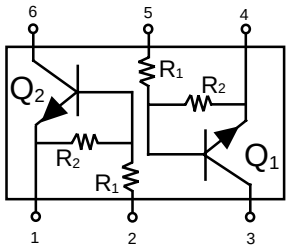
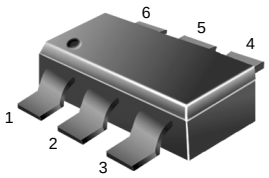
MUN52xxDW1T1 Series Dual Bias ResistorTransistors

NPN Silicon Surface Mount Transistors with Monolithic Bias Resistor Network





SOT– 363

The BRT (Bias Resistor Transistor) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base–emitter resistor. These digital transistors are designed to replace a single device and its external resistor bias network. The BRT eliminates these individual components by integrating them into a single device. In the MUN52xxDW1T1 series, two BRT devices are housed in the SOT–363 package which is ideal for low power surface mount applications where board space is at a premium.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 8 mm, 7 inch/3000 Unit Tape and Reel

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted, common for Q_1 and Q_2)

Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	50	Vdc
Collector-Emitter Voltage	V_{CEO}	50	Vdc
Collector Current	I_C	100	mAdc

THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation T_A = 25°C	P_D	187 (Note 1.) 256 (Note 2.)	mW
Derate above 25°C		1.5 (Note 1.) 2.0 (Note 2.)	mW/°C
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	670 (Note 1.) 490 (Note 2.)	°C/W
Characteristic (Both Junctions Heated)	**Symbol**	**Max**	**Unit**
Total Device Dissipation T_A = 25°C	P_D	250 (Note 1.) 385 (Note 2.)	mW
Derate above 25°C		2.0 (Note 1.) 3.0 (Note 2.)	mW/°C
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	493 (Note 1.) 325 (Note 2.)	°C/W
Thermal Resistance – Junction-to-Lead	$R_{\theta JL}$	188 (Note 1.) 208 (Note 2.)	°C/W
Junction and Storage Temperature	T_J, T_{stg}	–55 to +150	°C

1. FR–4 @ Minimum Pad 2. FR–4 @ 1.0 x 1.0 inch Pad

DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R_1(K)	R_2(K)
MUN5211DW1T1	SOT–363	7A	10	10
MUN5212DW1T1	SOT–363	7B	22	22
MUN5213DW1T1	SOT–363	7C	47	47
MUN5214DW1T1	SOT–363	7D	10	47
MUN5215DW1T1 (Note 3.)	SOT–363	7E	10	∞
MUN5216DW1T1 (Note 3.)	SOT–363	7F	4.7	∞
MUN5230DW1T1 (Note 3.)	SOT–363	7G	1.0	1.0
MUN5231DW1T1 (Note 3.)	SOT–363	7H	2.2	2.2
MUN5232DW1T1 (Note 3.)	SOT–363	7J	4.7	4.7
MUN5233DW1T1 (Note 3.)	SOT–363	7K	4.7	47
MUN5234DW1T1 (Note 3.)	SOT–363	7L	22	47
MUN5235DW1T1 (Note 3.)	SOT–363	7M	2.2	47
MUN5236DW1T1 (Note 3.)	SOT–363	7N	100	100
MUN5237DW1T1 (Note 3.)	SOT–363	7P	47	22

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q_1 and Q_2)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector-Base Cutoff Current	(V_{CB} = 50 V, I_E = 0)	I_{CBO}	–	–	100	nAdc
Collector-Emitter Cutoff Current	(V_{CE} = 50 V, I_B = 0)	I_{CEO}	–	–	500	nAdc
Emitter-Base Cutoff Current	MUN5211DW1T1	I_{EBO}	–	–	0.5	mAdc
(V_{EB} = 6.0 V, I_C = 0)	MUN5212DW1T1		–	–	0.2	
	MUN5213DW1T1		–	–	0.1	
	MUN5214DW1T1		–	–	0.2	
	MUN5215DW1T1		–	–	0.9	
	MUN5216DW1T1		–	–	1.9	
	MUN5230DW1T1		–	–	4.3	
	MUN5231DW1T1		–	–	2.3	
	MUN5232DW1T1		–	–	1.5	
	MUN5233DW1T1		–	–	0.18	
	MUN5234DW1T1		–	–	0.13	
	MUN5235DW1T1		–	–	0.2	
	MUN5236DW1T1		–	–	0.05	
	MUN5237DW1T1		–	–	0.13	
Collector-Base Breakdown Voltage (I_C = 10 μA, I_E = 0)		$V_{(BR)CBO}$	50	–	–	Vdc
Collector-Emitter Breakdown Voltage(Note 4.)(I_C = 2.0 mA,I_B=0)		$V_{(BR)CEO}$	50	–	–	Vdc

