

RFD3055, RFD3055SM RFP3055

12A, 60V, Avalanche Rated, N-Channel Enhancement-Mode Power MOSFETs (MegaFETs)

February 1994

Features

- 12A, 60V
- $r_{DS(ON)} = 0.150\Omega$
- *Temperature Compensating* PSPICE Model
- Peak Current vs Pulse Width Curve
- UIS Rating Curve
- +175°C Operating Temperature

Description

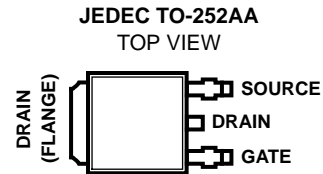
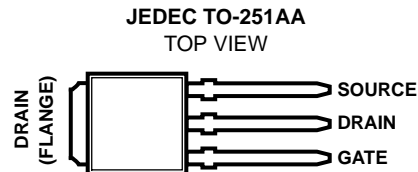
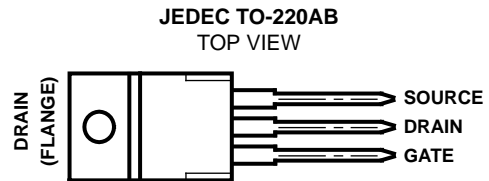
The RFD3055, RFD3055SM and RFP3055 N-Channel power MOSFETs are manufactured using the MegaFET process. This process, which uses feature sizes approaching those of LSI integrated circuits gives optimum utilization of silicon, resulting in outstanding performance. They were designed for use in applications such as switching regulators, switching converters, motor drivers, relay drivers and emitter switches for bipolar transistors. These transistors can be operated directly from integrated circuits.

The RFD3055 is supplied in the JEDEC TO-220AB plastic package, the RFD3055SM is supplied in the JEDEC TO-252AA plastic package and the RFP3055 is supplied in the JEDEC TO-251AA plastic package. Due to space limitations the RFD3055 and RFD3055SM are branded FD3055.

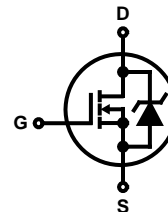
When ordering use the entire part number; eg. RFD3055SM.

Developmental type TA49082.

Packaging



Symbol



Absolute Maximum Ratings (T_C = +25°C), Unless Otherwise Specified

	RFD3055, RFD3055SM, RFP3055	UNITS
Drain Source Voltage	V _{DSS} 60	V
Drain Gate Voltage	V _{DGR} 60	V
Gate Source Voltage	V _{GS} ±20	V
Drain Current		
RMS Continuous	I _D 12	A
Pulsed Drain Current	I _{DM} Refer to Peak Current Curve	
Pulsed Avalanche Rating	E _{AS} Refer to UIS Curve	
Maximum Avalanche Current	I _{AM} 30	A
Power Dissipation		
T _C = +25°C	P _D 53	W
Derate above +25°C	P _T 0.357	W/°C
Operating and Storage Temperature	T _{STG} , T _J -55 to +175	°C

