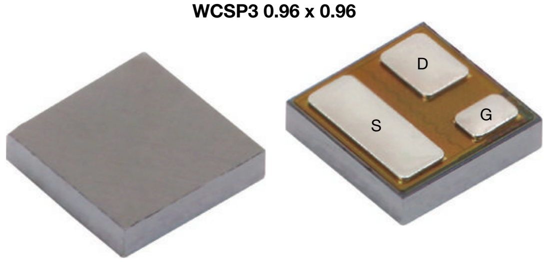
7 V (D-S), N-Channel Switch in WCSP3

WCSP3 0.96 x 0.96



Top View   Bottom View

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (mΩ) MAX.	I_D (A)	Q_g (TYP.)
7	20 at V_{GS} = 3 V	5	2.5 nC
	21.6 at V_{GS} = 2.65 V	5	
	22 at V_{GS} = 2.1 V	5	
	29 at V_{GS} = 1.8 V	1	

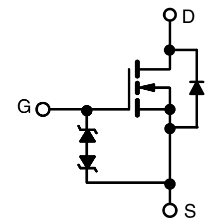
FEATURES

- Ultra compact 0.96 mm x 0.96 mm outline
- Ultra thin; 0.27 mm
- Low gate drive voltage
- ESD protection: 7 kV HBM, 1 kV CDM
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

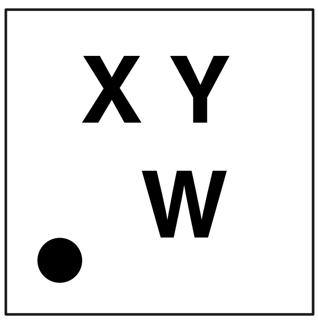
- Low side load switching with minimized voltage drop
- Smart phones, tablet, portable media players



ORDERING INFORMATION

Package	WCSP3 0.96 x 0.96
Lead (Pb)-free and halogen-free	SiP32481DB-T2-GE1

PART MARKING INFORMATION



● = **designates location of the gate pin**

XY = part number code (AA for SiP32481)

W = week code

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

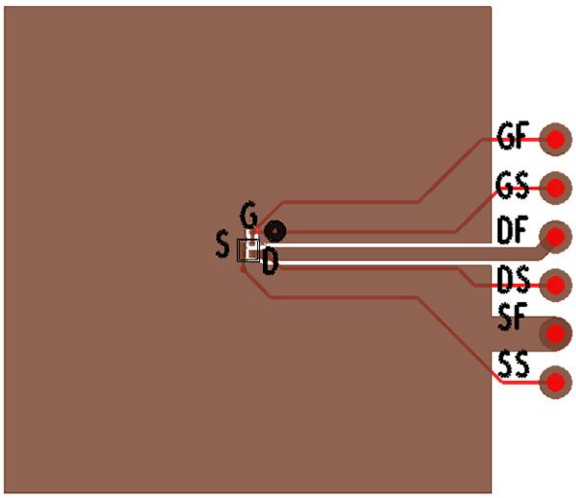
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	7	V
Gate-source voltage [c]		V_{GS}	± 7	
Continuous drain current, V_{GS} = 2.65 V	T_A = 25 °C	I_D	6.5 [a]	A
	T_A = 70 °C		5.2 [a]	
	T_A = 25 °C		3.9 [b]	
	T_A = 70 °C		3.1 [b]	
Pulsed drain current (t = 300 μs), V_{GS} = 2.65 V		I_{DM}	20	
Maximum power dissipation, V_{GS} = 2.65 V	T_A = 25 °C	P_D	1.3 [a]	W
	T_A = 70 °C		0.86 [a]	
	T_A = 25 °C		0.47 [b]	
	T_A = 70 °C		0.3 [b]	
Operating junction temperature range		T_J	-40 to +150	°C
Storage temperature range		T_{stg}	-55 to +150	
Soldering recommendation (peak temperature)			260	
ESD / HBM		ESD / HBM	7000	V
ESD / CDM		ESD / CDM	1000	

