

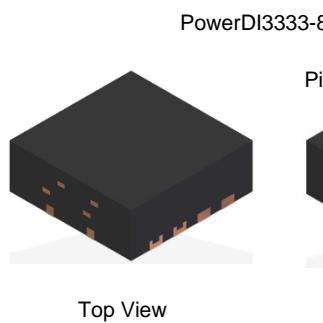
Product Summary

Device	BV _{DSS}	R _{DSON} Max
Q1	30V	14.3mΩ @ V _{GS} = 8V, I _D = 4A
Q2	30V	14.3mΩ @ V _{GS} = 8V, I _D = 4A

Description and Applications

This new generation MOSFET is designed to minimize the on-state resistance (R_{DSON}) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- DC-DC Converters
- Power Management Functions
- Analog Switch

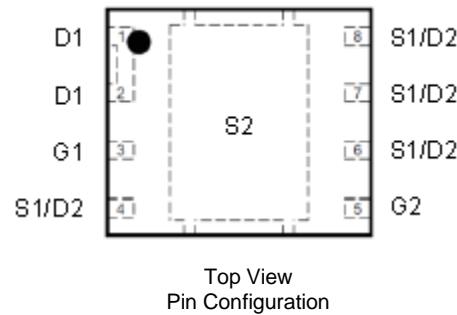


Features and Benefits

- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Lead-Free Finish; RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)

Mechanical Data

- Case: PowerDI®3333-8 (Type D)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.044 grams (Approximate)



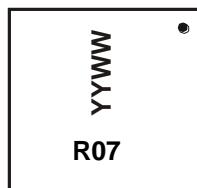
Ordering Information (Note 4)

Part Number	Case	Packaging
DMN3013LDG-7	PowerDI3333-8 (Type D)	1,000/Tape & Reel
DMN3013LDG-13	PowerDI3333-8 (Type D)	3,000/Tape & Reel

Notes:

1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



R07 = Product Type Marking Code

YYWW = Date Code Marking

YY = Last Two Digits of Year (ex: 18 = 2018)

WW = Week Code (01 to 53)

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Q1	Q2	Unit
Drain-Source Voltage	V_{DSS}	30		V
Gate-Source Voltage	V_{GSS}	10		V
Continuous Drain Current @ $V_{GS} = 5\text{V}$	$T_C = +25^\circ\text{C}$	I_D	15	A
	$T_C = +70^\circ\text{C}$		12	
Continuous Drain Current @ $V_{GS} = 5\text{V}$	$T_A = +25^\circ\text{C}$	I_D	9.5	A
	$T_A = +70^\circ\text{C}$		7.6	
Continuous Source-Drain Diode Current (Note 5)	I_S	2.7	2.7	A
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)	I_{DM}	80	80	A
Avalanche Current (Note 6) L = 0.1mH	I_{AS}	24	24	A
Avalanche Energy (Note 6) L = 0.1mH	E_{AS}	28	28	mJ

 Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Total Power Dissipation	P_D	2.16	W
		1.25	
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	58.8	°C/W
		34	
Thermal Resistance, Junction to Case	$R_{\theta JC}$	6.9	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

 Electrical Characteristics Q1 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	30	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	100	nA	$V_{GS} = 10\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.75	0.95	1.2	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	10.9	14.3	$\text{m}\Omega$	$V_{GS} = 8\text{V}, I_D = 4\text{A}$
		—	13.3	16.1	$\text{m}\Omega$	$V_{GS} = 4.5\text{V}, I_D = 4\text{A}$
		—	15.3	17.7	$\text{m}\Omega$	$V_{GS} = 3.5\text{V}, I_D = 4\text{A}$
Forward Transfer Admittance	$ Y_{FS} $	—	13	—	s	$V_{DS} = 15\text{V}, I_D = 4\text{A}$
Diode Forward Voltage	V_{SD}	—	0.8	1.0	V	$V_{GS} = 0\text{V}, I_S = 4\text{A}$
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	387	600	pF	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	219	350		
Reverse Transfer Capacitance	C_{rss}	—	10.4	16		
Gate Resistance	R_G	—	3.3	6.8	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Total Gate Charge ($V_{GS} = 4.5\text{V}$)	Q_G	—	3.3	5.7	nC	$V_{DS} = 15\text{V}, I_D = 4\text{A}$
Total Gate Charge at V_{TH}	$Q_{G(TH)}$	—	0.37	—		
Gate-Source Charge	Q_{GS}	—	0.6	—		
Gate-Drain Charge	Q_{GD}	—	0.6	—		
Turn-On Delay Time	$t_{D(ON)}$	—	4.2	6.3	ns	$V_{DD} = 15\text{V}, V_{GS} = 4.5\text{V}, I_D = 4\text{A}, R_G = 2\Omega$
Turn-On Rise Time	t_R	—	6.2	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	9.7	15		
Turn-Off Fall Time	t_F	—	2.0	—	ns	$V_{DS} = 15\text{V}, I_F = 4\text{A}, di/dt = 300\text{A}/\mu\text{s}$
Reverse Recovery Time	t_{RR}	—	11.7	—		
Reverse Recovery Charge	Q_{RR}	—	7.5	—	nC	

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

6. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep $T_J = +25^\circ\text{C}$.

