30V SYNCHRONOUS N-CHANNEL ENHANCEMENT MODE MOSFET
PowerDI3333-8 (Type D)

Product Summary

Device	BV_{DSS}	$R_{DS(ON)}$ Max
Q1	30V	22mΩ @ V_{GS} = 5V, I_D = 10A
Q2	30V	8mΩ @ V_{GS} = 5V, I_D = 10A

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)**

Description and Applications

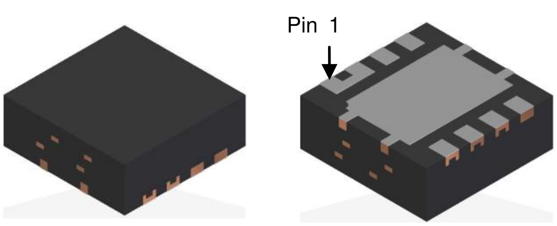
This new generation MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

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

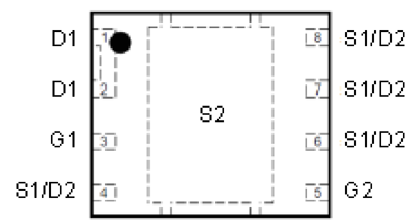
Mechanical Data

- 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)

PowerDI3333-8 (Type D)



Top View   Bottom View



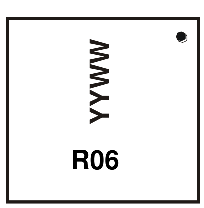
Top View
Pin Configuration

Ordering Information (Note 4)

Part Number	Case	Packaging
DMN3022LDG-7	PowerDI3333-8 (Type D)	1,000/Tape & Reel
DMN3022LDG-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



R06 = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 18 = 2018)
WW = Week Code (01 to 53)

PowerDI is a registered trademark of Diodes Incorporated.

Maximum Ratings (@T_A = +25°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} = 5V	T_C = +25°C T_C = +70°C	I_D	15 12		A
	T_A = +25°C T_A = +70°C	I_D	7.6 6.1		A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I_{DM}	50	100	A
Avalanche Current (Note 6) L = 0.1mH		I_{AS}	24	43	A
Avalanche Energy (Note 6) L = 0.1mH		E_{AS}	28	92	mJ

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Total Power Dissipation	T_A = +25°C	P_D	1.96	W
	T_A = +70°C		1.25	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	64	°C/W
	t < 10s		36	
Thermal Resistance, Junction to Case (Note 5)		$R_{\theta JC}$	8.7	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Electrical Characteristics Q1 (@T_A = +25°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} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±10V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	1.4	2.1	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	16	22	mΩ	V_{GS} = 5V, I_D = 10A
Forward Transfer Admittance	$\|Y_{FS}\|$	—	17	—	S	V_{DS} = 5V, I_D = 8A
Diode Forward Voltage	V_{SD}	—	0.84	1	V	V_{GS} = 0V, I_S = 8A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	370	481	pF	V_{DS} = 15V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	176	228		
Reverse Transfer Capacitance	C_{rss}	—	8.2	10.6		
Gate Resistance	R_G	—	2.5	6.5	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_G	—	2.8	3.7	nC	V_{DS} = 15V, I_D = 8A
Total Gate Charge at V_{TH}	$Q_{G(TH)}$	—	0.35	—		
Gate-Source Charge	Q_{GS}	—	0.6	—		
Gate-Drain Charge	Q_{GD}	—	0.5	—		
Turn-On Delay Time	$t_{D(ON)}$	—	4.5	6.7	ns	V_{DD} = 15V, V_{GS} = 4.5V, I_D = 8A, R_G = 2Ω
Turn-On Rise Time	t_R	—	1.8	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	7.2	10.8		
Turn-Off Fall Time	t_F	—	1.9	—		
Reverse Recovery Time	t_{RR}	—	11.5	—	ns	I_F = 8A, di/dt = 300A/µs
Reverse Recovery Charge	Q_{RR}	—	6.9	—	nC	

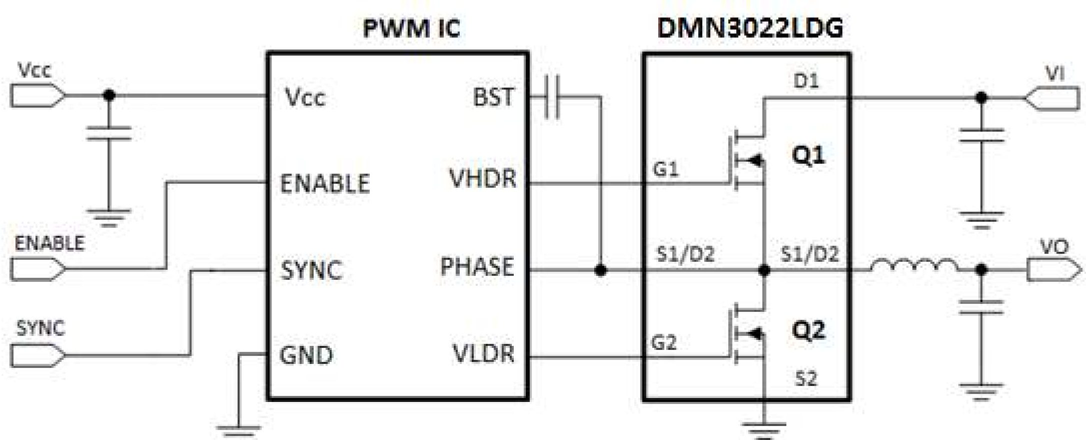
Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
6. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

