

# MPSW45, MPSW45A

## One Watt Darlington Transistors

### NPN Silicon

#### Features

- Pb-Free Packages are Available\*

#### MAXIMUM RATINGS

Rating		Symbol	Value	Unit
Collector - Emitter Voltage	MPSW45 MPSW45A	$V_{CES}$	40 50	Vdc
Collector - Base Voltage	MPSW45 MPSW45A	$V_{CBO}$	50 60	Vdc
Emitter - Base Voltage		$V_{EBO}$	12	Vdc
Collector Current - Continuous		$I_C$	1.0	Adc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$		$P_D$	1.0 8.0	W mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$		$P_D$	2.5 20	W mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range		$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

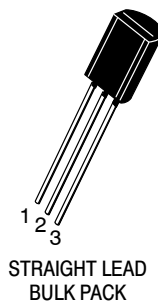
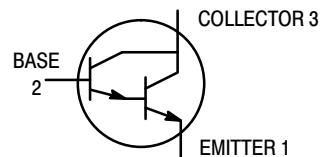
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	125	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	50	$^\circ\text{C/W}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

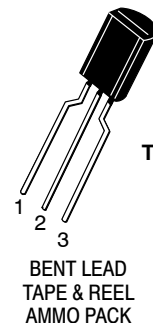


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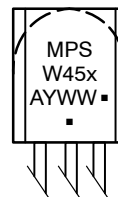


STRAIGHT LEAD  
BULK PACK



TO-92 1 WATT  
(TO-226)  
CASE 29-10  
STYLE 1

#### MARKING DIAGRAM



MPSW45x = Device Code

x = 45A Devices

A = Assembly Location

Y = Year

WW = Work Week

■ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# MPSW45, MPSW45A

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector – Emitter Breakdown Voltage ( $I_C = 100\ \mu\text{Adc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	40 50	– –	Vdc
Collector – Base Breakdown Voltage ( $I_C = 100\ \mu\text{Adc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	50 60	– –	Vdc
Emitter – Base Breakdown Voltage ( $I_E = 10\ \mu\text{Adc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	12	–	Vdc
Collector Cutoff Current ( $V_{CB} = 30\ \text{Vdc}$ , $I_E = 0$ ) ( $V_{CB} = 40\ \text{Vdc}$ , $I_E = 0$ )	$I_{CBO}$	– –	100 100	nAdc
Emitter Cutoff Current ( $V_{EB} = 10\ \text{Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	100	nAdc

## ON CHARACTERISTICS (Note 1)

DC Current Gain ( $I_C = 200\ \text{mAdc}$ , $V_{CE} = 5.0\ \text{Vdc}$ ) ( $I_C = 500\ \text{mAdc}$ , $V_{CE} = 5.0\ \text{Vdc}$ ) ( $I_C = 1.0\ \text{Adc}$ , $V_{CE} = 5.0\ \text{Vdc}$ )	$h_{FE}$	25,000 15,000 4,000	150,000 – –	–
Collector – Emitter Saturation Voltage ( $I_C = 1.0\ \text{Adc}$ , $I_B = 2.0\ \text{mAdc}$ )	$V_{CE(sat)}$	–	1.5	Vdc
Base – Emitter Saturation Voltage ( $I_C = 1.0\ \text{Adc}$ , $I_B = 2.0\ \text{mAdc}$ )	$V_{BE(sat)}$	–	2.0	Vdc
Base – Emitter On Voltage ( $I_C = 1.0\ \text{Adc}$ , $V_{CE} = 5.0\ \text{Vdc}$ )	$V_{BE(on)}$	–	2.0	Vdc

## SMALL – SIGNAL CHARACTERISTICS

Current – Gain – Bandwidth Product ( $I_C = 200\ \text{mAdc}$ , $V_{CE} = 5.0\ \text{Vdc}$ , $f = 100\ \text{MHz}$ )	$f_T$	100	–	MHz
Collector – Base Capacitance ( $V_{CB} = 10\ \text{Vdc}$ , $I_E = 0$ , $f = 1.0\ \text{MHz}$ )	$C_{cb}$	–	6.0	pF

1. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ ; Duty Cycle  $\leq 2.0\%$ .

