

RFL1N08, RFL1N10, RFP2N08, RFP2N10

File Number 1385

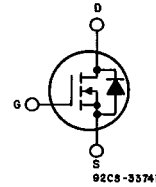
N-Channel Enhancement-Mode Power Field-Effect Transistors

1 and 2 A, 80 and 100 V

 $r_{DS(on)}$: 1.05 Ω and 1.2 Ω

Features:

- SOA is power-dissipation limited
- Nanosecond switching speeds
- Linear transfer characteristics
- High input impedance
- Majority carrier device



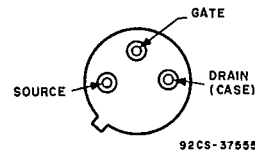
N-CHANNEL ENHANCEMENT MODE

The RFL1N08 and RFL1N10 and the RFP2N08 and RFP2N10 are n-channel enhancement-mode silicon-gate power field-effect transistors designed for applications such as switching regulators, switching converters, motor drivers, relay drivers, and drivers for high-power bipolar switching transistors requiring high speed and low gate-drive power. These types can be operated directly from integrated circuits.

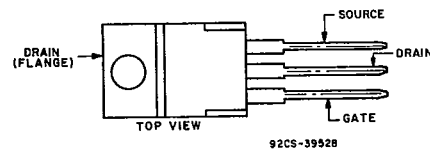
The RFL-series types are supplied in the JEDEC TO-205AF metal package and the RFP-series types in the JEDEC TO-220AB plastic package.

*The RFL and RFP series were formerly RCA developmental numbers TA9282 and TA9283, respectively.

TERMINAL DESIGNATIONS

RFL1N08
RFL1N10

JEDEC TO-205AF

RFP2N08
RFP2N10

JEDEC TO-220AB

MAXIMUM RATINGS, Absolute-Maximum Values ($T_C=25^\circ\text{C}$):

		RFL1N08	RFL1N10	RFP2N08	RFP2N10	
DRAIN-SOURCE VOLTAGE	V_{DS}	80	100	80	100	V
DRAIN-GATE VOLTAGE ($R_{GS}=1\text{ M}\Omega$)	V_{DGR}	80	100	80	100	V
GATE-SOURCE VOLTAGE	V_{GS}			± 20		V
DRAIN CURRENT	RMS Continuous I_D	1	1	2	2	A
	Pulsed I_{DM}			5		A
POWER DISSIPATION @ $T_C=25^\circ\text{C}$	P_T	8.33	8.33	25	25	W
	Derate above $T_C=25^\circ\text{C}$	0.0667	0.0667	0.2	0.2	W/ $^\circ\text{C}$
OPERATING AND STORAGE TEMPERATURE	T_J, T_{stg}			-55 to +150		$^\circ\text{C}$

RFL1N08, RFL1N10, RFP2N08, RFP2N10

ELECTRICAL CHARACTERISTICS, At Case Temperature (T_c)=25°C unless otherwise specified

