

Dual N-Channel 20 V (D-S) MOSFET with Schottky Diode

PRODUCT SUMMARY

	V _{DS}	R _{DS(on)} (Ω)	I _D (A) ^{a, f}	Q _g (Typ.)
Channel-1	20	0.022 at V _{GS} = 10 V	8	8
		0.025 at V _{GS} = 4.5 V	8	
Channel-2	20	0.015 at V _{GS} = 10 V	8	17
		0.019 at V _{GS} = 4.5 V	8	

SCHOTTKY PRODUCT SUMMARY

V _{DS} (V)	V _{SD} (V) Diode Forward Voltage	I _F (A) ^a
20	0.43 V at 1 A	4

FEATURES

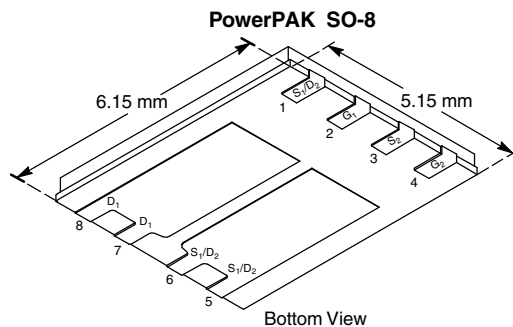
- TrenchFET® Power MOSFET
- 100 % R_g and UIS Tested
- Material categorization:
For definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

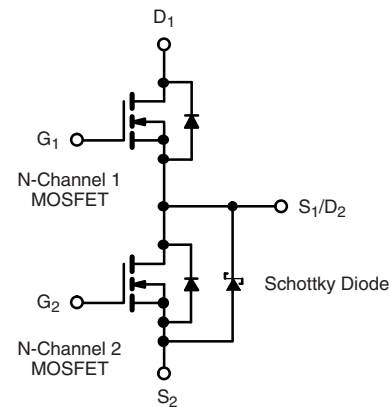
APPLICATIONS

- Synchronous Buck Converter
 - Game Machines
 - Notebook Computers



Ordering Information:

Si7980DP-T1-GE3 (Lead (Pb)-free and Halogen-free)



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

Parameter		Symbol	Channel-1	Channel-2	Unit
Drain-Source Voltage		V _{DS}	20	20	V
Gate-Source Voltage		V _{GS}	± 16	± 16	
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	I _D	8 ^f	8 ^f	A
	T _C = 70 °C		8 ^f	8 ^f	
	T _A = 25 °C		8.8 ^{b, c}	11 ^{b, c}	
	T _A = 70 °C		7.1 ^{b, c}	9 ^{b, c}	
Pulsed Drain Current		I _{DM}	30	30	
Source-Drain Current Diode Current	T _C = 25 °C	I _S	8 ^f	8 ^f	
	T _A = 25 °C		2.8 ^{b, c}	2.8 ^{b, c}	
Pulsed Source-Drain Current		I _{SM}	30	30	
Single Pulse Avalanche Current	L = 0.1 mH	I _{AS}	15	15	mJ
Single Pulse Avalanche Energy		E _{AS}	11.2	11.2	
Maximum Power Dissipation	T _C = 25 °C	P _D	19.8	21.9	W
	T _C = 70 °C		12.6	14	
	T _A = 25 °C		3.1 ^{b, c}	3.4 ^{b, c}	
	T _A = 70 °C		2 ^{b, c}	2.2 ^{b, c}	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150		°C
Soldering Recommendations (Peak Temperature) ^{d, e}			260		

Notes:

- Based on T_C = 25 °C.
- Surface mounted on 1" x 1" FR4 board.
- t = 10 s.
- See solder profile (www.vishay.com/doc?73257). The PowerPAK SO-8 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.
- Package limited.

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Channel-1		Channel-2		Unit
			Typ.	Max.	Typ.	Max.	
Maximum Junction-to-Ambient ^{a, b}	$t \leq 10$ s	R_{thJA}	32	40	30	36	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	5	6.3	4.5	5.7	

SPECIFICATIONS ($T_J = 25$ °C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ. ^c	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	Ch-1	20		V	
		V _{GS} = 0 V, I _D = 1 mA	Ch-2	20			
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA	Ch-1		22	mV/°C	
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J	I _D = 250 μA	Ch-1		- 5		
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	Ch-1	1		V	
		V _{DS} = V _{GS} , I _D = 1 mA	Ch-2	1.4			
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 16 V	Ch-1			100	nA
		V _{DS} = 0 V, V _{GS} = ± 16 V	Ch-2			100	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V	Ch-1			0.001	mA
		V _{DS} = 20 V, V _{GS} = 0 V	Ch-2		0.05	0.50	
		V _{DS} = 20 V, V _{GS} = 0 V, T _J = 100 °C	Ch-1			0.025	
		V _{DS} = 20 V, V _{GS} = 0 V, T _J = 100 °C	Ch-2		3	15	
On-State Drain Current ^d	I _{D(on)}	V _{DS} = 5 V, V _{GS} = 10 V	Ch-1	10			A
		V _{DS} = 5 V, V _{GS} = 10 V	Ch-2	10			
Drain-Source On-State Resistance ^d	R _{DS(on)}	V _{GS} = 10 V, I _D = 5 A	Ch-1		0.018	0.022	Ω
		V _{GS} = 10 V, I _D = 5 A	Ch-2		0.012	0.015	
		V _{GS} = 4.5 V, I _D = 4 A	Ch-1		0.020	0.025	
		V _{GS} = 4.5 V, I _D = 4 A	Ch-2		0.015	0.019	
Forward Transconductance ^d	g _{fs}	V _{DS} = 15 V, I _D = 5 A	Ch-1		40		S
		V _{DS} = 15 V, I _D = 5 A	Ch-2		47		
Dynamic ^c							
Input Capacitance	C _{iss}	Channel-1 V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	Ch-1		1010		pF
			Ch-2		1370		
Output Capacitance	C _{oss}	Channel-2 V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	Ch-1		220		
			Ch-2		320		
Reverse Transfer Capacitance	C _{rss}		Ch-1		100		
			Ch-2		120		

Notes:

a. Surface mounted on 1" x 1" FR4 board.

b. Maximum under steady state conditions is 88 °C/W (channel-1) and 83 °C/W (channel-2).

c. Guaranteed by design, not subject to production testing.

d. Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %.