THERMAL RESISTANCE RATINGS					
PARAMETER	SYMBOL	CONDITION	LIMIT		UNIT
			TYP.	MAX.	
Junction to ambient	R_{thJA}	Steady state, test board a	75	93	°C/W
		t = 10 s, test board a	45	56	
		Steady state, test board b	210	262	
		t = 10 s, test board b	154	192	

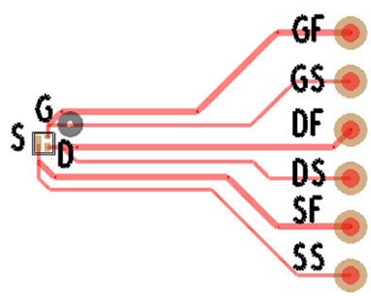
Notes

a. Surface mounted on 1.5" x 1.5" FR4 board with single sided 1" x 1" 2 oz. copper
b. Surface mounted on 1.5" x 1.5" FR4 board with minimum 2 oz. copper pad

BOARD LAYOUTS



Test board a, 75 °C/W (typical)



Test board b, 210 °C/W (typical)

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	8	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	0.45	-	0.8	
Gate-source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 5.5 V	-0.2	-	0.2	µA
On-state drain current [a]	$I_{D(on)}$	V_{DS} = 5.5 V, V_{GS} = 4.5 V	10	-	-	A
Zero gate voltage drain current	I_{DSS}	V_{DS} = 5.5 V, V_{GS} = 0 V, T_J = 25 °C	-	0.02	1	µA
		V_{DS} = 5.5 V, V_{GS} = 0 V, T_J = 85 °C	-	-	1.8	
		V_{DS} = 5.5 V, V_{GS} = 0 V, T_J = 125 °C	-	-	18	
		V_{DS} = 5.5 V, V_{GS} = 0 V, T_J = 150 °C	-	35	72	
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = 3 V, I_D = 5 A, T_J = 25 °C	-	13	20	mΩ
		V_{GS} = 3 V, I_D = 5 A, T_J = 150 °C	-	19.6	31	
		V_{GS} = 2.65 V, I_D = 5 A, T_J = 25 °C	-	13.8	21.6	
		V_{GS} = 2.65 V, I_D = 5 A, T_J = 150 °C	-	21	31.3	
		V_{GS} = 2.1 V, I_D = 5 A, T_J = 25 °C	-	15.2	22	
		V_{GS} = 2.1 V, I_D = 5 A, T_J = 150 °C	-	23.9	38	
		V_{GS} = 1.8 V, I_D = 5 A, T_J = 25 °C	-	17.5	29	
		V_{GS} = 1.8 V, I_D = 1 A, T_J = 150 °C	-	-	45	
Forward transconductance [a]	g_{fs}	V_{DS} = 4 V, I_D = 1 A	-	9	-	S
		V_{DS} = 5.5 V, I_D = 4 A	-	20	-	
Dynamic [b]						
Input capacitance	C_{iss}	V_{DS} = 4 V, V_{GS} = 0 V, f = 1 MHz	-	450	680	pF
Output capacitance	C_{oss}	V_{DS} = 4 V, V_{GS} = 0 V, f = 1 MHz	-	293	-	
Reverse transfer capacitance	C_{rss}		-	91	-	
Total gate charge	Q_g	V_{DS} = 4 V, I_D = 4 A, V_{GS} = 3 V	-	2.7	-	nC
Gate-source charge	Q_{gs}		-	0.63	-	
Gate-drain charge	Q_{gd}		-	0.76	-	
Gate resistance	R_g	V_{GS} = 0.1 V, f = 1 MHz	-	0.73	-	Ω
Turn-on delay time	$t_{d(on)}$	V_{DS} = 4 V, R_L = 2 Ω, V_{GEN} = 2.5 V, R_g = 1 Ω	-	-	20	ns
Rise time	t_r		-	-	30	
Turn-off delay time	$t_{d(off)}$		-	-	80	
Fall time	t_f		-	-	20	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	T_A = 25 °C	-	-	1.5	A
Pulse diode forward current [b]	I_{SM}	t = 300 µs, at 25 °C	-	-	10	
Body diode voltage	V_{SD}	I_S = 1.5 A, V_{GD} = 0 V	-	0.65	1.2	V
Body diode reverse recovery time [b]	t_{rr}	I_F = 2 A, di/dt = 100 A/µs, T_J = 25 °C	-	102	200	ns
Body diode reverse recovery charge [b]	Q_{rr}		-	0.03	0.1	nC
Reverse recovery fall time [b]	t_a		-	17	-	ns
Reverse recovery rise time [b]	t_b		-	85	-	

