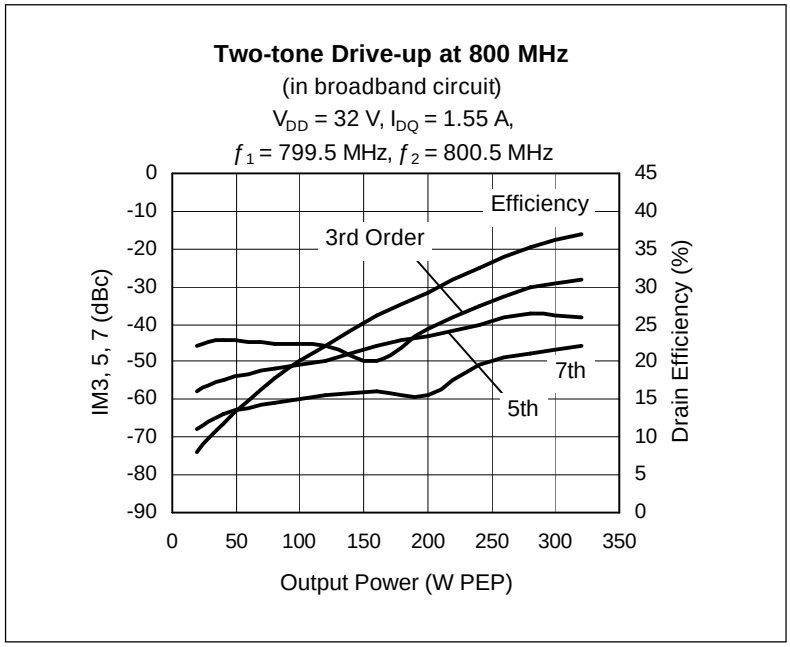
Thermally-Enhanced High Power RF LDMOS FET
300 W, 470 – 860 MHz

Description

The PTFA043002 is a 300-watt, internally-matched, laterally diffused, *GOLDMOS*® push-pull FET intended for analog and digital broadcast, including 8VSB and COFDM applications from 470 to 860 MHz. Thermally-enhanced packaging provides the coolest operation available. Full gold metallization ensures excellent device lifetime and reliability.



PTFA043002E
Package 30275



Features

- Thermally-enhanced packaging
- Broadband internal matching
- Typical 8VSB performance
  - Average output power = 100 W
  - Gain = 16 dB
  - Adjacent < –33 dBc
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability
- Low HCI drift
- Pb-free and RoHS compliant
- Capable of handling 5:1 VSWR @ 32 V, 300 W (CW) output power

RF Characteristics

ATSC 8VSB Characteristics (broadband fixture, push-pull configuration)

(V_{DD} = 32 V, P_{OUT} = 100 W_{AVG}, I_{DQ} = 1.55 A, f = 800 MHz)

Characteristic	Symbol	Min	Typ	Max	Unit
Common Source Power Gain	G_{ps}	—	16	—	dB
Drain Efficiency	η_D	—	28	—	%
FIrst Adjacent	IMD	—	–33	—	dBc

All published data at T_{CASE} = 25°C unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!

RF Characteristics (cont.)

Two-Tone Measurements (tested in broadband test fixture)
V_{DD} = 32 V, I_{DQ} = 1.55 A, P_{OUT} = 300 W_{PEP}, f = 860 MHz, tone spacing = 1 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Gain	G_{ps}	16	17.5	—	dB
Drain Efficiency	η_D	38	41	—	%
Intermodulation Distortion	IMD	—	–29	–28	dBc

DC Characteristics (one side)

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_{DS} = 10 mA/side	$V_{(BR)DSS}$	65	—	—	V
Drain Leakage Current	V_{DS} = 28 V, V_{GS} = 0 V	I_{DSS}	—	—	1.0	µA
	V_{DS} = 63 V, V_{GS} = 0 V	I_{DSS}	—	—	10.0	µA
On-State Resistance	V_{GS} = 10 V, V_{DS} = 0.1 V	$R_{DS(on)}$	—	0.08	—	W
Operating Gate Voltage	V_{DS} = 28 V, I_{DQ} = 0.75 A/side	V_{GS}	2.0	2.5	3.0	V
Gate Leakage Current	V_{GS} = 10 V, V_{DS} = 0 V	I_{GSS}	—	—	1.0	µA

