YOUSHANG SEMICONDUCTOR

设计研发新型功率器件

各类小信号开关

中低压及高压大电流等场效应管

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Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max (Note 10) T_C = +25°C
40V	3.0mΩ @ V_{GS} = 10V	100A
	5.0mΩ @ V_{GS} = 5V	93A

Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching, Test in Production – Ensures More Reliable and Robust End Application
- Low $R_{DS(ON)}$ – Ensures On-State Losses are Minimized
- Excellent Q_{GD} × $R_{DS(ON)}$ Product (FOM)

Description and Applications

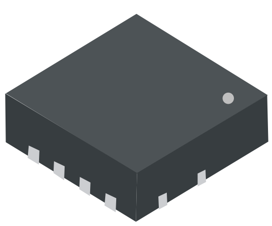
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Motor controls
- DC-DC converters
- Power managements

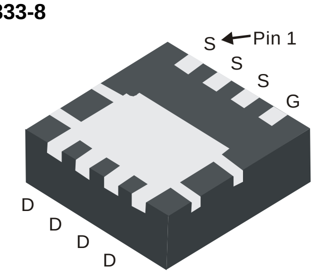
Mechanical Data

- Package: PowerDI®3333-8
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.034 grams (Approximate)

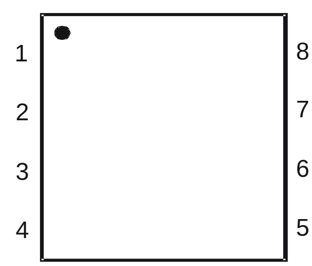
PowerDI3333-8



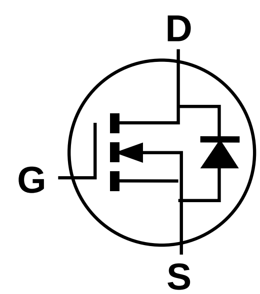
Top View



Bottom View



Top View



Equivalent Circuit

Maximum Ratings (@T_C = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Drain-Source Voltage		V_{DSS}	40	V
Gate-Source Voltage		V_{GSS}	±20	V
Continuous Drain Current (Note 7) (Note 10) V_{GS} = 10V	T_C = +25°C T_C = +100°C	I_D	100 85	A
Continuous Drain Current (Note 6) V_{GS} = 10V	T_A = +25°C T_A = +100°C	I_D	24.0 16.9	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I_{DM}	400	A
Maximum Continuous Body Diode Forward Current (Note 7) (Note 10)		I_S	100	A
Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%)		I_{SM}	400	A
Avalanche Current, L = 1mH		I_{AS}	18.2	A
Avalanche Energy, L = 1mH		E_{AS}	165	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	2.62	W
Thermal Resistance, Junction to Ambient (Note 6)		$R_{\theta JA}$	57.8	°C/W
Total Power Dissipation (Note 7)	T_C = +25°C	P_D	65.2	W
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	2.3	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	°C

Electrical Characteristics (@T_J = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	40	—	—	V	V_{GS} = 0V, I_D = 1mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 32V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	1.5	2.5	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	2.3	3.0	mΩ	V_{GS} = 10V, I_D = 20A
		—	3.4	5.0		V_{GS} = 5V, I_D = 15A
Static Drain-Source On-Resistance (T_J = +175°C) (Note 9)	$R_{DS(ON)}$	—	—	6.0		V_{GS} = 10V, I_D = 20A
		—	—	9.0		V_{GS} = 5V, I_D = 15A
Diode Forward Voltage	V_{SD}	—	0.8	1.0	V	V_{GS} = 0V, I_S = 20A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	2798	—	pF	V_{DS} = 20V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	904	—		
Reverse Transfer Capacitance	C_{rss}	—	88	—		
Gate Resistance	R_g	—	2.44	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 10V)	Q_g	—	40.1	—	nC	V_{DS} = 20V, I_D = 20A, V_{GS} = 10V
Gate-Source Charge	Q_{gs}	—	5.2	—		
Gate-Drain Charge	Q_{gd}	—	8.8	—		
Turn-On Delay Time	$t_{D(ON)}$	—	5.16	—	ns	V_{DD} = 20V, V_{GS} = 10V, R_G = 1.6Ω, I_D = 20A
Turn-On Rise Time	t_R	—	10.7	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	24.6	—		
Turn-Off Fall Time	t_F	—	12.4	—		
Body Diode Reverse Recovery Time	t_{RR}	—	32.6	—	ns	I_F = 15A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	26.6	—	nC	

Notes:
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
7. Thermal resistance from junction to soldering point (on the exposed drain pad).
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.
10. Package limit.