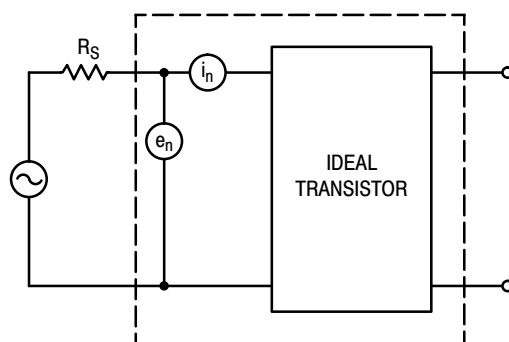
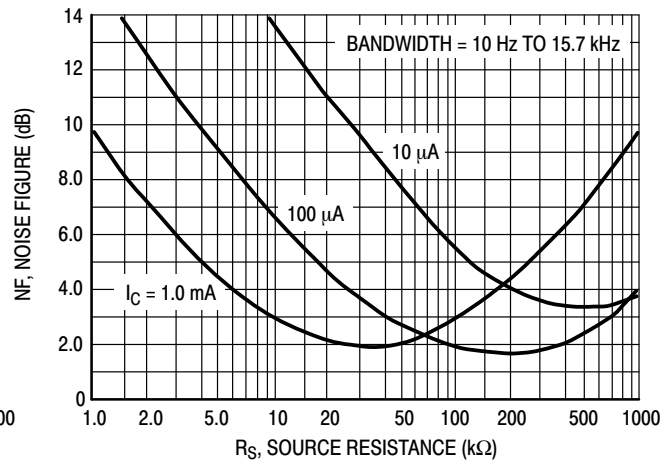
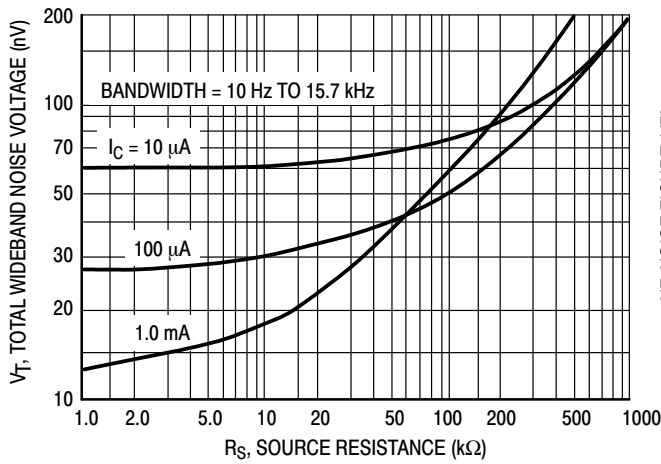
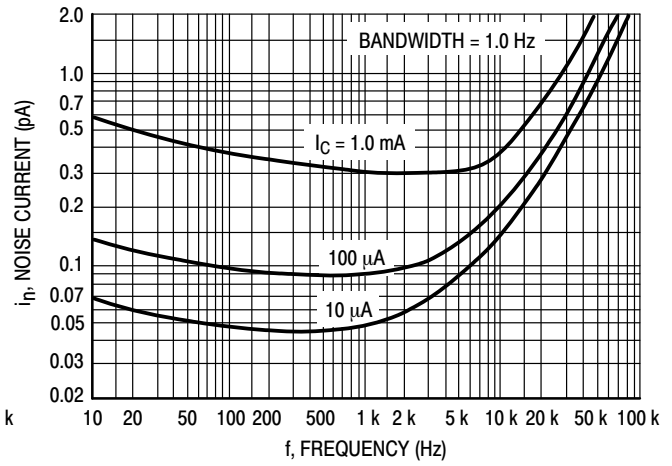
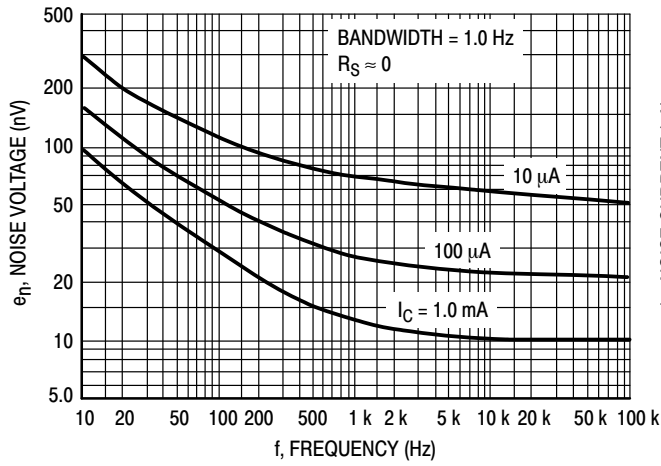