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	V
Gate-Source Voltage	V_{GS}	–0.5 to +12	V
Junction Temperature	T_J	200	°C
Total Device Dissipation	P_D	761	W
Above 25°C derate by		4.35	W/°C
Storage Temperature Range	T_{STG}	–40 to +150	°C
Thermal Resistance (T_{CASE} = 70°C, 300 W CW)	$R_{\theta JC}$	0.23	°C/W

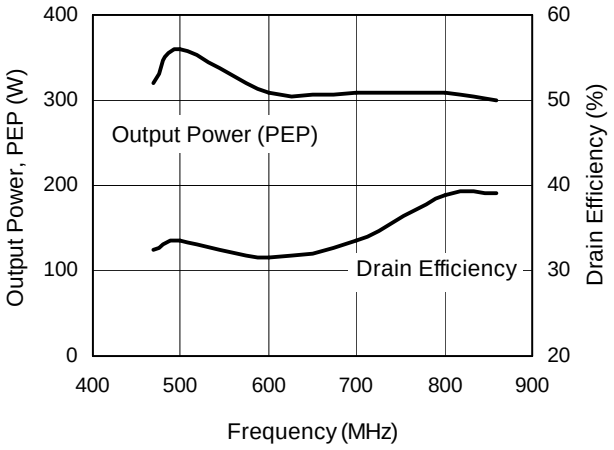
Ordering Information

Type	Package Outline	Package Description	Marking
PTFA043002E	30275	Thermally-enhanced, flange mount	PTFA043002E

Typical Performance (data taken in a broadband test fixture)

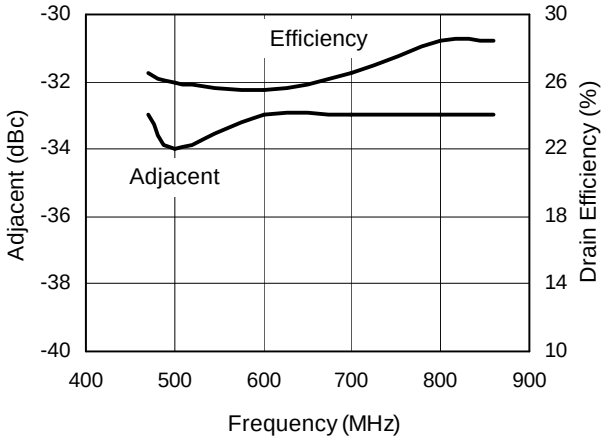
Two-tone IMD Performance

V_{DD} = 32 V, I_{DQ} = 1.55 A, IMD = –28 dBc



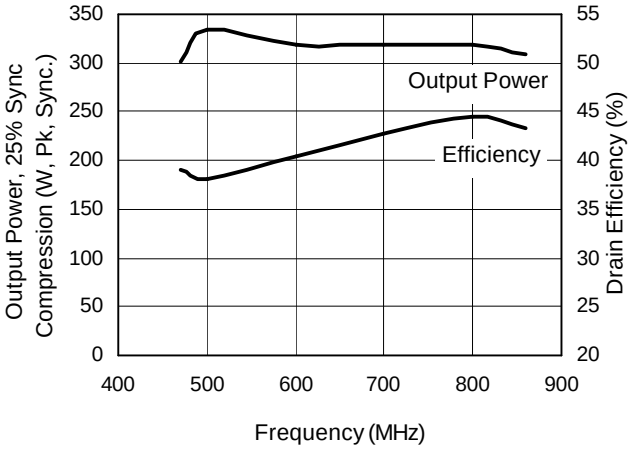
8VSB Performance vs. Frequency @ 100 W Average Power