3. New resistor combinations. Updated curves to follow in subsequent data sheets.
4. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q_1 and Q_2,) (Continued)

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS(Note 5.)						
DC Current Gain	MUN5211DW1T1	h_{FE}	35	60	–	
(V_{CE} = 10 V, I_C = 5.0 mA)	MUN5212DW1T1		60	100	–	
	MUN5213DW1T1		80	140	–	
	MUN5214DW1T1		80	140	–	
	MUN5215DW1T1		160	350	–	
	MUN5216DW1T1		160	350	–	
	MUN5230DW1T1		3.0	5.0	–	
	MUN5231DW1T1		8.0	15	–	
	MUN5232DW1T1		15	30	–	
	MUN5233DW1T1		80	200	–	
	MUN5234DW1T1		80	150	–	
	MUN5235DW1T1		80	140	–	
	MUN5235DW1T1		80	150	–	
	MUN5235DW1T1		80	140	–	
Collector-Emitter Saturation Voltage (I_C= 10mA,I_B= 0.3 mA)		$V_{CE(sat)}$	–	–	0.25	Vdc
(I_C= 10mA, I_B= 5mA) MUN5230DW1T1/MUN5231DW1T1						
(I_C= 10mA, I_B= 1mA) MUN5215DW1T1/MUN5216DW1T1						
MUN5232DW1T1/MUN5233DW1T1/MUN5234DW1T1						
Output Voltage (on)		V_{OL}				Vdc
(V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)	MUN5211DW1T1		–	–	0.2	
	MUN5212DW1T1		–	–	0.2	
	MUN5214DW1T1		–	–	0.2	
	MUN5215DW1T1		–	–	0.2	
	MUN5216DW1T1		–	–	0.2	
	MUN5230DW1T1		–	–	0.2	
	MUN5231DW1T1		–	–	0.2	
	MUN5232DW1T1		–	–	0.2	
	MUN5233DW1T1		–	–	0.2	
	MUN5234DW1T1		–	–	0.2	
	MUN5235DW1T1		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 3.5 V, R_L = 1.0 kΩ)	MUN5213DW1T1		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 5.5 V, R_L = 1.0 kΩ)	MUN5236DW1T1		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 4.0 V, R_L = 1.0 kΩ)	MUN5237DW1T1		–	–	0.2	
Output Voltage (off) (V_{CC} = 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ)		V_{OH}	4.9	–	–	Vdc
(V_{CC} = 5.0 V, V_B = 0.05 V, R_L = 1.0 kΩ)	MUN5230DW1T1					
(V_{CC} = 5.0 V, V_B = 0.25 V, R_L = 1.0 kΩ)	MUN5215DW1T1					
	MUN5216DW1T1					
	MUN5233DW1T1					

5. Pulse Test: Pulse Width < 300 ms, Duty Cycle < 2.0%

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q_1 and Q_2,) (Continued)

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS(Note 6.)						
Input Resistor	MUN5211DW1T1	R_1	7.0	10	13	kΩ
	MUN5212DW1T1		15.4	22	28.6	
	MUN5213DW1T1		32.9	47	61.1	
	MUN5214DW1T1		7.0	10	13	
	MUN5215DW1T1		7.0	10	13	
	MUN5216DW1T1		3.3	4.7	6.1	
	MUN5230DW1T1		0.7	1.0	1.3	
	MUN5231DW1T1		1.5	2.2	2.9	
	MUN5232DW1T1		3.3	4.7	6.1	
	MUN5233DW1T1		3.3	4.7	6.1	
	MUN5234DW1T1		15.4	22	28.6	
	MUN5235DW1T1		1.54	2.2	2.86	
	MUN5236DW1T1		70	100	130	
	MUN5237DW1T1		32.9	47	61.1	
Resistor Ratio	MUN5211DW1T1/MUN5212DW1T1/ MUN5213DW1T1/MUN5236DW1T1	R_1/R_2	0.8	1.0	1.2	
	MUN5214DW1T1		0.17	0.21	0.25	
	MUN5215DW1T1/MUN5216DW1T1		–	–	–	
	MUN5230DW1T1/MUN5231DW1T1/MUN5232DW1T1		0.8	1.0	1.2	
	MUN5233DW1T1		0.055	0.1	0.185	
	MUN5234DW1T1		0.38	0.47	0.56	
	MUN5235DW1T1		0.038	0.047	0.056	
	MUN5237DW1T1		1.7	2.1	2.6	