7. Short duration pulse test used to minimize self-heating effect.

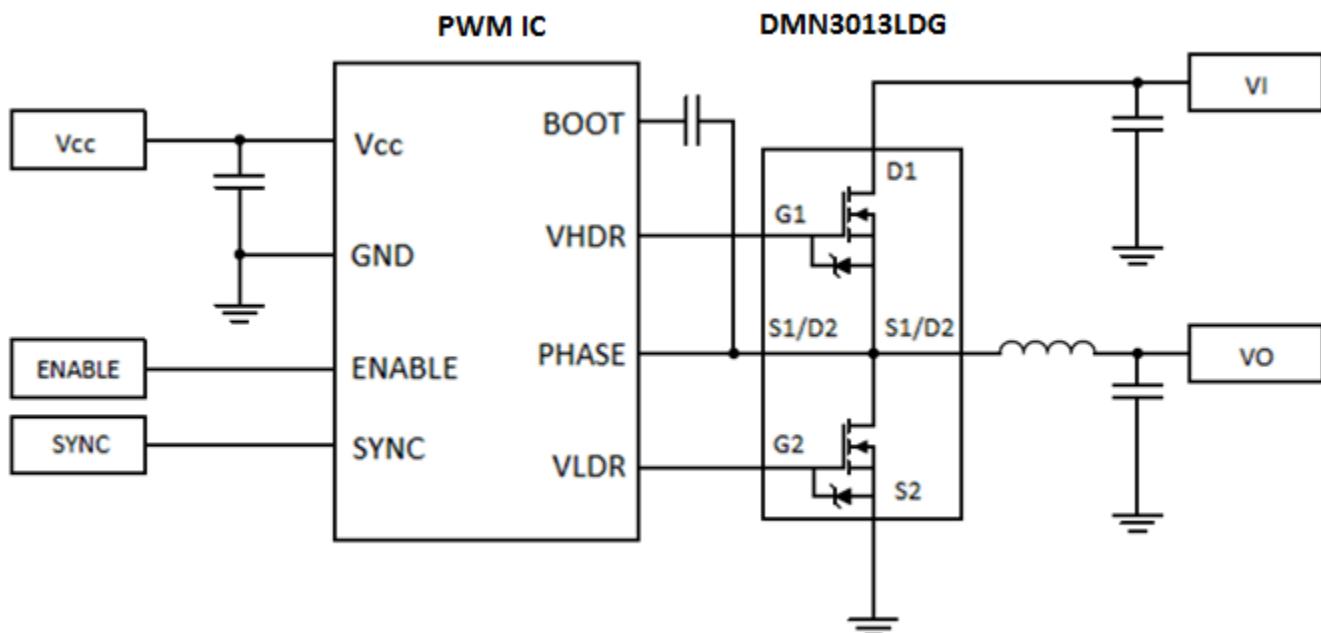
8. Guaranteed by design. Not subject to product testing.

Electrical Characteristics Q2 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	30	—	—	V	$\text{V}_{\text{GS}} = 0\text{V}$, $\text{I}_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	I_{DSS}	—	—	1.0	μA	$\text{V}_{\text{DS}} = 20\text{V}$, $\text{V}_{\text{GS}} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	100	nA	$\text{V}_{\text{GS}} = 10\text{V}$, $\text{V}_{\text{DS}} = 0\text{V}$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$\text{V}_{\text{GS(TH)}}$	0.75	0.95	1.2	V	$\text{V}_{\text{DS}} = \text{V}_{\text{GS}}$, $\text{I}_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$\text{R}_{\text{DS(ON)}}$	—	10.2	14.3	$\text{m}\Omega$	$\text{V}_{\text{GS}} = 8\text{V}$, $\text{I}_D = 4\text{A}$
		—	12.7	16.1	$\text{m}\Omega$	$\text{V}_{\text{GS}} = 4.5\text{V}$, $\text{I}_D = 4\text{A}$
		—	14.8	17.7	$\text{m}\Omega$	$\text{V}_{\text{GS}} = 3.5\text{V}$, $\text{I}_D = 4\text{A}$
Forward Transfer Admittance	$ \text{Y}_{\text{FS}} $	—	13	—	s	$\text{V}_{\text{DS}} = 15\text{V}$, $\text{I}_D = 4\text{A}$
Diode Forward Voltage	V_{SD}	—	0.8	1.0	V	$\text{V}_{\text{GS}} = 0\text{V}$, $\text{I}_D = 4\text{A}$
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	397	600	pF	$\text{V}_{\text{DS}} = 15\text{V}$, $\text{V}_{\text{GS}} = 0\text{V}$, $f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	217	350	pF	
Reverse Transfer Capacitance	C_{rss}	—	10.4	16	pF	
Gate Resistance	R_{G}	—	3.3	6.8	Ω	$\text{V}_{\text{DS}} = 0\text{V}$, $\text{V}_{\text{GS}} = 0\text{V}$, $f = 1\text{MHz}$
Total Gate Charge ($\text{V}_{\text{GS}} = 4.5\text{V}$)	Q_{G}	—	3.4	5.7	nC	$\text{V}_{\text{DS}} = 15\text{V}$, $\text{I}_D = 4\text{A}$
Total Gate Charge at V_{TH}	$\text{Q}_{\text{G(TH)}}$	—	0.39	—	nC	
Gate-Source Charge	Q_{GS}	—	0.6	—	nC	
Gate-Drain Charge	Q_{GD}	—	0.6	—	nC	$\text{V}_{\text{DD}} = 15\text{V}$, $\text{V}_{\text{GS}} = 4.5\text{V}$, $\text{I}_D = 4\text{A}$, $\text{R}_{\text{G}} = 2\Omega$
Turn-On Delay Time	$\text{t}_{\text{D(ON)}}$	—	4.4	6.3	ns	
Turn-On Rise Time	t_{R}	—	6.7	—	ns	
Turn-Off Delay Time	$\text{t}_{\text{D(OFF)}}$	—	10.4	15	ns	$\text{V}_{\text{DS}} = 15\text{V}$, $\text{I}_F = 4\text{A}$, $d\text{I}/dt = 300\text{A}/\mu\text{s}$
Turn-Off Fall Time	t_{F}	—	2.2	—	ns	
Reverse Recovery Time	t_{RR}	—	11.8	—	ns	
Reverse Recovery Charge	Q_{RR}	—	7.8	—	nC	$\text{V}_{\text{DS}} = 15\text{V}$, $\text{I}_F = 4\text{A}$, $d\text{I}/dt = 300\text{A}/\mu\text{s}$

Notes: 7. Short duration pulse test used to minimize self-heating effect.
 8. Guaranteed by design. Not subject to product testing.

