TriQuint SEMICONDUCTOR

POWERBAND™

T1L2003028-SP
30 W, 28V, 500 MHz-2 GHz, Powerband™ LDMOS RF Power Transistor

Introduction

The T1L2003028-SP is a POWERBAND™ discrete LDMOS, enhancement mode RF Power Transistor designed to operate from 500MHz to 2GHz in wide-band circuits. The device has an instantaneous band-width P1dB output power of 30watts across the entire band when operated in the TriQuint wide-band test fixture. The T1L2003028-SP can also be used in narrow band applications and is rated at 45Watts P1dB at 2GHz.

Figure 1. Available Packages

Features

-Exceptional Instantaneous band-width performance from 500MHz - 2GHz
-Increased efficiency results in significant advantages
  -Smaller and lighter systems
  -Reduced system component costs
  -Reduced energy consumption
-Typical Performance ratings
 -Wide-Band 500MHz - 2GHz
  (as tested in TriQuint Wideband Fixture)
   -10dB Gain
   -45% Efficiency
   -30Watt P1dB
-Narrow Band up to 2GHz
   -14dB Gain
   -59% Efficiency
   -45%Watt P1dB

Table 1. Thermal Characteristics

Parameter	Sym	Value	Unit
Thermal Resistance, Junction to Case:	R_ JC	1.3	°C/W

Table 2. Absolute Maximum Ratings*

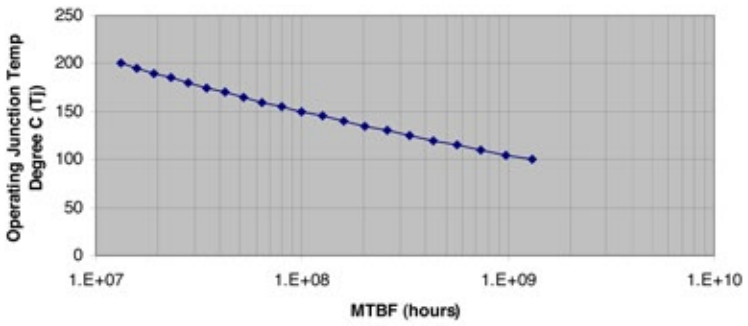
Parameter	Sym	Value	Unit
Drain-source Voltage	VDSS	65	Vdc
Gate-source Voltage	VGS	–0.5, +15	Vdc
Drain Current—Continuous	ID	4.25	Adc
Total Dissipation at TC = 25 °C:			
T1L2003028-SP	PD	135	W
Derate Above 25 °C:			
T1L2003028-SP	—	0.77	W/°C
Operating Junction Temperature	TJ	200	°C
Storage Temperature Range	TSTG	–65, +150	°C

* Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Table 3. ESD Rating*

T1L2003028-SP	Minimum (V)	Class
HBM	500	1B
MM	50	A
CDM	1500	4

Figure 2. Lifetime Median Curve



Electrical Characteristics

Recommended operating conditions apply unless otherwise specified: TC = 30° C.

Table 4. dc Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Drain-source Breakdown Voltage (VGS = 0, ID = 200 µA)	V(BR)DSS	65	—	—	Vdc
Gate-source Leakage Current (VGS = 5 V, VDS = 0 V)	IGSS	—	—	1.3	µAdc
Zero Gate Voltage Drain Leakage Current (VDS = 28 V, VGS = 0 V)	IDSS	—	—	75	µAdc
On Characteristics					
Forward Transconductance (VDS = 10 V, ID = 1.0 A)	GFS	—	3	—	S
Gate Threshold Voltage (VDS = 10 V, ID = 400 µA)	VGS(TH)	—	—	4.8	Vdc
Gate Quiescent Voltage (VDS = 28 V, IDQ = 450 mA)	VGS(Q)	—	3.5	—	Vdc
Drain-source On-voltage (VGS = 10 V, ID = 1.0 A)	VDS(ON)	—	0.25	—	Vdc