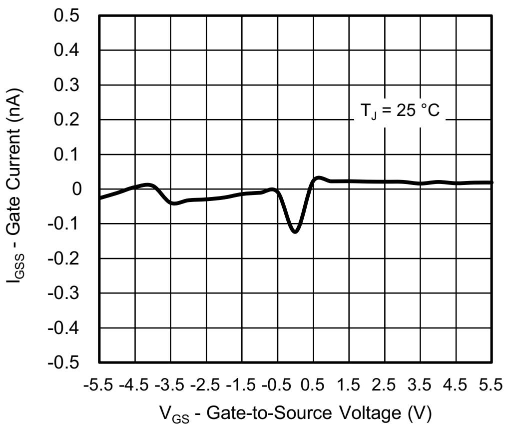
Notes

a. Pulse test: pulse width ≤ 300 µs, duty cycle ≤ 2 %

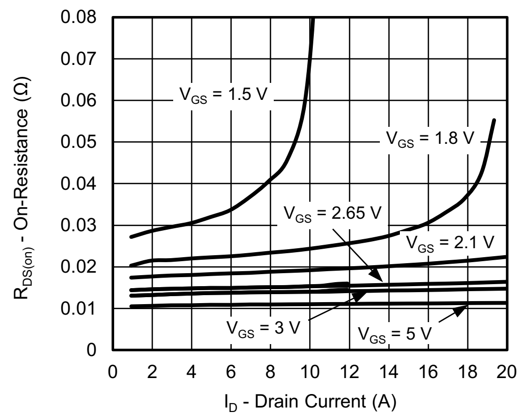
b. Guaranteed by design, not subject to production testing

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

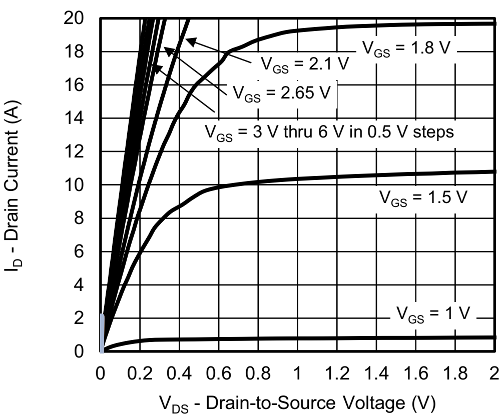
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