Typical Circuit



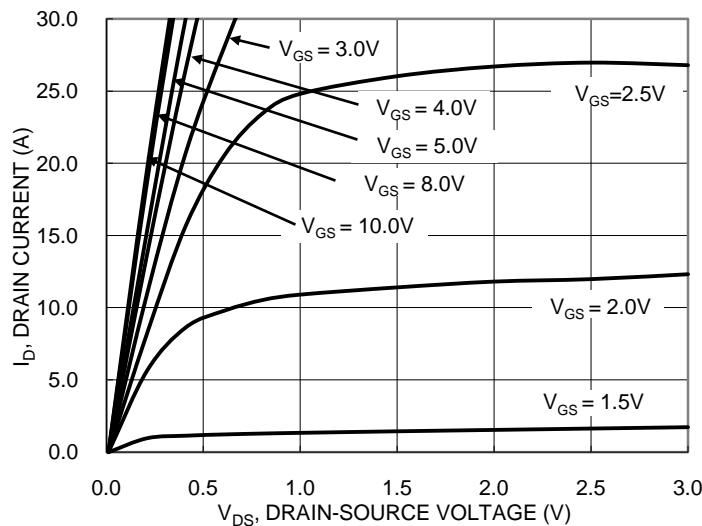


Figure 1. Q1 Typical Output Characteristic

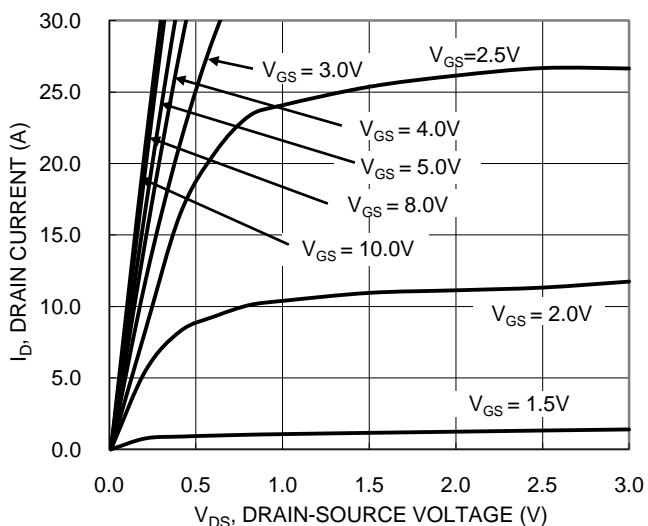


Figure 2. Q2 Typical Output Characteristic

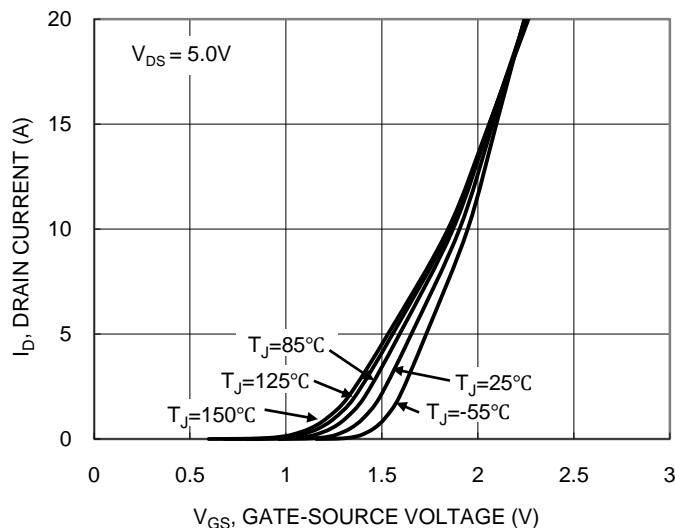


Figure 3. Q1 Typical Transfer Characteristic

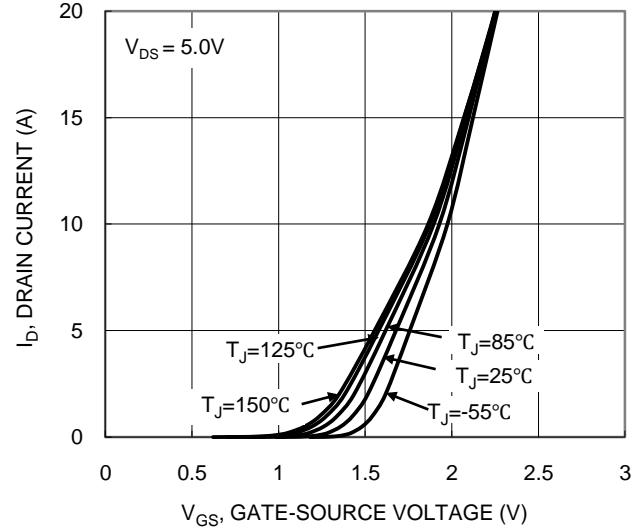


Figure 4. Q2 Typical Transfer Characteristic