Electrical Characteristics Q2 (@T_A = +25°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} = 0V, I_D = 250μA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	1.0	μA	V_{DS} = 20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±10V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.8	0.96	1.2	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	6.4	8	mΩ	V_{GS} = 5V, I_D = 10A
Forward Transfer Admittance	$\|Y_{FS}\|$	—	33	—	S	V_{DS} = 5V, I_D = 8A
Diode Forward Voltage	V_{SD}	—	0.78	1	V	V_{GS} = 0V, I_S = 8A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	766	996	pF	V_{DS} = 15V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	441	573	pF	
Reverse Transfer Capacitance	C_{rss}	—	19	25	pF	
Gate Resistance	R_G	—	0.69	1.5	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_G	—	6.1	8	nC	V_{DS} = 15V, I_D = 8A
Total Gate Charge at V_{TH}	$Q_{G(TH)}$	—	0.47	—	nC	
Gate-Source Charge	Q_{GS}	—	0.8	—	nC	
Gate-Drain Charge	Q_{GD}	—	1.1	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	5.6	8.4	ns	V_{DD} = 15V, V_{GS} = 4.5V, I_D = 8A, R_G = 2Ω
Turn-On Rise Time	t_R	—	2.5	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	11.7	17.5	ns	
Turn-Off Fall Time	t_F	—	2.4	—	ns	
Reverse Recovery Time	t_{RR}	—	27.9	—	ns	I_F = 8A, di/dt = 300A/μs
Reverse Recovery Charge	Q_{RR}	—	9.9	—	nC	