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFL1N08 RFP2N08		RFL1N10 RFP2N10		
			Min.	Max.	Min.	Max.	
Drain-Source Breakdown Voltage	BV _{DSS}	I _D =1 mA V _{GS} =0	80	—	100	—	V
Gate-Threshold Voltage	V _{GS(th)}	V _{GS} =V _{DS} I _D =1 mA	2	4	2	4	V
Zero-Gate Voltage Drain Current	I _{DSS}	V _{DS} =65 V	—	1	—	—	μA
		V _{DS} =80 V	—	—	—	1	
		T _C =125° C V _{DS} =65 V	—	50	—	—	
		V _{DS} =80 V	—	—	—	50	
Gate-Source Leakage Current	I _{GSS}	V _{GS} =±20 V V _{DS} =0	—	100	—	100	nA
Drain-Source On Voltage	V _{DS(on)} ^a	I _D =1 A RFP	—	1.05	—	1.05	V
		V _{GS} =10 V RFL	—	1.2	—	1.2	
		I _D =2 A RFP	—	3.0	—	3.0	
		V _{GS} =10 V RFL	—	3.3	—	3.3	
Static Drain-Source On Resistance	r _{DS(on)} ^a	I _D =1 A RFP	—	1.05	—	1.05	Ω
		V _{GS} =10 V RFL	—	1.4	—	1.4	
Forward Transconductance	g _{fs} ^a	V _{DS} =10 V I _D =1 A	400	—	400	—	mmho
Input Capacitance	C _{iss}	V _{DS} =25 V	—	150	—	150	pF
Output Capacitance	C _{oss}	V _{GS} =0 V	—	80	—	80	
Reverse-Transfer Capacitance	C _{rss}	f = 1MHz	—	20	—	20	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 50 V	17(Typ)	25	17(Typ)	25	ns
Rise Time	t _r	I _D =1 A	30(Typ)	45	30(Typ)	45	
Turn-Off Delay Time	t _{d(off)}	R _{gen} =R _{gs} =50 Ω	30(Typ)	45	30(Typ)	45	
Fall Time	t _f	V _{GS} =10 V RFP	17(Typ)	25	17(Typ)	25	
		RFL	30(Typ)	50	30(Typ)	50	
Thermal Resistance Junction-to-Case	R _{θJC}	RFL1N08, RFL1N10	—	15	—	15	°C/W
		RFP2N08, RFP2N10	—	5	—	5	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS							
CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFL1N08 RFP2N08		RFL1N10 RFP2N10		
			Min.	Max.	Min.	Max.	
Diode Forward Voltage	V_{SD} ^a	$I_{SD} = 1A$	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	$I_F = 2A$ $dI_F/dt = 50A/\mu s$	100(typ.)		100(typ.)		ns

^aPulsed: Pulse duration=300 μs max., duty cycle=2%.

RFL1N08, RFL1N10, RFP2N08, RFP2N10

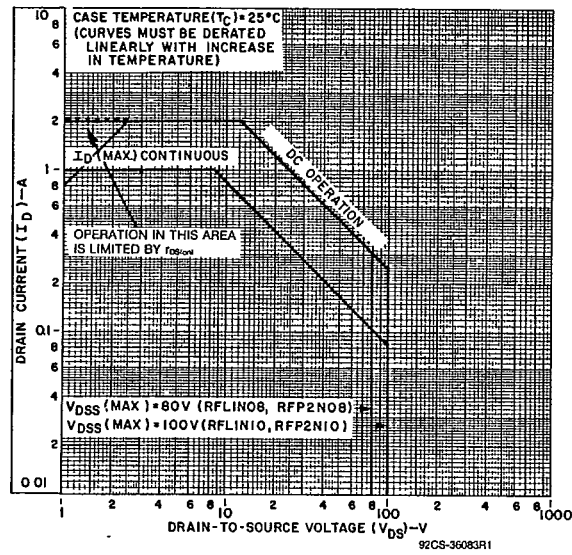


Fig. 1 - Maximum operating areas for all types.

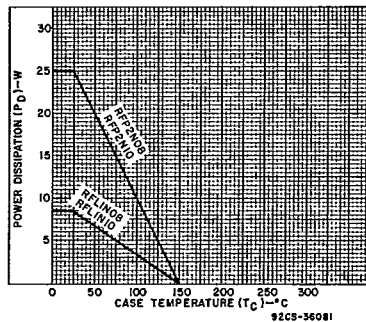


Fig. 2 - Power dissipation vs. temperature derating curve for all types.