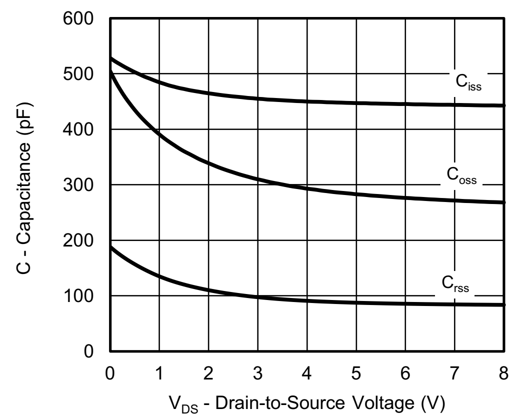
Gate Current vs. Gate-to-Source Voltage



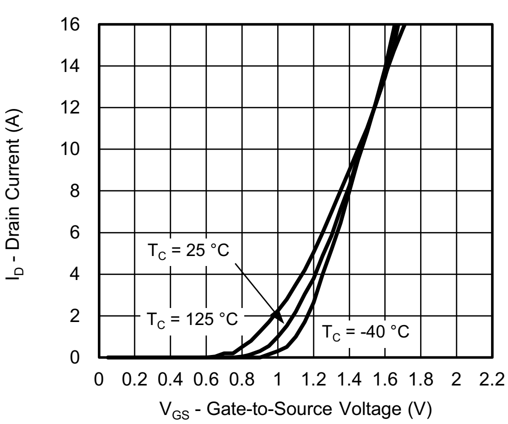
On-Resistance vs. Drain Current and Gate Voltage



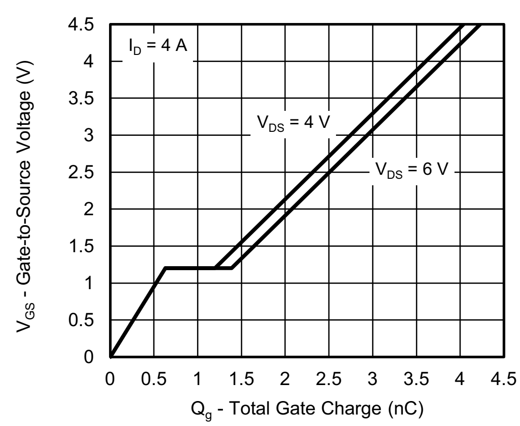
Output Characteristics



Capacitance

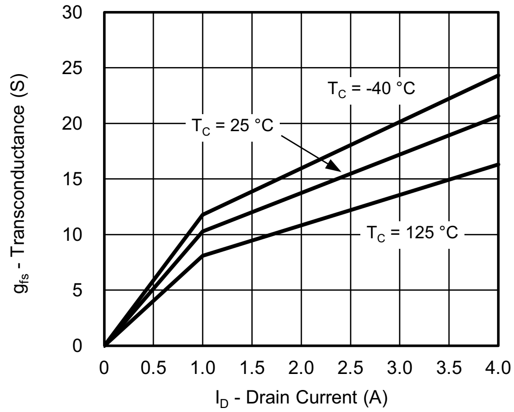


Transfer Characteristics

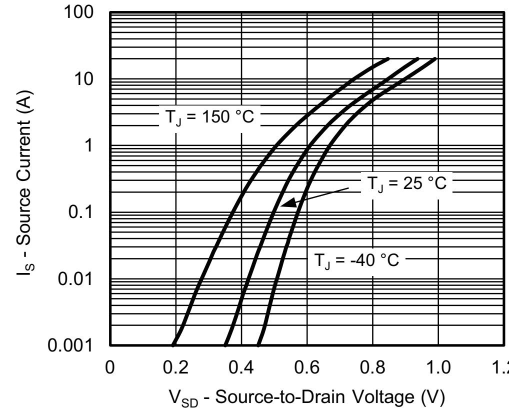


Gatecharge

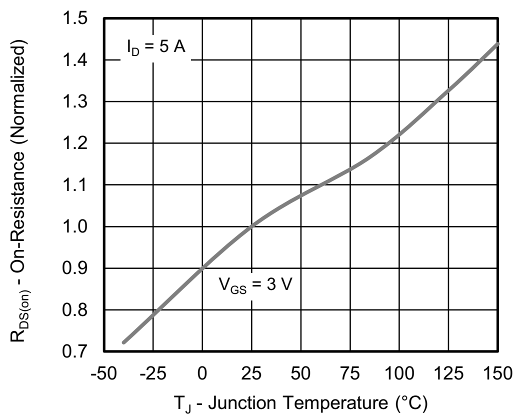
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