Table 5. RF Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Dynamic Characteristics					
Input Capacitance (VDS = 28 Vdc, VGS = 0, f = 1 MHz)	CISS	—	73	—	pF
Output Capacitance (VDS = 28 Vdc, VGS = 0, f = 1 MHz)	COSS	—	23	—	pF
Reverse Transfer Capacitance (VDS = 28 Vdc, VGS = 0, f = 1 MHz)	CRSS	—	1.2	—	pF
Functional Tests, Instantaneous Band-Width (Tested in TriQuint's Wide-Band Test Fixture)					
Gain @ P1dB, 500MHz-2GHz (VDS = 28 V, POUT = 30 W, IDD = 200 mA)	G	—	10	—	dB
P1dB, 500MHz-2GHz (VDS = 28 V, POUT = 30 W, IDD = 200 mA)	P1dB	—	30	—	W
Power Added Efficiency, 500MHz-2GHz (VDS = 28 V, POUT = 30 W, IDD = 200 mA)	—	—	45	—	%
Functional Tests, Narrow Band RF Performance (1GHz)					
Linear Power Gain (VDS = 28 V, POUT = 6 W, IDQ = 450 mA)	GL	19	20	—	dB
Output Power (VDS = 28 V, 1 dB compression, IDQ = 450 mA)	P1dB	45	60	—	W
Drain Efficiency (VDS = 28 V, POUT = P1dB, IDQ = 450 mA)	—	—	59	—	%
Third-order Intermodulation Distortion (100 kHz spacing, VDS = 28 V, POUT = 45 WPEP, IDQ = 450 mA)	IMD	—	-31	—	dBc
Input Return Loss	IRL	—	10	—	dB
Ruggedness (VDS = 28 V, POUT = 45 W, IDQ = 450 mA, f = 880 MHz, VSWR = 10:1, all angles)	—	No degradation in output power.			

Figure 3.
P1dB and Efficiency (Narrow Band Performance Plotted Over Frequency)

