优尚

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
-40V	25mΩ @ V_{GS} = -10V	-40A
	45mΩ @ V_{GS} = -4.5V	-30A

Features and Benefits

- Rated to +175°C—Ideal for High Ambient Temperature Environments
- Low $R_{DS(ON)}$—Ensures Minimal On-State Losses
- 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 Products

Description and Applications

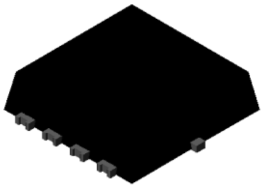
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP, and is ideal for use in:

- Reverse-polarity protections
- Power-management functions
- DC-DC converters

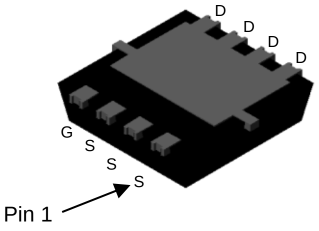
Mechanical Data

- 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 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)

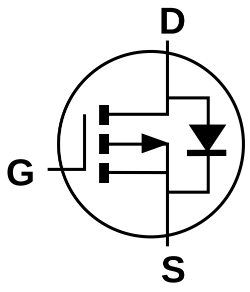
PowerDI3333-8/SWP (Type UX)



Top View



Bottom View



Equivalent Circuit

Maximum Ratings (@T_A = +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 5) V_{GS} = -10V	T_A = +25°C T_A = +70°C	I_D	-8.7 -7.3	A
	T_C = +25°C T_C = +70°C	I_D (Package Limited)	-40 -33	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I_{DM}	-80	A
Maximum Continuous Body Diode Forward Current		I_S	-3	A
Pulsed Source Current (10µs Pulse, Duty Cycle = 1%)		I_{SM}	-80	A
Avalanche Current, L = 0.3mH		I_{AS}	-23	A
Avalanche Energy, L = 0.3mH		E_{AS}	82	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	2.3	W
	T_C = +25°C		60	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	53	°C/W
Thermal Resistance, Junction to Case (Note 5)		$R_{\theta JC}$	2.5	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	°C

Note: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	-40	—	—	V	V_{GS} = 0V, I_D = -250μA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-1	μA	V_{DS} = -40V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.8	—	-1.8	V	V_{DS} = V_{GS}, I_D = -250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	18	25	mΩ	V_{GS} = -10V, I_D = -30A
		—	23	45		V_{GS} = -4.5V, I_D = -15A
Diode Forward Voltage	V_{SD}	—	—	-1	V	V_{GS} = 0V, I_S = -1A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	—	1918	—	pF	V_{DS} = -20V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	390	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	151	—	pF	
Gate Resistance	R_g	—	5.76	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	19.6	—	nC	V_{DS} = -20V, I_D = -3A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	38.6	—	nC	
Gate-Source Charge	Q_{gs}	—	3.7	—	nC	
Gate-Drain Charge	Q_{gd}	—	7.3	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	4.8	—	ns	V_{DD} = -20V, V_{GS} = -10V I_D = -3A
Turn-On Rise Time	t_R	—	14.2	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	72.2	—	ns	
Turn-Off Fall Time	t_F	—	35.9	—	ns	