Specifications RFD3055, RFD3055SM, RFP3055

Electrical Specifications $T_C = +25^\circ\text{C}$, Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNITS	
			MIN	TYP	MAX		
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D = 0.25\text{mA}$, $V_{GS} = 0\text{V}$	60	-	-	V	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$, $I_D = 0.25\text{mA}$	2	-	4	V	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60\text{V}$, $V_{GS} = 0\text{V}$	$T_C = +25^\circ\text{C}$	-	-	1	μA
			$T_C = +150^\circ\text{C}$	-	-	50	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{V}$	-	-	100	nA	
On Resistance	$r_{DS(ON)}$	$I_D = 12\text{A}$, $V_{GS} = 10\text{V}$	-	-	0.150	W	
Turn-On Time	t_{ON}	$V_{DD} = 30\text{V}$, $I_D = 12\text{A}$ $R_L = 2.5\Omega$, $V_{GS} = +10\text{V}$ $R_{GS} = 10\Omega$	-	-	40	ns	
Turn-On Delay Time	$t_{D(ON)}$		-	7	-	ns	
Rise Time	t_R		-	21	-	ns	
Turn-Off Delay Time	$t_{D(OFF)}$		-	16	-	ns	
Fall Time	t_F		-	10	-	ns	
Turn-Off Time	t_{OFF}		-	-	40	ns	
Total Gate Charge	$Q_{G(TOT)}$		$V_{GS} = 0$ to 20V	$V_{DD} = 48\text{V}$, $I_D = 12\text{A}$, $R_L = 4\Omega$	-	19	23
Gate Charge at 10V	$Q_{G(10)}$	$V_{GS} = 0$ to 10V	-		10	12	nC
Threshold Gate Charge	$Q_{G(TH)}$	$V_{GS} = 0$ to 2V	-		0.6	0.8	nC
Plateau Voltage	$V_{(PLATEAU)}$	$I_D = 12\text{A}$, $V_{DS} = 15\text{V}$	-	-	7.5	V	
Input Capacitance	C_{ISS}	$V_{DS} = 25\text{V}$, $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	300	-	pF	
Output Capacitance	C_{OSS}		-	100	-	pF	
Reverse Transfer Capacitance	C_{RSS}		-	30	-	pF	
Thermal Resistance Junction to Case	$R_{\theta JC}$		-	-	2.8	$^\circ\text{C/W}$	
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	TO-251 and TO-252 Package	-	-	100	$^\circ\text{C/W}$	
		TO-220 Package	-	-	80	$^\circ\text{C/W}$	

Source-Drain Diode Ratings and Characteristics

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNITS
			MIN	TYP	MAX	
Forward Voltage	V_{SD}	$I_{SD} = 12\text{A}$	-	-	1.5	V
Reverse Recovery Time	t_{RR}	$I_{SD} = 12\text{A}$, $di_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	100	ns