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

Typical Circuit



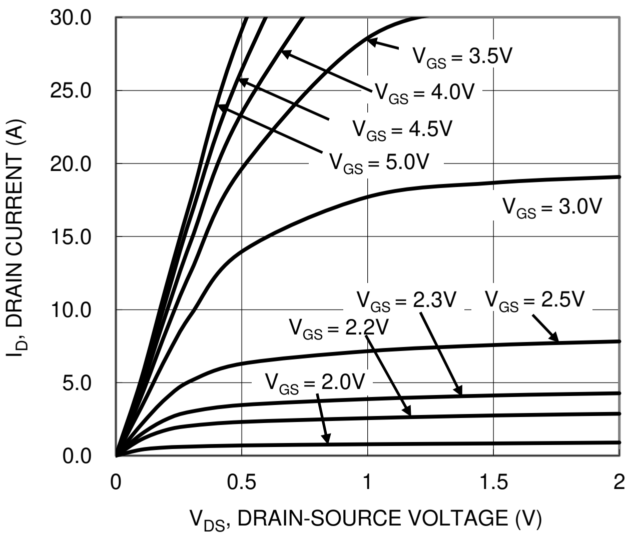


Figure 1. Q1 Typical Output Characteristic

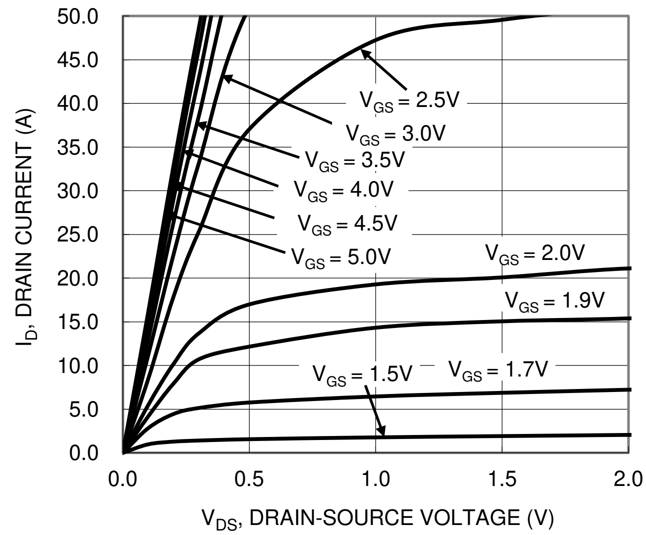


Figure 2. Q2 Typical Output Characteristic

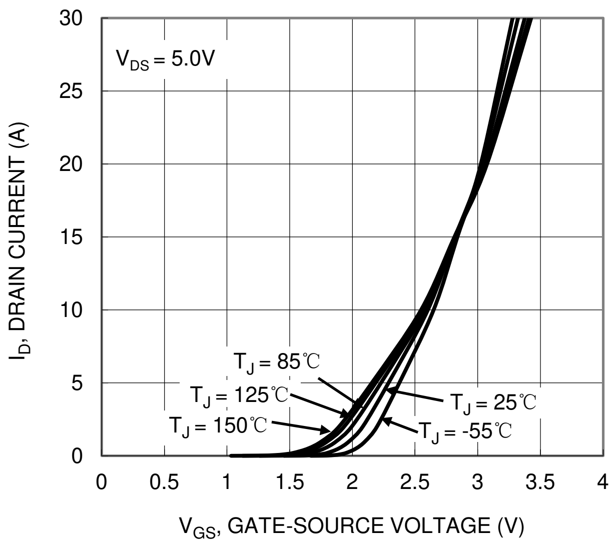


Figure 3. Q1 Typical Transfer Characteristic

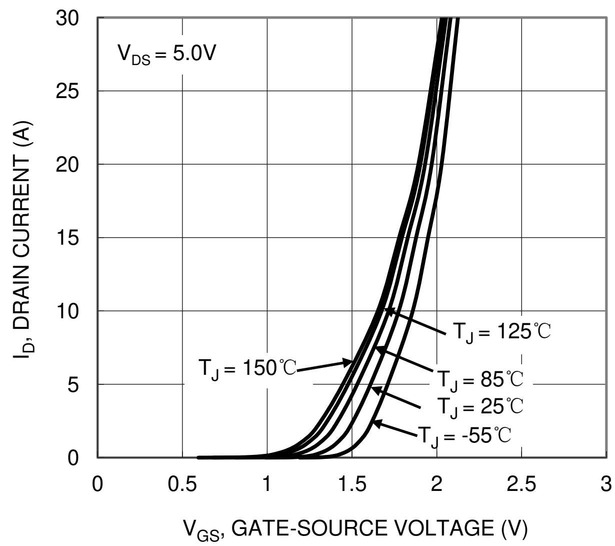


Figure 4. Q2 Typical Transfer Characteristic

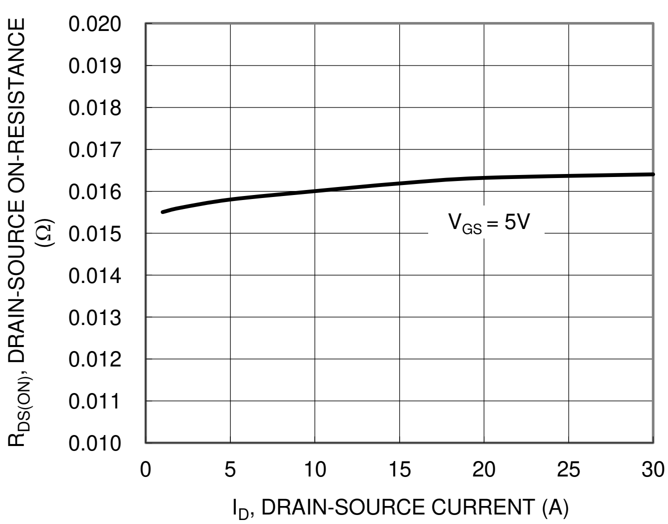


Figure 5. Q1 Typical On-Resistance vs. Drain Current and Gate Voltage