6. Pulse Test: Pulse Width < 300 ms, Duty Cycle < 2.0%

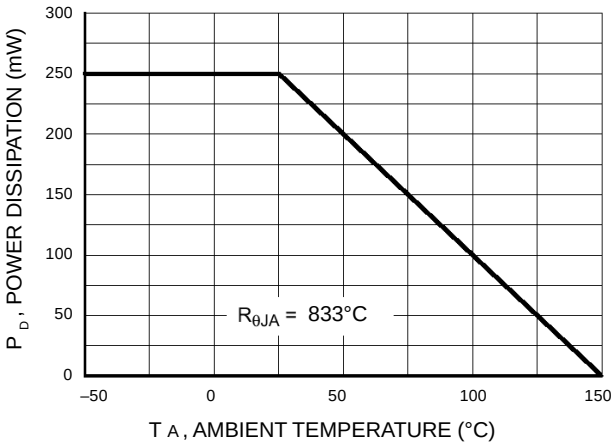


Figure 1. Derating Curve

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5211DW1T1

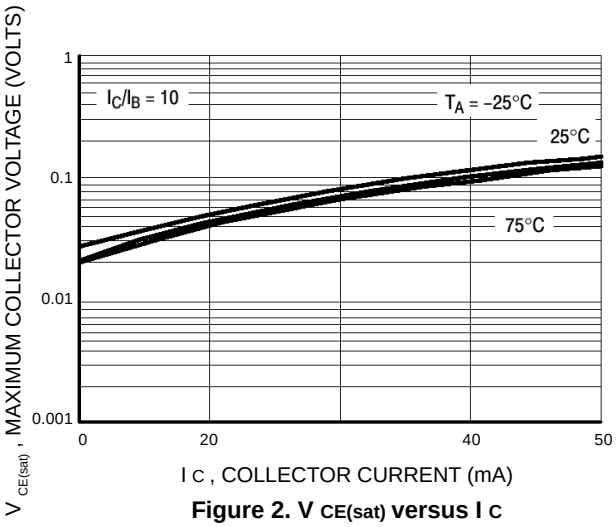


Figure 2. V CE(sat) versus I C

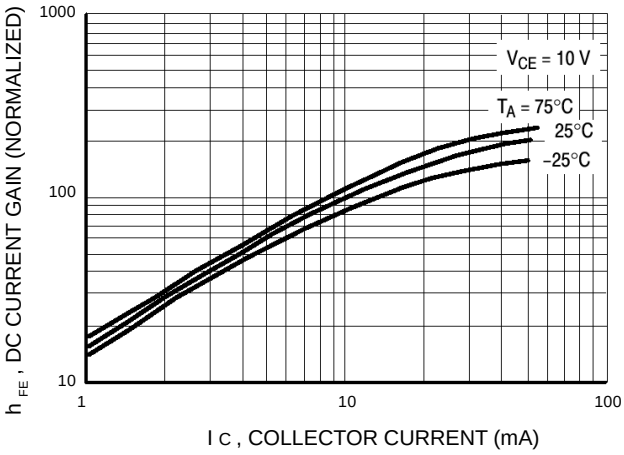


Figure 3. DC Current Gain

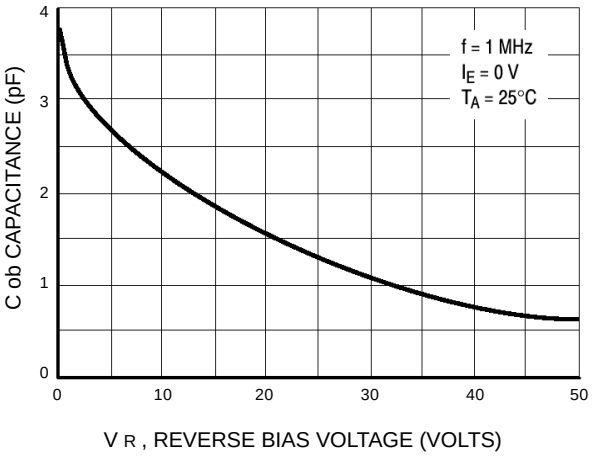


Figure 4. Output Capacitance

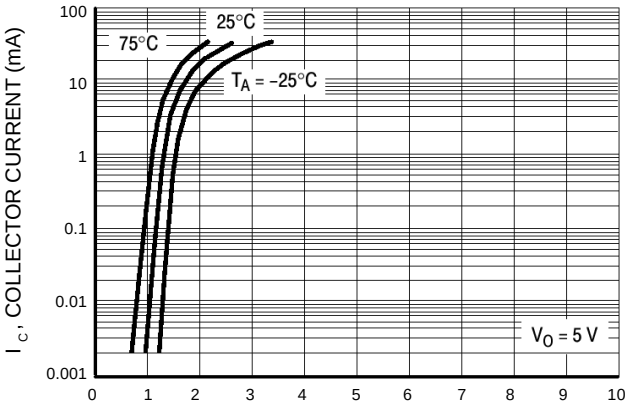