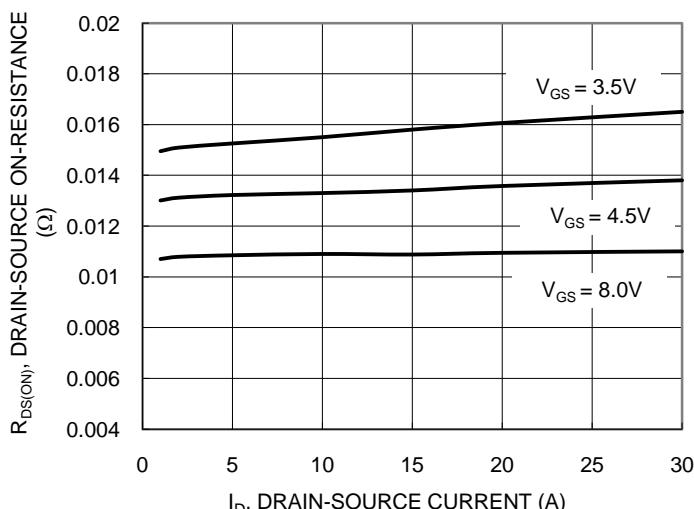


Figure 5. Q1 Typical On-Resistance vs. Drain Current and Gate Voltage

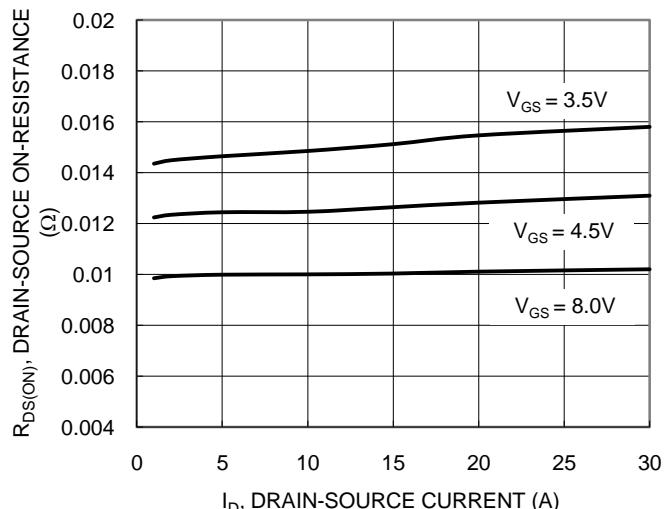
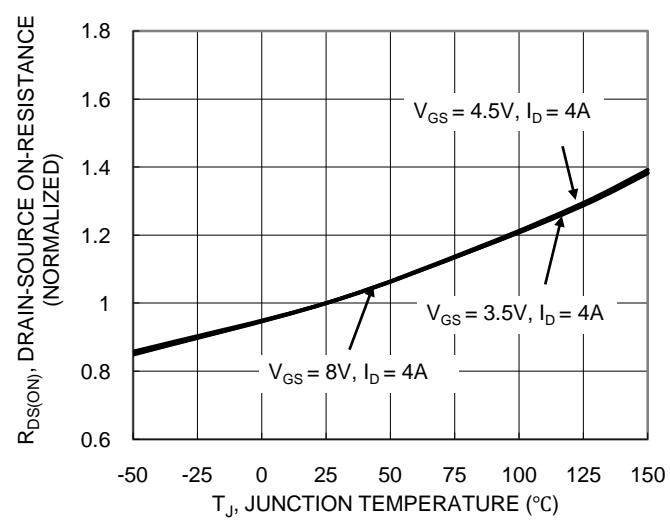
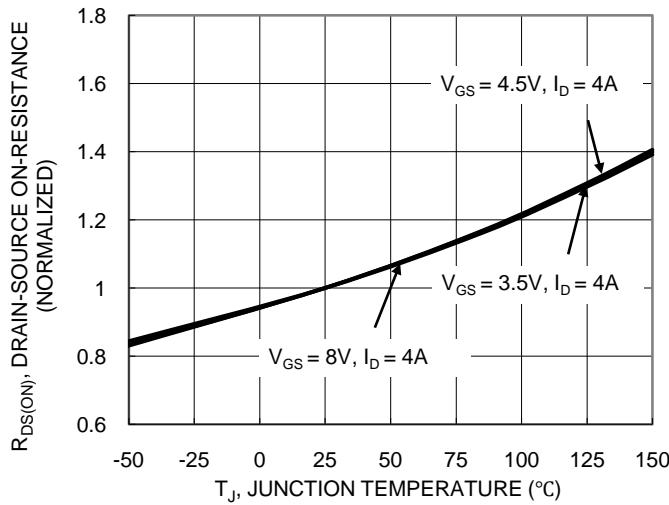
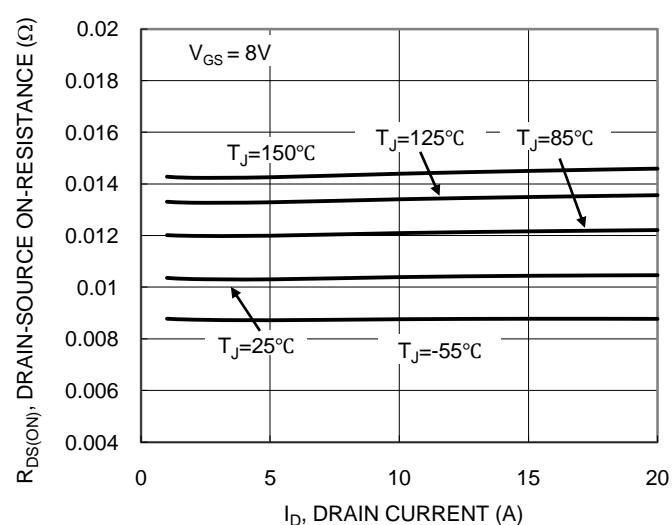
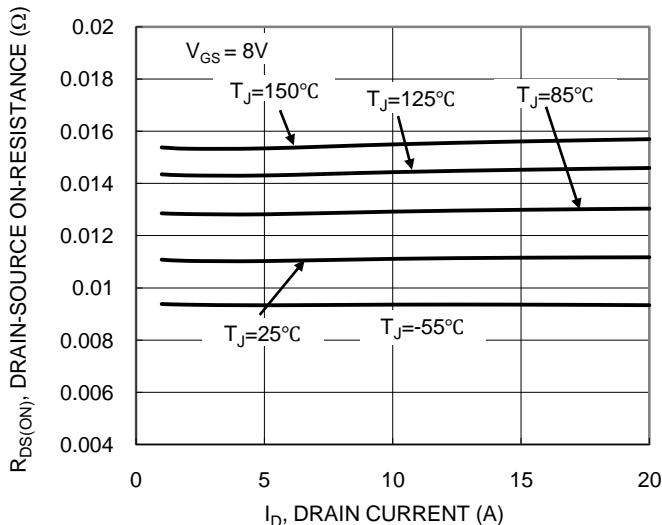
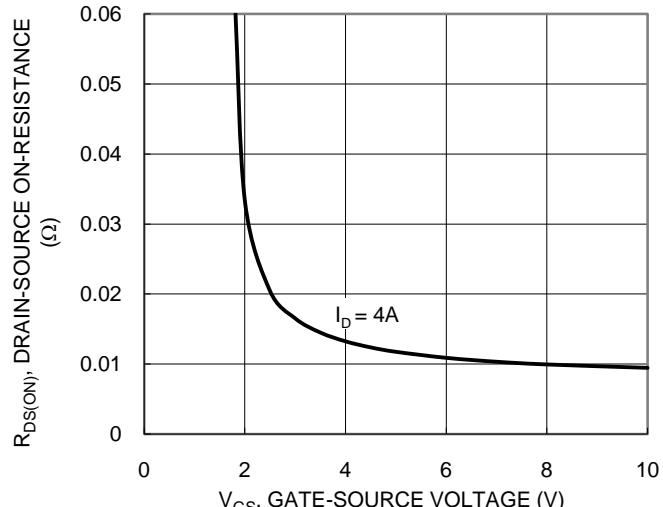
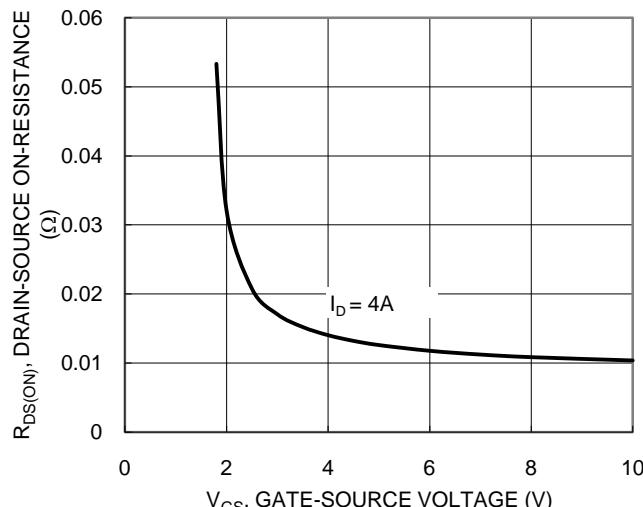


