

## Product Summary

Device	BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max
Q1	30V	12mΩ @ V <sub>GS</sub> = 5V, I <sub>D</sub> = 15A
Q2	30V	6mΩ @ V <sub>GS</sub> = 5V, I <sub>D</sub> = 15A

## Description and Applications

This new generation MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- DC-DC Converters
- Power Management Functions

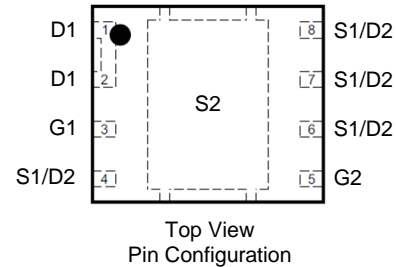
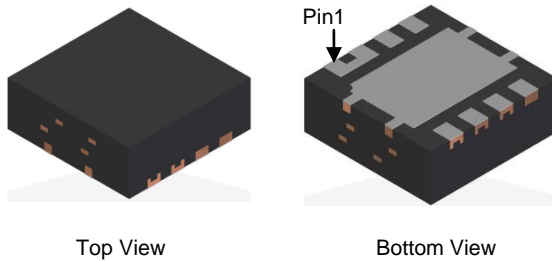
## Features and Benefits

- 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<sup>®</sup> 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 (3)
- Weight: 0.044 grams (Approximate)

PowerDI3333-8 (Type D)

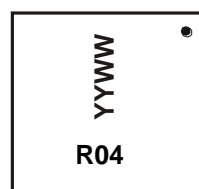


## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN3012LDG-7	PowerDI3333-8 (Type D)	1,000/Tape & Reel
DMN3012LDG-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



R04 = 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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Q1	Q2	Unit
Drain-Source Voltage	V <sub>DSS</sub>	30		V
Gate-Source Voltage	V <sub>GSS</sub>	±10		V
Continuous Drain Current @ V <sub>GS</sub> = 5V	T <sub>C</sub> = +25°C	20		A
	T <sub>C</sub> = +70°C	16		A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	T <sub>A</sub> = +25°C	10		A
	T <sub>A</sub> = +70°C	8		A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I <sub>DM</sub>	70	100	A
Continuous Source-Drain Diode Current (Note 5)	I <sub>S</sub>	2.7	3.2	A
Avalanche Current (Note 6) L = 0.1mH	I <sub>AS</sub>	34	50	A
Avalanche Energy (Note 6) L = 0.1mH	E <sub>AS</sub>	58	125	mJ

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Total Power Dissipation	P <sub>D</sub>	T <sub>C</sub> = +25°C	2.2
		T <sub>C</sub> = +70°C	1.4
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	Steady State	58
		t < 10s	36
Thermal Resistance, Junction to Case (Note 5)	R <sub>θJC</sub>	9.5	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics Q1** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

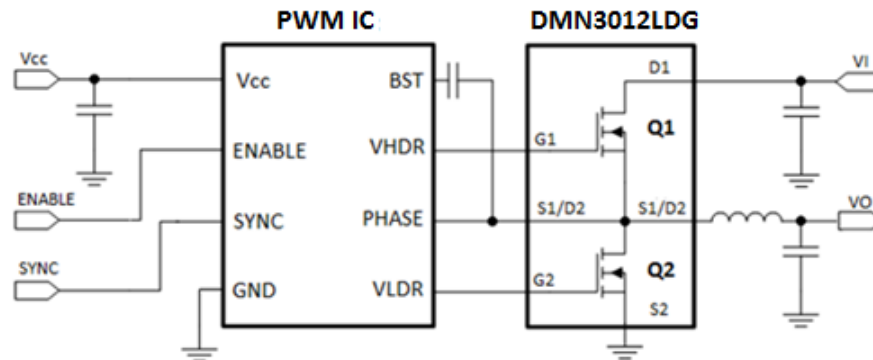
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 7)						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250µA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1	µA	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±10V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b> (Note 7)						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1	—	2.1	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	10.5	12	mΩ	V <sub>GS</sub> = 5V, I <sub>D</sub> = 15A
Forward Transfer Admittance	Y <sub>FS</sub>	—	27	—	S	V <sub>DS</sub> = 5V, I <sub>D</sub> = 15A
Diode Forward Voltage	V <sub>SD</sub>	—	—	1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 15A
<b>DYNAMIC CHARACTERISTICS</b> (Note 8)						
Input Capacitance	C <sub>iss</sub>	—	650	850	pF	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	314	410		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	12	16		
Gate Resistance	R <sub>G</sub>	—	1.63	3.3	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>G</sub>	—	4.7	6.1	nC	V <sub>DS</sub> = 15V, I <sub>D</sub> = 15A
Total Gate Charge at V <sub>TH</sub>	Q <sub>G(TH)</sub>	—	0.91	—		
Gate-Source Charge	Q <sub>GS</sub>	—	1.6	—		
Gate-Drain Charge	Q <sub>GD</sub>	—	0.9	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	5.1	7.7	ns	V <sub>DD</sub> = 15V, V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 15A, R <sub>G</sub> = 2Ω
Turn-On Rise Time	t <sub>R</sub>	—	2.7	—		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	6.4	9.6		
Turn-Off Fall Time	t <sub>F</sub>	—	2.3	—		
Reverse Recovery Time	t <sub>RR</sub>	—	24.5	—	ns	I <sub>F</sub> = 15A, di/dt = 300A/µs
Reverse Recovery Charge	Q <sub>RR</sub>	—	8.3	—	nC	