V_{DD} = 32 V, I_{DQ} = 1.55 A, IMD = –28 dBc



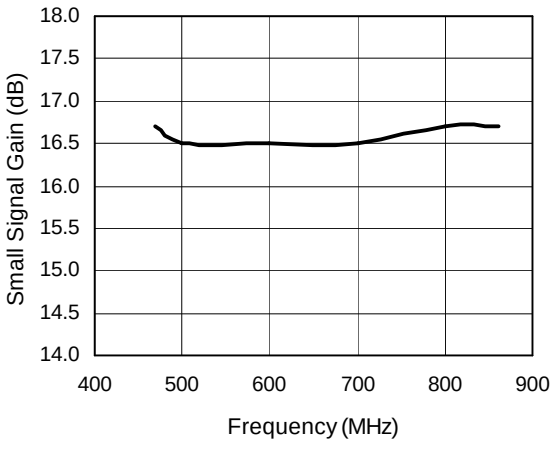
Analog NTSC Performance

V_{DD} = 32 V, I_{DQ} = 1.55 A



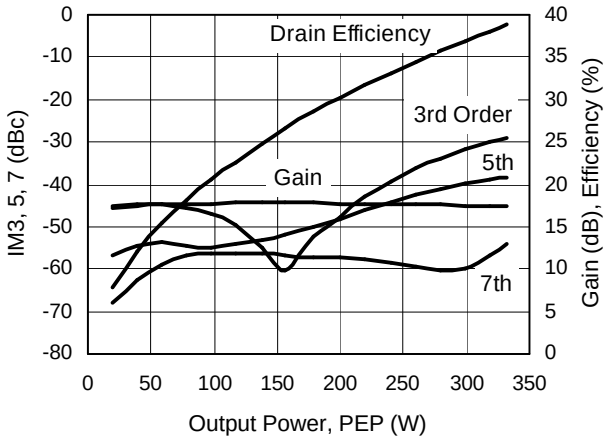
Gain vs. Frequency

V_{DD} = 32 V, I_{DQ} = 1.55 A

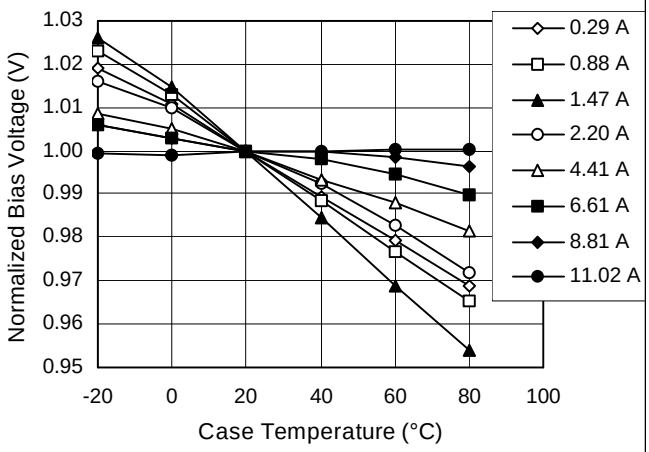


Typical Performance (cont.)

Two-tone Drive-up at 800 MHz
(in narrowband circuit)
V_{DD} = 32 V, I_{DQ} = 1.55 A, f_1 = 799.5 MHz, f_2 = 800.5 MHz

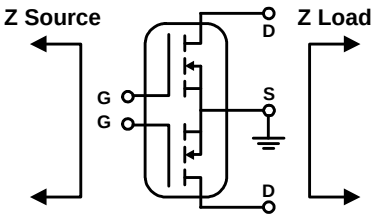


Bias Voltage vs. Temperature
Voltage normalized to typical gate voltage,
series show current