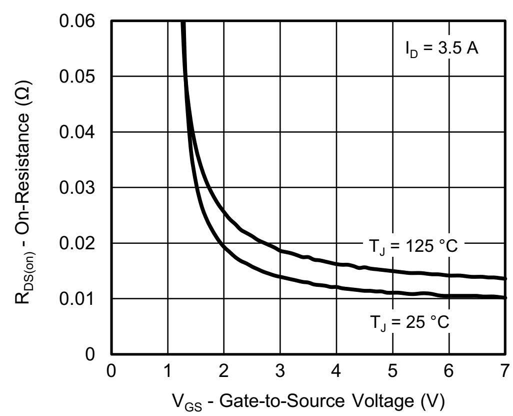
Transconductance



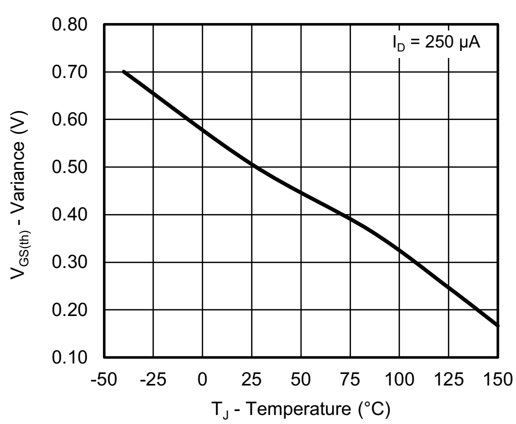
Forward Diode Voltage



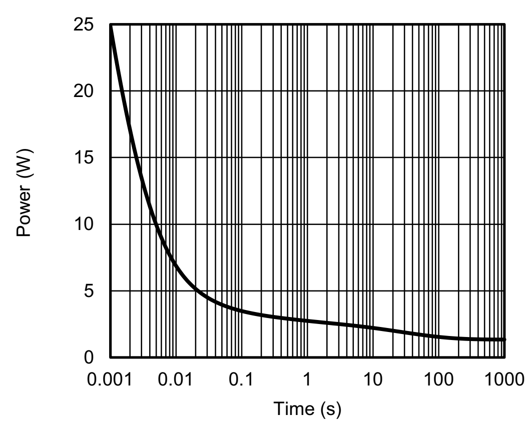
$R_{DS(on)}$ - On-Resistance (Normalized) vs. Junction Temperature