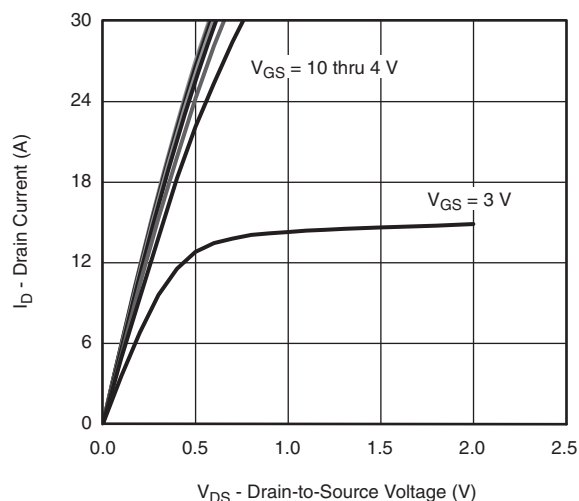
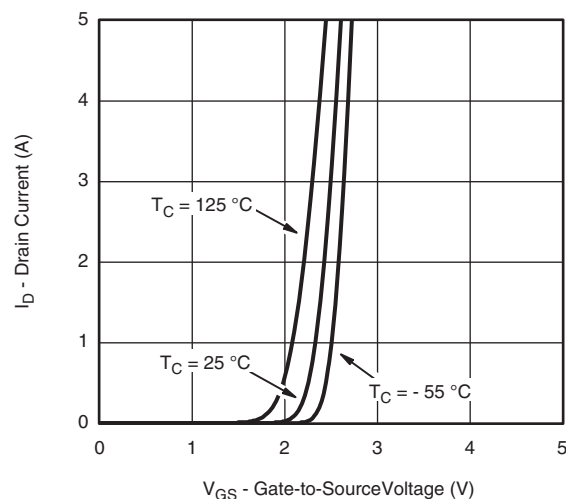
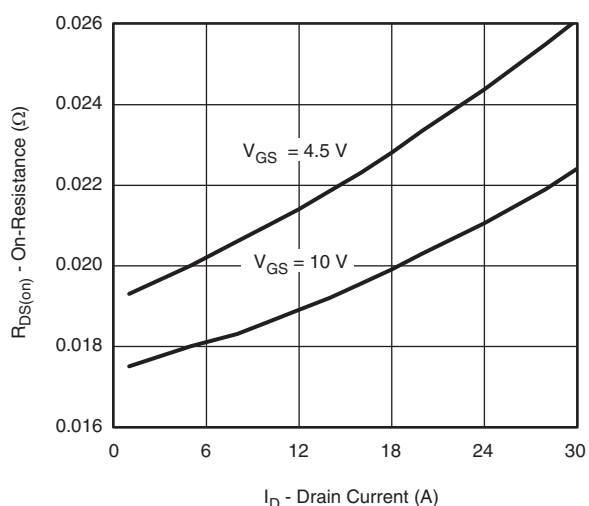
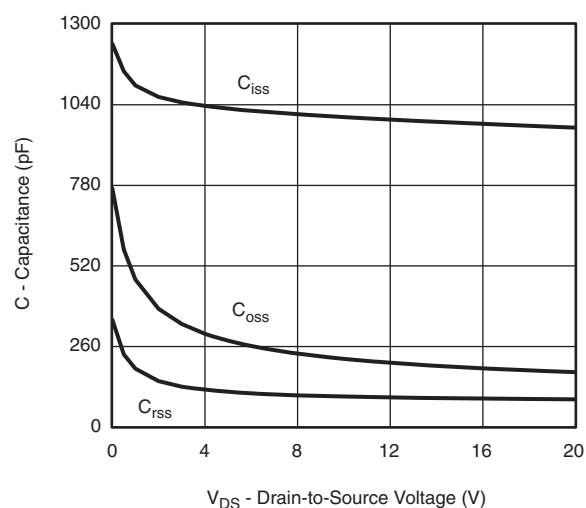
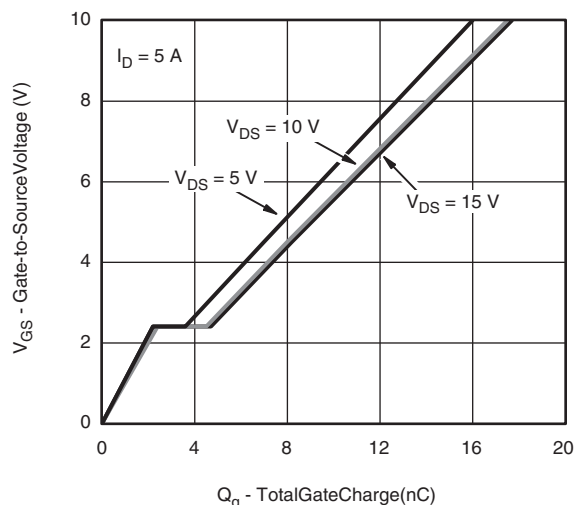
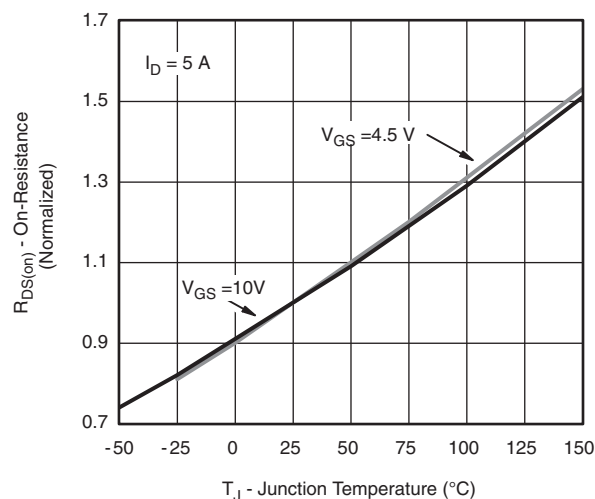


SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)							
Parameter	Symbol	Test Conditions		Min.	Typ. ^a	Max.	Unit
Dynamic ^a							
Total Gate Charge	Q _g	V _{DS} = 10 V, V _{GS} = 10 V, I _D = 5 A	Ch-1		17.5	27	nC
		V _{DS} = 10 V, V _{GS} = 10 V, I _D = 5 A	Ch-2		22.5	34	
		Channel-1 V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 5 A	Ch-1		8	12	
			Ch-2		10.3	16	
Gate-Source Charge	Q _{gs}	Channel-2 V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 5 A	Ch-1		2.5		
Gate-Drain Charge	Q _{gd}		Ch-2		3.4		
			Ch-1		2.1		
			Ch-2		2.6		
Gate Resistance	R _g	f = 1 MHz	Ch-1	0.2	1.1	2.2	Ω
			Ch-2	0.2	1.3	2.6	
Turn-On Delay Time	t _{d(on)}	Channel-1 V _{DD} = 10 V, R _L = 2 Ω I _D ≅ 5 A, V _{GEN} = 10 V, R _g = 1 Ω	Ch-1		9	18	ns
Rise Time	t _r		Ch-2		13	25	
			Ch-1		16	30	
Turn-Off Delay Time	t _{d(off)}		Ch-2		16	30	
		Ch-1		20	35		
Fall Time	t _f	Ch-2		24	45		
		Ch-1		9	18		
Turn-On Delay Time	t _{d(on)}	Channel-2 V _{DD} = 10 V, R _L = 2 Ω I _D ≅ 5 A, V _{GEN} = 10 V, R _g = 1 Ω	Ch-2		8	16	
			Ch-1		15	30	
Rise Time	t _r		Ch-2		18	35	
			Ch-1		18	35	
Turn-Off Delay Time	t _{d(off)}	Ch-2		18	35		
		Ch-1		20	40		
Fall Time	t _f	Ch-2		25	45		
		Ch-1		12	24		
		Ch-2		10	20		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	Ch-1			8	A
			Ch-2			8	
Pulse Diode Forward Current ^a	I _{SM}		Ch-1			30	
			Ch-2			30	
Body Diode Voltage	V _{SD}	I _S = 2 A	Ch-1		0.73	1.1	V
		I _S = 1 A	Ch-2		0.37	0.43	
Body Diode Reverse Recovery Time	t _{rr}	Channel-1 I _F = 5 A, dI/dt = 100 A/μs, T _J = 25 °C	Ch-1		16	32	ns
			Ch-2		20	40	
Body Diode Reverse Recovery Charge	Q _{rr}		Ch-1		8	16	nC
			Ch-2		10	20	
Reverse Recovery Fall Time	t _a	Channel-2 I _F = 5 A, dI/dt = 100 A/μs, T _J = 25 °C	Ch-1		8		ns
			Ch-2		9		
Reverse Recovery Rise Time	t _b		Ch-1		8		
			Ch-2		11		

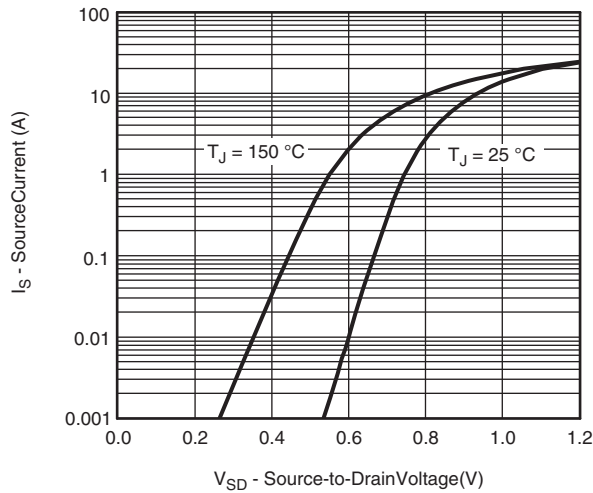
Note:

a. Guaranteed by design, not subject to production testing.

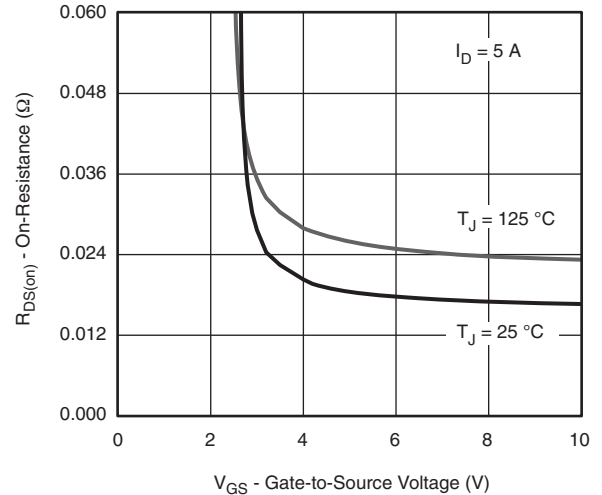
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)**Output Characteristics****Transfer Characteristics****On-Resistance vs. Drain Current****Capacitance****Gate Charge****On-Resistance vs. Junction Temperature**

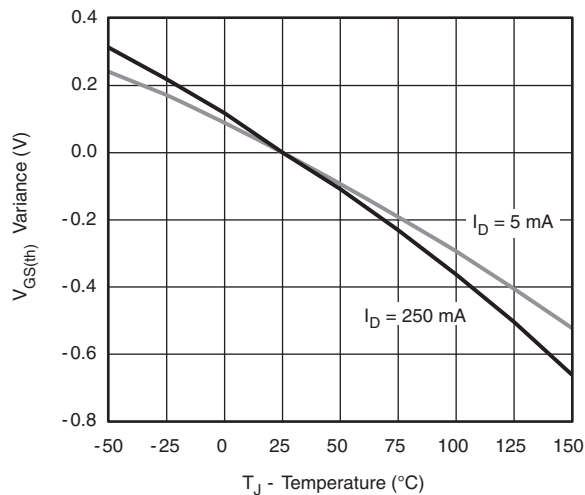
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