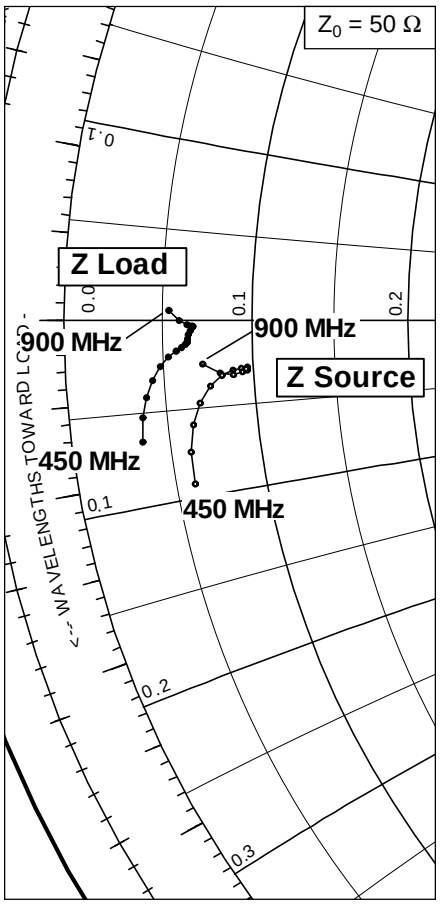


See next page for impedance information

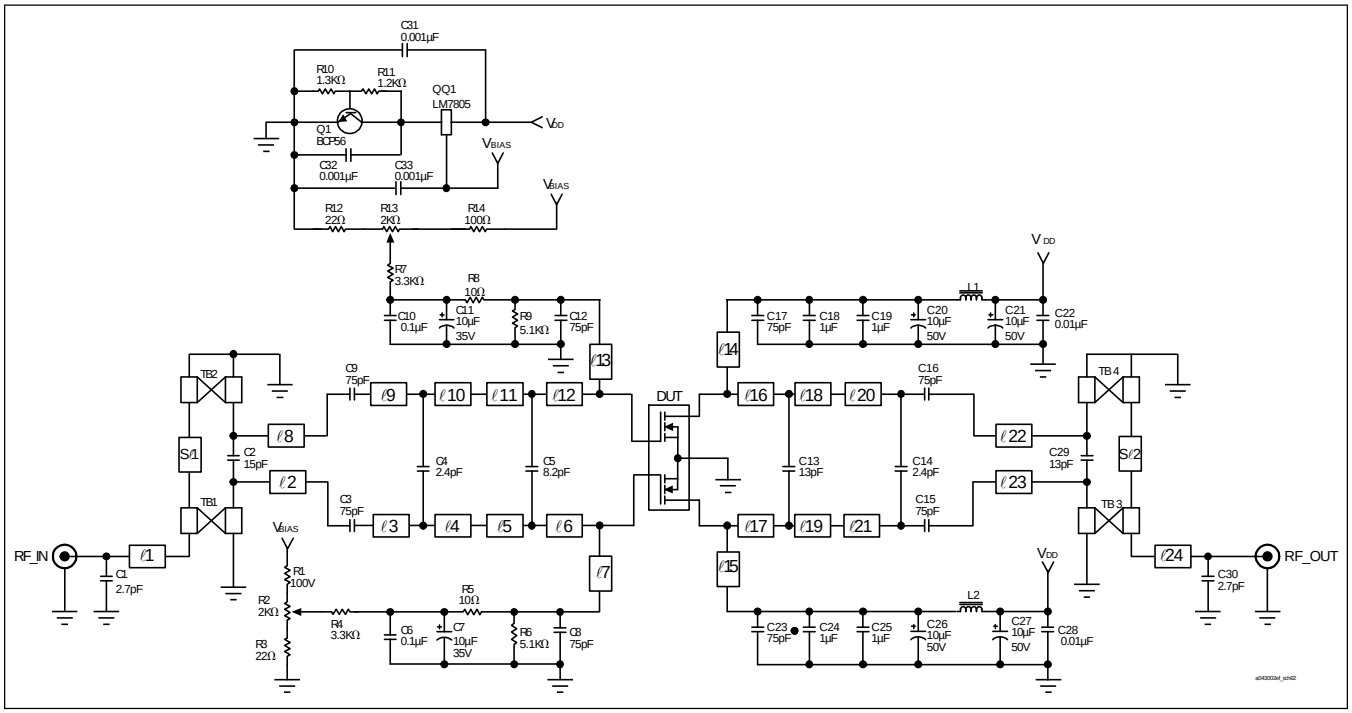
Broadband Circuit Impedance Data



Frequency	Z Source W		Z Load W	
MHz	R	jX	R	jX
450	3.00	–4.61	1.78	–3.26
475	3.02	–3.71	1.85	–2.63
500	3.18	–2.96	1.99	–2.09
525	3.43	–2.36	2.18	–1.64
550	3.75	–1.90	2.41	–1.28
575	4.10	–1.61	2.64	–1.03
600	4.42	–1.47	2.85	–0.87
625	4.66	–1.44	3.01	–0.77
650	4.79	–1.47	3.10	–0.70
675	4.84	–1.50	3.15	–0.63
700	4.84	–1.50	3.17	–0.53
725	4.82	–1.46	3.20	–0.42
750	4.82	–1.42	3.24	–0.31
775	4.83	–1.41	3.30	–0.22
800	4.80	–1.46	3.33	–0.18
825	4.69	–1.54	3.30	–0.16
850	4.43	–1.61	3.17	–0.13
875	4.04	–1.54	2.95	–0.01
900	3.57	–1.27	2.67	0.27