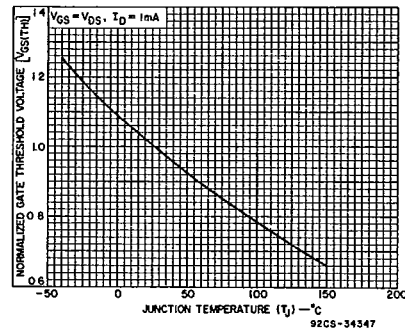


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

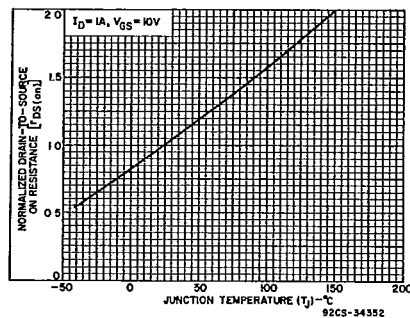


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

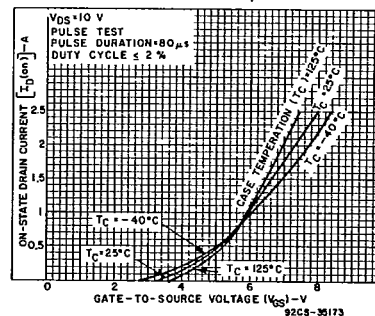


Fig. 5 - Typical transfer characteristics for all types.

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RFL1N08, RFL1N10, RFP2N08, RFP2N10

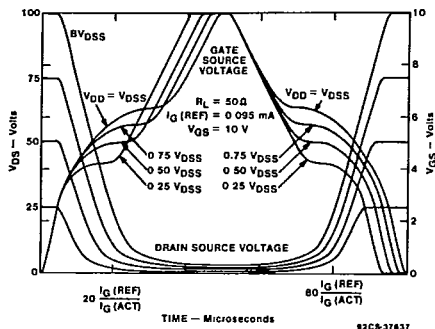


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

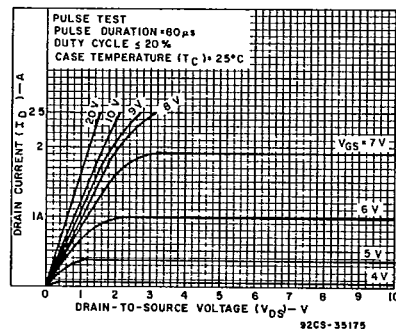


Fig. 7 - Typical saturation characteristics for all types.