Figure 1. Transistor Noise Model

# MPSW45, MPSW45A

## NOISE CHARACTERISTICS

( $V_{CE} = 5.0 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ )



# MPSW45, MPSW45A

## SMALL-SIGNAL CHARACTERISTICS

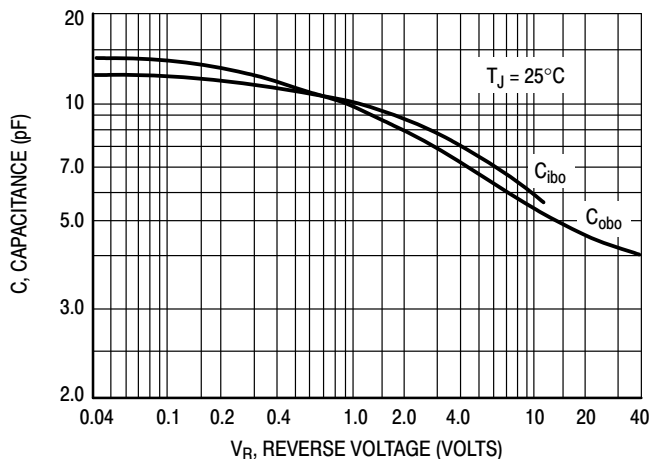


Figure 6. Capacitance

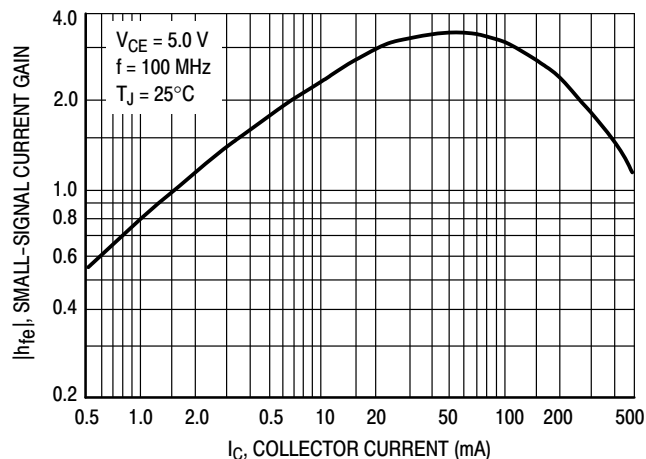


Figure 7. High Frequency Current Gain

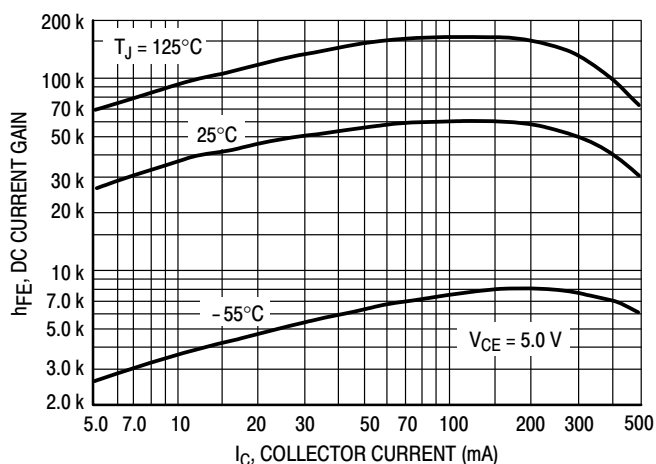


Figure 8. DC Current Gain

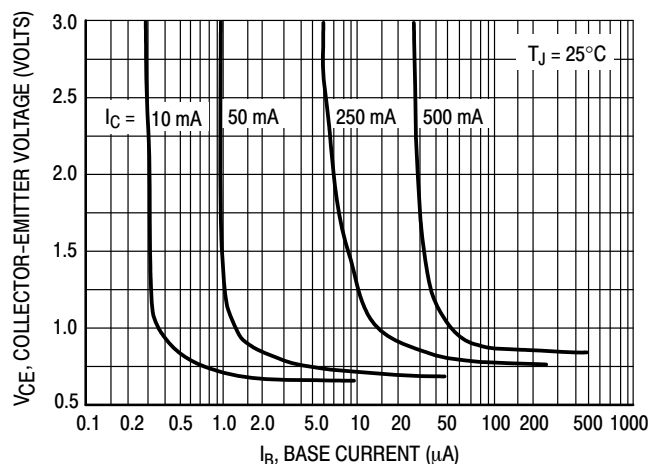