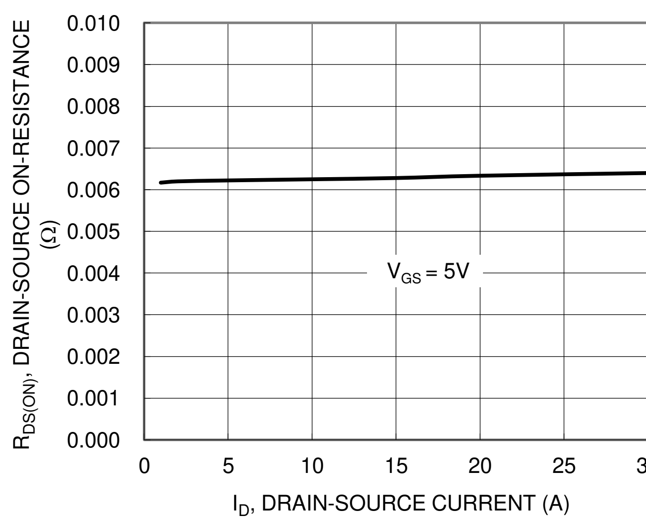


Figure 6. Q2 Typical On-Resistance vs. Drain Current and Gate Voltage

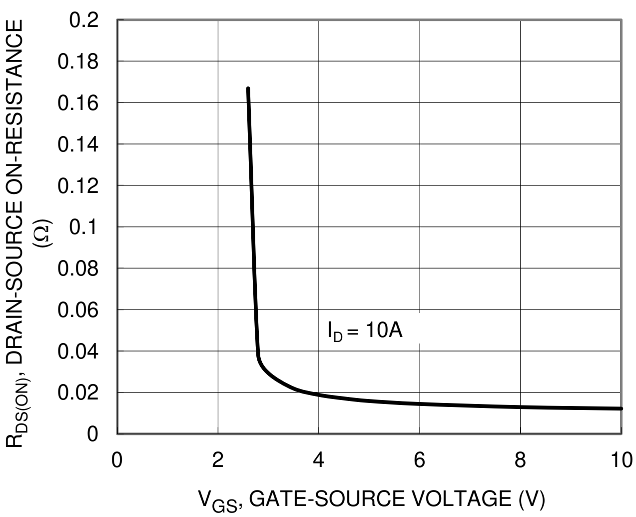


Figure 7. Q1 Typical Transfer Characteristic

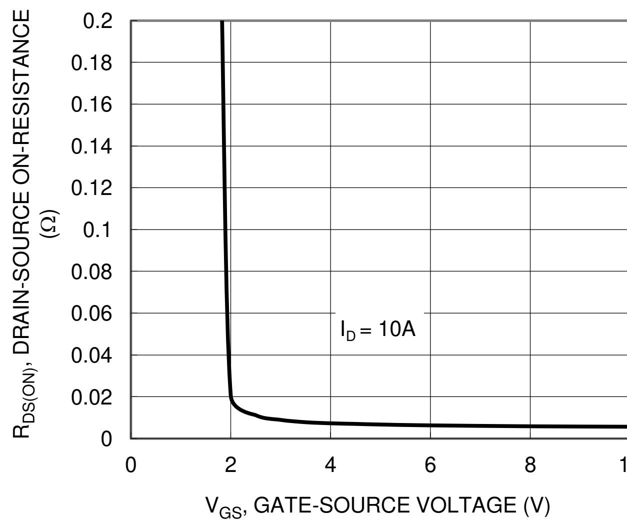


Figure 8. Q2 Typical Transfer Characteristic

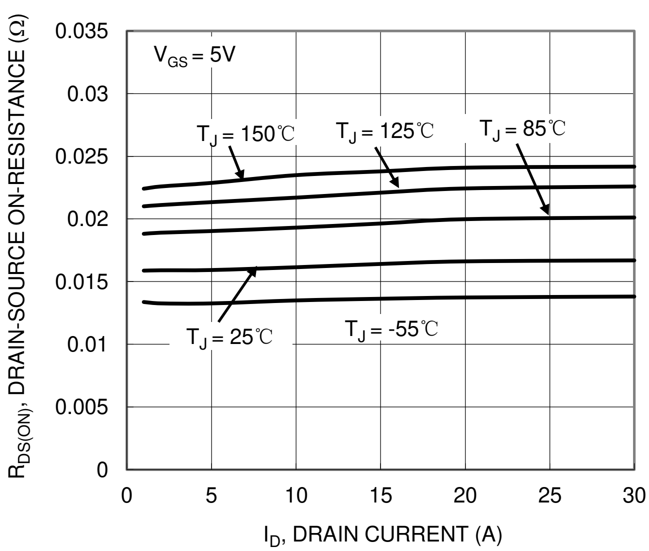


Figure 9. Q1 Typical On-Resistance vs. Drain Current and Temperature

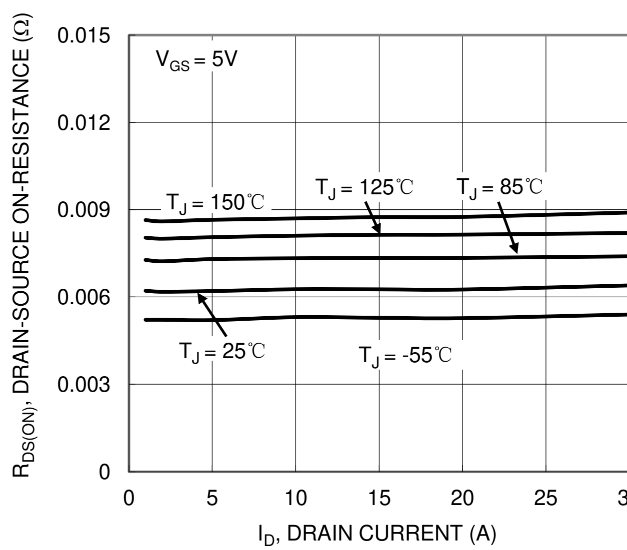