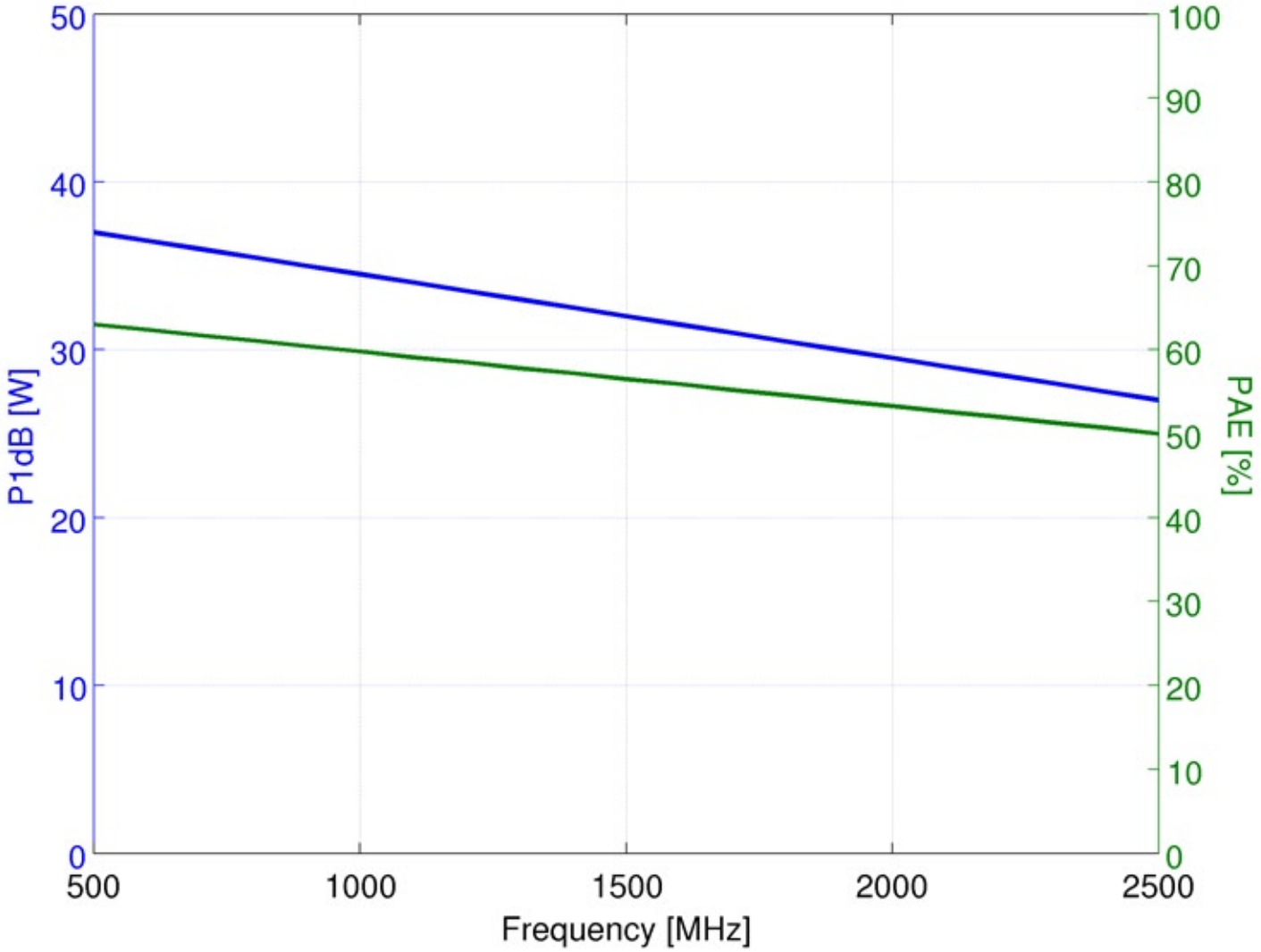


Figure 4.
P1dB and Gain (Narrow Band Performance Plotted Over Frequency)