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  - I<sub>AS</sub> and E<sub>AS</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.
  - Short duration pulse test used to minimize self-heating effect.
  - 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
<b>OFF CHARACTERISTICS</b> (Note 7)						
Drain-Source Breakdown Voltage	$BV_{DSS}$	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	$I_{DSS}$	—	—	1.0	$\mu A$	$V_{DS} = 20V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 10V, V_{DS} = 0V$
<b>ON CHARACTERISTICS</b> (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.75	—	1.15	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	5.2	6	m $\Omega$	$V_{GS} = 5V, I_D = 15A$
Forward Transfer Admittance	$ Y_{FS} $	—	46	—	S	$V_{DS} = 5V, I_D = 15A$
Diode Forward Voltage	$V_{SD}$	—	—	1.0	V	$V_{GS} = 0V, I_S = 15A$
<b>DYNAMIC CHARACTERISTICS</b> (Note 8)						
Input Capacitance	$C_{iss}$	—	1,137	1,480	pF	$V_{DS} = 15V, V_{GS} = 0V, f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	—	620	810	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	24	32	pF	
Gate Resistance	$R_G$	—	0.54	1.1	$\Omega$	$V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$
Total Gate Charge ( $V_{GS} = 4.5V$ )	$Q_G$	—	9.7	12.6	nC	$V_{DS} = 15V, I_D = 15A$
Total Gate Charge at $V_{TH}$	$Q_{G(TH)}$	—	0.96	—	nC	
Gate-Source Charge	$Q_{GS}$	—	1.7	—	nC	
Gate-Drain Charge	$Q_{GD}$	—	1.2	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	4.4	6.6	ns	$V_{DD} = 15V, V_{GS} = 4.5V, I_D = 15A, R_G = 2\Omega$
Turn-On Rise Time	$t_R$	—	3.5	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	12.4	18.6	ns	
Turn-Off Fall Time	$t_F$	—	2.9	—	ns	
Reverse Recovery Time	$t_{RR}$	—	30.5	—	ns	$I_F = 15A, di/dt = 300A/\mu s$
Reverse Recovery Charge	$Q_{RR}$	—	10.8	—	nC	