Typical Performance Curves

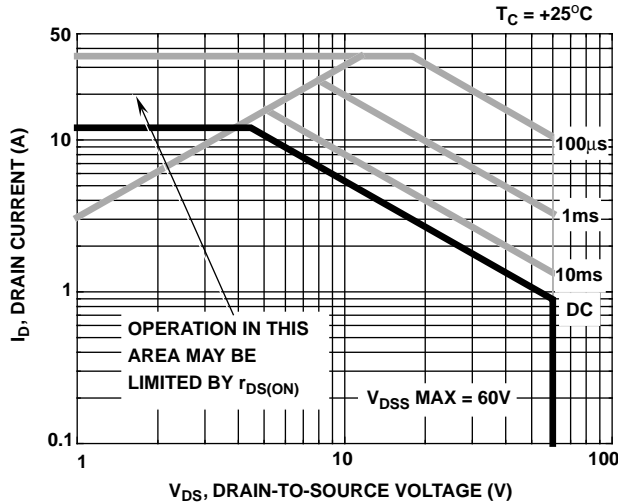


FIGURE 1. SAFE- OPERATING AREA CURVE

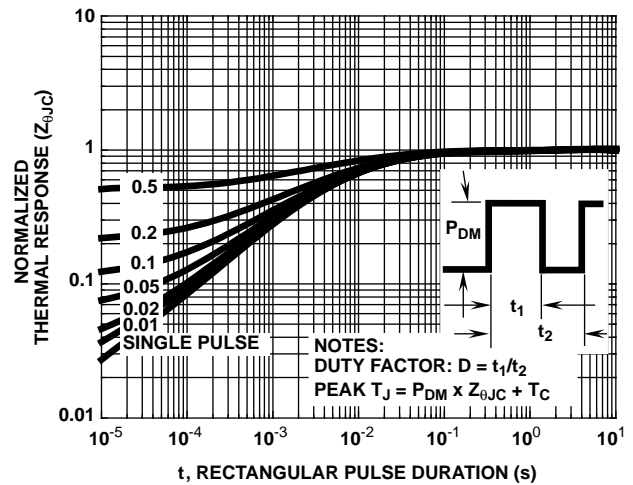


FIGURE 2. NORMALIZED MAXIMUM TRANSIENT THERMAL IMPEDANCE

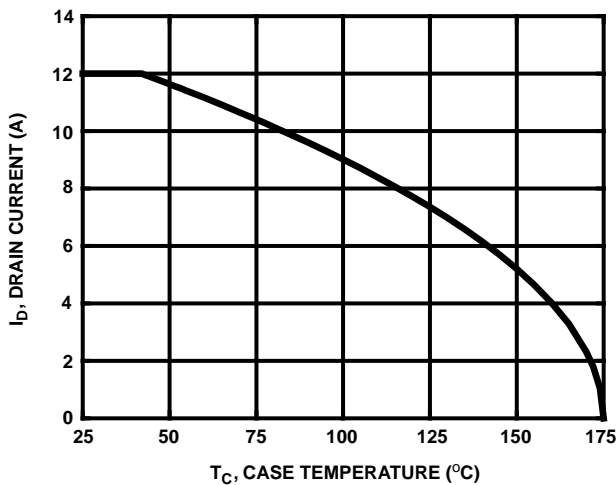


FIGURE 3. MAXIMUM CONTINUOUS DRAIN CURRENT vs TEMPERATURE

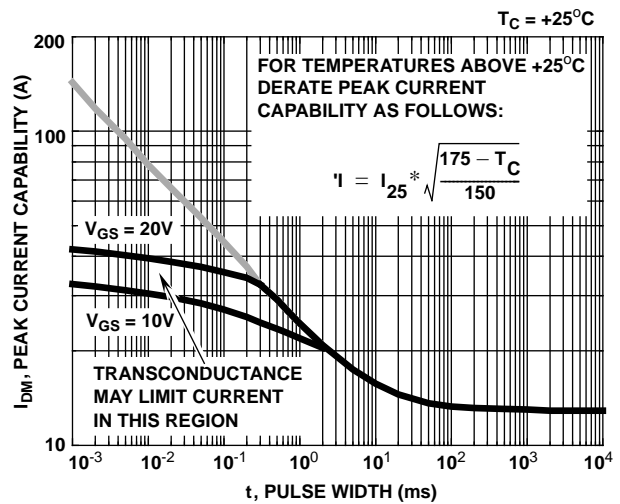


FIGURE 4. PEAK CURRENT CAPABILITY

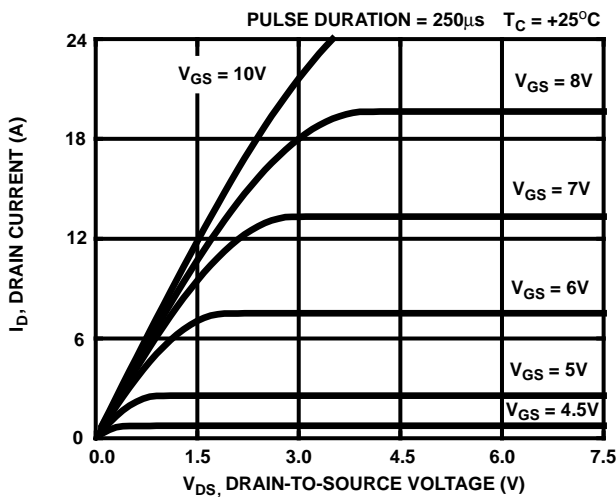


FIGURE 5. TYPICAL SATURATION CHARACTERISTICS

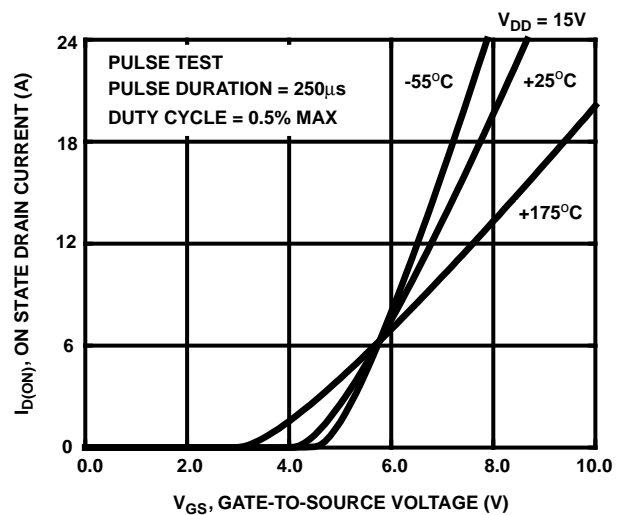


FIGURE 6. TYPICAL TRANSFER CHARACTERISTICS

Typical Performance Curves (Continued)

