



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 T _C = +25°C
24V	5.0mΩ @ V _{GS} = 10V	70A
	6.5mΩ @ V _{GS} = 4.5V	60A
	10.0mΩ @ V _{GS} = 2.5V	45A

Description and Applications

This 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.

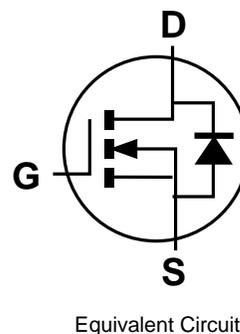
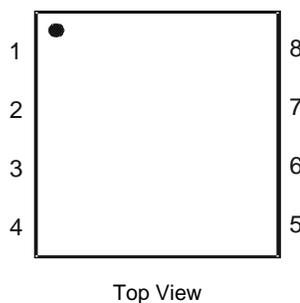
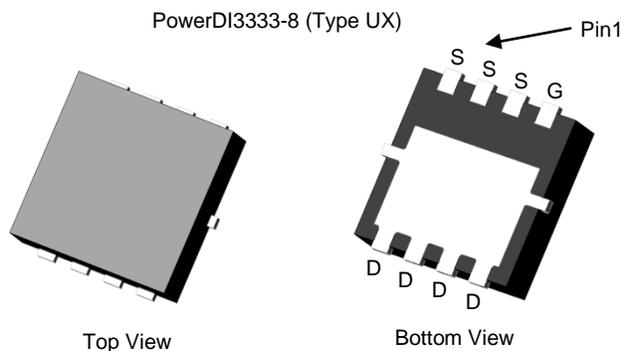
- Backlighting
- Power Management Functions
- DC-DC Converters

Features and Benefits

- Low R_{DS(ON)} – ensures on state losses are minimized
- Small form factor thermally efficient package enables higher density end products
- Occupies just 33% of the board area occupied by SO-8 enabling smaller end product
- 100% Unclamped Inductive Switch (UIS) Test in Production

Mechanical Data

- Case: PowerDI[®] 3333-8 (Type UX)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.072 grams (Approximate)



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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DS}	24	V
Gate-Source Voltage			V_{GS}	± 12	V
Continuous Drain Current (Note 7) $V_{GS} = 10\text{V}$	Steady State	$T_C = +25^\circ\text{C}$	I_D	70	A
		$T_C = +70^\circ\text{C}$		55	
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	90	A
Continuous Source-Drain Diode Current (Note 6)			I_S	2.5	A
Avalanche Current (Note 8) $L = 0.1\text{mH}$			I_{AS}	26	A
Avalanche Energy (Note 8) $L = 0.1\text{mH}$			E_{AS}	36	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	P_D	1.2	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	106	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	2.3	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	54	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	3.5	$^\circ\text{C/W}$
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
Drain-Source Breakdown Voltage	BV_{DSS}	24	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current ($T_J = +25^\circ\text{C}$)	I_{DSS}	—	—	1	μA	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 10\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.55	—	1.45	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	3.8	5.0	m Ω	$V_{GS} = 10\text{V}, I_D = 12\text{A}$
		—	4.6	6.5		$V_{GS} = 4.5\text{V}, I_D = 12\text{A}$
		—	6.8	10.0		$V_{GS} = 2.5\text{V}, I_D = 12\text{A}$
Diode Forward Voltage	V_{SD}	—	0.65	1.0	V	$V_{GS} = 0\text{V}, I_S = 2\text{A}$
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	1683	—	pF	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	581	—		
Reverse Transfer Capacitance	C_{rss}	—	559	—		
Gate Resistance	R_G	—	1.6	—	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	—	29.6	—	nC	$V_{DD} = 15\text{V}, I_D = 9\text{A}$
Total Gate Charge ($V_{GS} = 10\text{V}$)	Q_g	—	53.7	—		
Gate-Source Charge	Q_{gs}	—	4.2	—		
Gate-Drain Charge	Q_{gd}	—	13.4	—		
Turn-On Delay Time	$t_{D(ON)}$	—	3.9	—	ns	$V_{DD} = 15\text{V}, V_{GS} = 10\text{V}, R_G = 3\Omega, I_D = 9\text{A}$
Turn-On Rise Time	t_R	—	9.6	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	30.8	—		
Turn-Off Fall Time	t_F	—	38.6	—		
Reverse Recovery Time	t_{RR}	—	11.2	—	ns	$I_F = 1.5\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge	Q_{RR}	—	22.9	—	nC	