Figure 5. Output Current versus Input Voltage

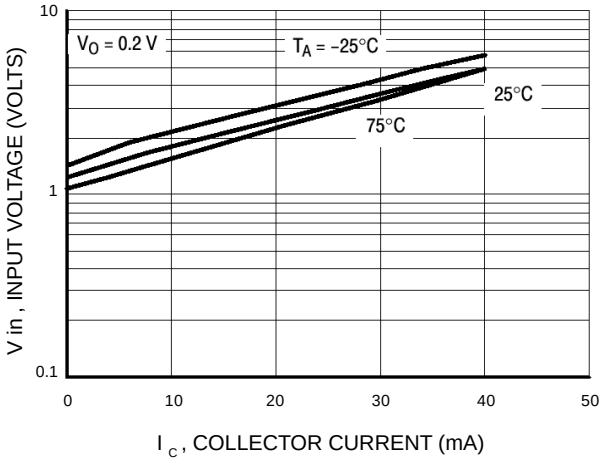


Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5212DW1T1

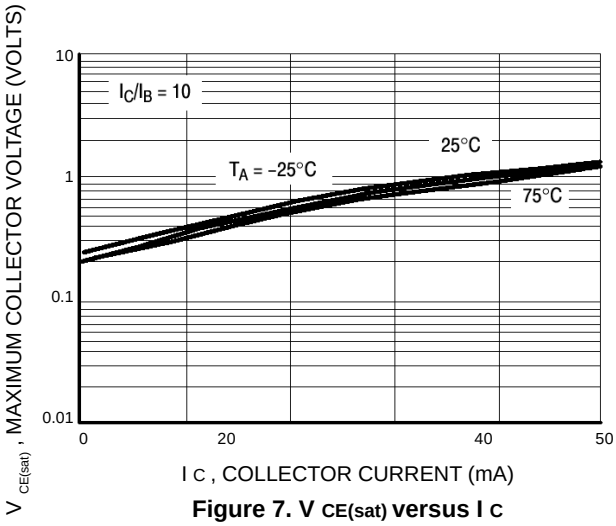


Figure 7. $V_{CE(sat)}$ versus I_C

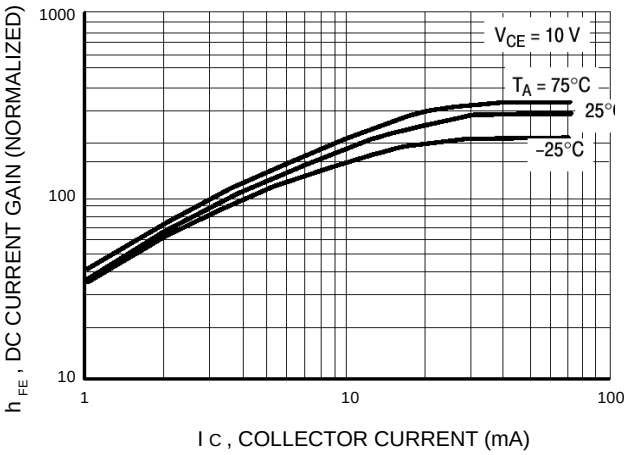


Figure 8. DC Current Gain

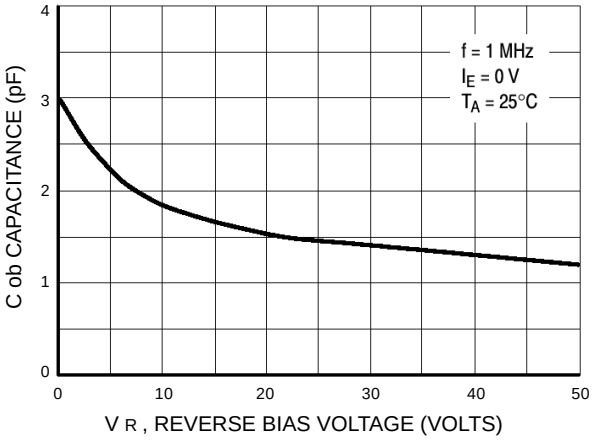


Figure 9. Output Capacitance

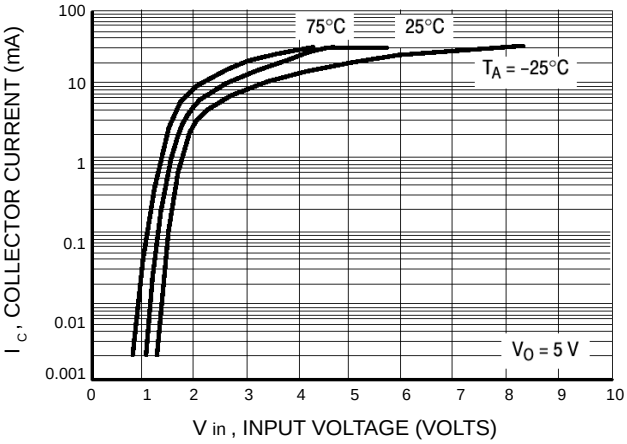