Figure 9. Collector Saturation Region

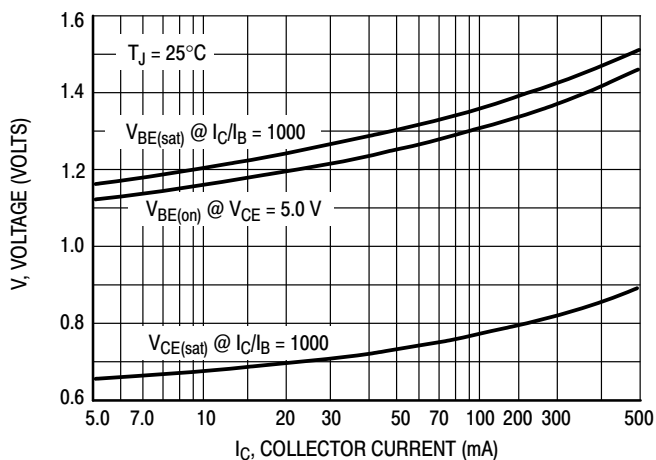


Figure 10. "On" Voltages

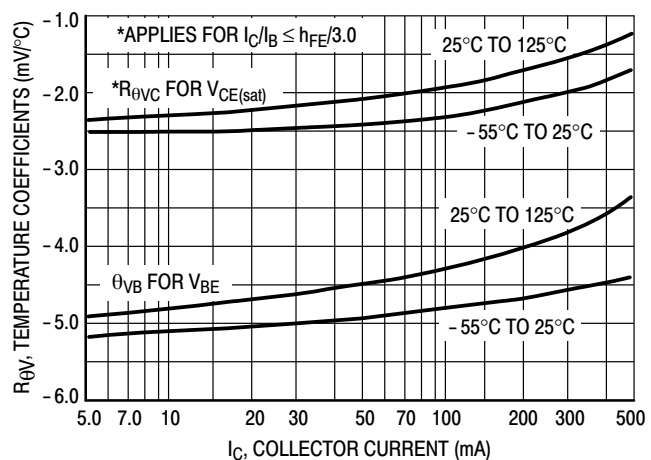


Figure 11. Temperature Coefficients

## MPSW45, MPSW45A

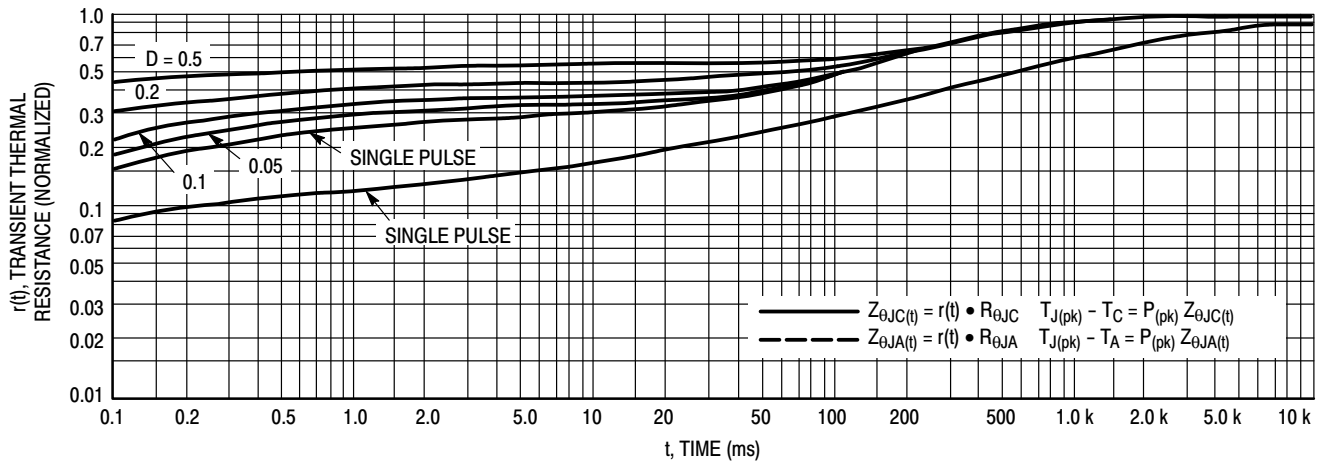


Figure 12. Thermal Response

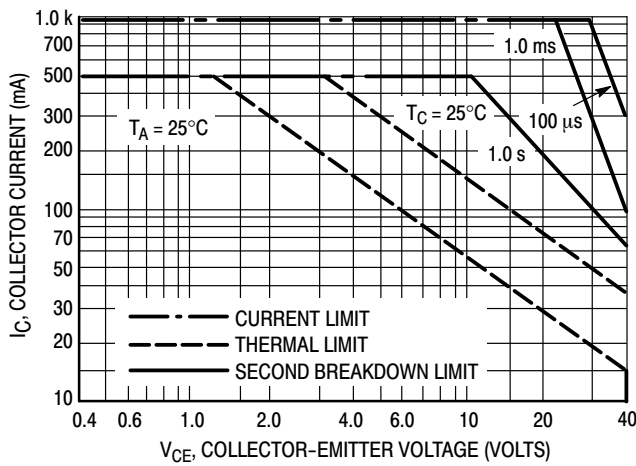
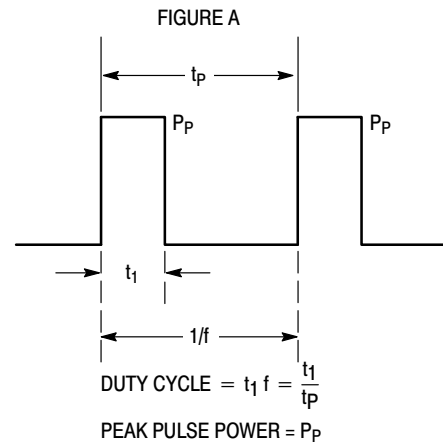


Figure 13. Active Region Safe Operating Area



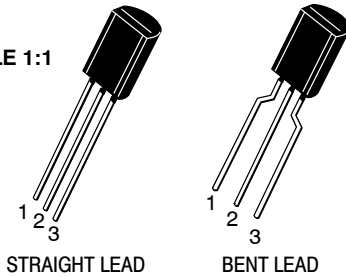
Design Note: Use of Transient Thermal Resistance Data

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MPSW45G	TO-92 (Pb-Free)	5,000 Units / Box
MPSW45RLREG	TO-92 (Pb-Free)	2,000 / Tape & Reel
MPSW45A	TO-92	5,000 Units / Box
MPSW45AG	TO-92 (Pb-Free)	5,000 Units / Box
MPSW45ARLRA	TO-92	2,000 / Tape & Reel
MPSW45ARLRAG	TO-92 (Pb-Free)	2,000 / Tape & Reel
MPSW45AZL1	TO-92	2,000 / Ammo Pack
MPSW45AZL1G	TO-92 (Pb-Free)	2,000 / Ammo Pack