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

**Typical Circuit**


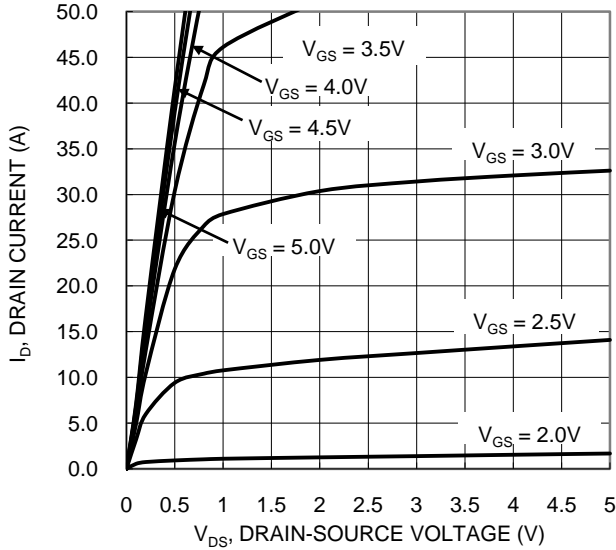


Figure 1. Q1 Typical Output Characteristic

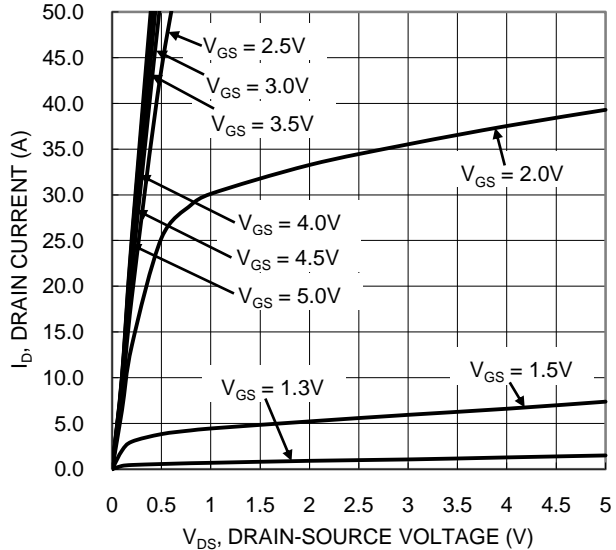


Figure 2. Q2 Typical Output Characteristic

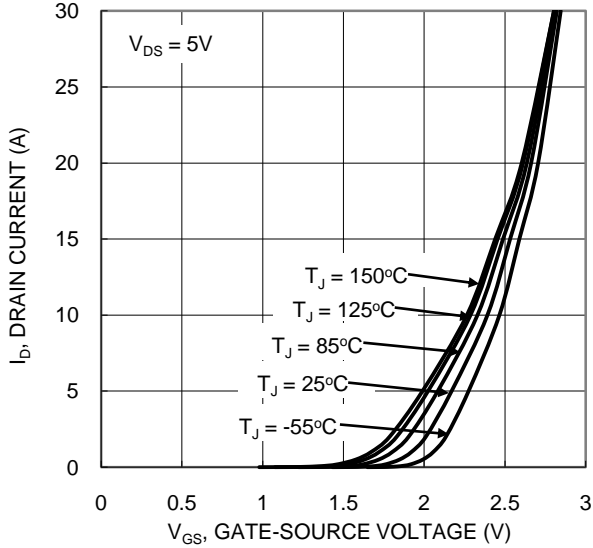


Figure 3. Q1 Typical Transfer Characteristic

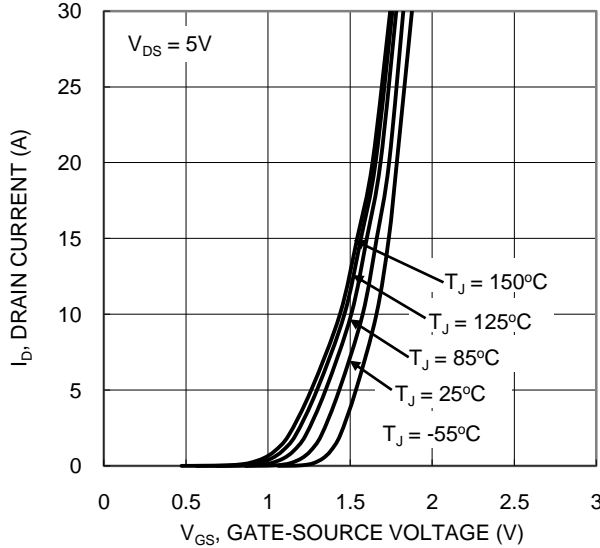


Figure 4. Q2 Typical Transfer Characteristic

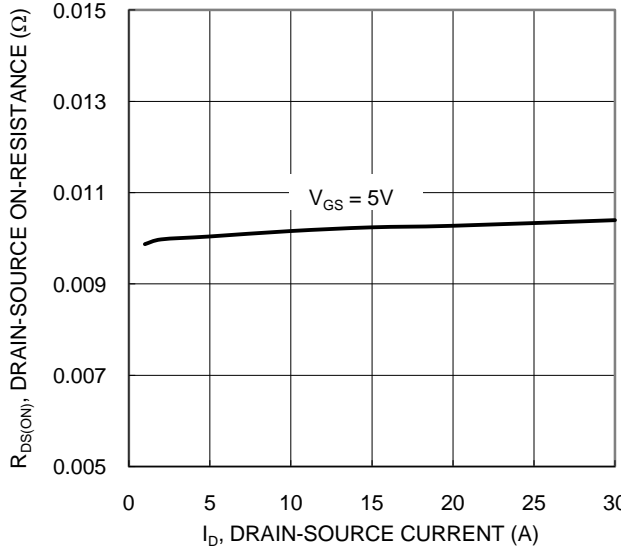