Reference Circuit



Reference Circuit Schematic for 470 to 860 MHz

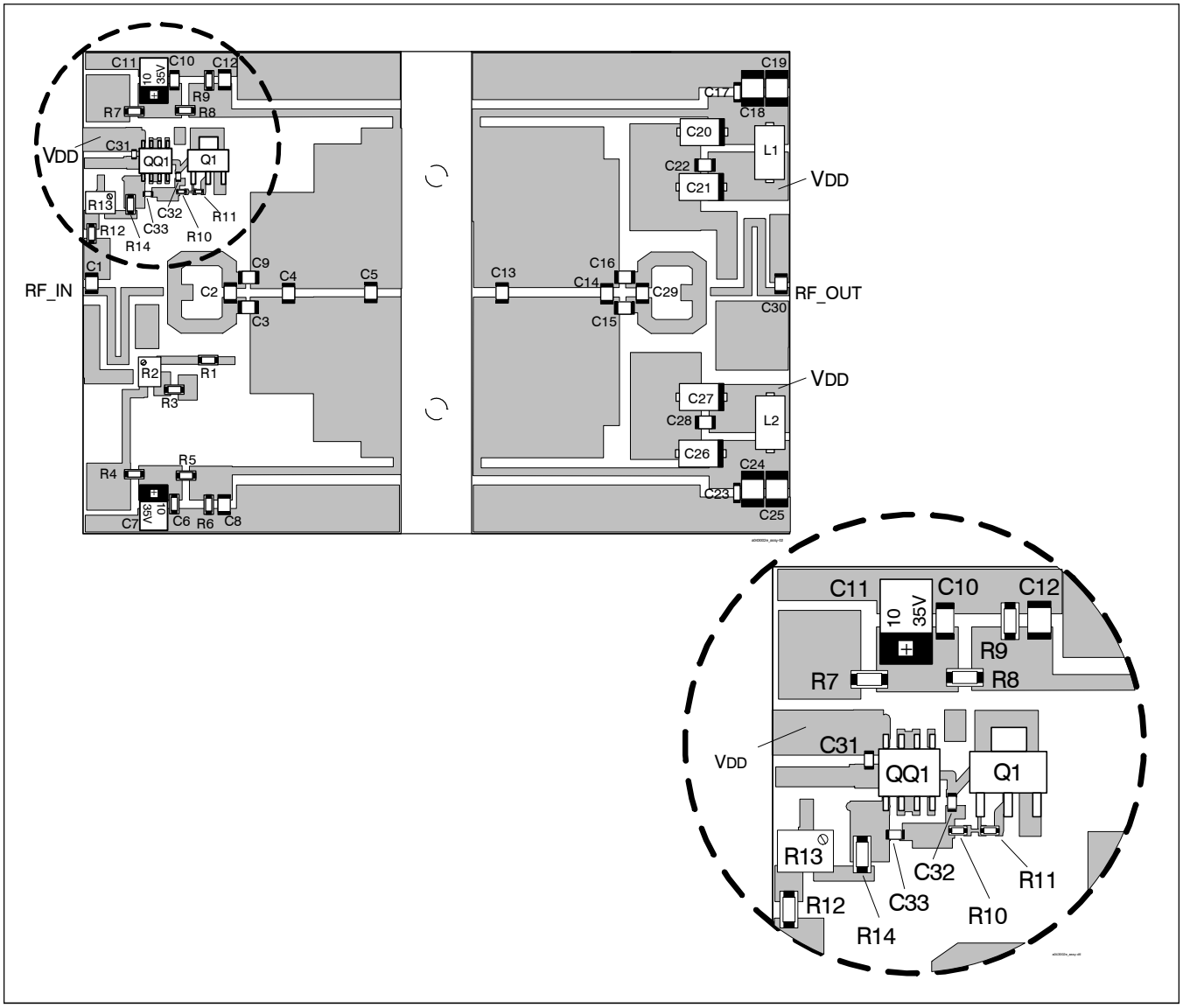
Circuit Assembly Information

DUT	PTFA043002E	LDMOS transistor
Circuit board	0.35 mm [.010"] over .635 mm [.025"] thick, ε_r = 10.2 copper: 10 mils top 25 mils bottom	Rogers 3010, multilayer