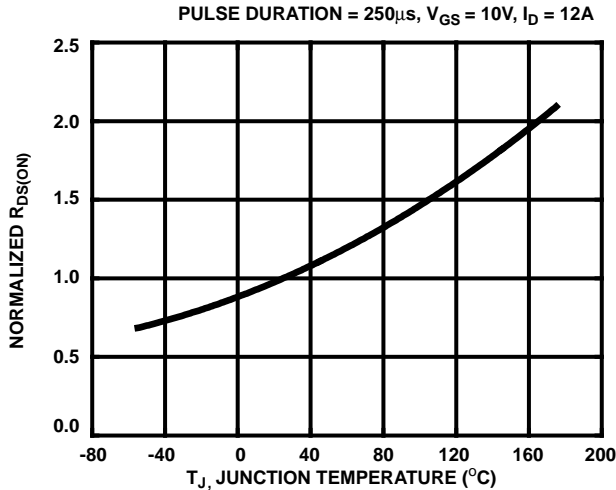


FIGURE 7. NORMALIZED $R_{DS(ON)}$ vs JUNCTION TEMPERATURE

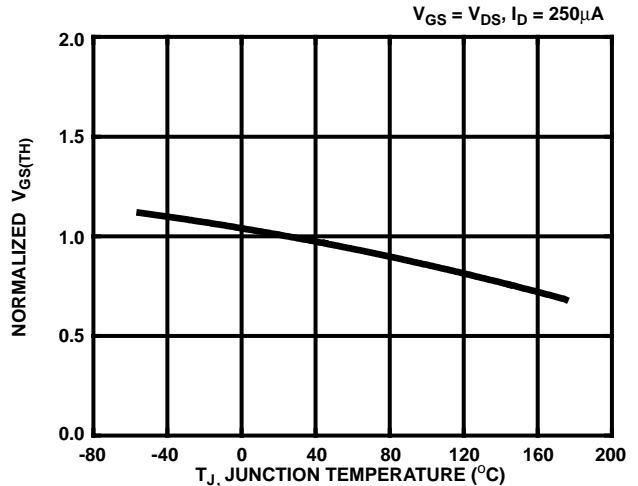


FIGURE 8. NORMALIZED GATE THRESHOLD VOLTAGE vs TEMPERATURE

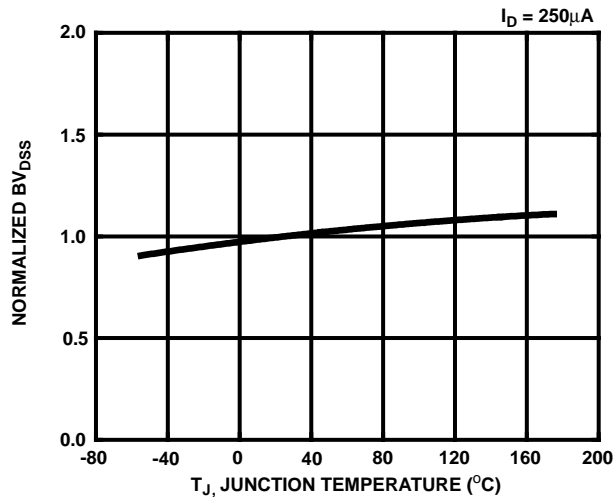


FIGURE 9. NORMALIZED DRAIN SOURCE BREAKDOWN VOLTAGE vs TEMPERATURE

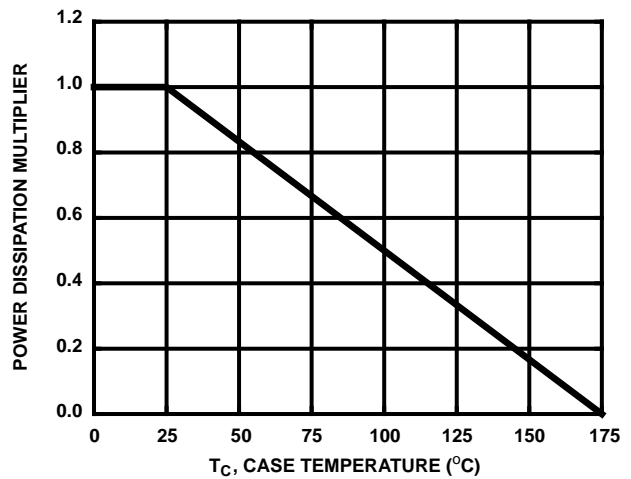