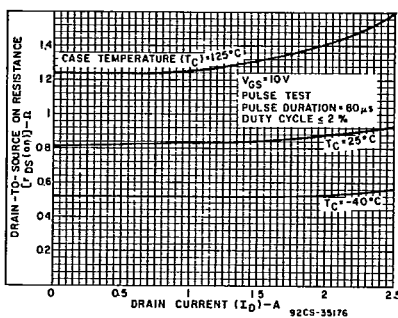


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

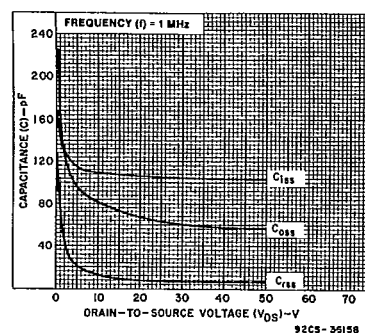


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

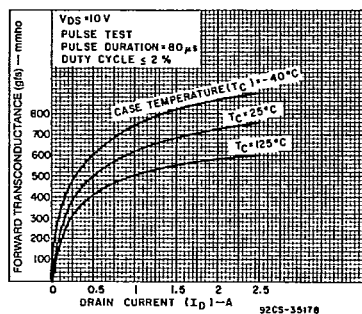


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

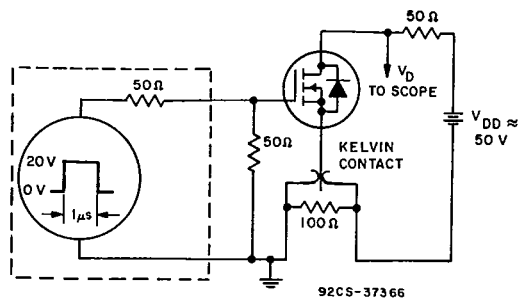
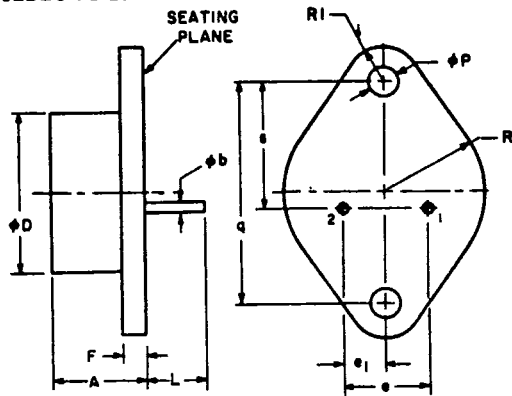


Fig. 11 - Switching Time Test Circuit.

Dimensional Outlines and Mounting Hardware

Dimensional Outlines

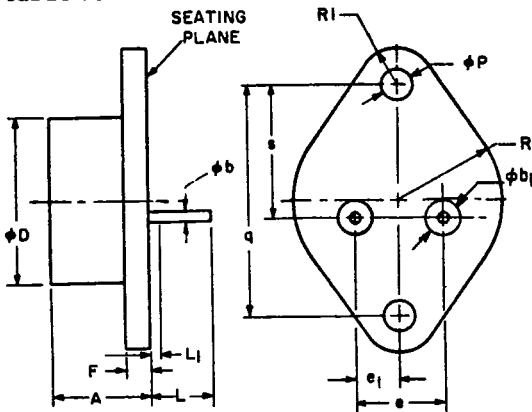
JEDEC TO-204AA



SYMBOL	INCHES		MILLIMETERS		NOTE
	MIN.	MAX.	MIN.	MAX.	
A	0.250	0.450	6.4	11.4	
ϕb	0.038	0.043	0.968	1.092	
ϕD	—	0.875	—	22.22	
e	0.420	0.440	10.67	11.17	
e_1	0.205	0.225	5.21	5.71	
F	—	0.135	—	3.42	
L	0.312	—	7.93	—	
ϕP	0.151	0.161	3.84	4.08	
q	1.187 BSC		30.15 BSC		
R	—	0.525	—	13.33	
R_1	—	0.188	—	4.77	
s	0.655	0.675	16.64	17.14	

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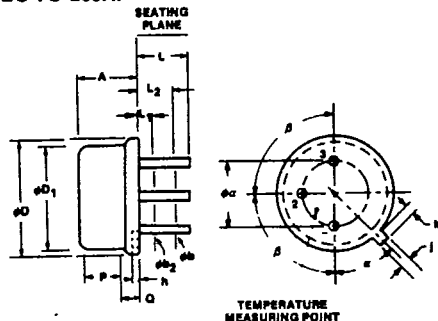
JEDEC TO-204AE



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	0.250	0.450	6.4	11.4	
ϕb	0.057	0.063	1.45	1.60	
ϕb_1	0.141 NOM		3.58 NOM		
ϕD_2	—	0.875	—	22.22	
e	0.420	0.440	10.67	11.17	
e_1	0.205	0.225	5.21	5.71	
F	0.060	0.135	1.53	3.42	
L	0.440	0.480	11.18	12.19	
ϕP	0.151	0.161	3.84	4.08	
q	1.187 BSC		30.15 BSC		
R	0.495	0.525	12.58	13.33	
R_1	0.131	0.168	3.33	4.77	
s	0.655	0.675	16.64	17.14	

92CS-37523

JEDEC TO-205AF



Notes:

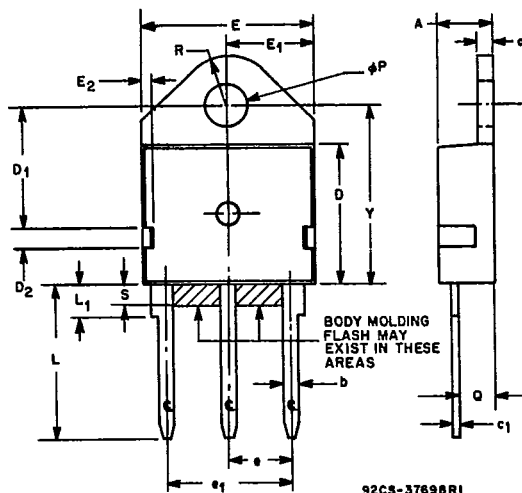
1. Dimension k measured from ϕD maximum.
2. ϕD_1 shall not vary more than 0.010 in Zone P. This zone controlled for automatic handling.
3. Details of outline in this zone optional.
4. Leads at gauge plane 0.054-0.055 below seating plane shall be within 0.007 radius of positional tolerance at MMC relative to tab at MMC. Device may be measured by direct methods or by gauge and gauging procedure described on JEDEC gauge drawing G8-1.
5. ϕb_2 applies between L_1 and L_2 . ϕb applies between L_2 and L minimum. Diameter is uncontrolled in L_1 and beyond L minimum.

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
ϕa	0.200 BSC		5.08 BSC		4
A	0.160	0.180	4.07	4.57	
ϕb	0.016	0.021	0.41	0.53	5
ϕb_2	0.016	0.019	0.41	0.48	5
ϕD	0.340	0.370	8.64	9.39	
ϕD_1	0.315	0.355	8.01	9.01	2
h	0.009	0.041	0.23	1.04	
j	0.028	0.034	0.72	0.86	
k	0.029	0.045	0.74	1.14	1
L	0.500	0.750	12.70	19.05	5
L_1	—	0.050	—	1.27	5
L_2	0.250	—	6.35	—	5
P	0.070	—	1.78	—	2
Q	—	0.050	—	1.27	3
α	45° NOMINAL				
β	90° NOMINAL				

92CS-38248R1

Dimensional Outlines

JEDEC TO-218AC



Notes:

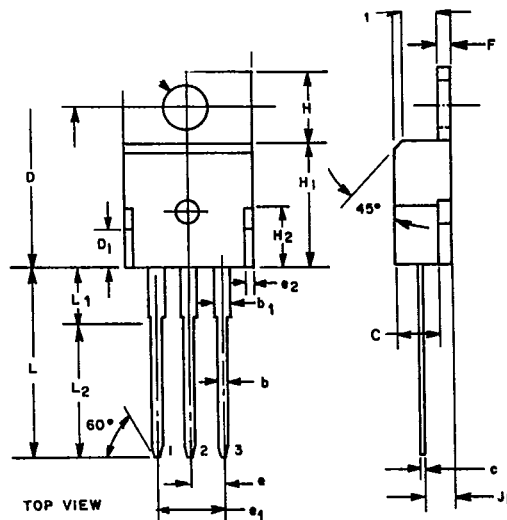
- 1: Tab outline optional within boundaries of dimensions E and R.
- 2: Lead dimensions uncontrolled in L₁.
- 3: Controlling dimensions: Inch.

92CS-37698R1

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	.185	.200	4.191	5.080	1
b	.040	.063	1.016	1.600	
c	.053	.085	1.346	1.651	
c ₁	.018	.030	.457	.762	
D	.485	.505	12.319	12.827	
D ₁	.395	.415	10.033	10.541	
D ₂	.070	.090	1.778	2.286	
E	.610	.640	15.494	16.256	
E ₁	.305	.320	7.747	8.128	
E ₂	.040	.060	1.016	1.524	
e	.205	.225	5.207	5.715	
e ₁	.420	.440	10.688	11.176	
L	.500	.610	12.700	15.494	
L ₁	—	.125	—	3.175	2
phi P	.157	.167	3.988	4.241	
Q	.094	.126	2.388	3.200	
R	.170	.190	4.318	4.826	
S	—	0.60	—	1.524	
Y	.626	.670	15.900	17.018	