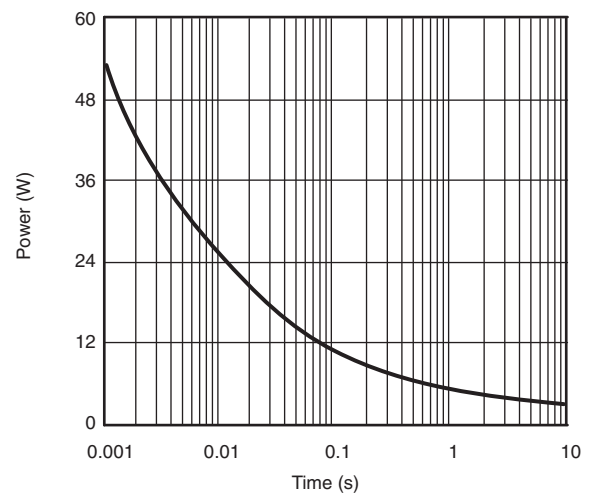
Source-Drain Diode Forward Voltage



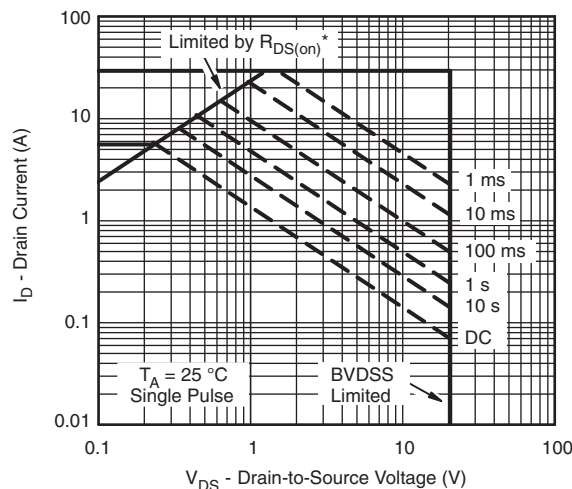
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

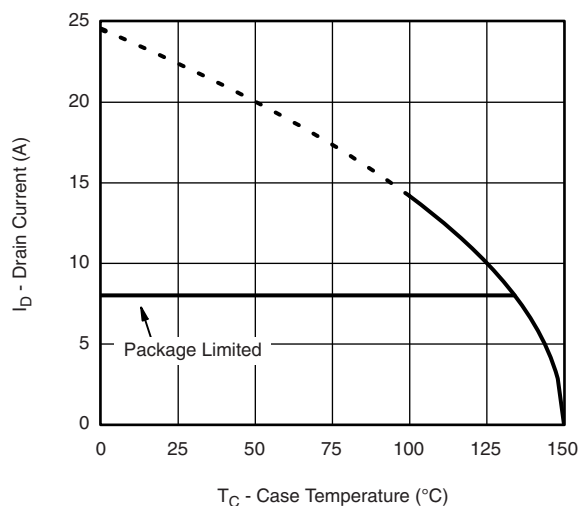
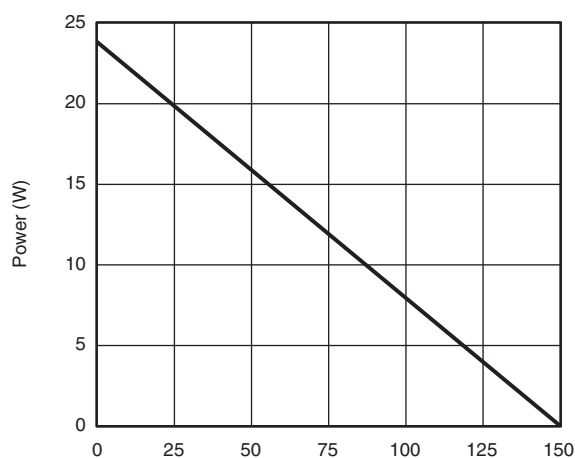
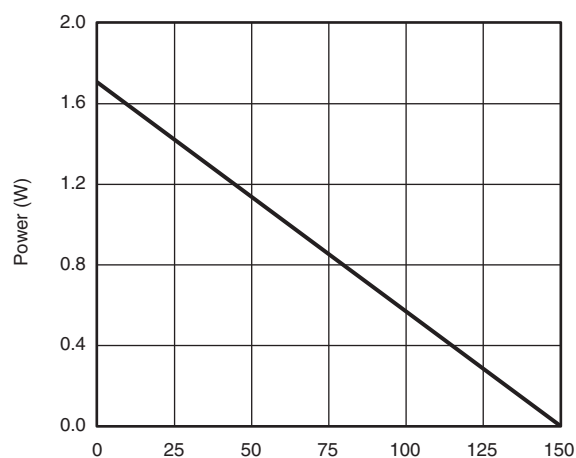


Single Pulse Power, Junction-to-Ambient



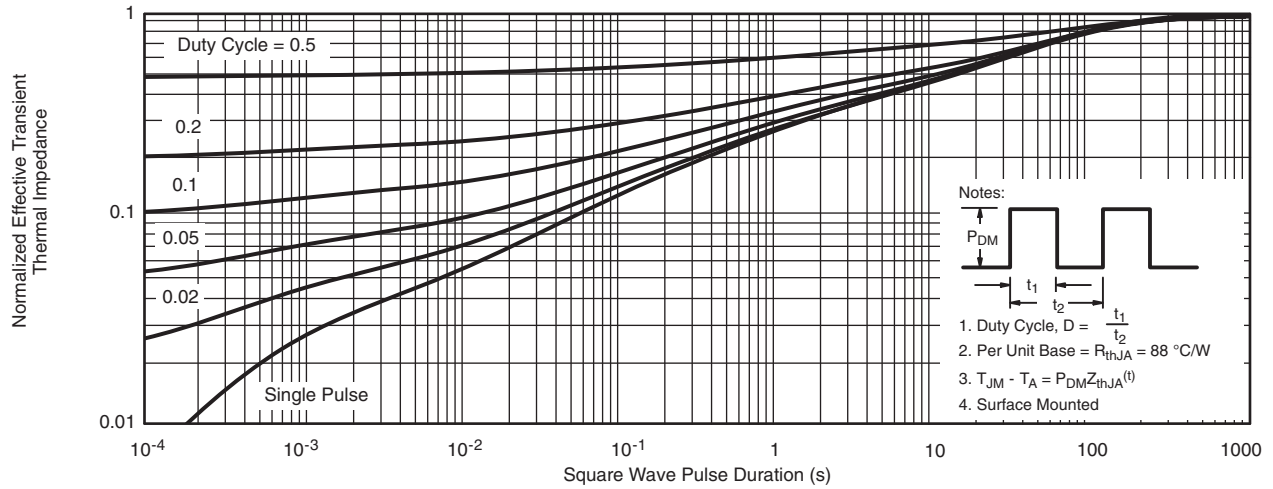
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