Figure 6. Q2 Typical On-Resistance vs. Drain Current and Gate Voltage



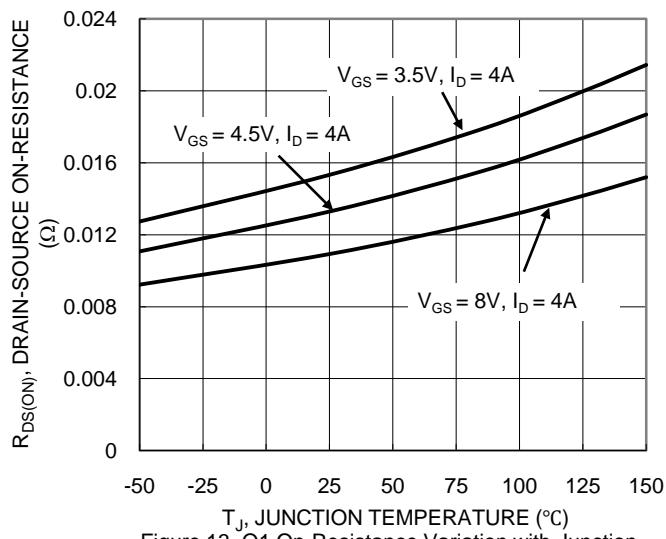


Figure 13. Q1 On-Resistance Variation with Junction Temperature

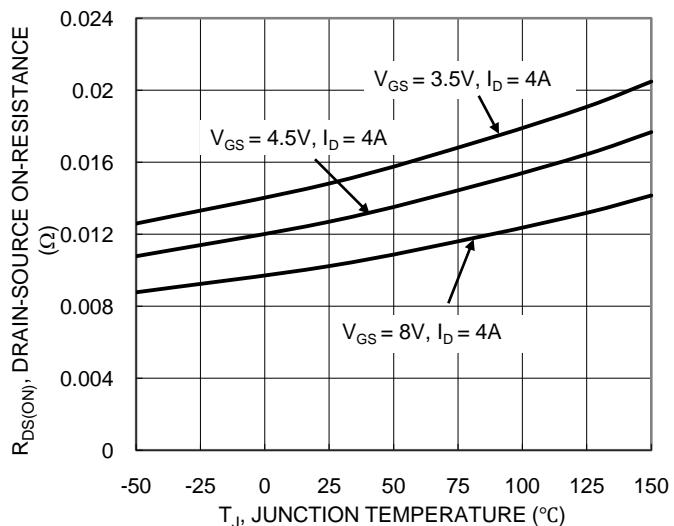


Figure 14. Q2 On-Resistance Variation with Junction Temperature