Microstrip	Electrical Characteristics at 860 MHz[1]	Dimensions: L x W (mm)	Dimensions: L x W (in.)
TB1, TB2, TB3, TB4	Broadside coupled striplines	14.63 x 1.70	0.576 x 0.067
Sℓ1, Sℓ2	0.017 λ, 15.6 Ω	1.91 x 1.70	0.075 x 0.067
ℓ1, ℓ24	0.250 λ, 38.0 Ω	33.02 x 1.32	1.300 x 0.052
ℓ2, ℓ8, ℓ22, ℓ23	0.004 λ, 26.0 Ω	0.51 x 2.54	0.020 x 0.100
ℓ3, ℓ9	0.049 λ, 6.2 Ω	5.59 x 15.24	0.220 x 0.600
ℓ4, ℓ10	0.038 λ, 6.2 Ω	4.45 x 15.24	0.175 x 0.600
ℓ5, ℓ11	0.067 λ, 4.3 Ω	7.62 x 22.86	0.300 x 0.900
ℓ6, ℓ12	0.056 λ, 3.9 Ω	6.25 x 25.40	0.246 x 1.000
ℓ7, ℓ13	0.210 λ, 40.0 Ω	28.45 x 1.22	1.120 x 0.048
ℓ14, ℓ15	0.290 λ, 40.0 Ω	40.39 x 1.22	1.590 x 0.048
ℓ16, ℓ17	0.046 λ, 3.9 Ω	5.08 x 25.40	0.200 x 1.000
ℓ18, ℓ19	0.137 λ, 3.9 Ω	15.44 x 25.40	0.608 x 1.000
ℓ20, ℓ21	0.022 λ, 4.8 Ω	2.54 x 20.32	0.100 x 0.800

[1]Electrical characteristics are rounded.

Reference Circuit (cont.)



*Reference circuit assembly diagram (not to scale)**

**Gerber Files for this circuit available on request.*

Reference Circuit (cont.)

Component	Description	Suggested Manufacturer	P/N or Comment
C1, C30	Ceramic capacitor, 2.7 pF	ATC	100B 2R7
C2	Capacitor, 15 pF	ATC	100B 150
C13, C29	Ceramic capacitor, 13 pF	ATC	100B 130
C3, C8, C9, C12, C15, C16, C17, C23	Ceramic capacitor, 75 pF	ATC	100B 750
C4, C14	Ceramic capacitor, 2.4 pF	ATC	100B 2R4
C5	Ceramic capacitor, 8.2 pF	ATC	100B 8R2
C6, C10	Capacitor, 0.1 µF	Digi-Key	PCC104BCT-ND
C7, C11	Tantalum capacitor, 10 µF, 35 V	Digi-Key	PCS6106TR-ND
C22, C28	Ceramic capacitor, 0.01 µF	ATC	200B 103
C18, C19, C24, C25	Capacitor, 1 µF	ATC	920C105
C20, C21, C26, C27	Tantalum capacitor, 10 µF, 50 V	Garrett Electronics	TPS106K050R0400
C31, C32, C33	Capacitor, 0.001 µF	Digi-Key	PCC1772CT-ND
L1, L2	Ferrite, 8.9 mm	Elna Magnetics	BDS 4.6/3/8.9-4S2
Q1	Transistor	Infinion	BCP56
QQ1	Voltage regulator	National Semiconductor	LM7805
R1, R14	Chip Resistor 100 ohms	Digi-Key	P100ECT-ND
R2, R13	Potentiometer 2 k-ohms	Digi-Key	3224W-202ETR-ND
R3, R12	Chip Resistor 22 ohms	Digi-Key	P22KECT-ND
R4, R7	Chip Resistor 3.3 k-ohms	Digi-Key	P3.3KECT-ND
R5, R8	Chip Resistor 10 ohms	Digi-Key	P10ECT-ND
R6, R9	Chip Resistor 5.1 k-ohms	Digi-Key	P5.1KECT-ND
R10	Chip Resistor 1.0 k-ohms	Digi-Key	P1KGCT-ND
R11	Chip Resistor 1.1 k-ohms	Digi-Key	P1.1KGCT-ND