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
 - Thermal resistance from junction to soldering point (on the exposed drain pad).
 - I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep $T_J = +25^\circ\text{C}$.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

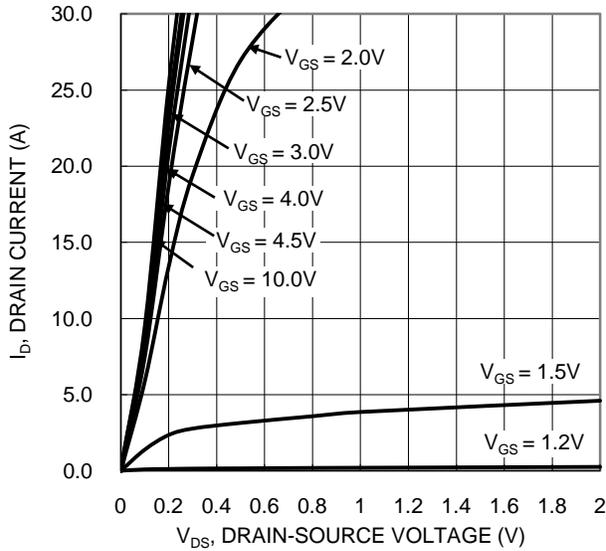


Figure 1. Typical Output Characteristic

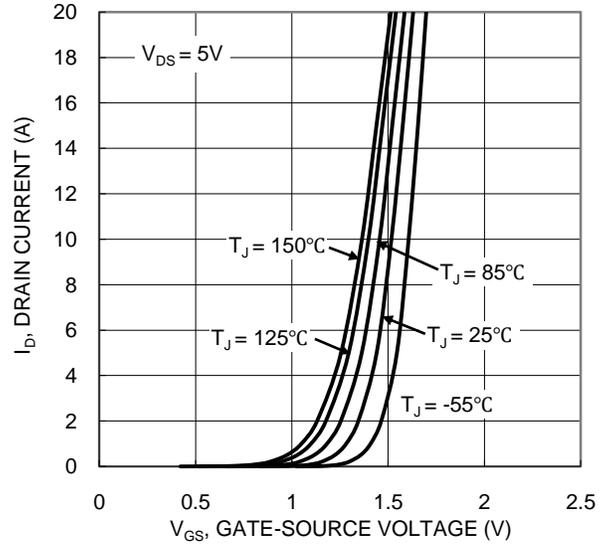