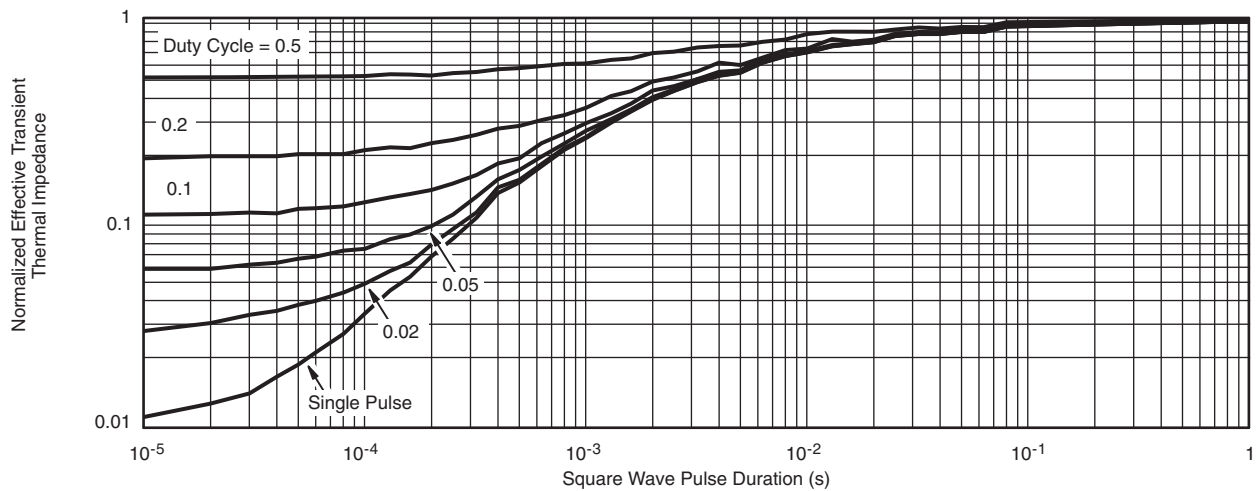
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)**Current Derating*****Power Derating, Junction-to-Case****Power Derating, Junction-to-Ambient**

* The power dissipation P_D is based on $T_{J(max.)} = 150$ °C, using junction-to-case 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.

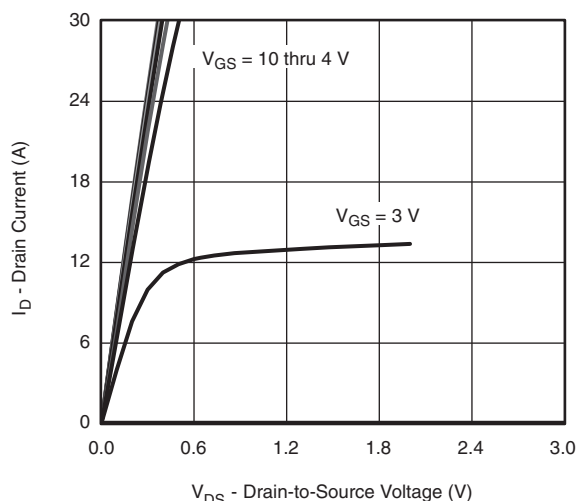
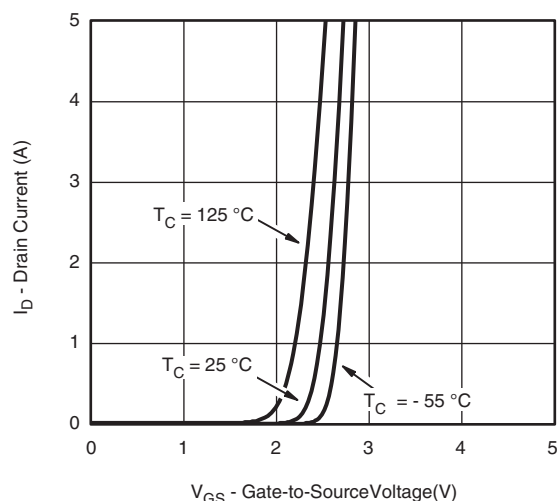
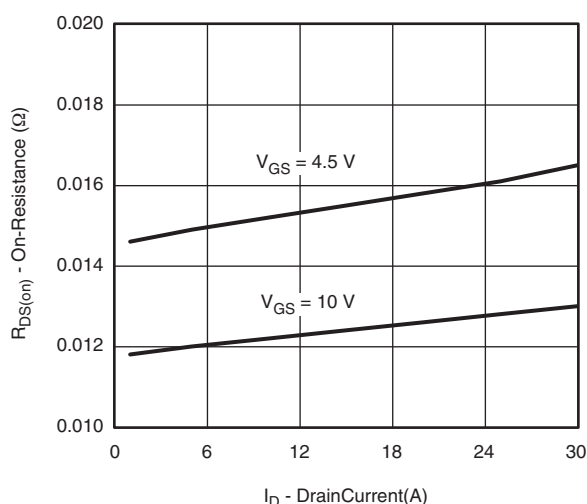
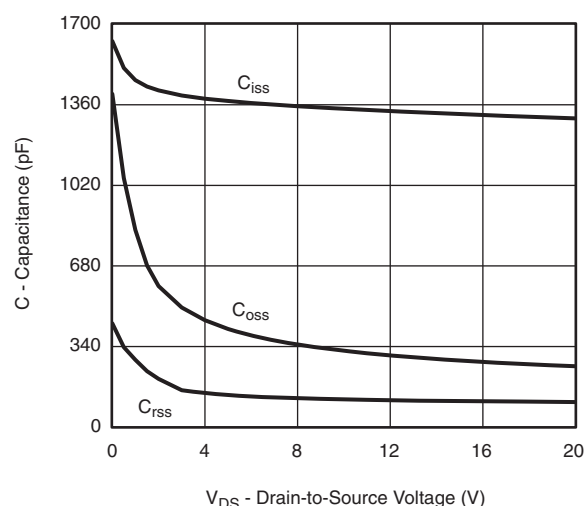
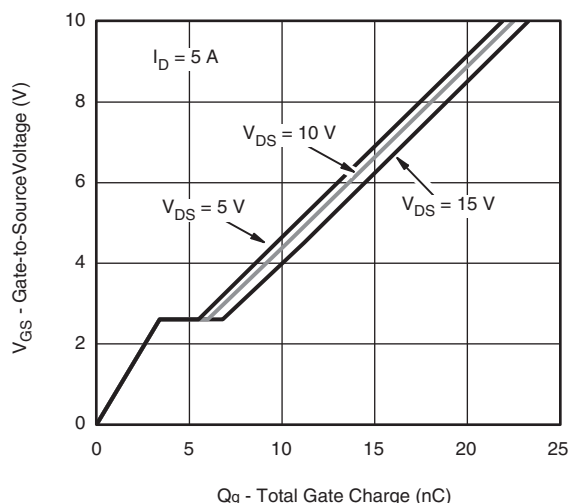
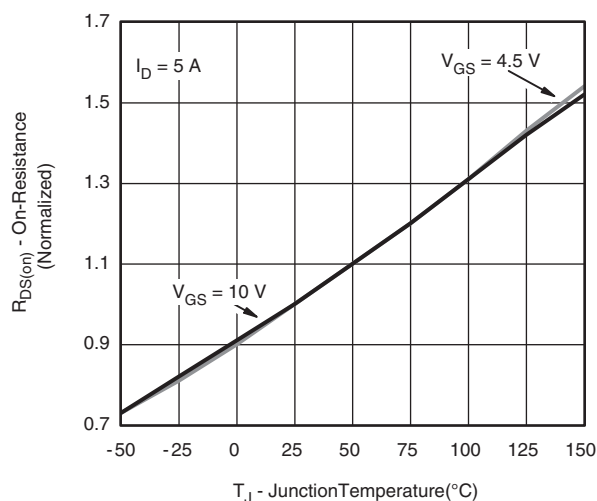
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