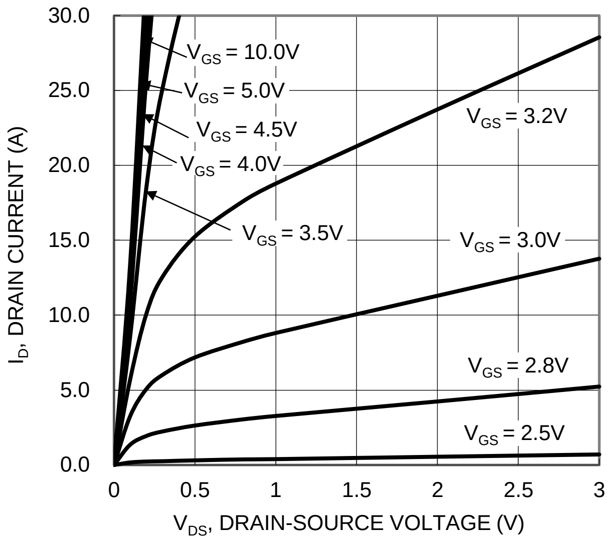


Figure 1.Typical Output Characteristic

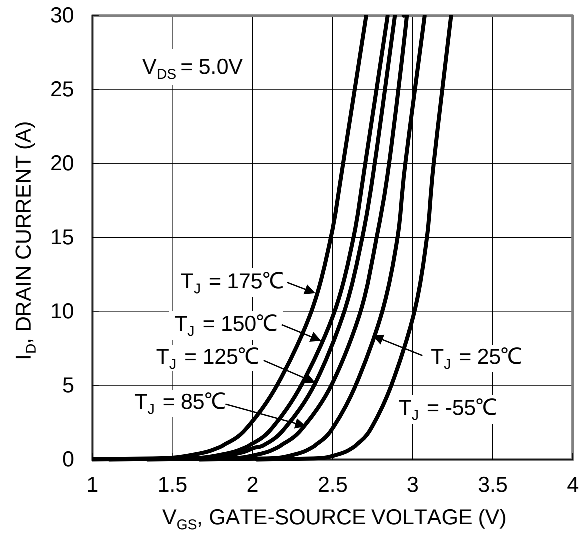


Figure 2. Typical Transfer Characteristic

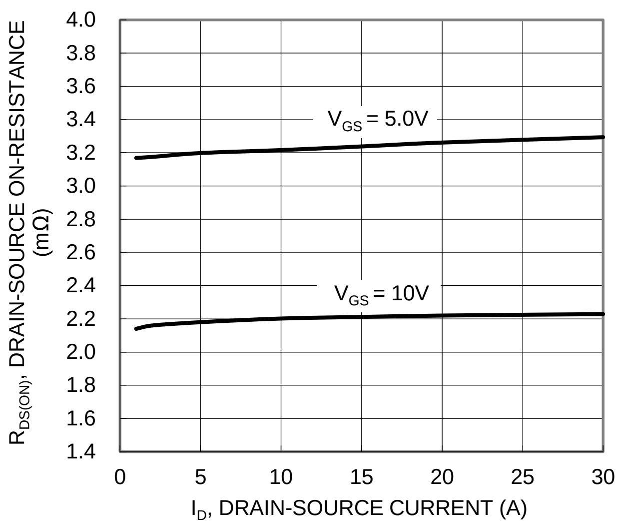


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

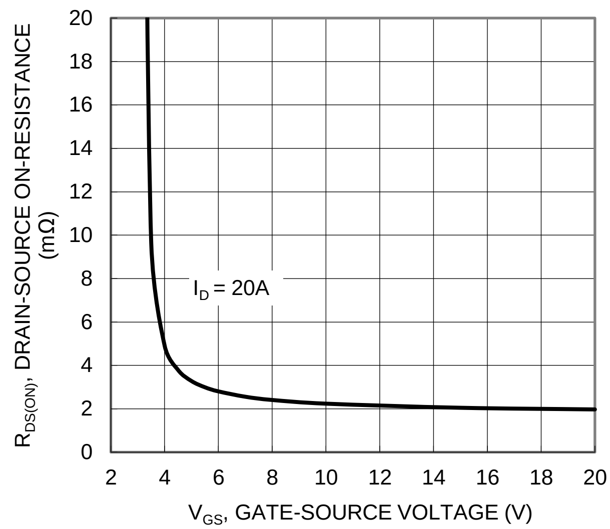


Figure 4. Typical Transfer Characteristic

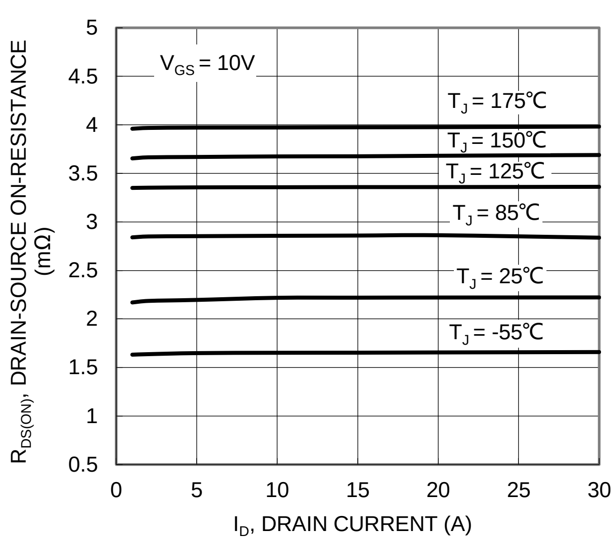