Figure 2. Typical Transfer Characteristic

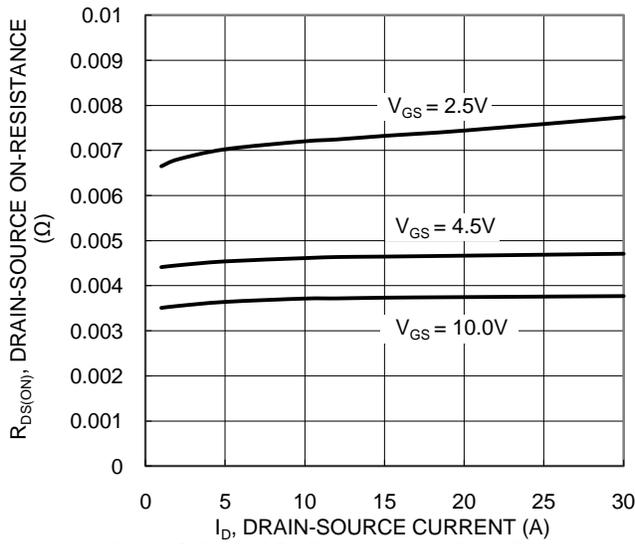


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

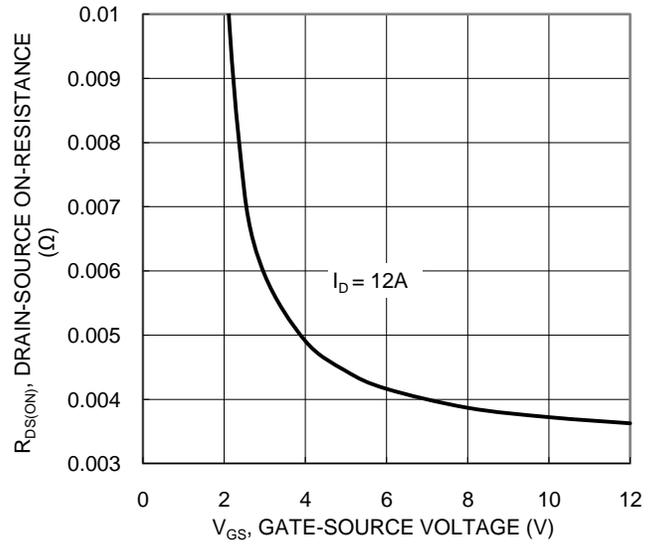


Figure 4. Typical Transfer Characteristic

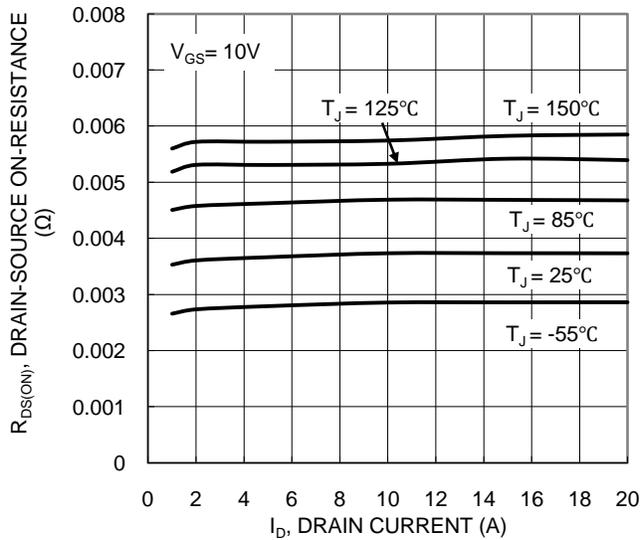


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

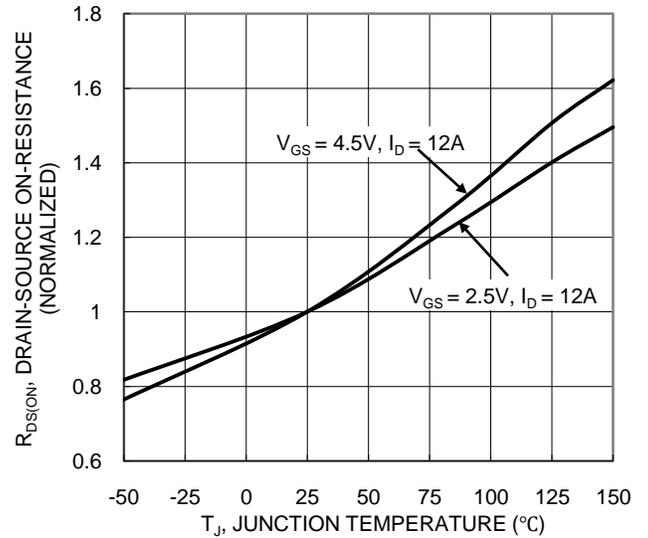


Figure 6. On-Resistance Variation with Temperature