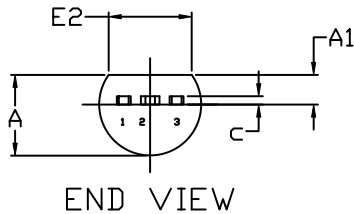
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

SCALE 1:1

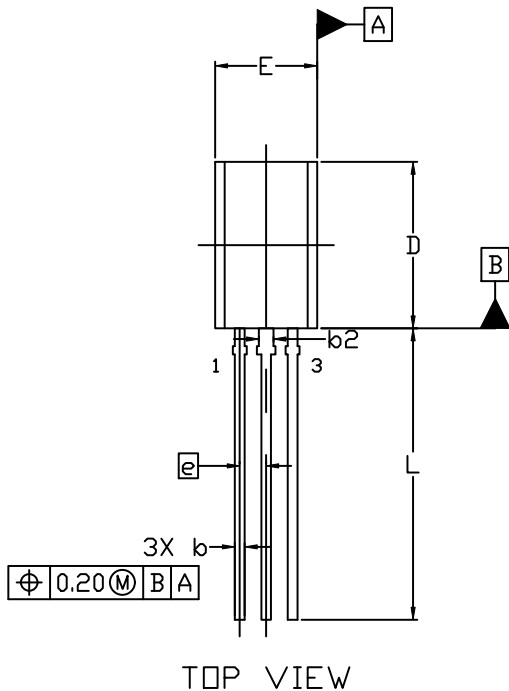

**TO-92 (TO-226) 1 WATT**  
CASE 29-10  
ISSUE D

DATE 05 MAR 2021

## STRAIGHT LEAD



END VIEW



TOP VIEW

### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR GATE PROTRUSIONS.
4. DIMENSION b AND b2 DOES NOT INCLUDE DAMBAR PROTRUSION. LEAD WIDTH INCLUDING PROTRUSION SHALL NOT EXCEED 0.20. DIMENSION b2 LOCATED ABOVE THE DAMBAR PORTION OF MIDDLE LEAD.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	3.75	3.90	4.05
A1	1.28	1.43	1.58
b	0.38	0.465	0.55
b2	0.62	0.70	0.78
c	0.35	0.40	0.45
D	7.85	8.00	8.15
E	4.75	4.90	5.05
E2	3.90	---	---
e	1.27 BSC		
L	13.80	14.00	14.20

## STYLES AND MARKING ON PAGE 3

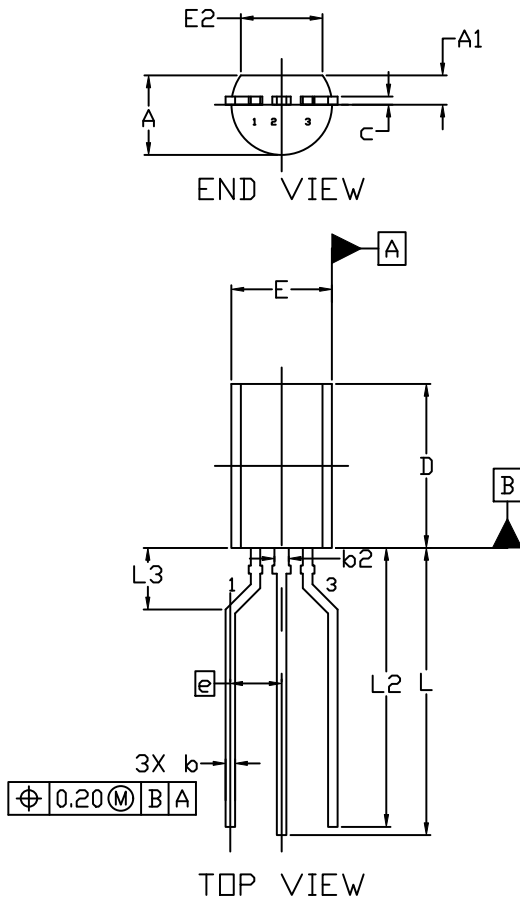
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CASE 29-10  
ISSUE D