Figure 10. Q2 Typical On-Resistance vs. Drain Current and Temperature

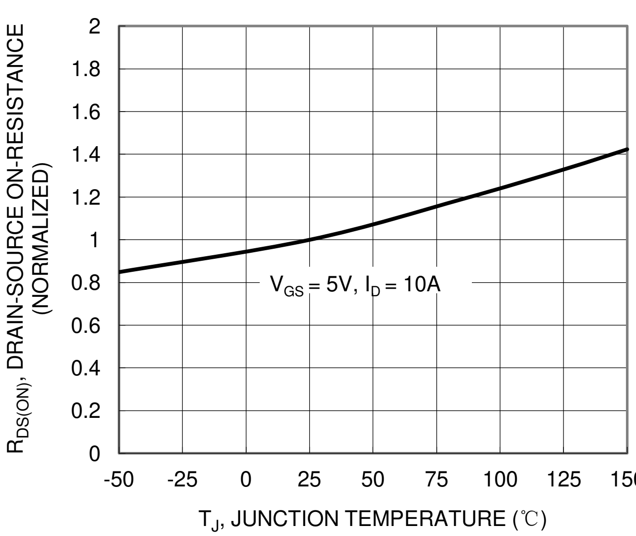


Figure 11. Q1 On-Resistance Variation with Temperature

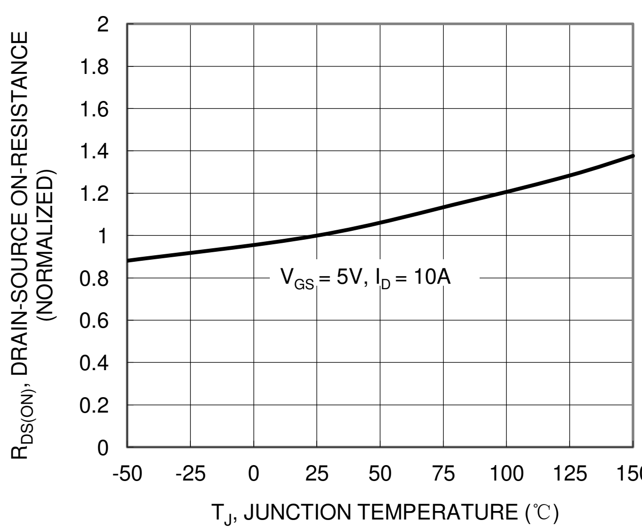


Figure 12. Q2 On-Resistance Variation with Temperature

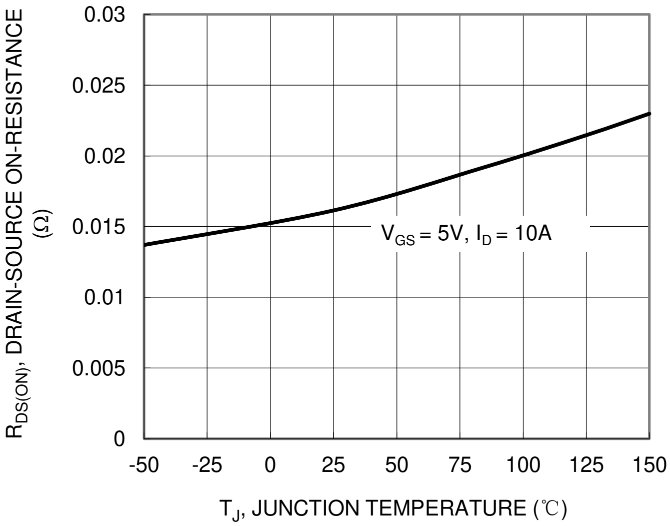


Figure 13. Q1 On-Resistance Variation with Temperature

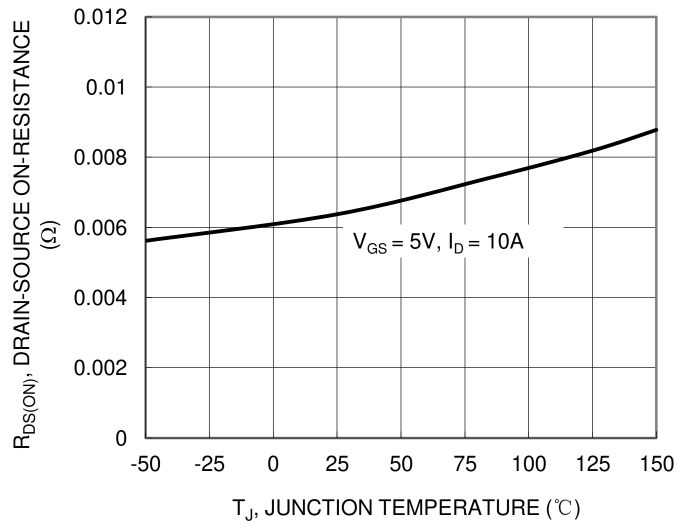


Figure 14. Q2 On-Resistance Variation with Temperature

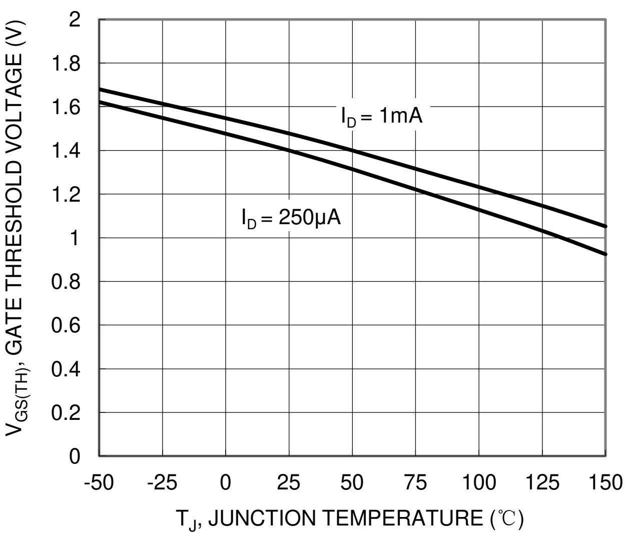