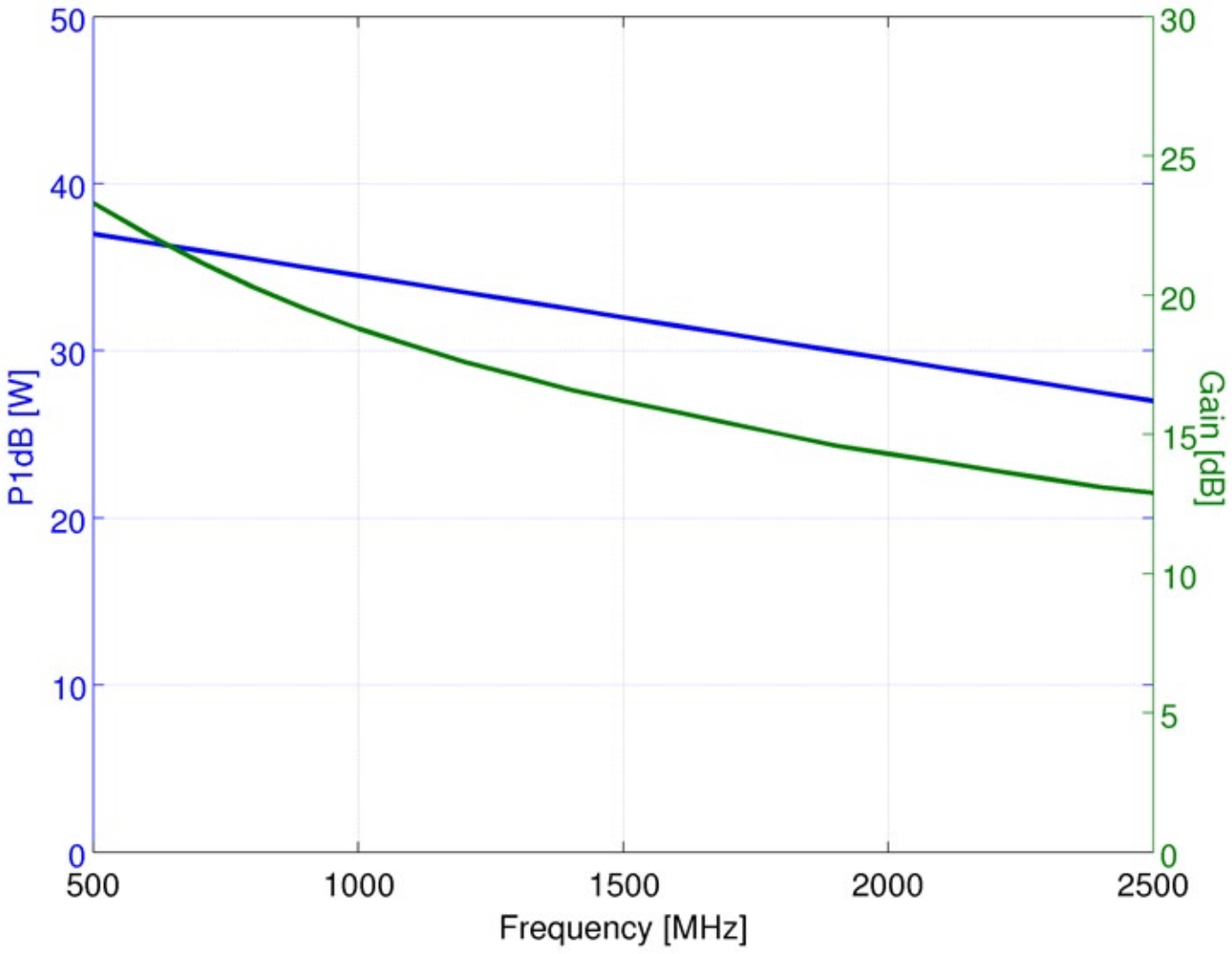


Figure 5.
Plot of Impedances to be Presented to the Source and Load of the device for optimal RF Performance.