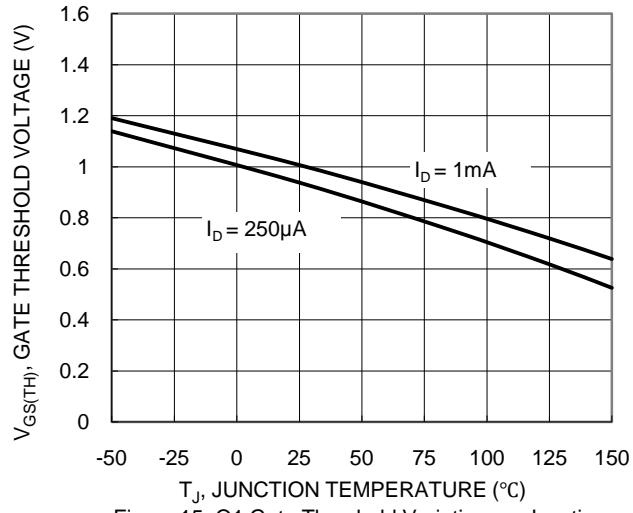


Figure 15. Q1 Gate Threshold Variation vs. Junction Temperature

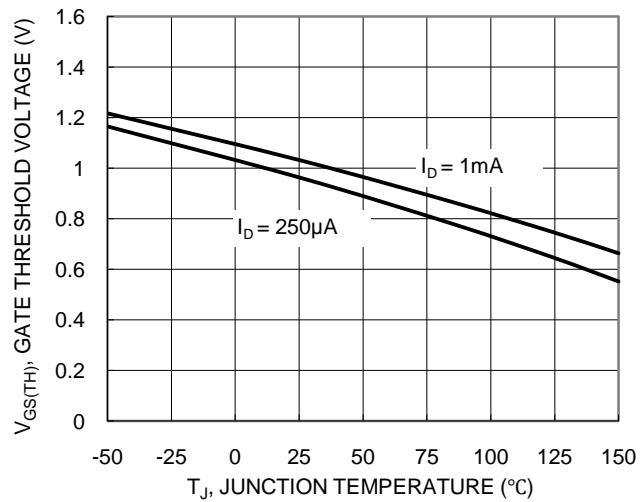


Figure 16. Q2 Gate Threshold Variation vs. Junction Temperature

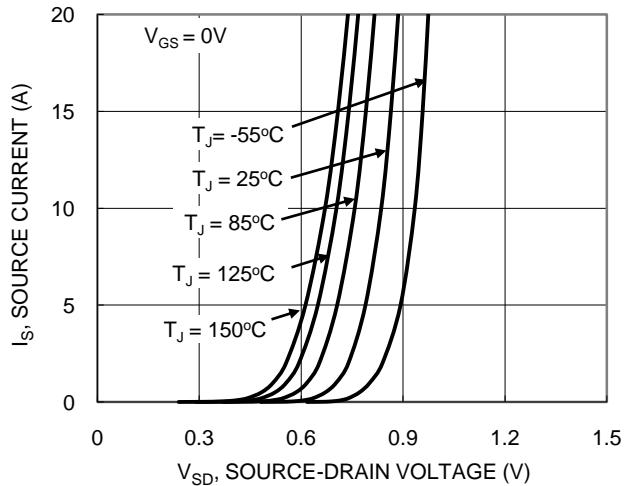


Figure 17. Q1 Diode Forward Voltage vs. Current