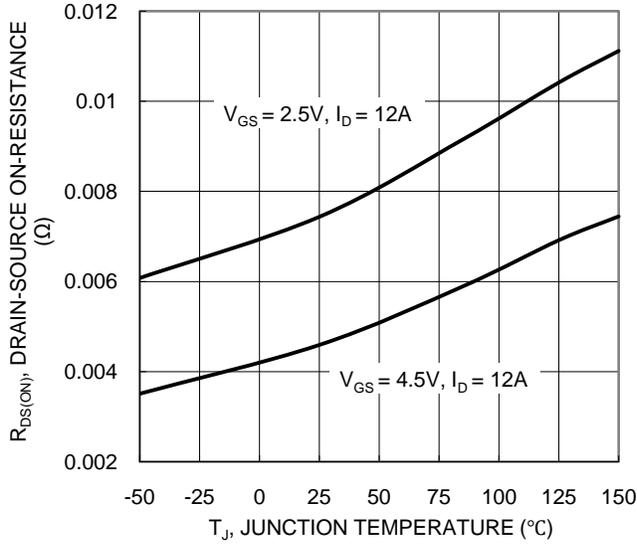


Figure 7. On-Resistance Variation with Temperature

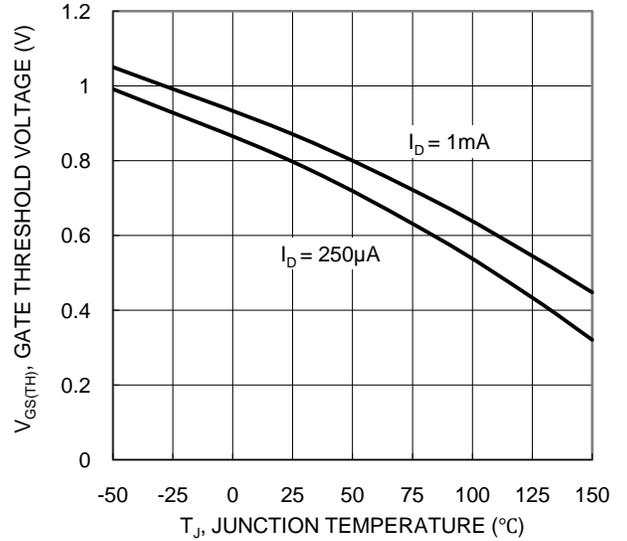


Figure 8. Gate Threshold Variation vs. Junction Temperature

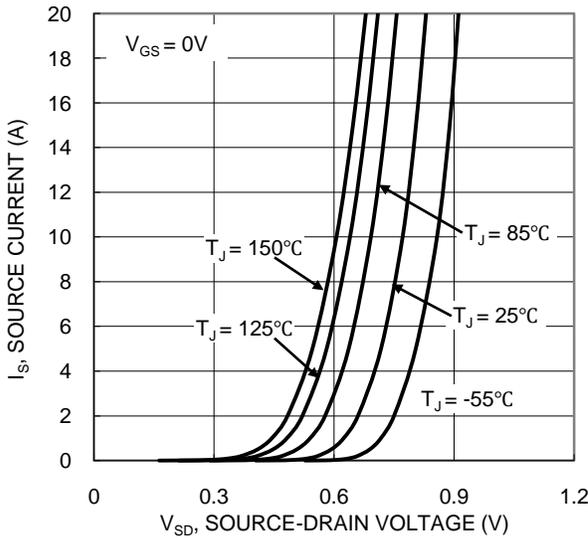


Figure 9. Diode Forward Voltage vs. Current

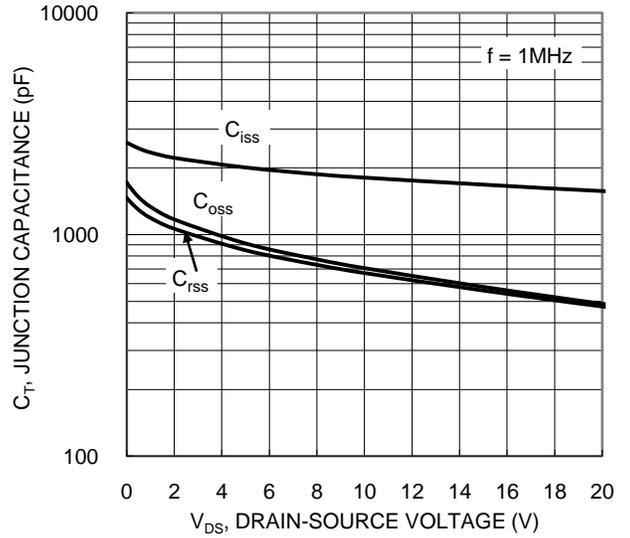


Figure 10. Typical Junction Capacitance