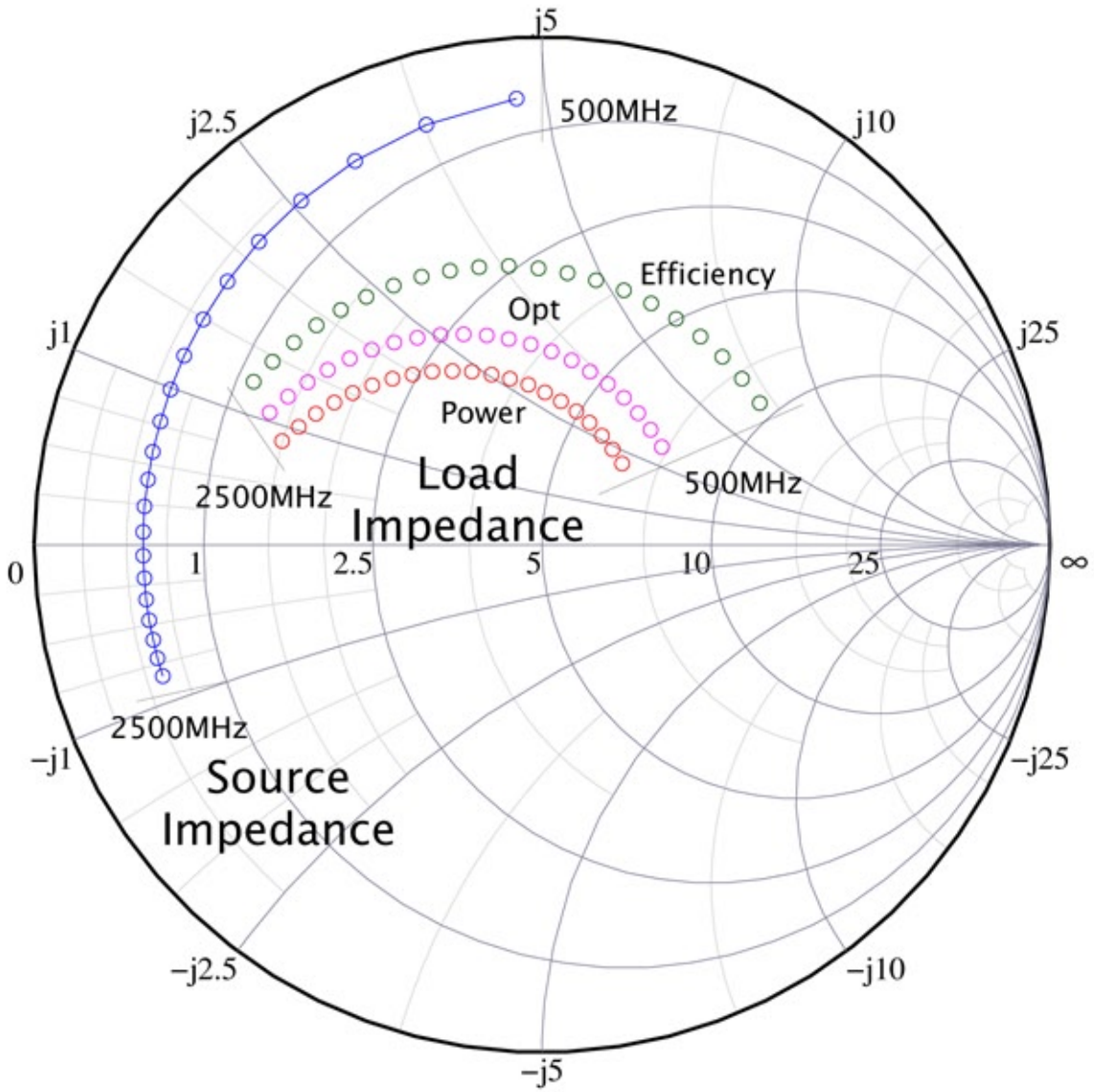


Figure 6.
S Parameters 800mA, 28 Volts

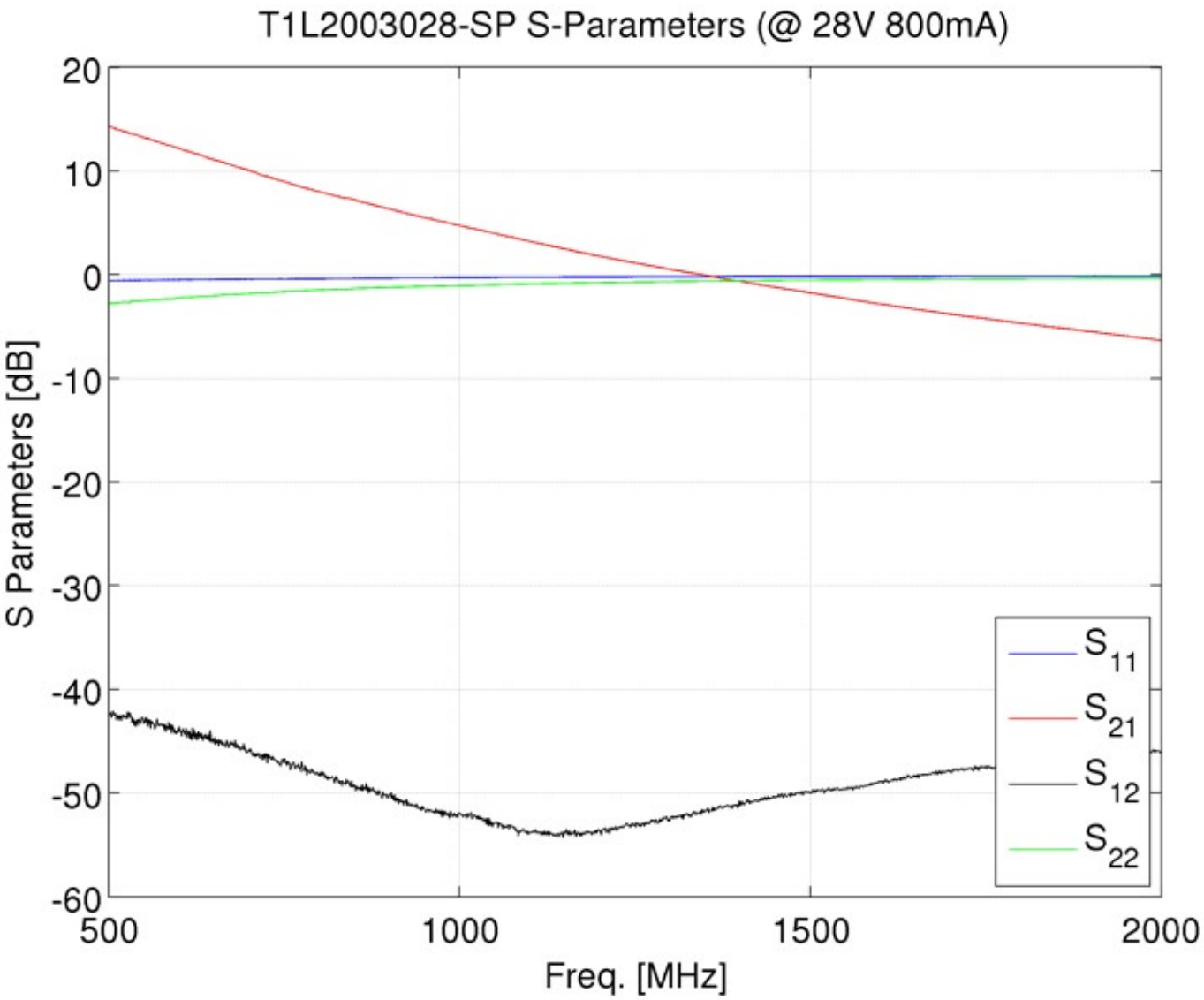


Table 6.