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

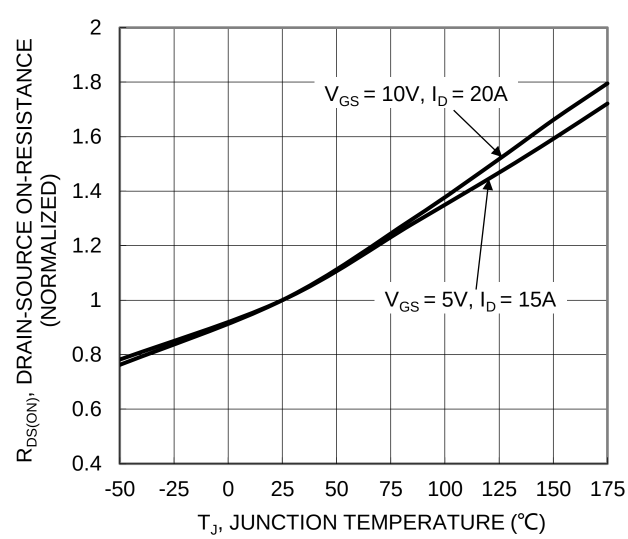


Figure 6. On-Resistance Variation with Temperature

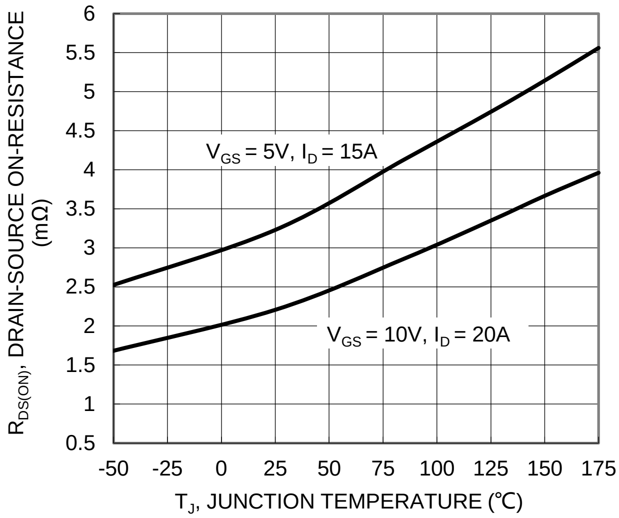


Figure 7. On-Resistance Variation with Temperature

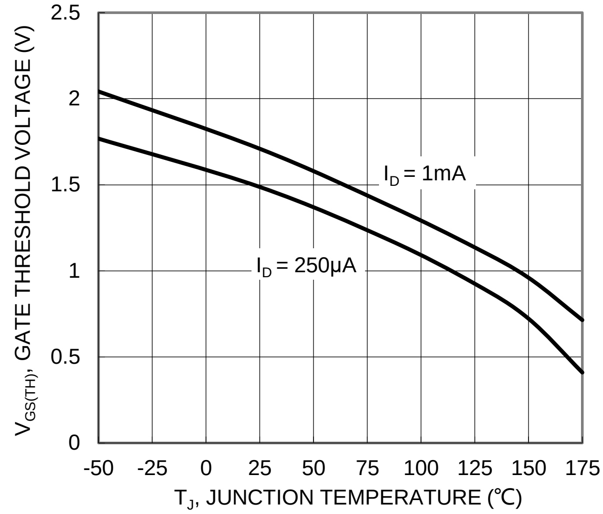


Figure 8. Gate Threshold Variation vs. JunctionTemperature