Figure 10. Output Current versus Input oltage

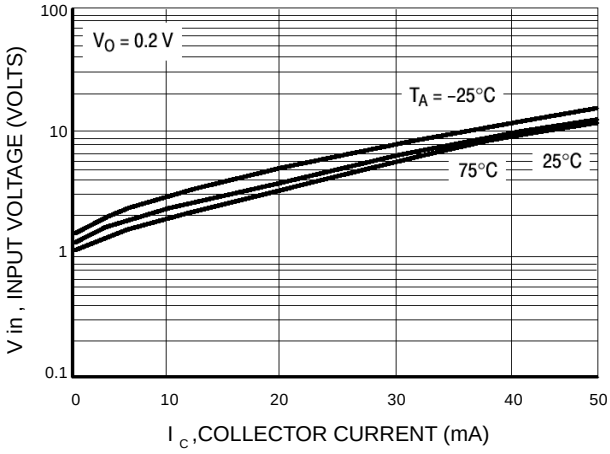


Figure 11. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5213DW1T1

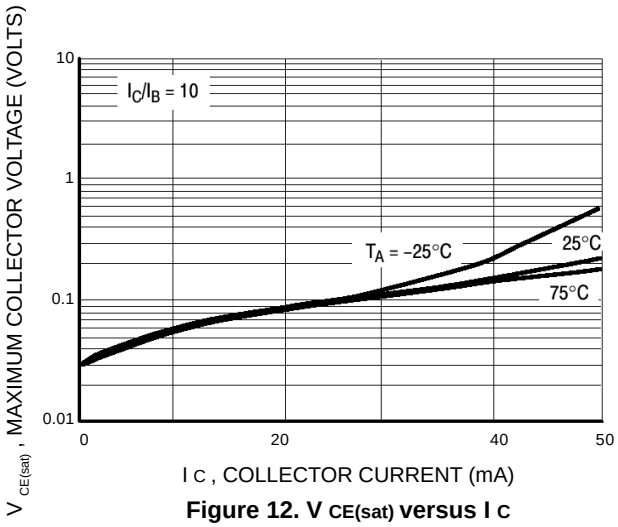


Figure 12. V CE(sat) versus I C

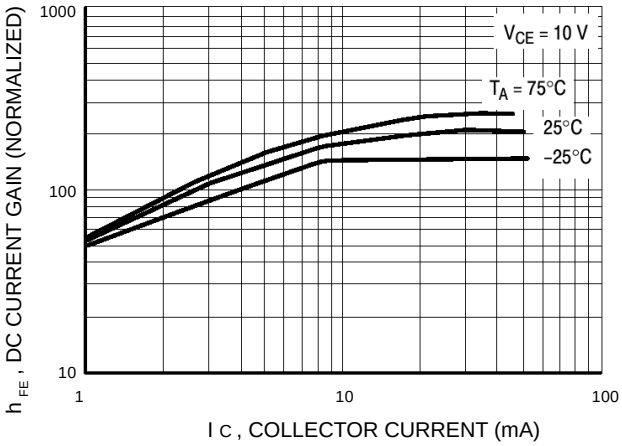


Figure 13. DC Current Gain

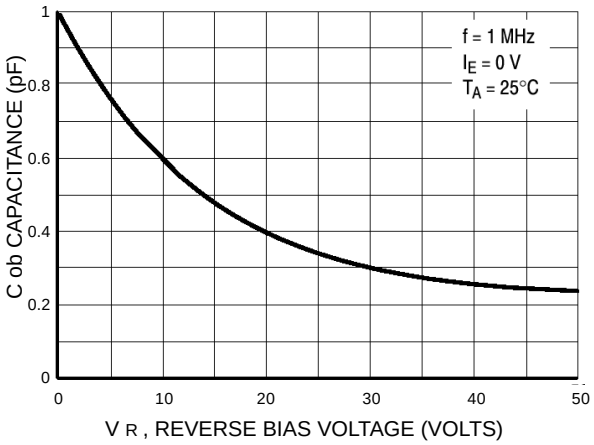


Figure 14. Output Capacitance

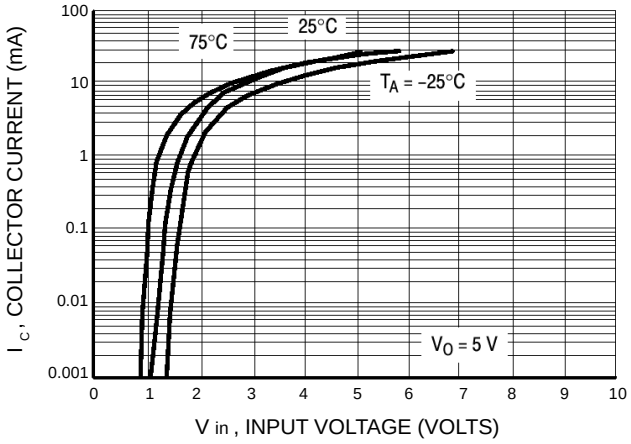