S Parameters 800mA, 28 Volts

Freq. (MHz)	Real(S11)	Imag(S11)	Real(S21)	Imag(S21)	Real(S12)	Imag(S12)	Real(S22)	Imag(S22)
500	-0.922389	-0.141939	3.442169	3.892102	0.006702	-0.003496	-0.618429	-0.380168
600	-0.937731	-0.117416	2.992273	2.726896	0.005862	-0.003025	-0.667645	-0.379747
700	-0.947335	-0.100493	2.55325	1.874774	0.004603	-0.002232	-0.729357	-0.359227
800	-0.953987	-0.086006	2.132991	1.331128	0.003609	-0.001582	-0.774675	-0.331553
900	-0.960672	-0.073563	1.834709	0.966367	0.002945	-0.000901	-0.810336	-0.310602
1000	-0.966889	-0.061292	1.576766	0.707514	0.002502	-0.000112	-0.838108	-0.286519
1100	-0.970899	-0.050085	1.35123	0.521212	0.001967	0.000565	-0.861553	-0.262319
1200	-0.974274	-0.040649	1.163025	0.392155	0.001684	0.001208	-0.88162	-0.239921
1300	-0.977932	-0.031466	1.01994	0.291782	0.001426	0.001866	-0.898607	-0.221596
1400	-0.979856	-0.022787	0.904409	0.216945	0.001406	0.002393	-0.91177	-0.205747
1500	-0.980454	-0.014219	0.803326	0.157075	0.001265	0.002897	-0.923506	-0.190767
1600	-0.981697	-0.007846	0.711266	0.120005	0.001164	0.00341	-0.931953	-0.173848
1700	-0.982815	-0.000984	0.638323	0.08707	0.001191	0.003867	-0.940047	-0.161003
1800	-0.984612	0.005168	0.579693	0.058515	0.001242	0.004149	-0.946311	-0.150365
1900	-0.985594	0.012243	0.529564	0.035175	0.001145	0.004692	-0.951789	-0.13964
2000	-0.985492	0.019104	0.482132	0.021833	0.001058	0.004946	-0.956188	-0.126832
2100	-0.985526	0.026114	0.443472	0.008653	0.000842	0.00545	-0.961151	-0.113894
2200	-0.985708	0.030901	0.407919	-0.00246	0.001216	0.005788	-0.963252	-0.105708
2300	-0.985362	0.037789	0.377957	-0.014872	0.001316	0.005982	-0.968493	-0.099204
2400	-0.98431	0.044056	0.34692	-0.022864	0.001381	0.006186	-0.971543	-0.088213
2500	-0.98409	0.048235	0.318019	-0.023985	0.00089	0.005922	-0.971838	-0.075412
2600	-0.985246	0.053767	0.296934	-0.029004	0.001355	0.007366	-0.974583	-0.066586
2700	-0.985066	0.058938	0.277241	-0.035002	0.001481	0.007292	-0.974	-0.059945
2800	-0.984571	0.066129	0.258276	-0.035971	0.001073	0.007883	-0.977731	-0.052995
2900	-0.982003	0.071617	0.240525	-0.039954	0.001792	0.007862	-0.980927	-0.044908
3000	-0.981434	0.074707	0.22585	-0.04251	0.001852	0.007914	-0.98103	-0.037902

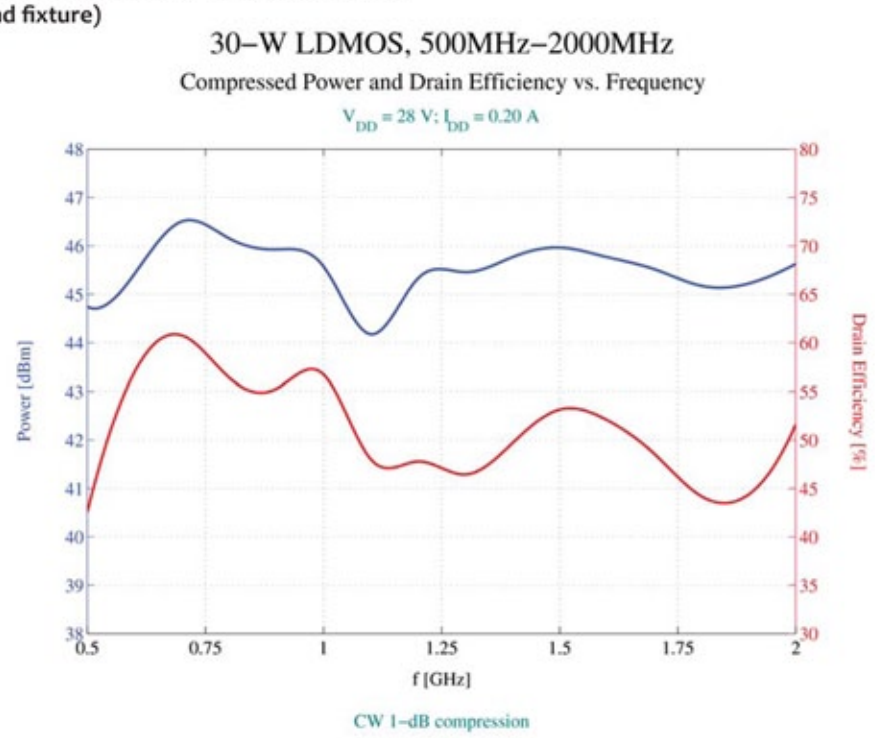
Table 7.