FIGURE 10. NORMALIZED POWER DISSIPATION vs TEMPERATURE DERATING CURVE

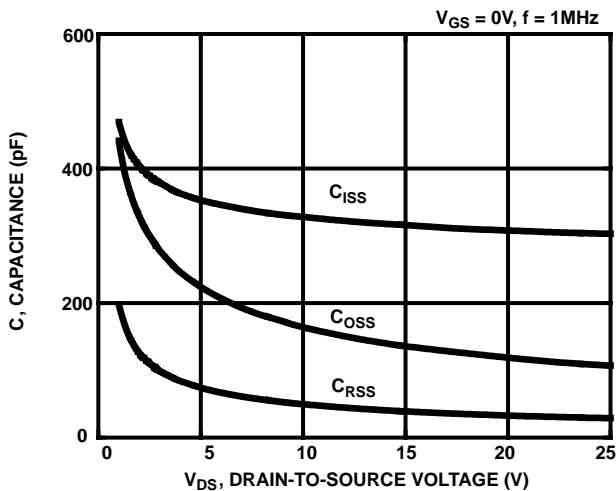


FIGURE 11. TYPICAL CAPACITANCE vs VOLTAGE

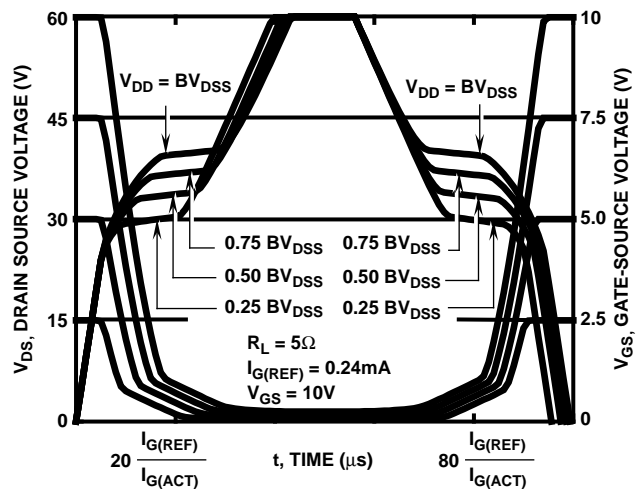


FIGURE 12. NORMALIZED SWITCHING WAVEFORMS FOR CONSTANT GATE CURRENT. REFER TO APPLICATION NOTE AN7254 AND AN7260

Typical Performance Curves (Continued)