Figure 5. Q1 Typical On-Resistance vs. Drain Current and Gate Voltage

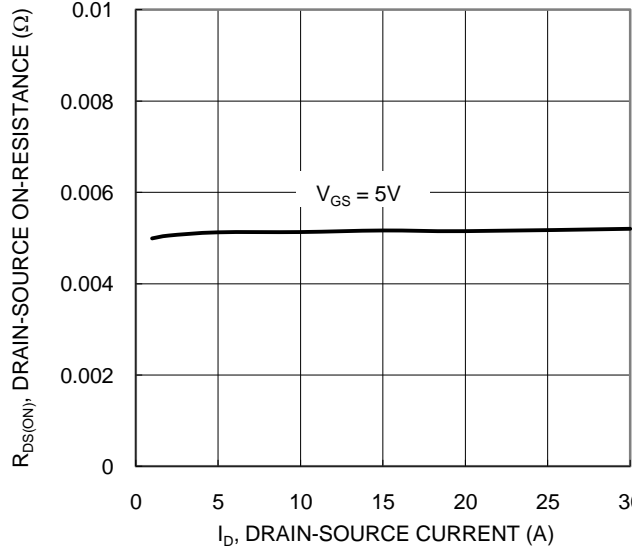


Figure 6. Q2 Typical On-Resistance vs. Drain Current and Gate Voltage

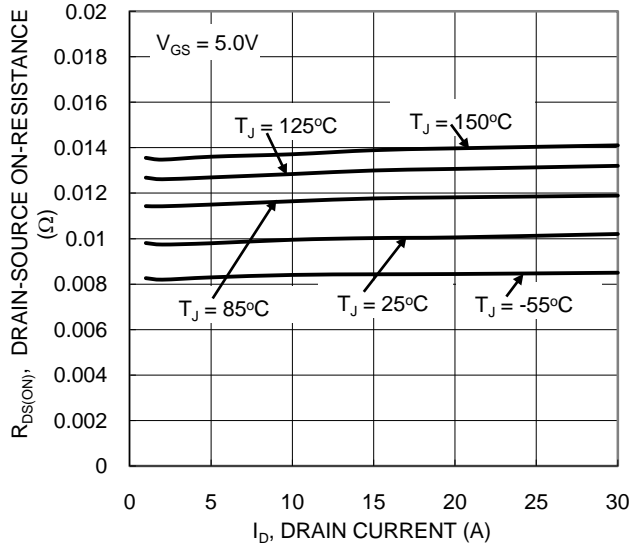


Figure 7. Q1 Typical On-Resistance vs. Drain Current and Temperature

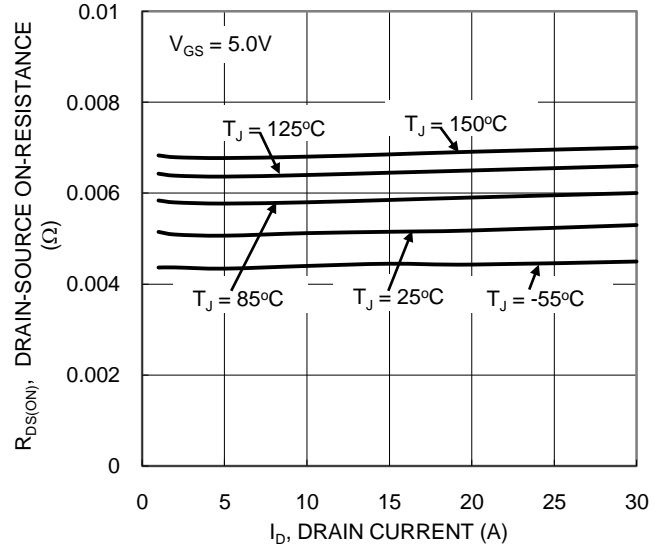


Figure 8. Q2 Typical On-Resistance vs. Drain Current and Temperature

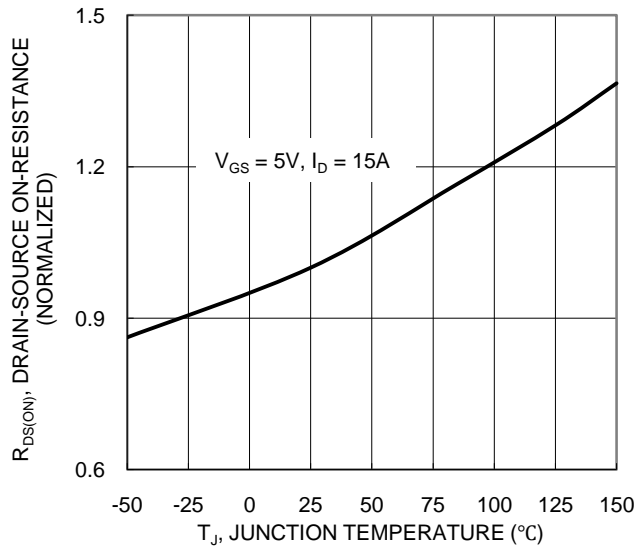


Figure 9. Q1 On-Resistance Variation with Temperature