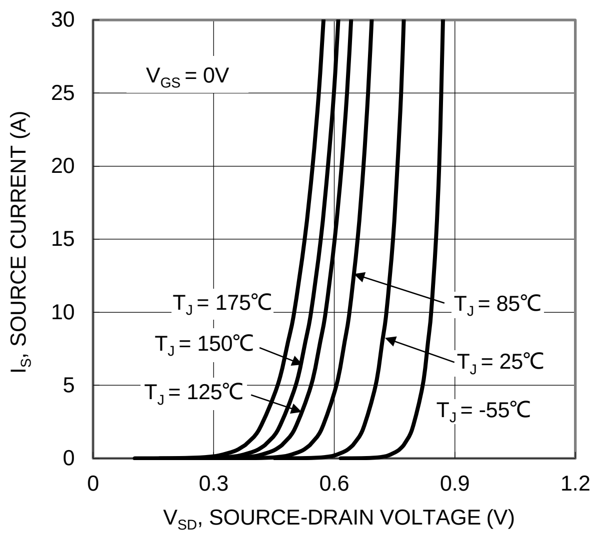


Figure 9. Diode Forward Voltage vs. Current

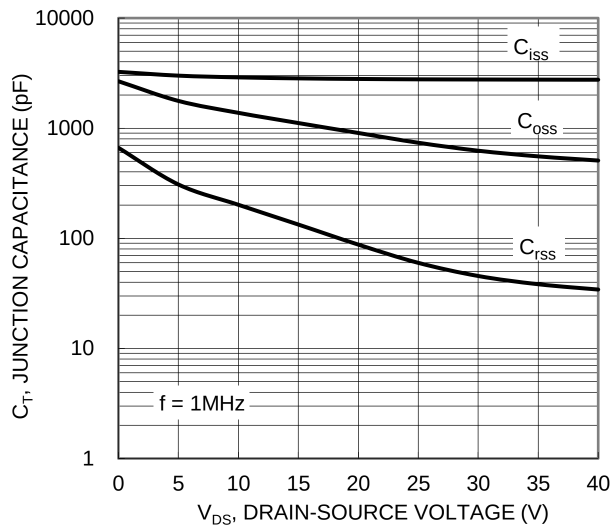


Figure 10. Typical Junction Capacitance

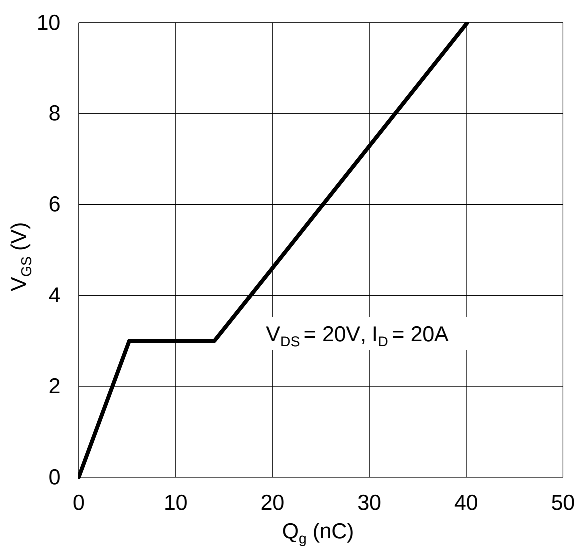


Figure 11. Gate Charge

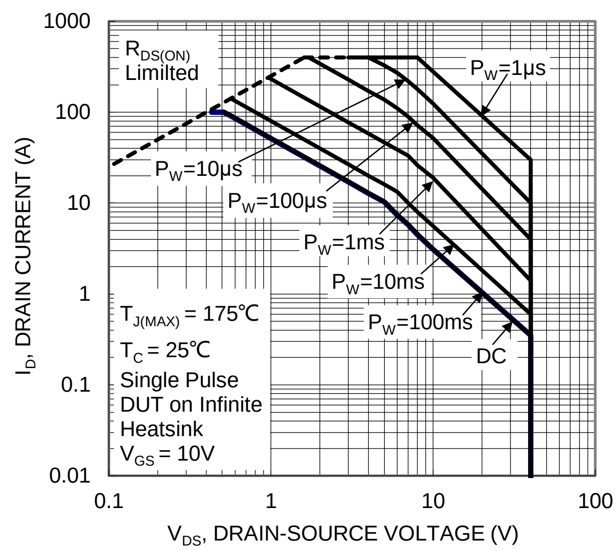


Figure 12. SOA, Safe Operation Area

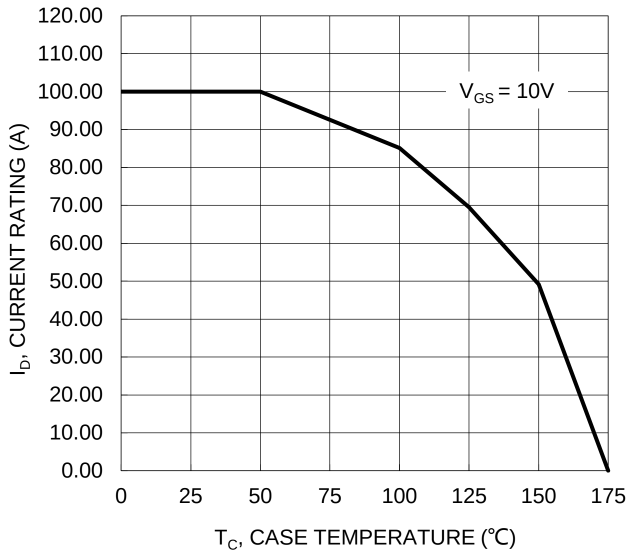


Figure 13. Current Function of T_C