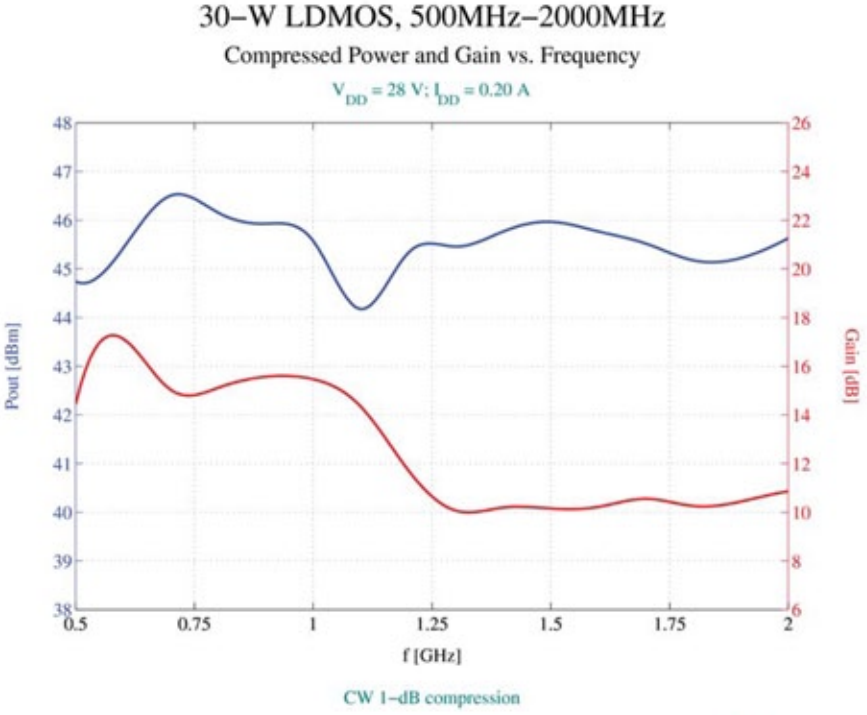
Table of RF performance that the device typically exhibits when placed in the specified impedance environment. The impedances are not the impedances of the device, they are the impedances presented to the device via an RF circuit or Load-pull system. The data is representative of typical device performance for both 100uSecond pulse width, 10% duty cycle conditions and 1000uSecond pulse width, 10% duty cycle conditions.

Frequency [MHz]	real(Γin)	imag(Γin)	real(Zin)	imag(Zin)	real(Γout)	imag(Γout)	real(Zout)	imag(Zout)
500	-0.96	0.182	0.6	4.69	-0.74	0.094	7.31	3.09
600	-0.965	0.147	0.6	3.77	-0.756	0.105	6.75	3.39
700	-0.969	0.121	0.6	3.1	-0.772	0.113	6.19	3.57
800	-0.971	0.1	0.6	2.57	-0.789	0.118	5.66	3.67
900	-0.973	0.084	0.6	2.15	-0.805	0.121	5.15	3.69
1000	-0.974	0.07	0.6	1.79	-0.821	0.122	4.68	3.65
1100	-0.975	0.058	0.6	1.49	-0.836	0.12	4.25	3.56
1200	-0.975	0.048	0.6	1.22	-0.849	0.118	3.86	3.44
1300	-0.976	0.039	0.6	0.99	-0.862	0.114	3.51	3.29
1400	-0.976	0.03	0.6	0.78	-0.873	0.11	3.2	3.12
1500	-0.976	0.023	0.6	0.58	-0.884	0.105	2.92	2.94
1600	-0.976	0.016	0.6	0.4	-0.893	0.099	2.67	2.76
1700	-0.976	0.009	0.6	0.24	-0.902	0.093	2.45	2.56
1800	-0.976	0.003	0.6	0.08	-0.91	0.087	2.25	2.37
1900	-0.976	-0.003	0.6	-0.07	-0.917	0.08	2.08	2.18
2000	-0.976	-0.008	0.6	-0.21	-0.923	0.074	1.92	1.99
2100	-0.976	-0.013	0.6	-0.34	-0.929	0.067	1.77	1.8
2200	-0.976	-0.018	0.6	-0.47	-0.934	0.06	1.64	1.61
2300	-0.976	-0.023	0.6	-0.59	-0.939	0.054	1.53	1.43
2400	-0.976	-0.028	0.6	-0.71	-0.944	0.047	1.42	1.25
2500	-0.976	-0.032	0.6	-0.83	-0.947	0.041	1.33	1.07