Figure 15. Q1 Gate Threshold Variation vs. Junction Temperature

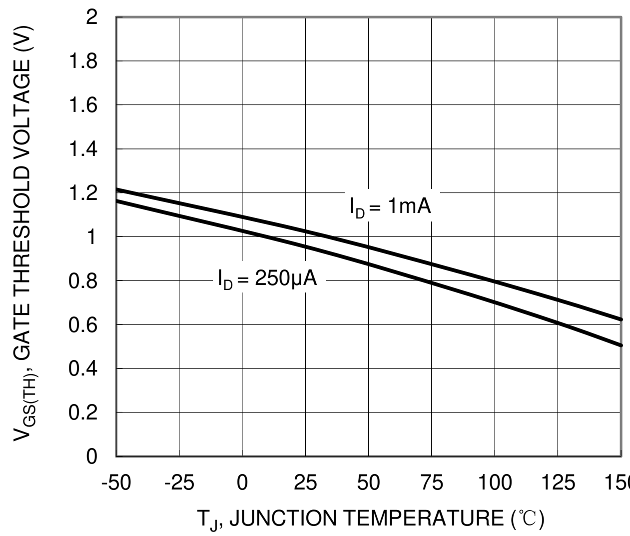


Figure 16. Q2 Gate Threshold Variation vs. Junction Temperature

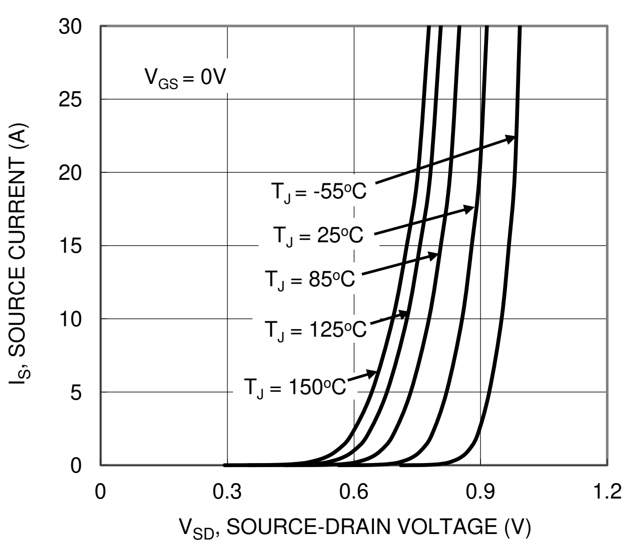


Figure 17. Q1 Diode Forward Voltage vs. Current

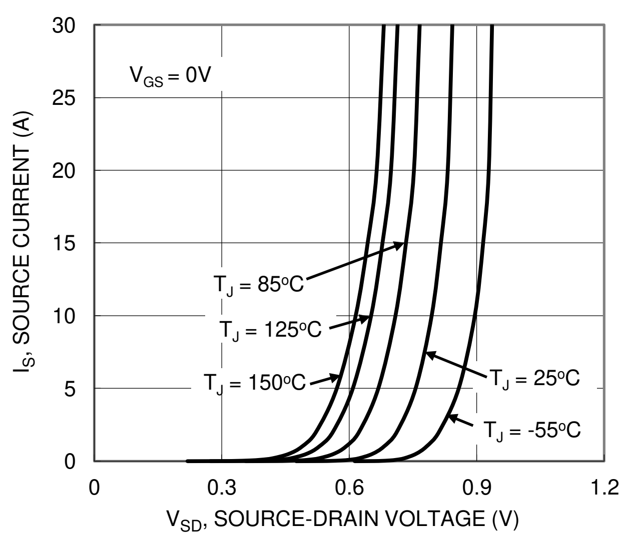


Figure 18. Q2 Diode Forward Voltage vs. Current

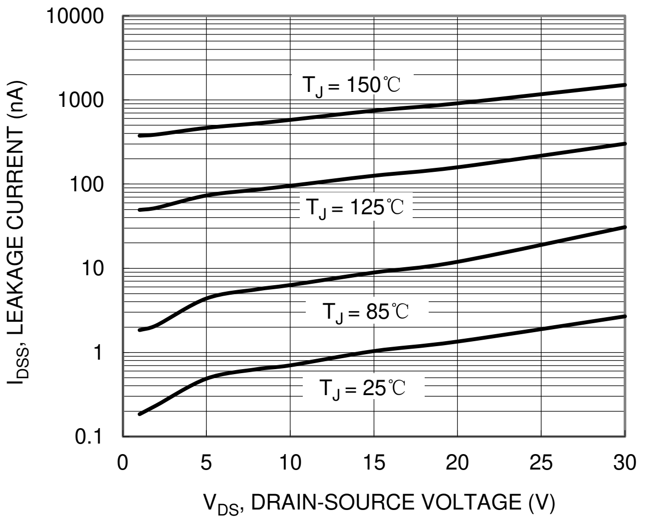


Figure 19. Q1 Typical Drain-Source Leakage Current vs. Voltage

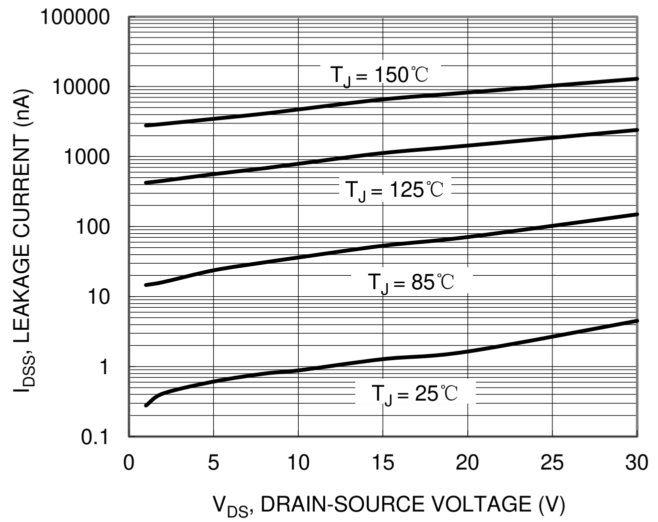