Figure 15. Output Current versus Input oltage

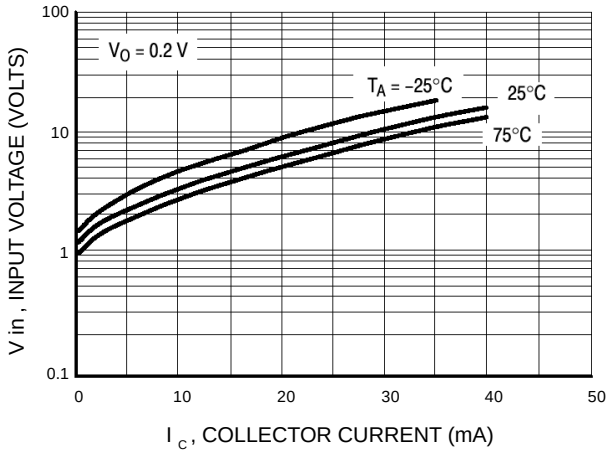


Figure 16. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5214DW1T1

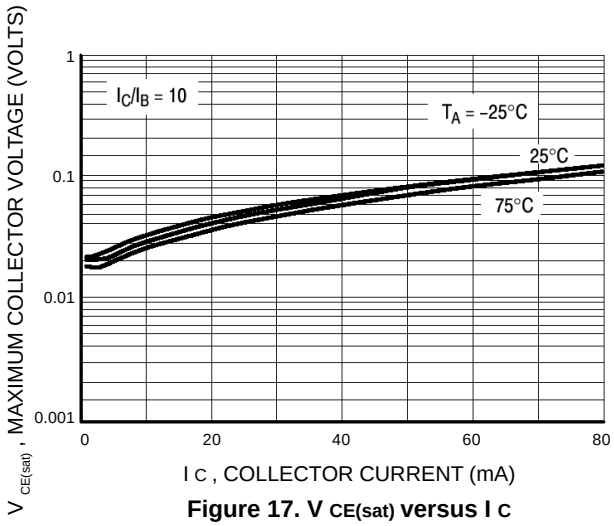


Figure 17. $V_{CE(sat)}$ versus I_C

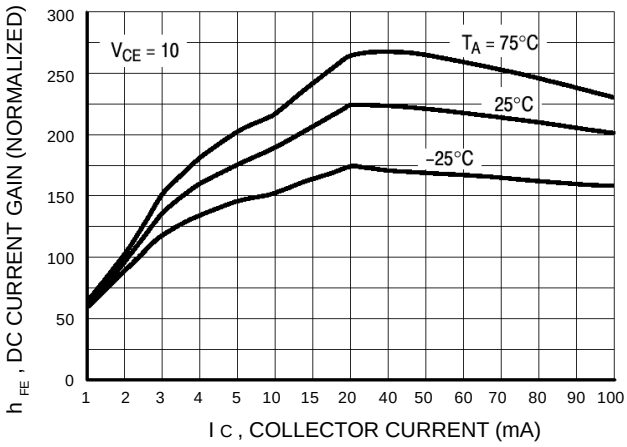


Figure 18. DC Current Gain

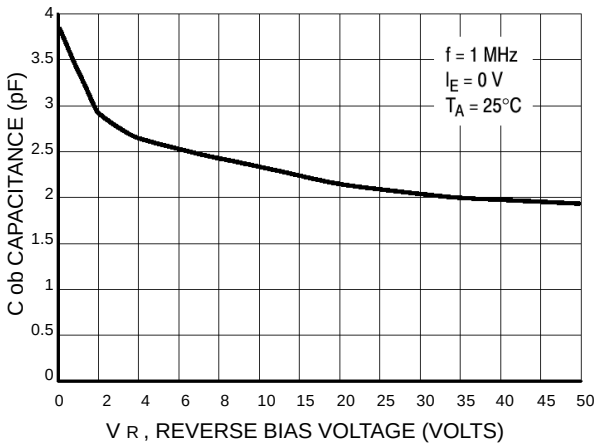


Figure 19. Output Capacitance

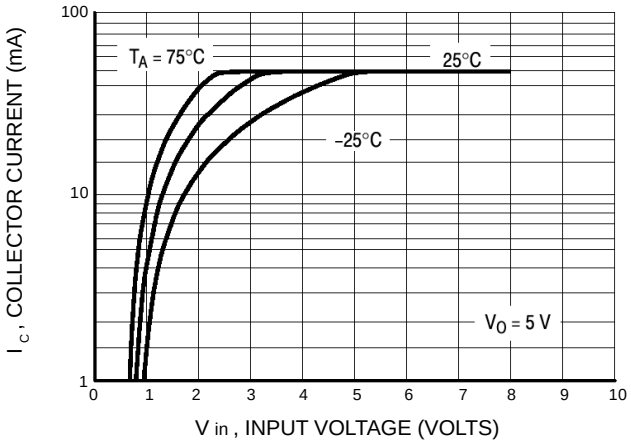