Figure 7.

Typical Instantaneous Wide-Band Performance Data, 500MHz-2GHz
(tested in TriQuint wide-band fixture)





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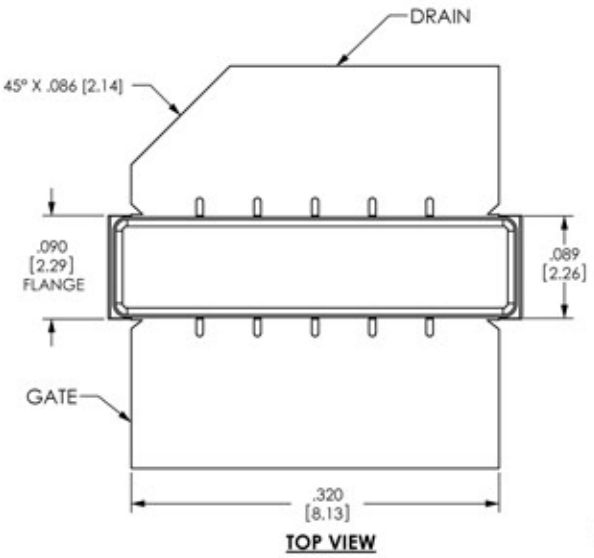
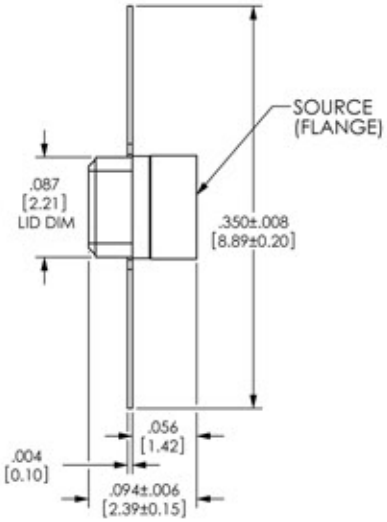
30 W, 28V, 500 MHz-2 GHz, Powerband™ LDMOS RF Power Transistor

Package Dimensions

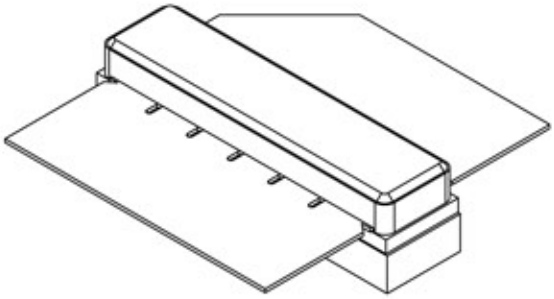
Note: All dimensions in inches. Scale 8:1

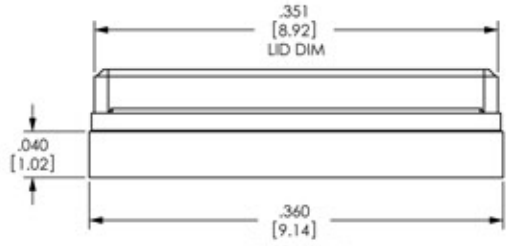


TOP VIEW



END VIEW





SIDE VIEW

ALL DIMENSIONS ARE IN INCHES [mm]
UNLESS OTHERWISE SPECIFIED

TOLERANCES

DECIMALS	ANGULAR
.XX ±0.01[.25]	.X ±0.5
.XXX ±0.003[.08]	