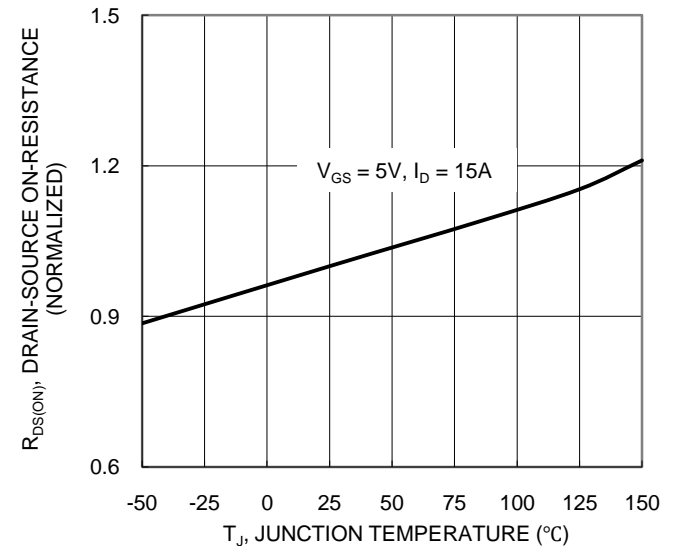


Figure 10. Q2 On-Resistance Variation with Temperature

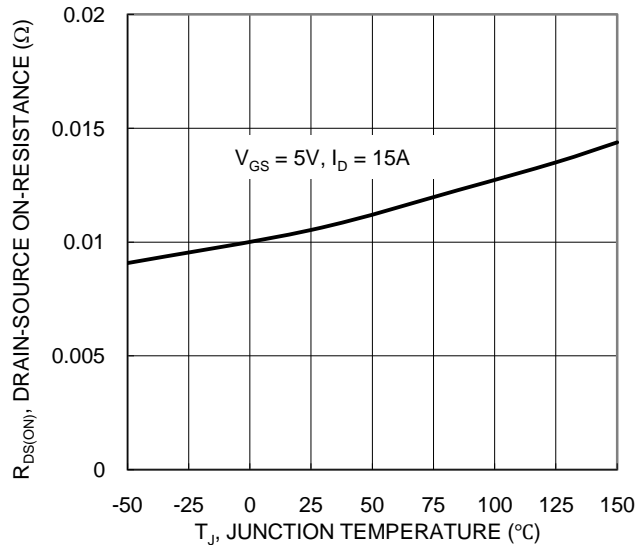


Figure 11. Q1 On-Resistance Variation with Temperature

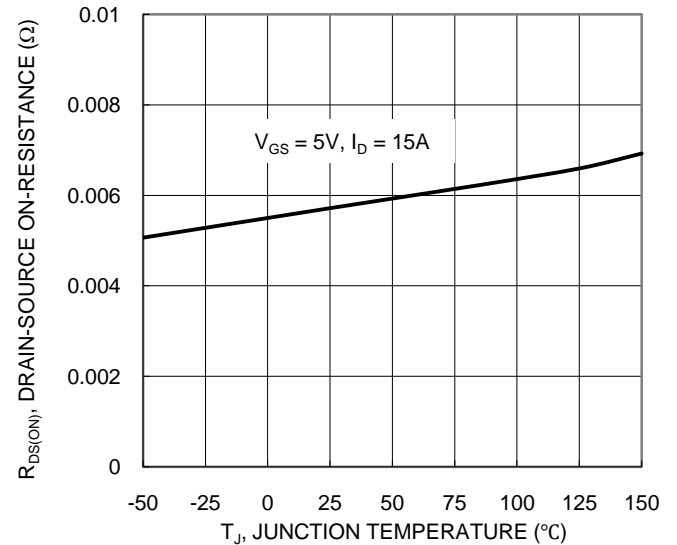


Figure 12. Q2 On-Resistance Variation with Temperature

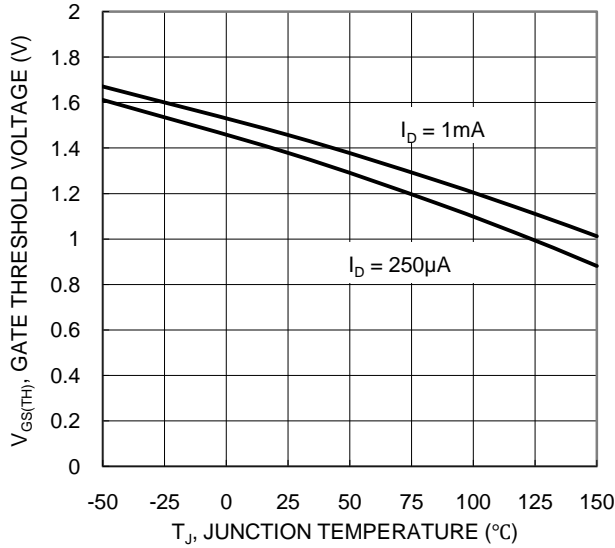


Figure 13. Q1 Gate Threshold Variation vs. Junction Temperature

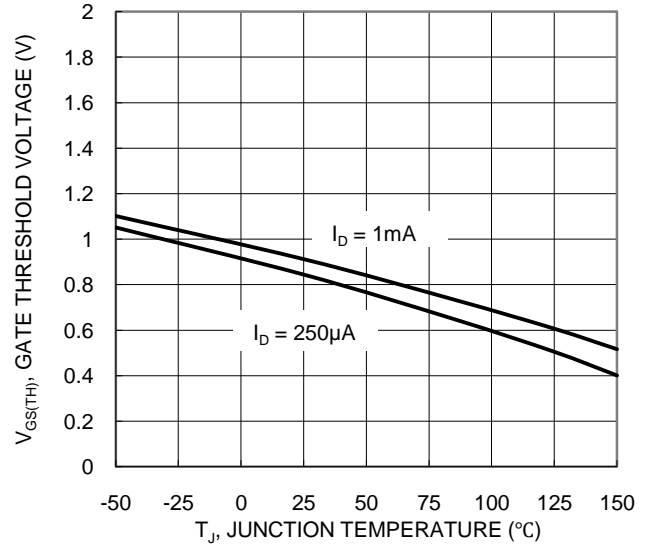


Figure 14. Q2 Gate Threshold Variation vs. Junction Temperature