Figure 20. Output Current versus Input oltage

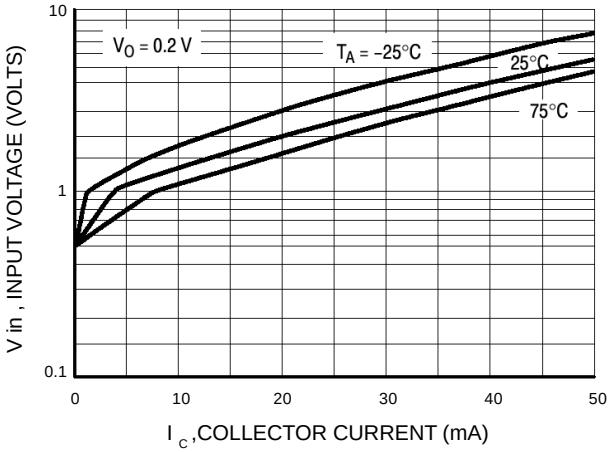


Figure 21. Input Voltage versus Output Current

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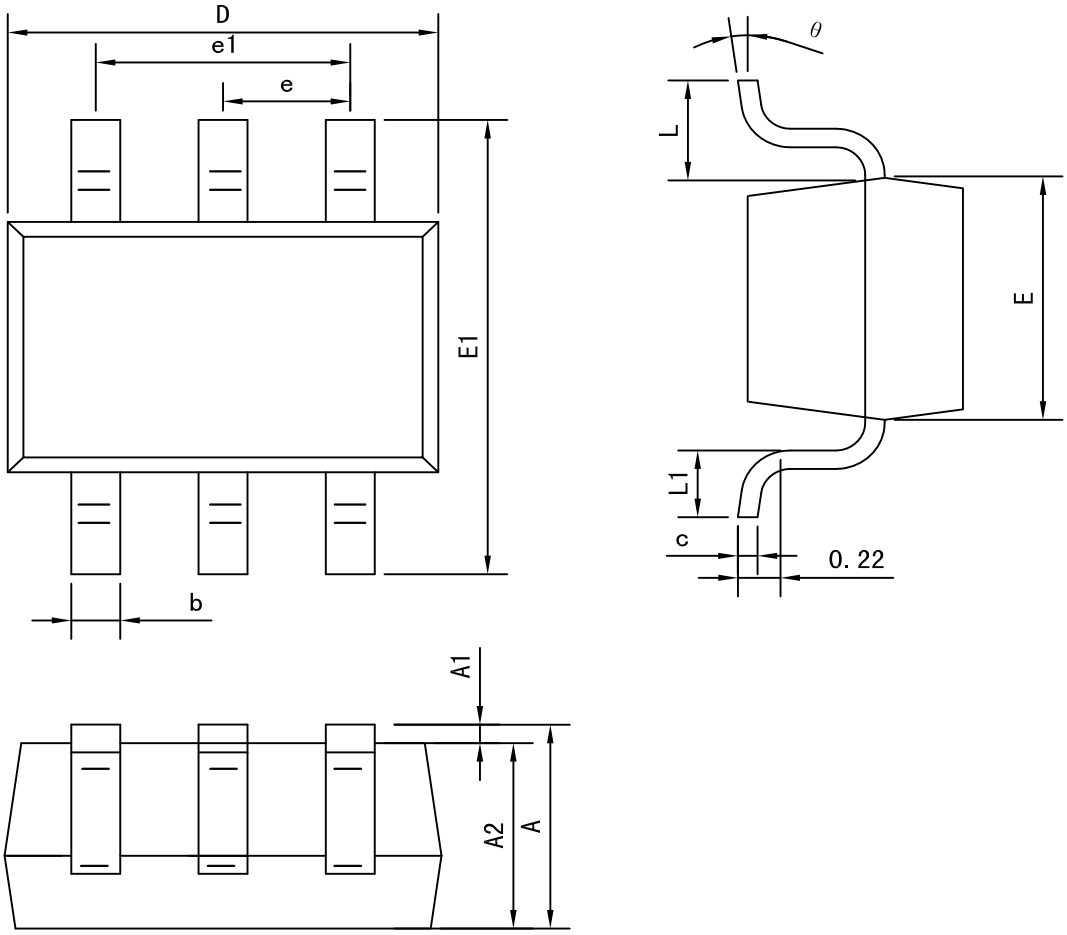
SOT-363 Package outline dimensions



Symbol	Dimension in Millimeters	
	Min	**Max**
A	0.900	1.100
A1	0.000	0.100
A2	0.900	1.000
b	0.150	0.350
c	0.080	0.150
D	2.000	2.200
E	1.150	1.350
E1	2.150	2.450
e	0.650 TYP	
e1	1.200	1.400
L	0.525 REF	
L1	0.260	0.460
θ	0°	8°

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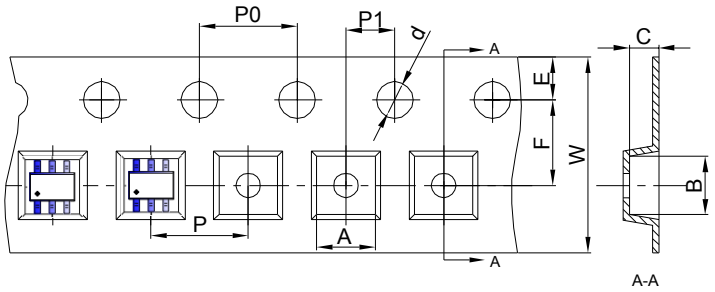
SOT-363 Embossed Carrier Tape



Packaging Description:

SOT-363 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 17.8cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT-363	2.25	2.55	1.20	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT-363 Tape Leader and Trailer