On-Resistance vs. Gate-to-Source Voltage

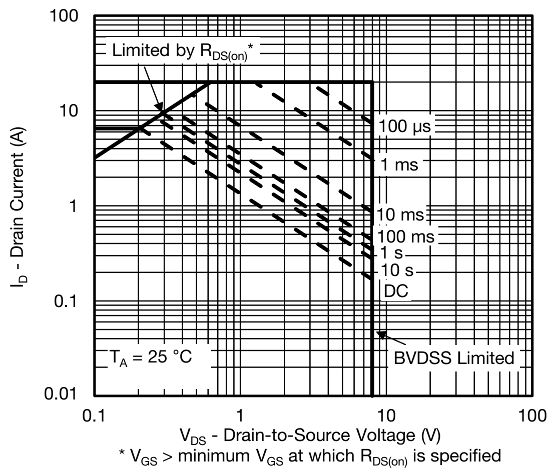


Threshold Voltage vs. Junction Temperature

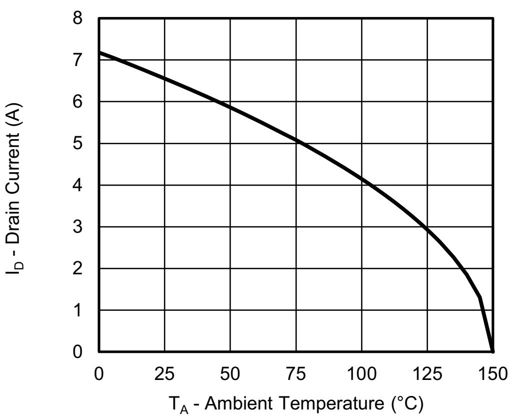


Single Pulse Power, Junction-to-Ambient

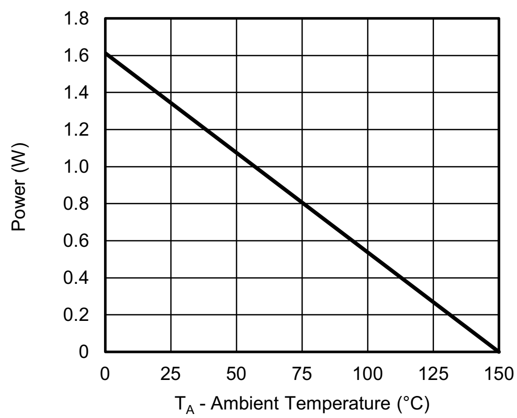
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Safe Operating Area, Junction-to-Ambient



Current Derating [a]

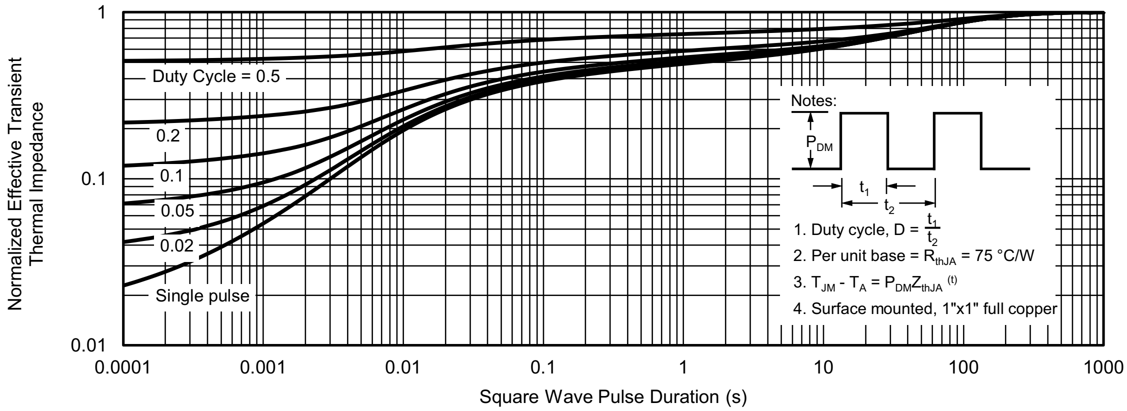


Power Derating [a]

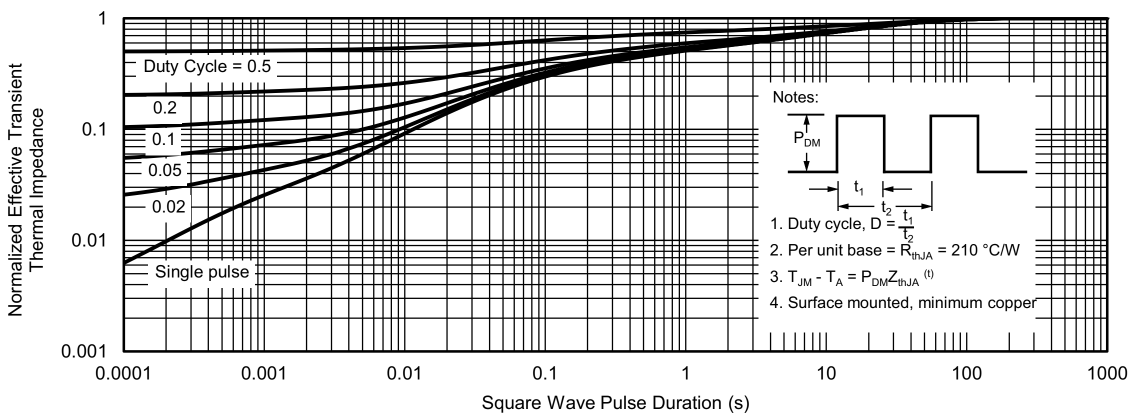
Note

a. The power dissipation P_D is based on T_A max. = 150 °C, using junction-to-ambient thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient (Test Board a)



Normalized Thermal Transient Impedance, Junction-to-Ambient (Test Board b)

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