Figure 20. Q2 Typical Drain-Source Leakage Current vs. Voltage

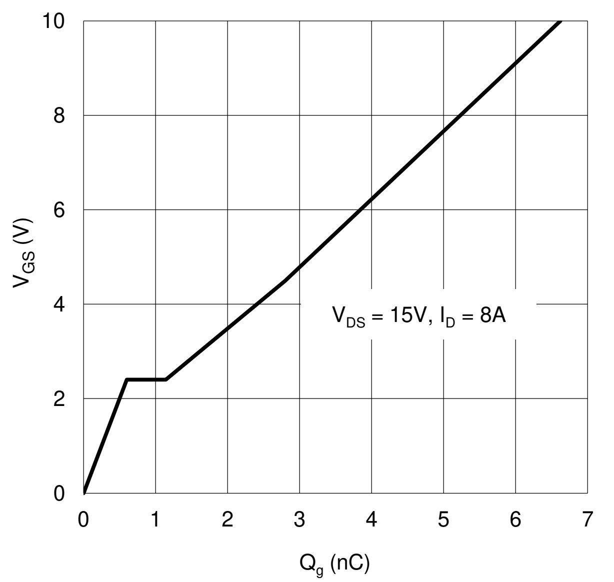


Figure 21. Q1 Gate Charge

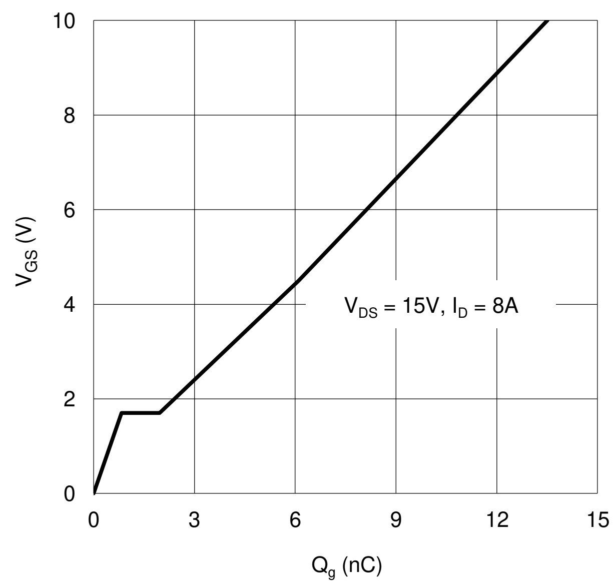


Figure 22. Q2 Gate Charge

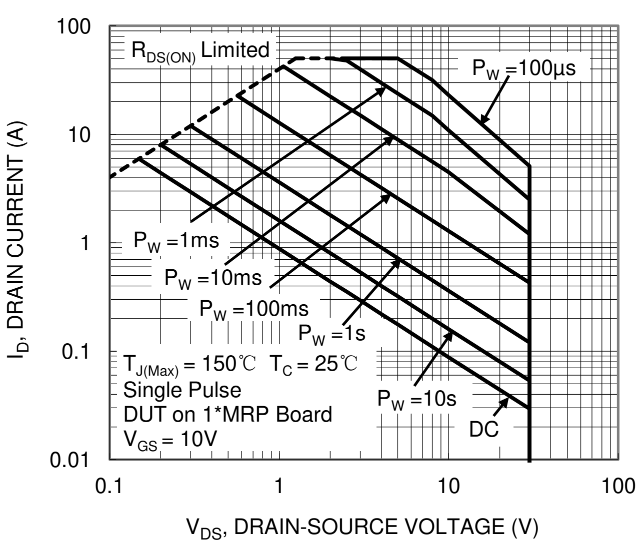


Figure 23. Q1 SOA, Safe Operation Area

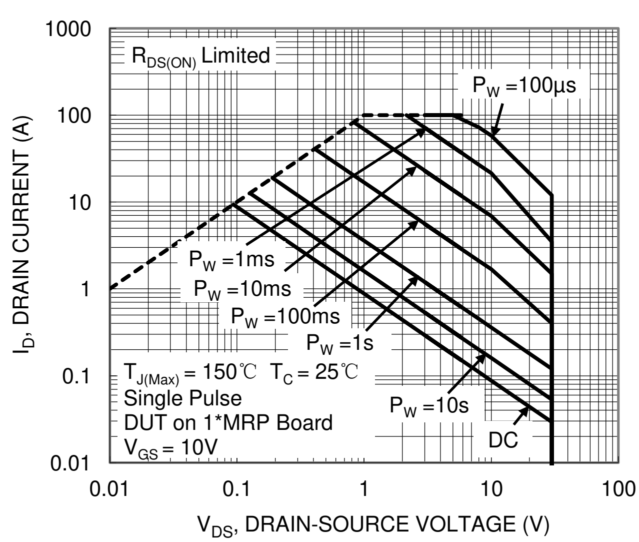


Figure 24. Q2 SOA, Safe Operation Area

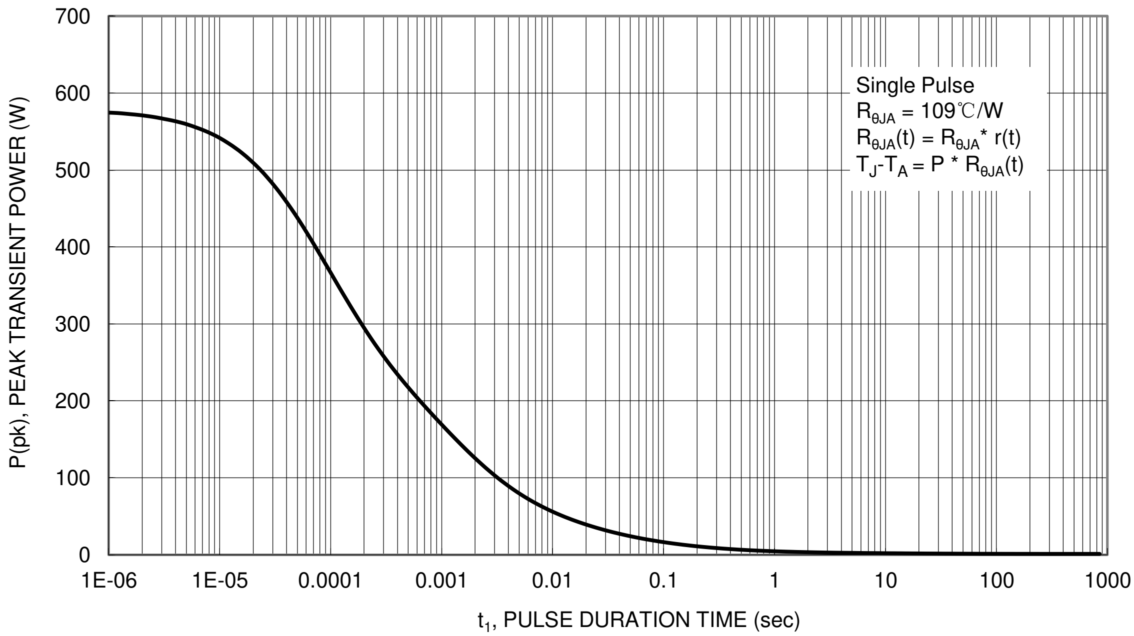


Figure 25. Single Pulse Maximum Power Dissipation

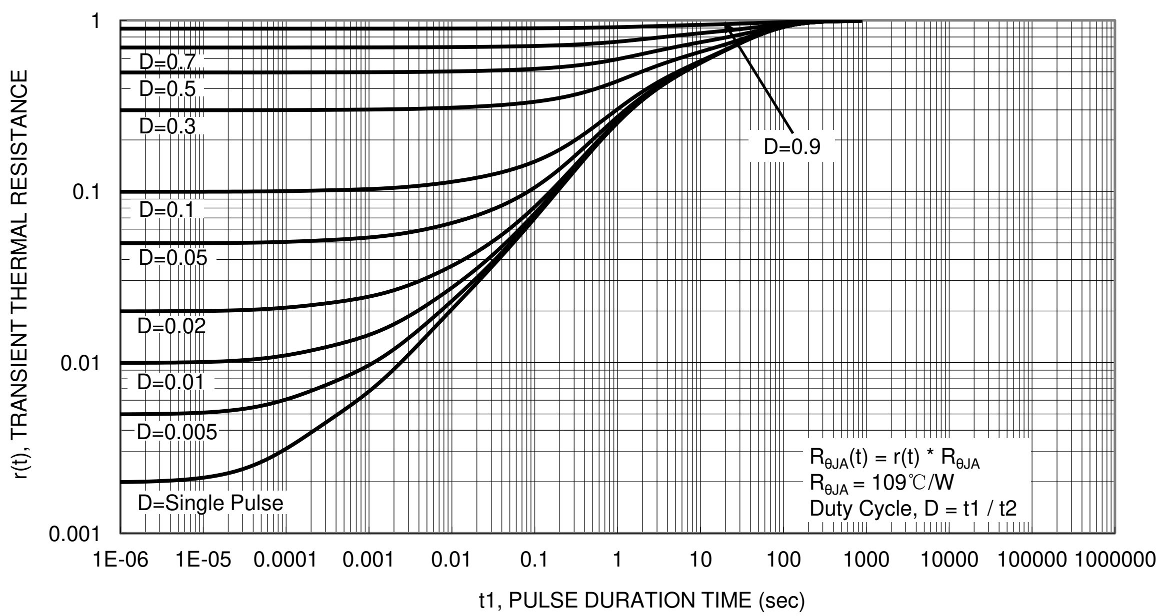