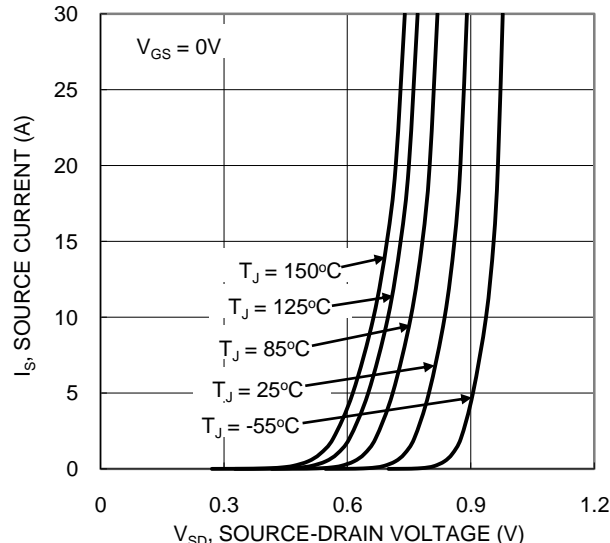


Figure 15. Q1 Diode Forward Voltage vs. Current

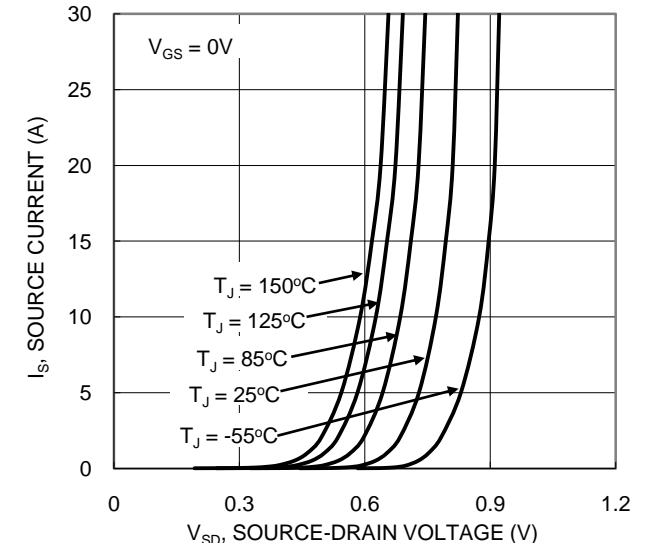


Figure 16. Q2 Diode Forward Voltage vs. Current

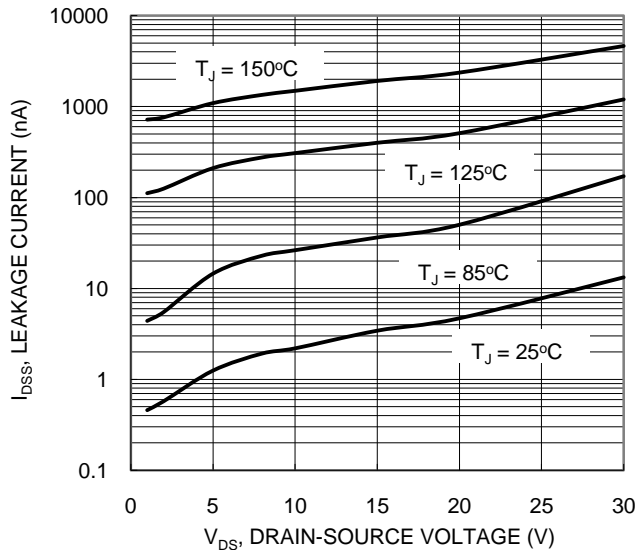


Figure 17. Q1 Typical Drain-Source Leakage Current vs. Voltage

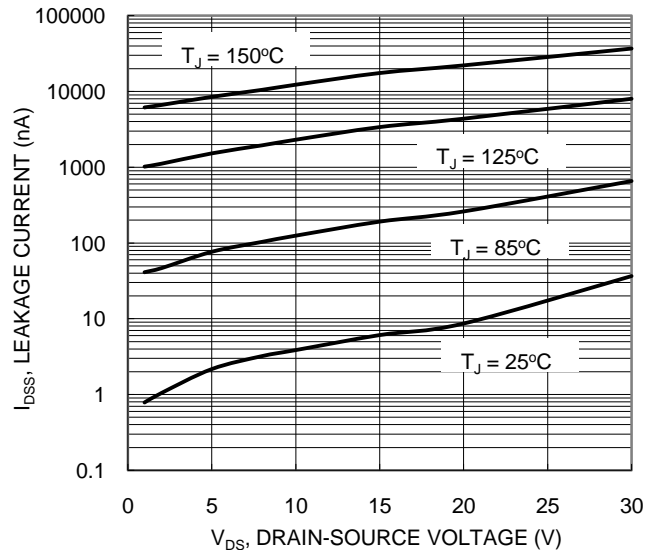


Figure 18. Q2 Typical Drain-Source Leakage Current vs. Voltage

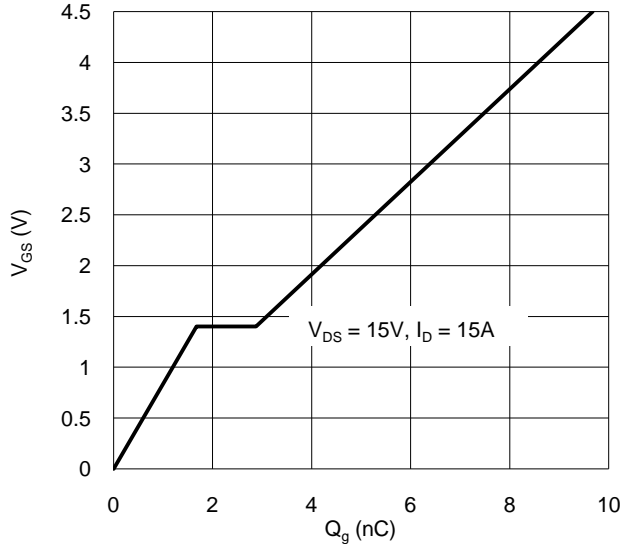


Figure 19. Q1 Gate Charge