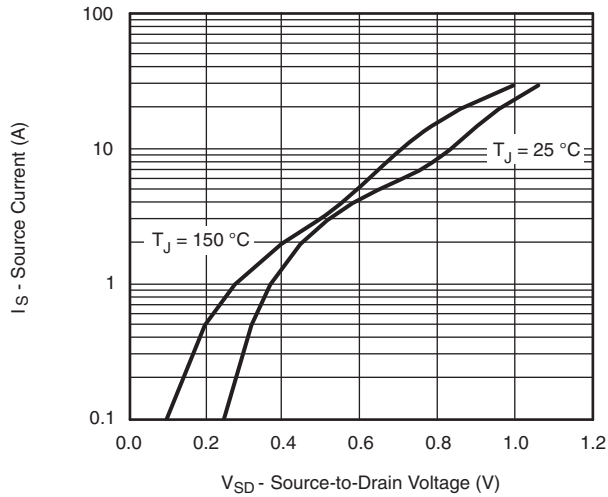
Normalized Thermal Transient Impedance, Junction-to-Ambient



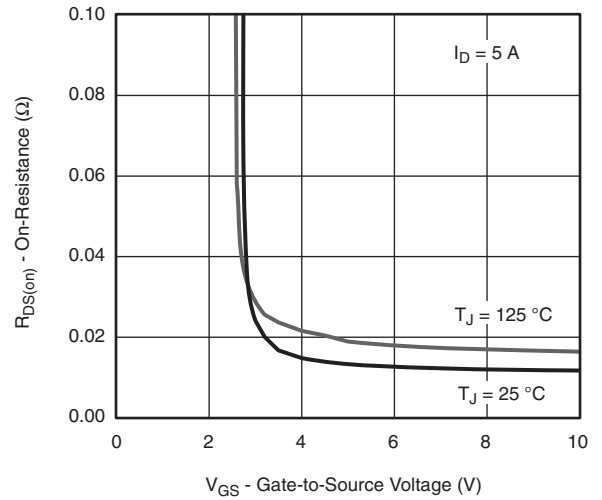
Normalized Thermal Transient Impedance, Junction-to-Case

CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)**Output Characteristics****Transfer Characteristics****On-Resistance vs. Drain Current****Capacitance****Gate Charge****On-Resistance vs. Junction Temperature**

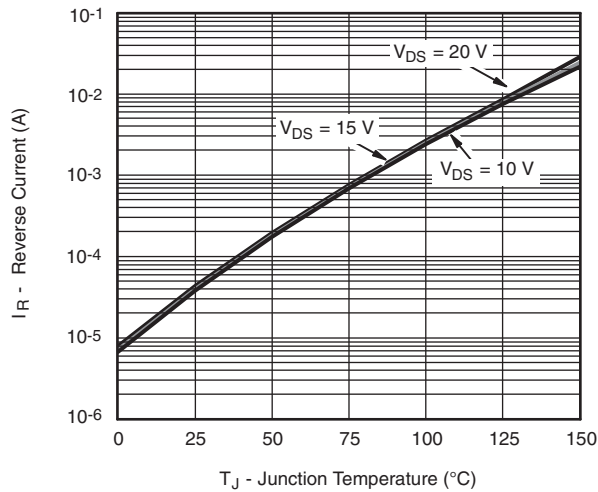
CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



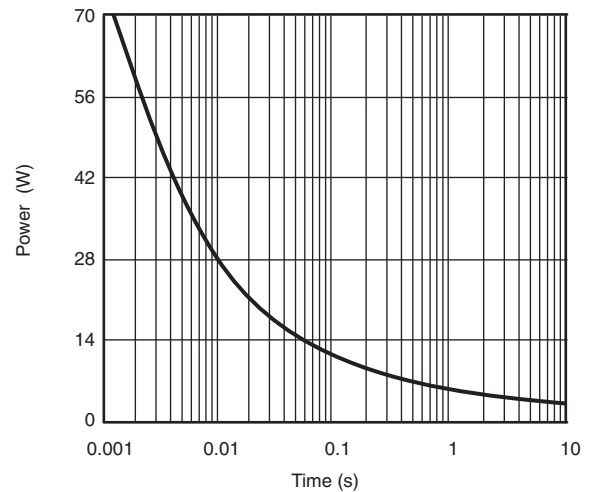
Source-Drain Diode Forward Voltage



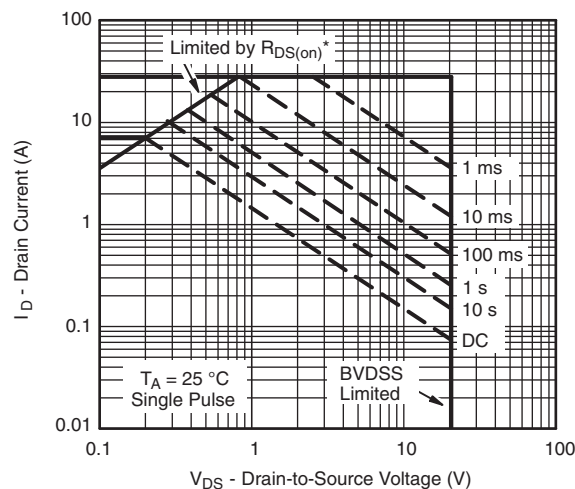
On-Resistance vs. Gate-to-Source Voltage



Reverse Current (Schottky)