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**FORMED LEAD**



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
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c	0.35	0.40	0.45
D	7.85	8.00	8.15
E	4.75	4.90	5.05
E2	3.90	---	---
e	2.50 BSC		
L	13.80	14.00	14.20
L2	13.20	13.60	14.00
L3	3.00 REF		

**STYLES AND MARKING ON PAGE 3**

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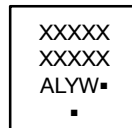
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**CASE 29-10**  
**ISSUE D**

DATE 05 MAR 2021

STYLE 1: PIN 1. EMITTER 2. BASE 3. COLLECTOR	STYLE 2: PIN 1. BASE 2. EMITTER 3. COLLECTOR	STYLE 3: PIN 1. ANODE 2. ANODE 3. CATHODE	STYLE 4: PIN 1. CATHODE 2. CATHODE 3. ANODE	STYLE 5: PIN 1. DRAIN 2. SOURCE 3. GATE
STYLE 6: PIN 1. GATE 2. SOURCE & SUBSTRATE 3. DRAIN	STYLE 7: PIN 1. SOURCE 2. DRAIN 3. GATE	STYLE 8: PIN 1. DRAIN 2. GATE 3. SOURCE & SUBSTRATE	STYLE 9: PIN 1. BASE 1 2. EMITTER 3. BASE 2	STYLE 10: PIN 1. CATHODE 2. GATE 3. ANODE
STYLE 11: PIN 1. ANODE 2. CATHODE & ANODE 3. CATHODE	STYLE 12: PIN 1. MAIN TERMINAL 1 2. GATE 3. MAIN TERMINAL 2	STYLE 13: PIN 1. ANODE 1 2. GATE 3. CATHODE 2	STYLE 14: PIN 1. EMITTER 2. COLLECTOR 3. BASE	STYLE 15: PIN 1. ANODE 1 2. CATHODE 3. ANODE 2
STYLE 16: PIN 1. ANODE 2. GATE 3. CATHODE	STYLE 17: PIN 1. COLLECTOR 2. BASE 3. EMITTER	STYLE 18: PIN 1. ANODE 2. CATHODE 3. NOT CONNECTED	STYLE 19: PIN 1. GATE 2. ANODE 3. CATHODE	STYLE 20: PIN 1. NOT CONNECTED 2. CATHODE 3. ANODE
STYLE 21: PIN 1. COLLECTOR 2. EMITTER 3. BASE	STYLE 22: PIN 1. SOURCE 2. GATE 3. DRAIN	STYLE 23: PIN 1. GATE 2. SOURCE 3. DRAIN	STYLE 24: PIN 1. EMITTER 2. COLLECTOR/ANODE 3. CATHODE	STYLE 25: PIN 1. MT 1 2. GATE 3. MT 2
STYLE 26: PIN 1. V <sub>CC</sub> 2. GROUND 2 3. OUTPUT	STYLE 27: PIN 1. MT 2. SUBSTRATE 3. MT	STYLE 28: PIN 1. CATHODE 2. ANODE 3. GATE	STYLE 29: PIN 1. NOT CONNECTED 2. ANODE 3. CATHODE	STYLE 30: PIN 1. DRAIN 2. GATE 3. SOURCE
STYLE 31: PIN 1. GATE 2. DRAIN 3. SOURCE	STYLE 32: PIN 1. BASE 2. COLLECTOR 3. EMITTER	STYLE 33: PIN 1. RETURN 2. INPUT 3. OUTPUT	STYLE 34: PIN 1. INPUT 2. GROUND 3. LOGIC	STYLE 35: PIN 1. GATE 2. COLLECTOR 3. EMITTER

**GENERIC  
MARKING DIAGRAM\***



XXXX = Specific Device Code  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week  
■ = Pb-Free Package

(Note: Microdot may be in either location)

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

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