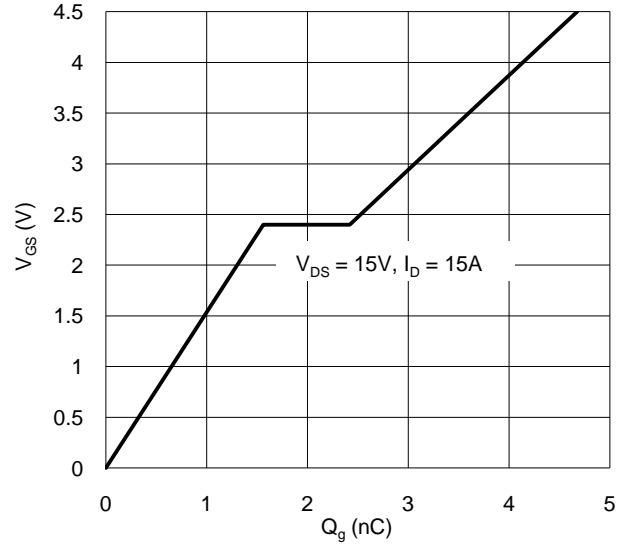


Figure 20. Q2 Gate Charge

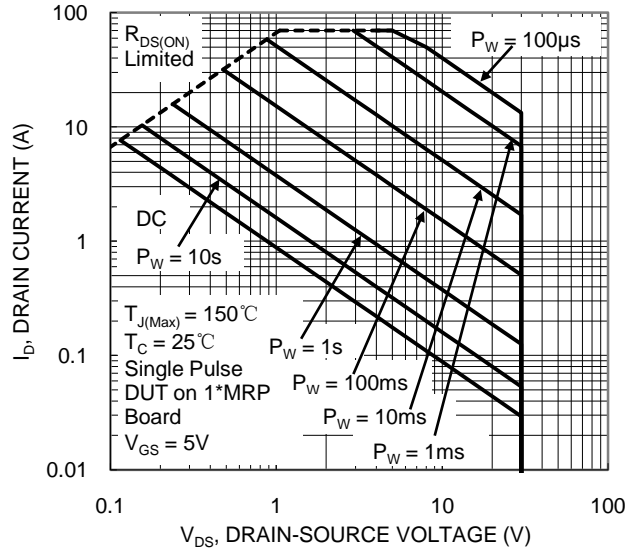


Figure 21. Q1 SOA, Safe Operation Area

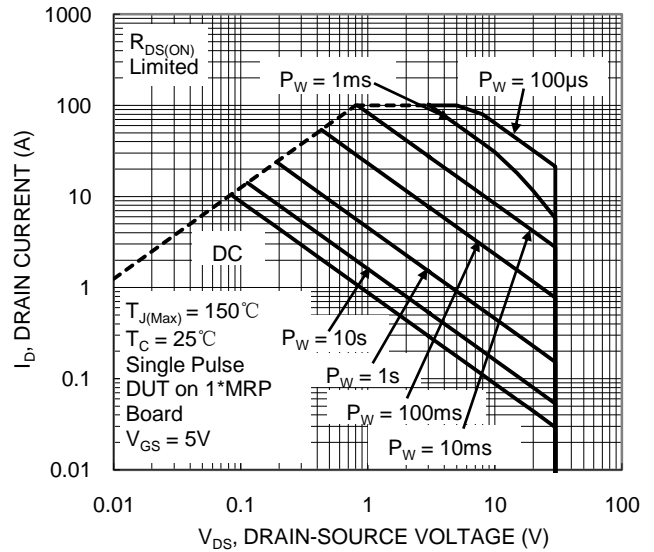


Figure 22. Q2 SOA, Safe Operation Area

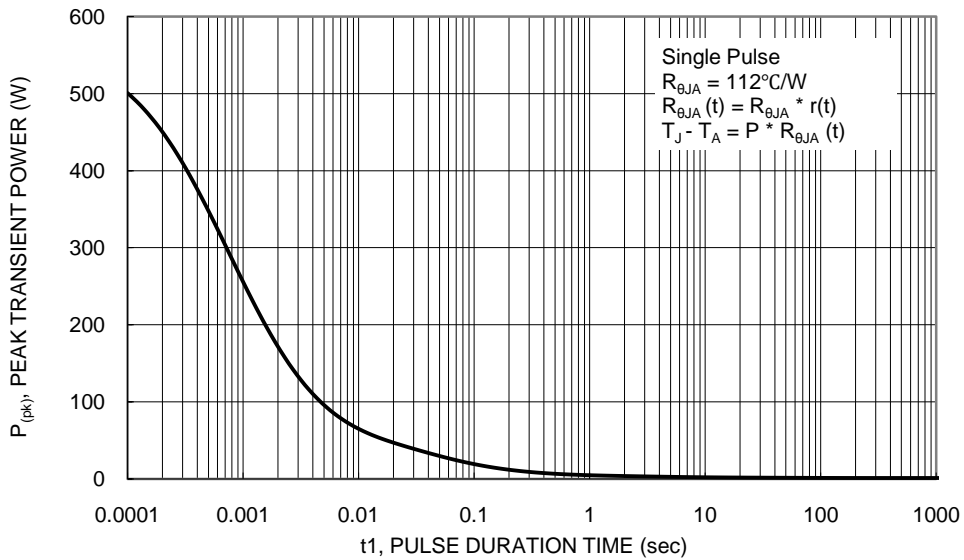


Figure 23. Single Pulse Maximum Power Dissipation

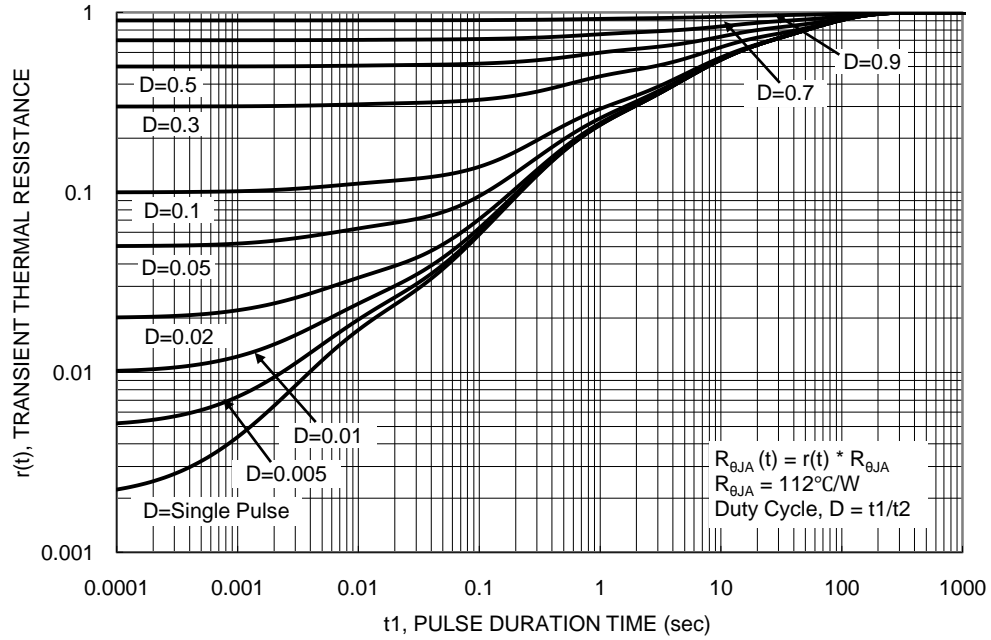
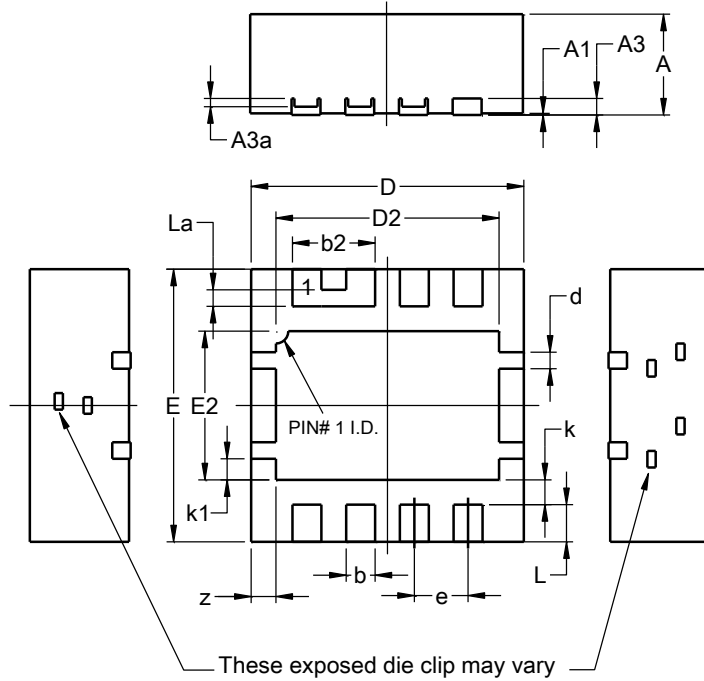


Figure 24. Transient Thermal Resistance