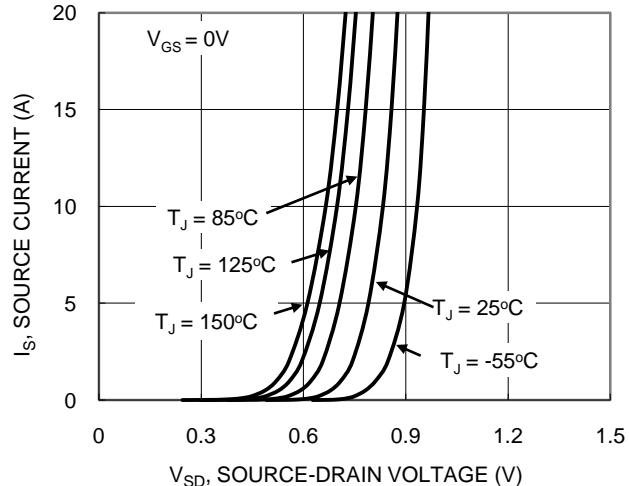
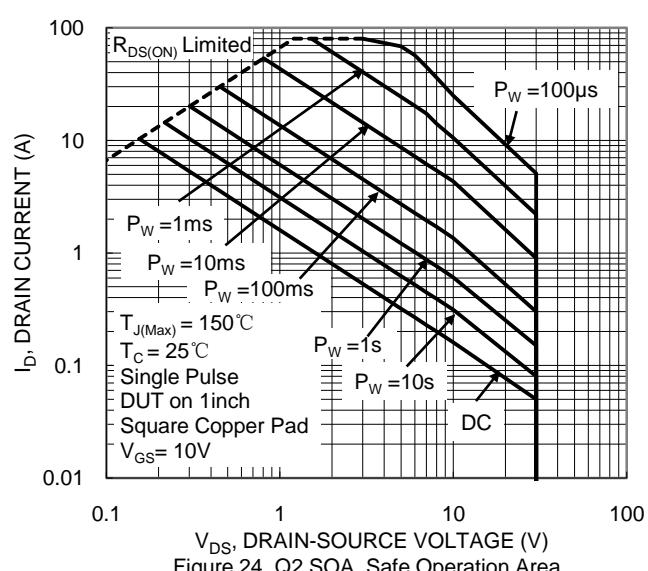
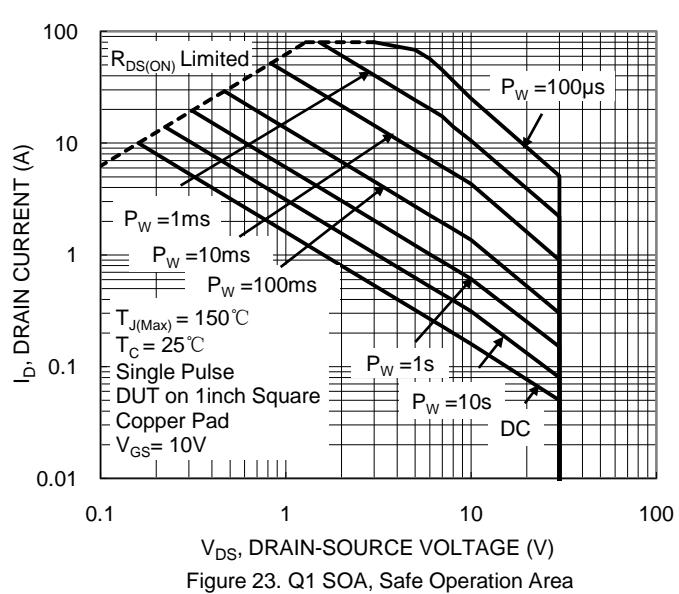
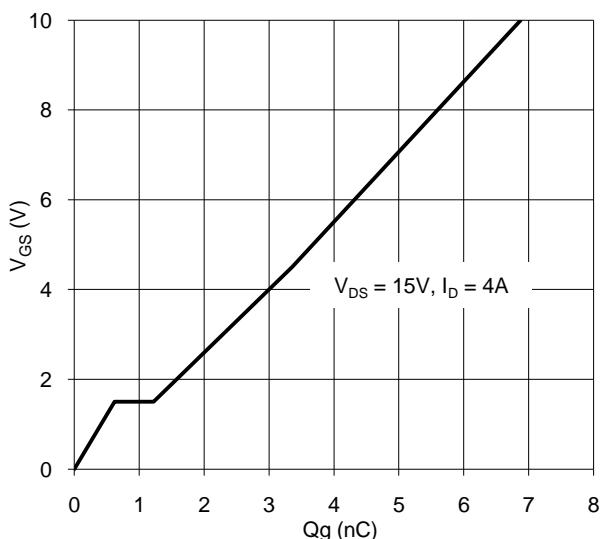
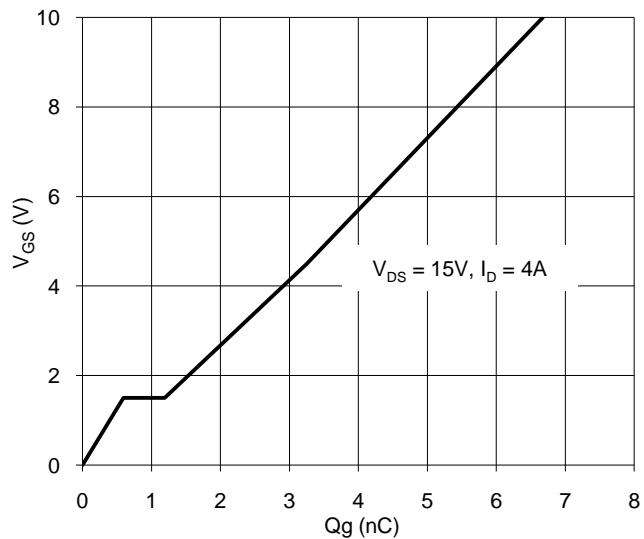
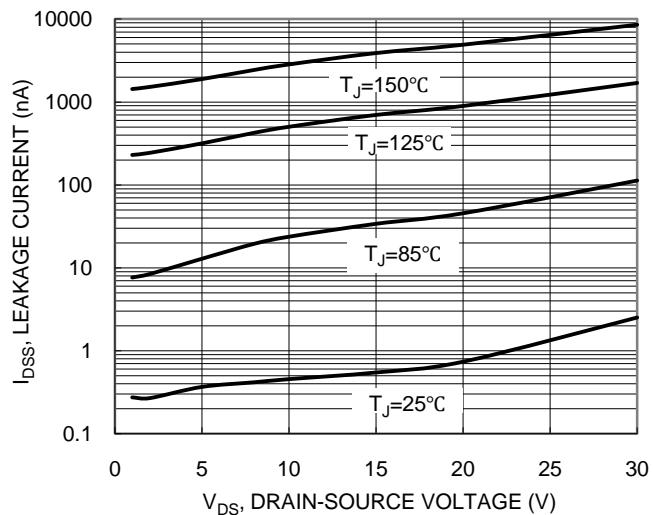
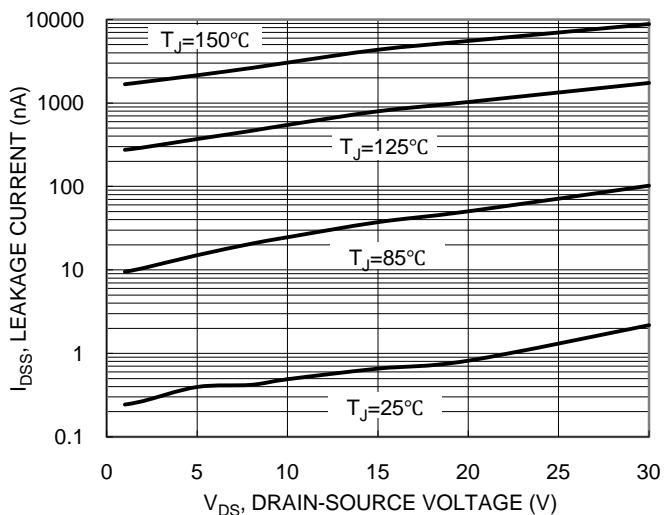