92CS-37698R1

JEDEC TO-220AB



NOTES:

1. Position of lead to be measured 0.250-0.255 in. (6.350-6.477 mm) from case.

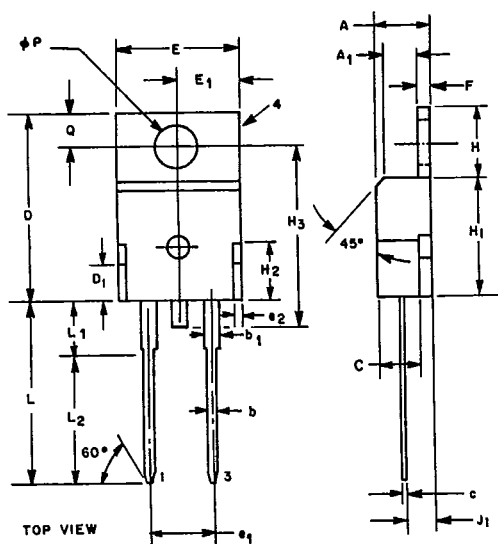
92CS-34697R1

SYMBOL	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.140	0.190	3.56	4.82
A ₁	0.080	0.085	2.03	2.16
b	0.020	0.045	0.51	1.14
b ₁	0.045	0.070	1.14	1.77
C	—	0.125	—	3.18
c	0.015	0.025	0.38	0.63
D	0.560	0.625	14.23	15.87
D ₁	—	0.100	—	2.54
E	0.380	0.420	9.66	10.66
e	0.090	0.110	2.29	2.79
e ₁	0.190	0.210	4.83	5.33
e ₂	—	0.030	—	0.76
F	0.045	0.055	1.14	1.39
H	0.230	0.270	5.85	6.85
H ₁	0.355	0.370	9.02	9.40
H ₂	—	0.160	—	4.06
J ₁	0.080	0.115	2.04	2.92
L	0.500	0.562	12.70	14.27
L ₁	—	0.250	—	6.35
L ₂	0.400	0.410	10.16	10.41
phi P	0.139	0.161	3.531	4.089
Q	0.100	0.120	2.54	3.04

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Dimensional Outlines

JEDEC TO-220AC



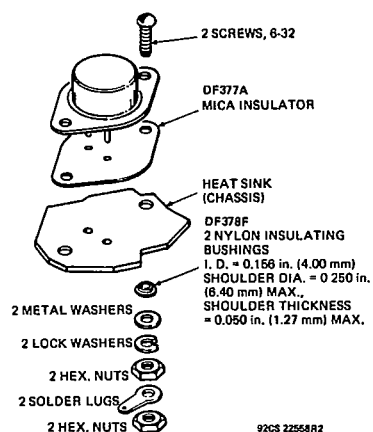
NOTES:

1. Position of lead to be measured 0.250-0.255 in.
(6.350-6.477 mm) from case.

SYMBOL	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.140	0.190	3.56	4.82
A ₁	0.080	0.085	2.03	2.16
b	0.020	0.045	0.51	1.14
b ₁	0.045	0.070	1.14	1.77
C	—	0.125	—	3.18
c	0.015	0.025	0.38	0.63
D	0.560	0.825	14.23	15.87
D ₁	—	0.100	—	2.54
E	0.380	0.420	9.66	10.66
e ₁	0.190	0.210	4.83	5.33
e ₂	—	0.030	—	0.76
F	0.045	0.055	1.14	1.39
H	0.230	0.270	5.85	6.85
H ₁	0.355	0.370	9.02	9.40
H ₂	—	0.180	—	4.06
H ₃	—	0.600	—	15.24
J ₁	0.080	0.115	2.04	2.92
L	0.500	0.562	12.70	14.27
L ₁	—	0.250	—	6.35
L ₂	0.400	0.410	10.16	10.41
φP	0.139	0.161	3.531	4.089
Q	0.100	0.120	2.54	3.04