**Package Outline Dimensions**

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

**PowerDI3333-8 (Type D)**

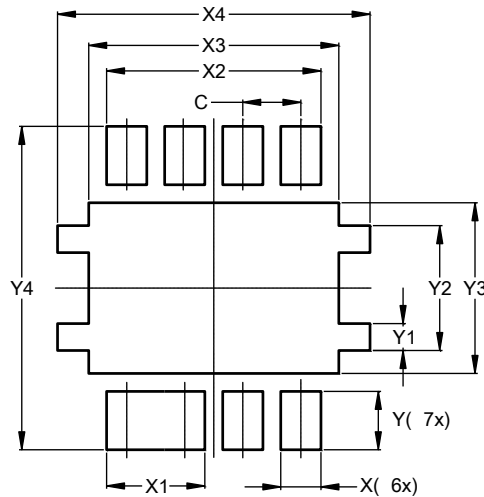


PowerDI3333-8 (Type D)			
Dim	Min	Max	Typ
A	1.17	1.23	1.20
A1	0.00	0.05	0.02
A3	0.15	0.25	0.20
A3a	0.05	0.15	0.10
b	0.30	0.40	0.35
b2	0.95	1.05	1.00
D	3.20	3.40	3.30
D2	2.65	2.75	2.70
E	3.20	3.40	3.30
E2	1.75	1.85	1.80
d	0.15	0.25	0.20
e	--	--	0.65
k	--	--	0.30
k1	0.21	0.31	0.26
L	0.40	0.50	0.45
La	0.15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