Figure 18. Q2 Diode Forward Voltage vs. Current



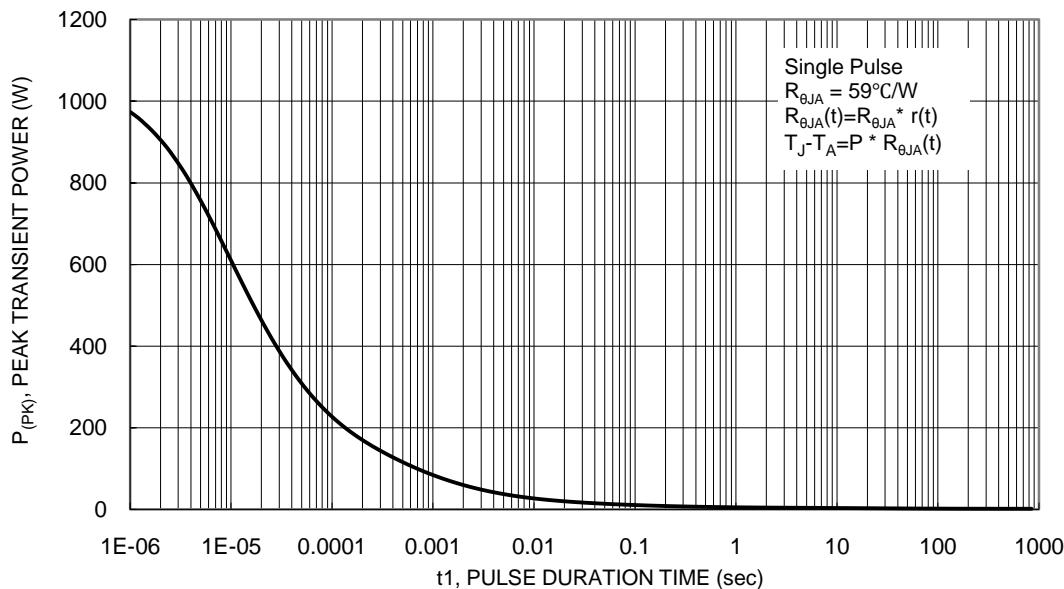


Figure 25. Single Pulse Maximum Power Dissipation

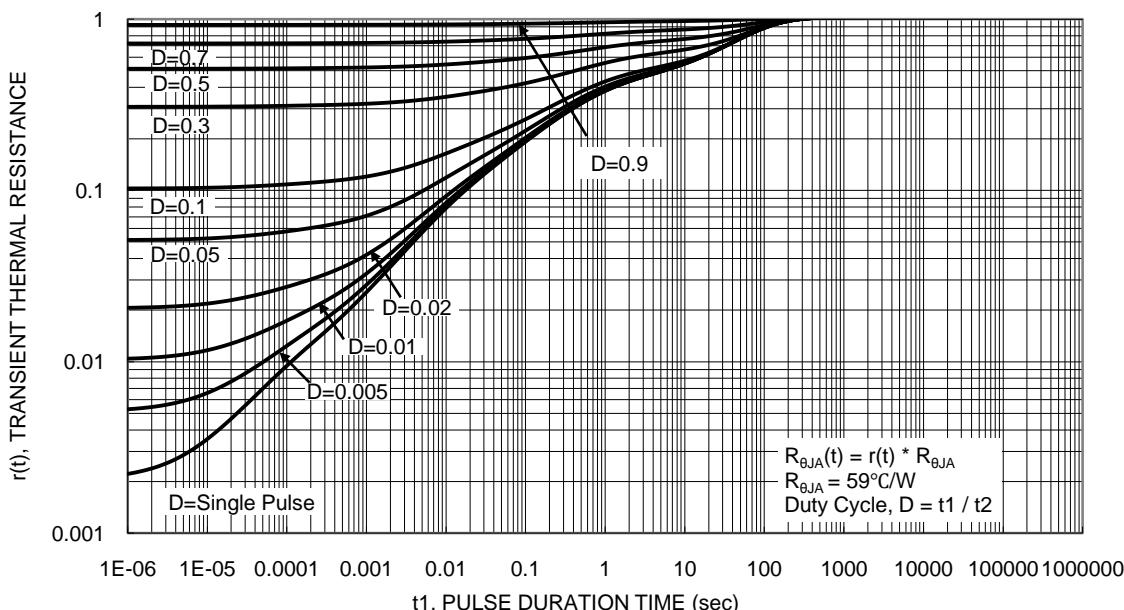
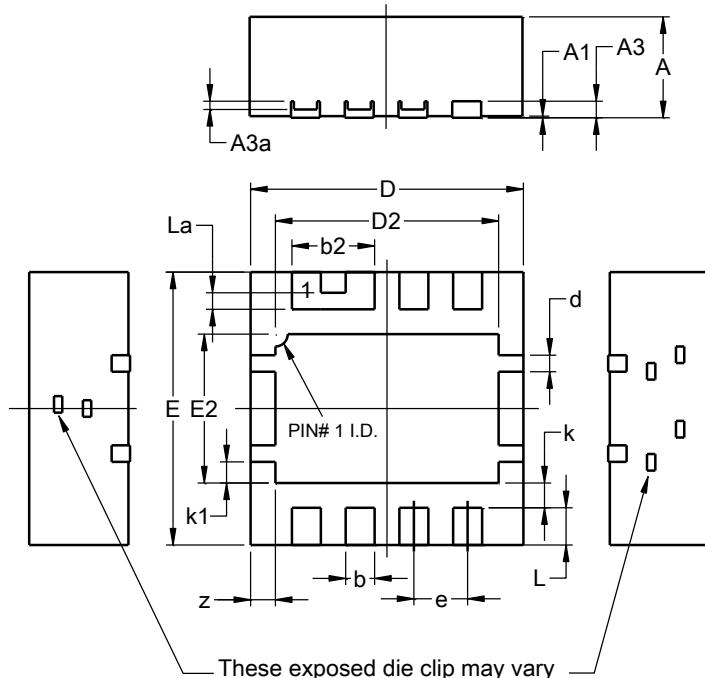


Figure 26. Transient Thermal Resistance

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

PowerDI3333-8 (Type D)



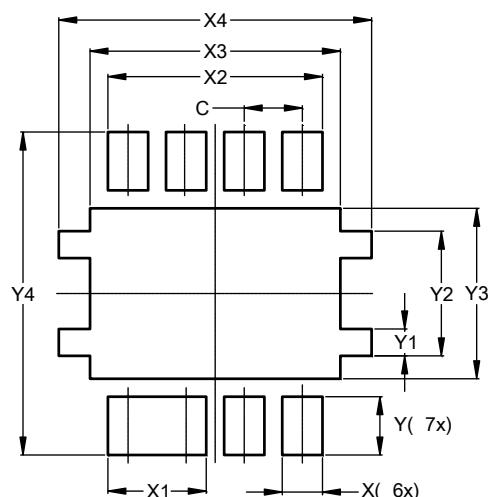
PowerDI3333-8 (Type D)			
Dim	Min	Max	Typ
A	1.17	1.23	1.20
A1	0.00	0.05	0.02
A3	0.15	0.25	0.20
A3a	0.05	0.15	0.10
b	0.30	0.40	0.35
b2	0.95	1.05	1.00
D	3.20	3.40	3.30
D2	2.65	2.75	2.70
E	3.20	3.40	3.30
E2	1.75	1.85	1.80
d	0.15	0.25	0.20
e	--	--	0.65
k	--	--	0.30
k1	0.21	0.31	0.26
L	0.40	0.50	0.45
La	0.15	0.25	0.20
z	0.25	0.35	0.30

All Dimensions in mm

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

PowerDI3333-8 (Type D)



Dimensions	Value (in mm)
C	0.650
X	0.450
X1	1.100
X2	2.400
X3	2.800
X4	3.500
Y	0.650
Y1	0.300
Y2	1.390
Y3	1.900
Y4	3.600

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2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

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