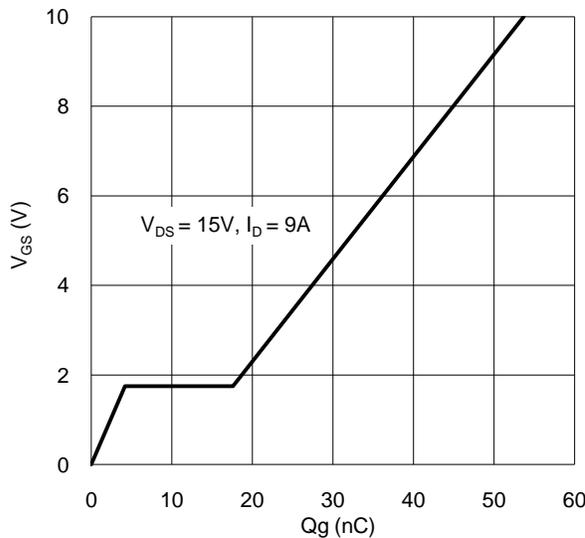


Figure 11. Gate Charge

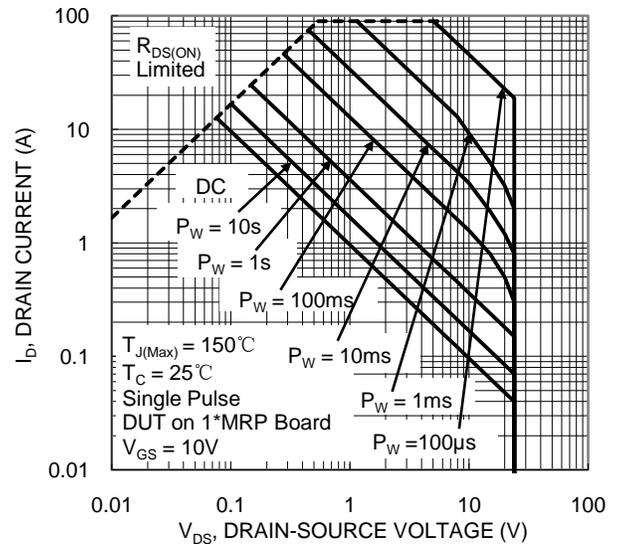


Figure 12. SOA, Safe Operation Area

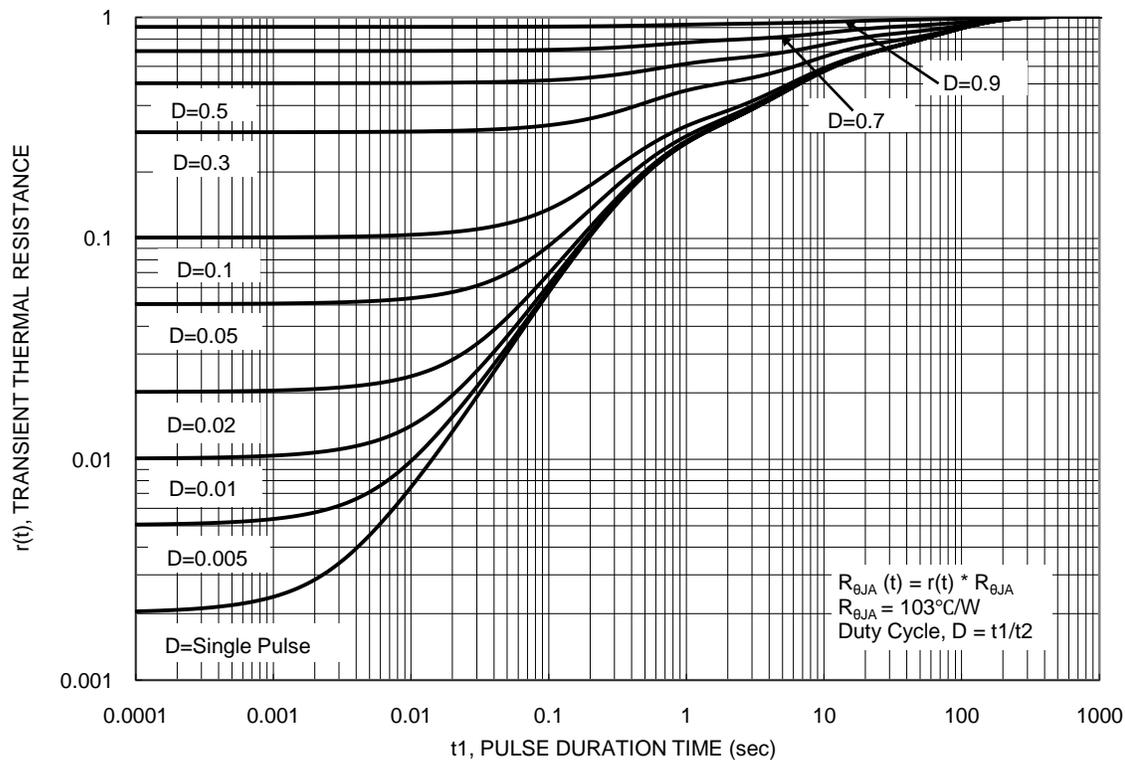
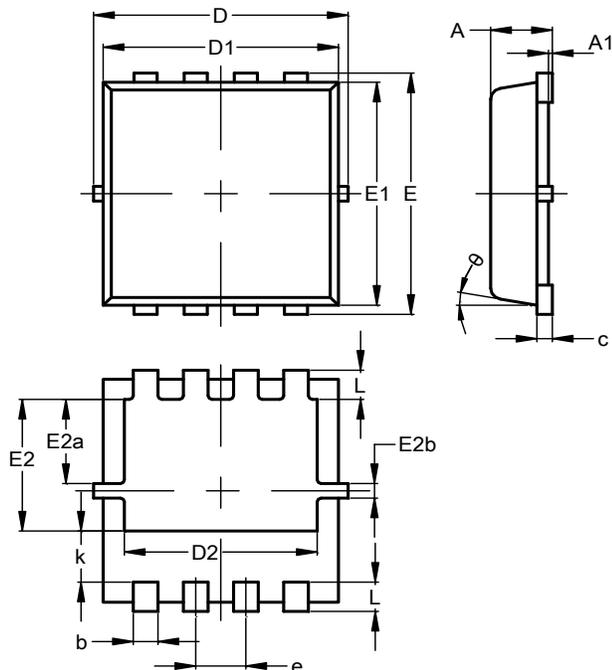


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

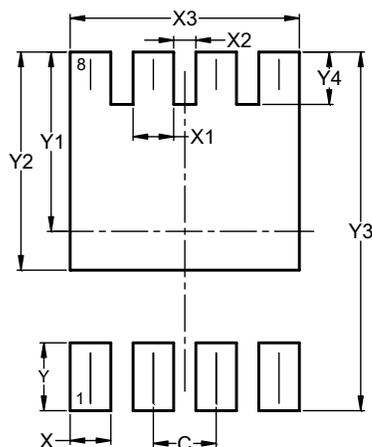
PowerDI3333-8 (Type UX)



PowerDI3333-8 (Type UX)			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0.00	0.05	--
b	0.25	0.40	0.32
c	0.10	0.25	0.15
D	3.20	3.40	3.30
D1	2.95	3.15	3.05
D2	2.30	2.70	2.50
E	3.20	3.40	3.30
E1	2.95	3.15	3.05
E2	1.60	2.00	1.80
E2a	0.95	1.35	1.15
E2b	0.10	0.30	0.20
e	0.65 BSC		
k	0.50	0.90	0.70
L	0.30	0.50	0.40
θ	0°	12°	10°
All Dimensions in mm			

Suggested Pad Layout

PowerDI3333-8 (Type UX)



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