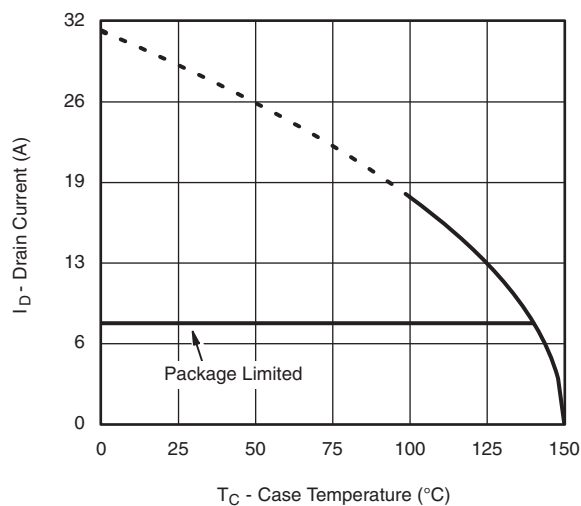
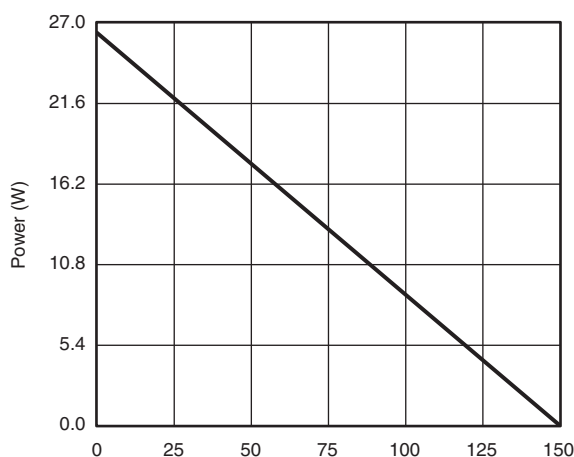
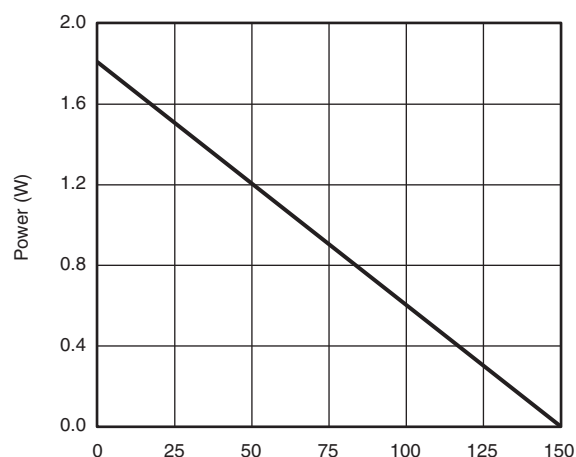


Single Pulse Power, Junction-to-Ambient



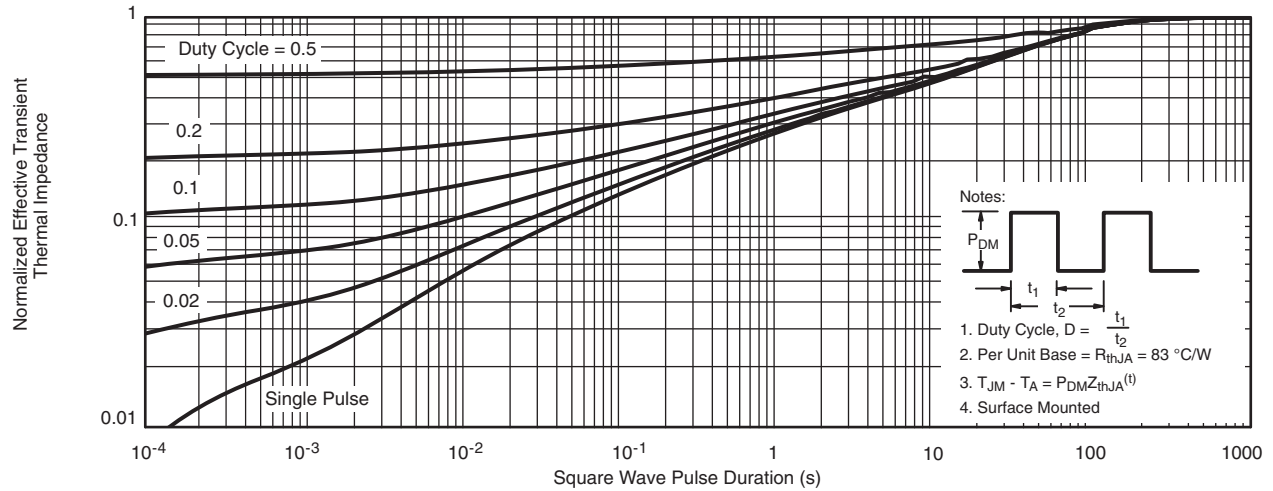
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

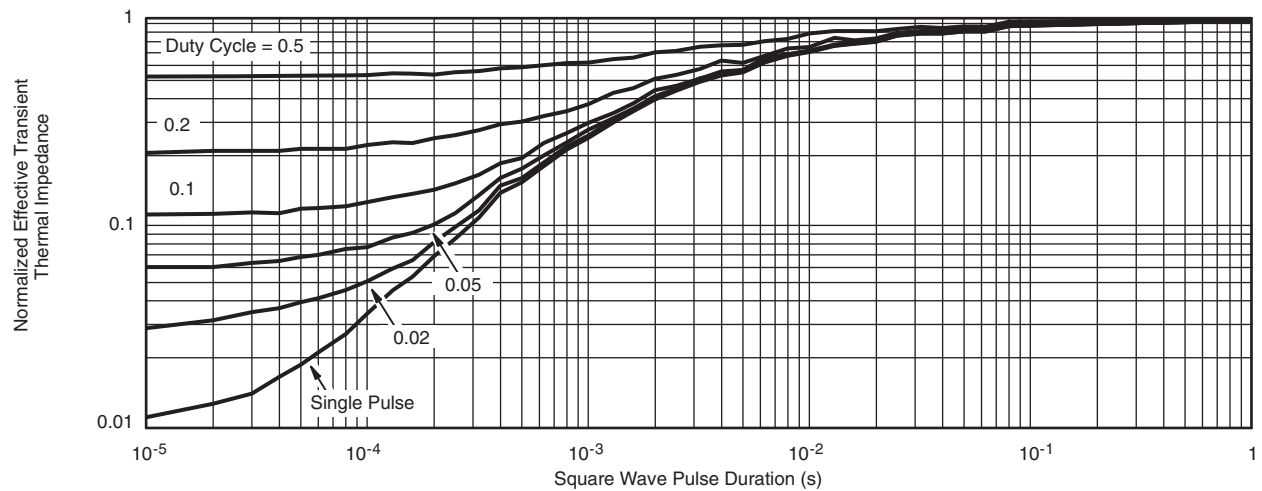
CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)**Current Derating*****Power Derating, Junction-to-Case****Power Derating, Junction-to-Ambient**

* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case 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.

CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



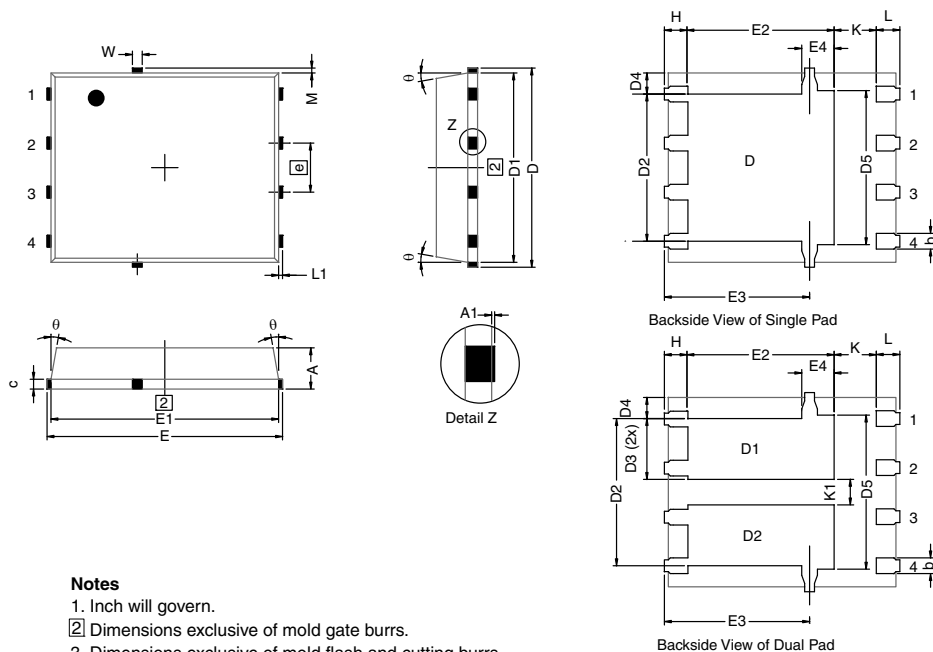
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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PowerPAK® SO-8, (Single/Dual)

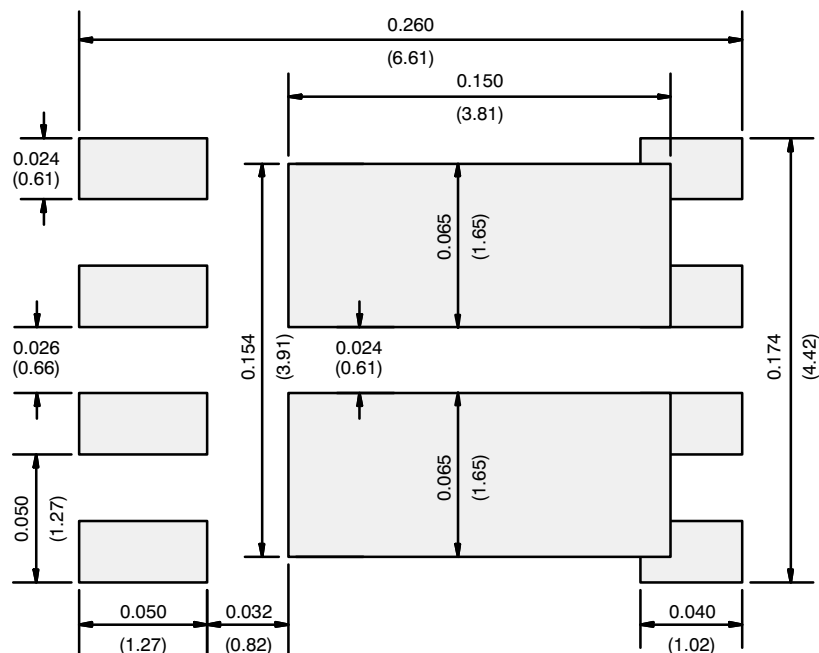


Notes

1. Inch will govern.
2. Dimensions exclusive of mold gate burrs.
3. Dimensions exclusive of mold flash and cutting burrs.

DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.97	1.04	1.12	0.038	0.041	0.044
A1		-	0.05	0	-	0.002
b	0.33	0.41	0.51	0.013	0.016	0.020
c	0.23	0.28	0.33	0.009	0.011	0.013
D	5.05	5.15	5.26	0.199	0.203	0.207
D1	4.80	4.90	5.00	0.189	0.193	0.197
D2	3.56	3.76	3.91	0.140	0.148	0.154
D3	1.32	1.50	1.68	0.052	0.059	0.066
D4	0.57 typ.			0.0225 typ.		
D5	3.98 typ.			0.157 typ.		
E	6.05	6.15	6.25	0.238	0.242	0.246
E1	5.79	5.89	5.99	0.228	0.232	0.236
E2 (for AL product)	3.30	3.48	3.66	0.130	0.137	0.144
E2 (for other product)	3.48	3.66	3.84	0.137	0.144	0.151
E3	3.68	3.78	3.91	0.145	0.149	0.154
E4 (for AL product)	0.58 typ.			0.023 typ.		
E4 (for other product)	0.75 typ.			0.030 typ.		
e	1.27 BSC			0.050 BSC		
K (for AL product)	1.45 typ.			0.057 typ.		
K (for other product)	1.27 typ.			0.050 typ.		
K1	0.56	-	-	0.022	-	-
H	0.51	0.61	0.71	0.020	0.024	0.028
L	0.51	0.61	0.71	0.020	0.024	0.028
L1	0.06	0.13	0.20	0.002	0.005	0.008
θ	0°	-	12°	0°	-	12°
W	0.15	0.25	0.36	0.006	0.010	0.014
M	0.125 typ.			0.005 typ.		
ECN: C13-0702-Rev. K, 20-May-13						
DWG: 5881						

RECOMMENDED MINIMUM PADS FOR PowerPAK® SO-8 Dual



Recommended Minimum Pads
Dimensions in Inches/(mm)

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