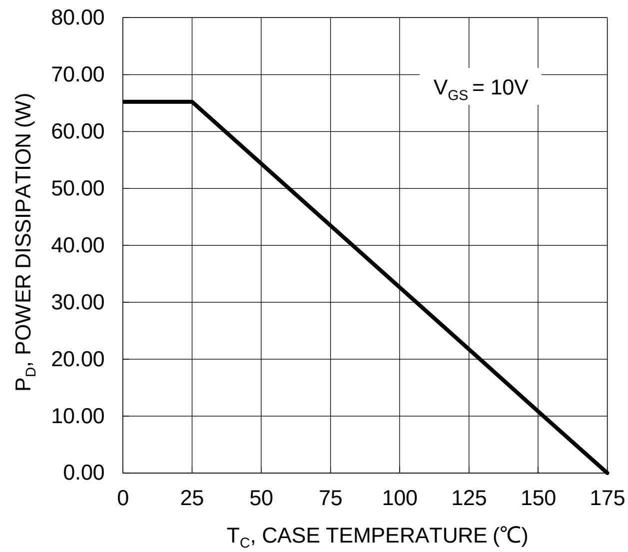


Figure 14. Power Dissipation Function of T_C

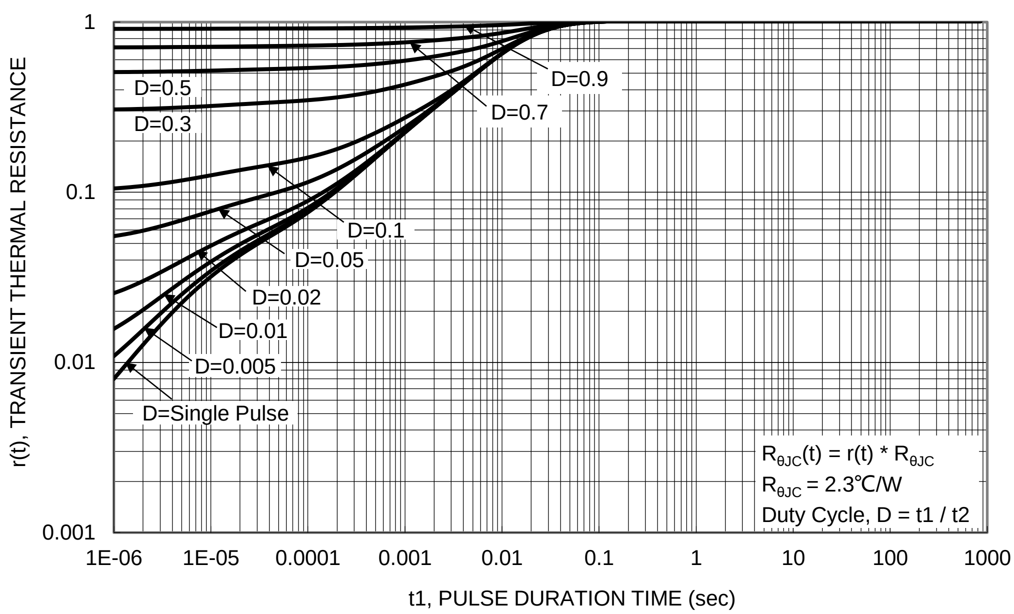
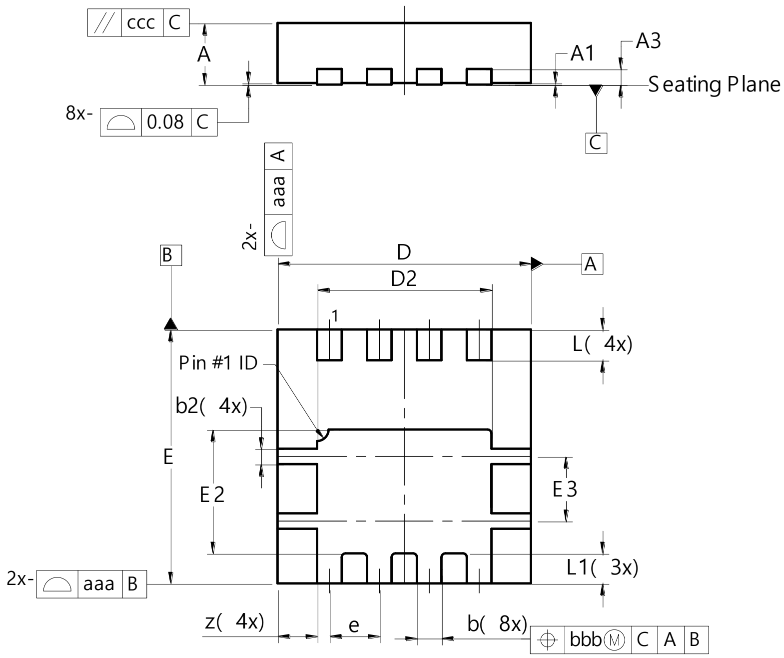


Figure 15. Transient Thermal Resistance

Package Outline Dimensions

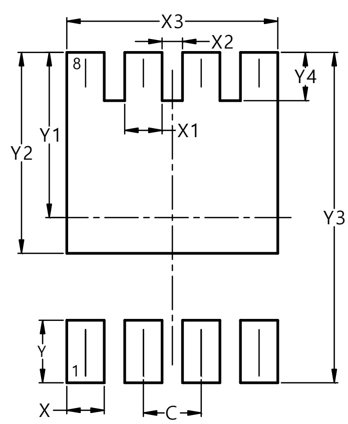
PowerDI3333-8



PowerDI3333-8			
Dim	**Min**	**Max**	**Typ**
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	–	–	0.203
b	0.27	0.37	0.32
b2	–	–	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
E3	0.79	0.89	0.84
e	–	–	0.65
L	0.35	0.45	0.40
L1	–	–	0.39
z	–	–	0.515
aaa	0.25		
bbb	0.10		
ccc	0.10		
All Dimensions in mm			

Suggested Pad Layout

PowerDI3333-8



Dimensions	Value (in mm)
C	0.650
X	0.420
X1	0.420
X2	0.230
X3	2.370
Y	0.700
Y1	1.850
Y2	2.250
Y3	3.700
Y4	0.540