See next page for package information

Package Outline Specifications

Package 30275

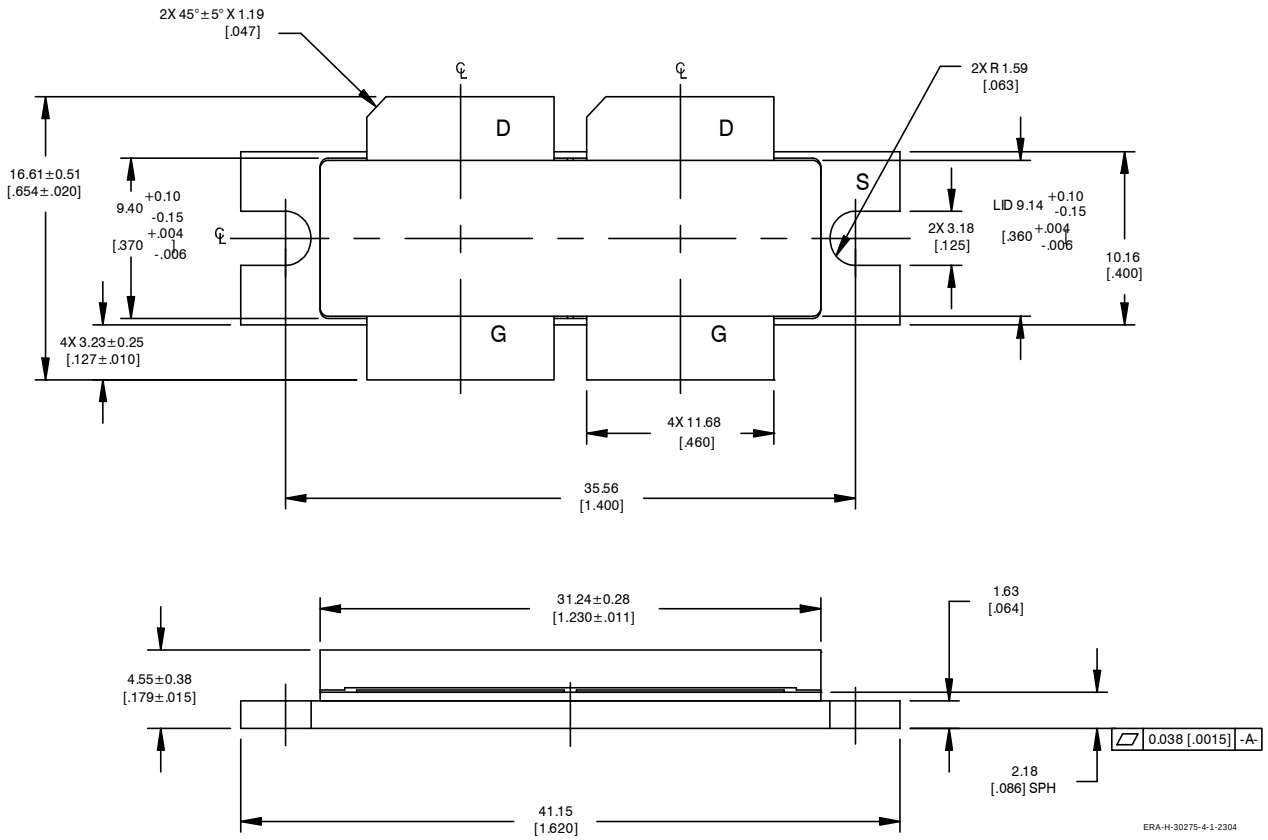


Diagram Notes:

1. Lead thickness: 0.13 +0.051/–0.025 [.005 +.002/–.001].
2. All tolerances ± 0.127 [.005] unless specified otherwise.
3. Pins: D = drain, S = source, G = gate.
4. Interpret dimensions and tolerances per ASME Y14.5M-1994.
5. Primary dimensions are mm. Alternate dimensions are inches.

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PTFA043002E

Revision History:	2005-11-18	Data Sheet
Previous Version:	2005-04-14	Preliminary Data Sheet

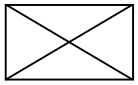
Page	Subjects (major changes since last revision)
5	Add Impedance data.
6 – 8	Revise circuit information.
all	Remove Preliminary status.

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