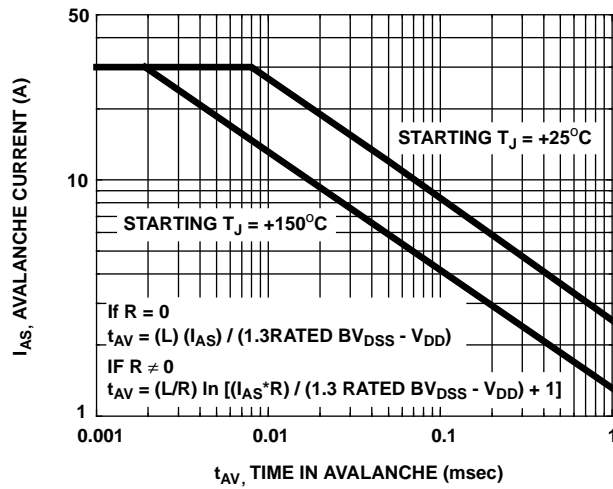


FIGURE 13. UNCLAMPED INDUCTIVE SWITCHING

Test Circuits

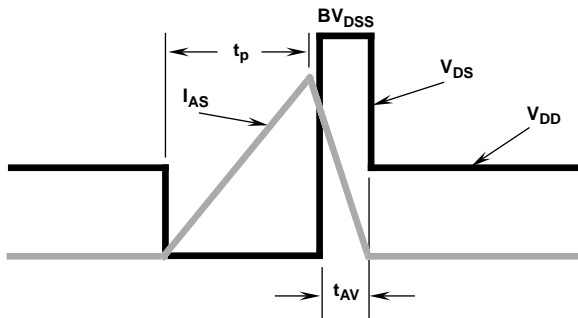


FIGURE 14. UNCLAMPED ENERGY WAVEFORMS

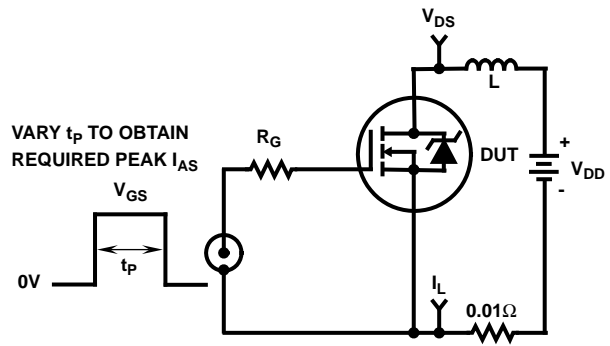


FIGURE 15. UNCLAMPED ENERGY TEST CIRCUIT

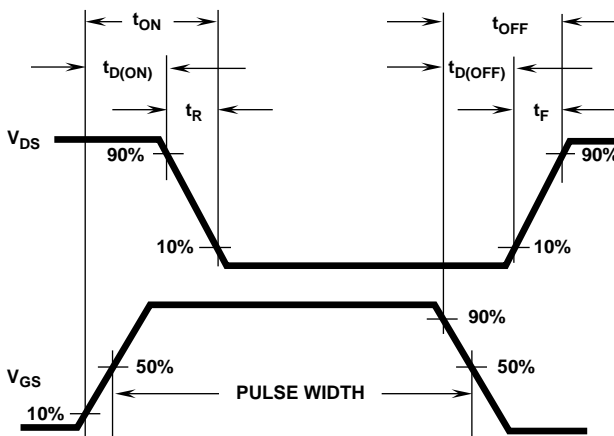


FIGURE 16. RESISTIVE SWITCHING WAVEFORMS

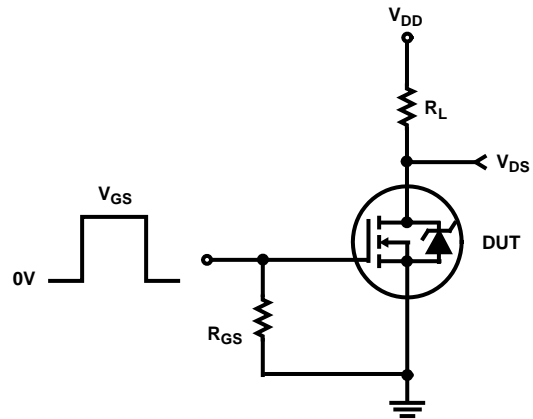
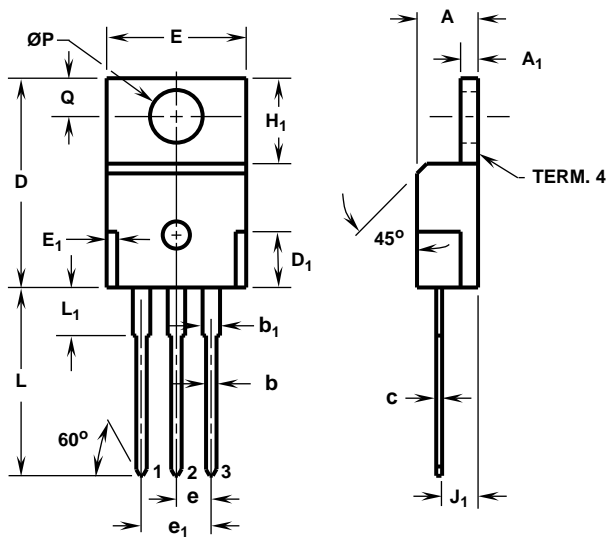