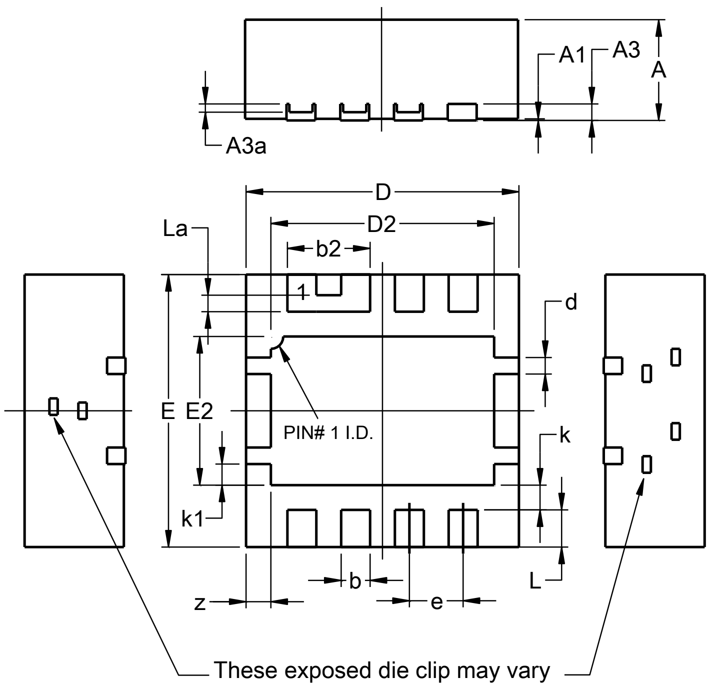


Figure 26. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI3333-8 (Type D)

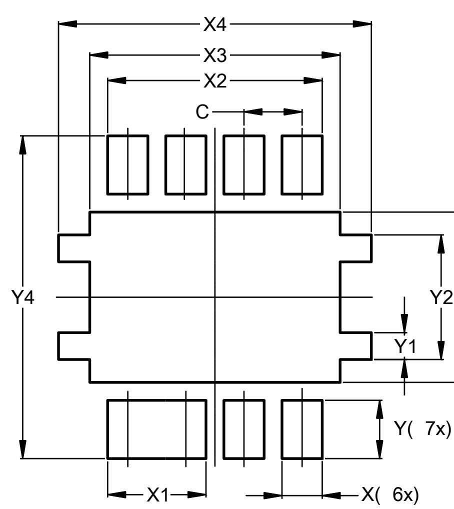


PowerDI3333-8 (Type D)			
Dim	**Min**	**Max**	**Typ**
A	1.17	1.23	1.20
A1	0.00	0.05	0.02
A3	0.15	0.25	0.20
A3a	0.05	0.15	0.10
b	0.30	0.40	0.35
b2	0.95	1.05	1.00
D	3.20	3.40	3.30
D2	2.65	2.75	2.70
E	3.20	3.40	3.30
E2	1.75	1.85	1.80
d	0.15	0.25	0.20
e	--	--	0.65
k	--	--	0.30
k1	0.21	0.31	0.26
L	0.40	0.50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