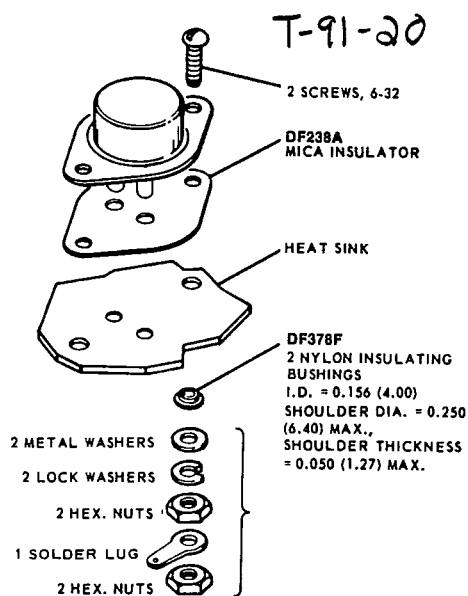
92CS-34830R1

Mounting Hardware

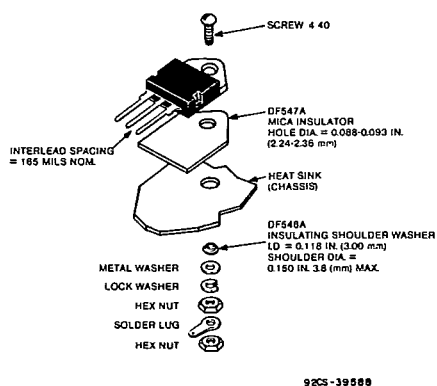


NOTE: MAXIMUM TORQUE APPLIED TO MOUNTING FLANGE IS 12 in.-lbs. (0.14 kgf-m)

Suggested mounting hardware for JEDEC TO-204AA
(formerly JEDEC TO-3)



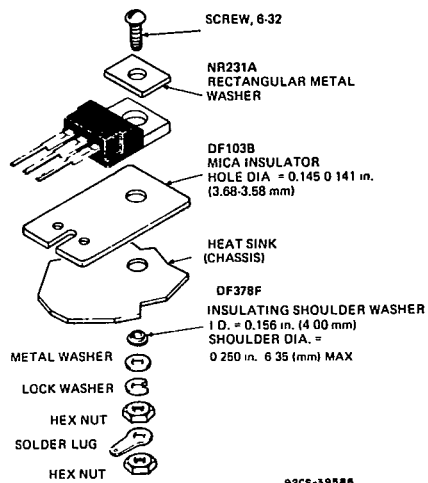
Suggested mounting hardware for JEDEC TO-204AE
(formerly JEDEC TO-3)



Suggested mounting hardware for JEDEC TO-218AC

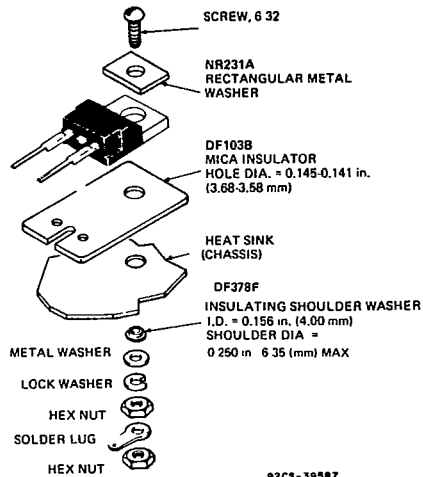
Mounting Hardware

T-91-20



NOTE: MAXIMUM TORQUE APPLIED TO MOUNTING FLANGE IS 8 in. lb. (0.09 kgf m)

Suggested mounting hardware for JEDEC TO-220AB



NOTE: MAXIMUM TORQUE APPLIED TO MOUNTING FLANGE IS 8 in. lb. (0.09 kgf m)

Suggested mounting hardware for JEDEC TO-220AC