FIGURE 17. RESISTIVE SWITCHING TEST CIRCUIT

RFD3055, RFD3055SM, RFP3055

Packaging



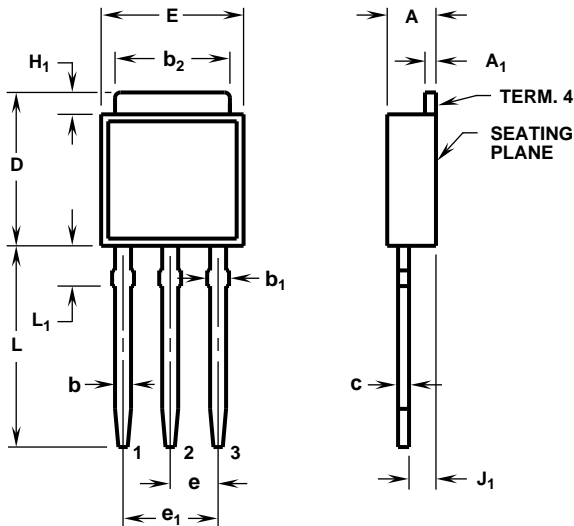
NOTES:

1. These dimensions are within allowable dimensions of Rev. J of JEDEC TO-220AB outline dated 3-24-87.
2. Lead dimension and finish uncontrolled in L_1 .
3. Lead dimension (without solder).
4. Add typically 0.002 inches (0.05mm) for solder coating.
5. Position of lead to be measured 0.250 inches (6.35mm) from bottom of dimension D.
6. Position of lead to be measured 0.100 inches (2.54mm) from bottom of dimension D.

TO-220AB
3 LEAD JEDEC TO-220AB PLASTIC PACKAGE

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.170	0.180	4.32	4.57	-
A ₁	0.048	0.052	1.22	1.32	-
b	0.030	0.034	0.77	0.86	3, 4
b ₁	0.045	0.055	1.15	1.39	2, 3
c	0.014	0.019	0.36	0.48	2, 3, 4
D	0.590	0.610	14.99	15.49	-
D ₁	-	0.160	-	4.06	-
E	0.395	0.410	10.04	10.41	-
E ₁	-	0.030	-	0.76	-
e	0.100 TYP		2.54 TYP		5
e ₁	0.200 BSC		5.08 BSC		5
H ₁	0.235	0.255	5.97	6.47	-
J ₁	0.100	0.110	2.54	2.79	6
L	0.530	0.550	13.47	13.97	-
L ₁	0.130	0.150	3.31	3.81	2
ØP	0.149	0.153	3.79	3.88	-
Q	0.102	0.112	2.60	2.84	-

7. Controlling dimension: Inch.
8. Revision 1 dated 1-93.



NOTES:

1. These dimensions are within allowable dimensions of Rev. C of JEDEC TO-251AA outline dated 9-88.
2. Solder finish uncontrolled.
3. Dimension (without solder).
4. Add typically 0.0006 inches (0.015mm) for solder coating.
5. Position of lead to be measured 0.250 inches (6.35mm) from bottom of dimension D.

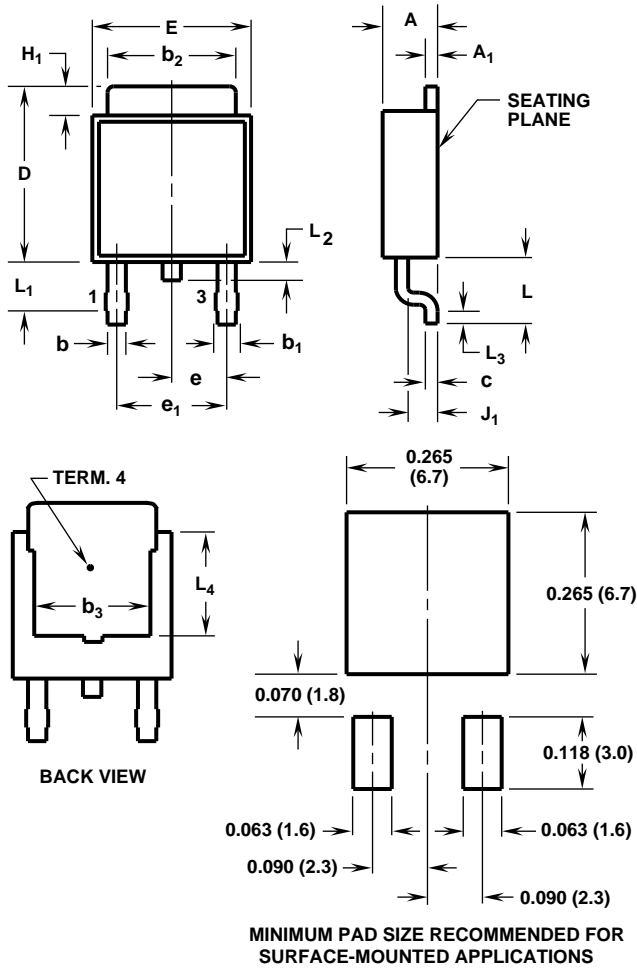
TO-251AA
3 LEAD JEDEC TO-251AA PLASTIC PACKAGE

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.086	0.094	2.19	2.38	-
A ₁	0.018	0.022	0.46	0.55	3, 4
b	0.028	0.032	0.72	0.81	3, 4
b ₁	0.033	0.040	0.84	1.01	3
b ₂	0.205	0.215	5.21	5.46	3, 4
c	0.018	0.022	0.46	0.55	3, 4
D	0.270	0.290	6.86	7.36	-
E	0.250	0.265	6.35	6.73	-
e	0.090 TYP		2.28 TYP		5
e ₁	0.180 BSC		4.57 BSC		5
H ₁	0.035	0.045	0.89	1.14	-
J ₁	0.040	0.045	1.02	1.14	6
L	0.355	0.375	9.02	9.52	-
L ₁	0.075	0.090	1.91	2.28	2

6. Position of lead to be measured 0.100 inches (2.54mm) from bottom of dimension D.
7. Controlling dimension: Inch.
8. Revision 1 dated 1-93.

Packaging (Continued)

TO-252AA
2 LEAD JEDEC TO-252AA PLASTIC PACKAGE



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.086	0.094	2.19	2.38	-
A ₁	0.018	0.022	0.46	0.55	4, 5
b	0.028	0.032	0.72	0.81	4, 5
b ₁	0.033	0.040	0.84	1.01	4
b ₂	0.205	0.215	5.21	5.46	4, 5
b ₃	0.190	-	4.83	-	2
c	0.018	0.022	0.46	0.55	4, 5
D	0.270	0.290	6.86	7.36	-
E	0.250	0.265	6.35	6.73	-
e	0.090 TYP		2.28 TYP		7
e ₁	0.180 BSC		4.57 BSC		7
H ₁	0.035	0.045	0.89	1.14	-
J ₁	0.040	0.045	1.02	1.14	-
L	0.100	0.115	2.54	2.92	-
L ₁	0.075	0.090	1.91	2.28	3
L ₂	0.025	0.040	0.64	1.01	-
L ₃	0.020	-	0.51	-	4, 6
L ₄	0.170	-	4.32	-	2

NOTES:

1. These dimensions are within allowable dimensions of Rev. B of JEDEC TO-252AA outline dated 9-88.
2. L₄ and b₃ dimensions establish a minimum mounting surface for terminal 4.
3. Solder finish uncontrolled.
4. Dimension (without solder).
5. Add typically 0.0006 inches (0.015mm) for solder coating.
6. L₃ is the terminal length for soldering.
7. Position of lead to be measured 0.090 inches (2.28mm) from bottom of dimension D.
8. Controlling dimension: Inch.
9. Revision 2 dated 6-93.

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