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

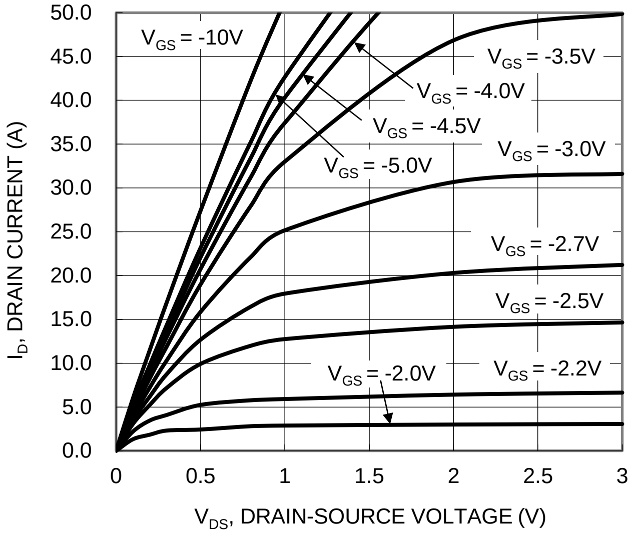


Figure 1. Typical Output Characteristic

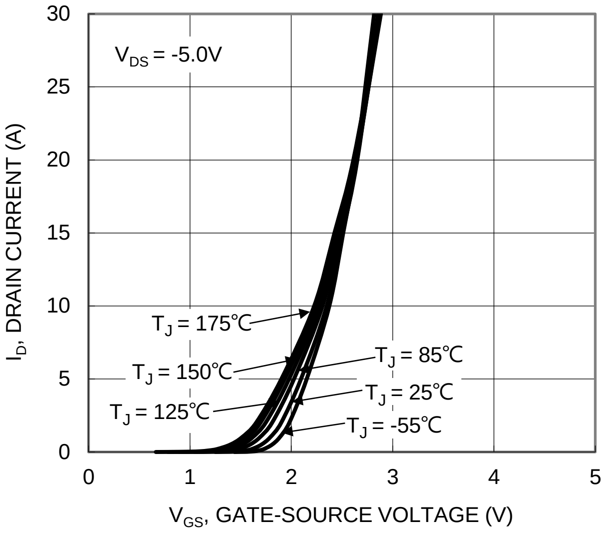


Figure 2. Typical Transfer Characteristic

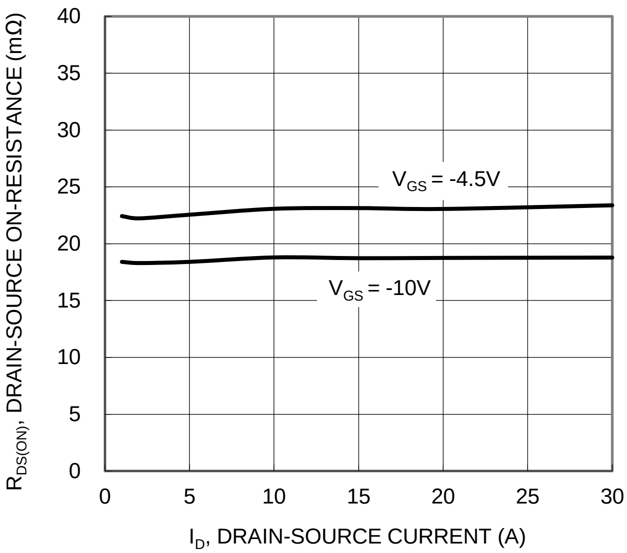


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

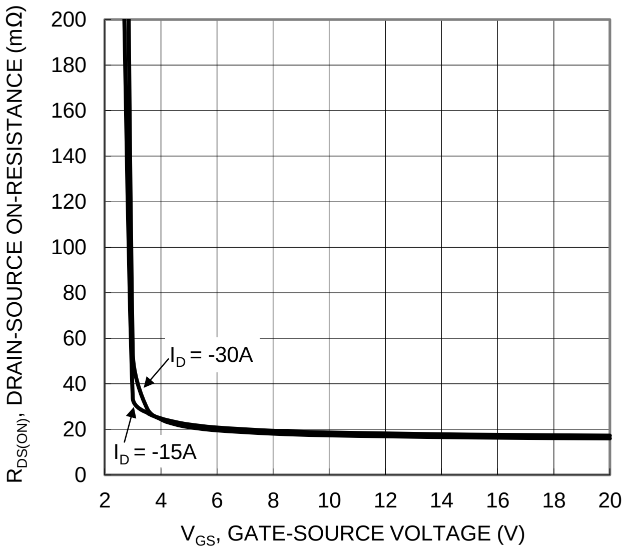


Figure 4. Typical Transfer Characteristic

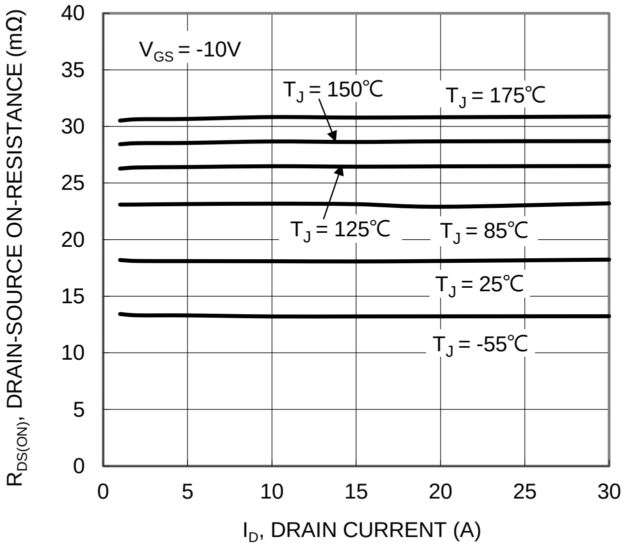


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

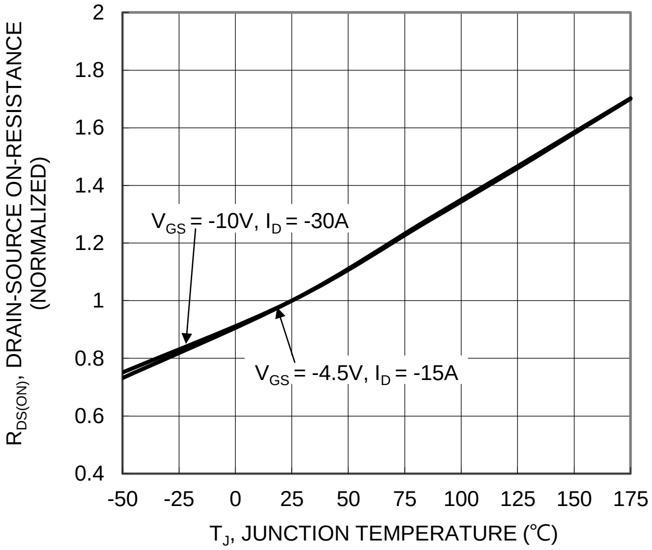


Figure 6. On-Resistance Variation with Temperature

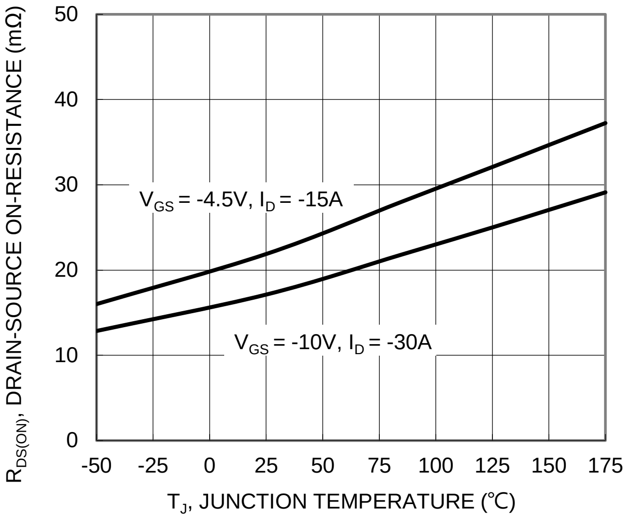


Figure 7. On-Resistance Variation with Temperature

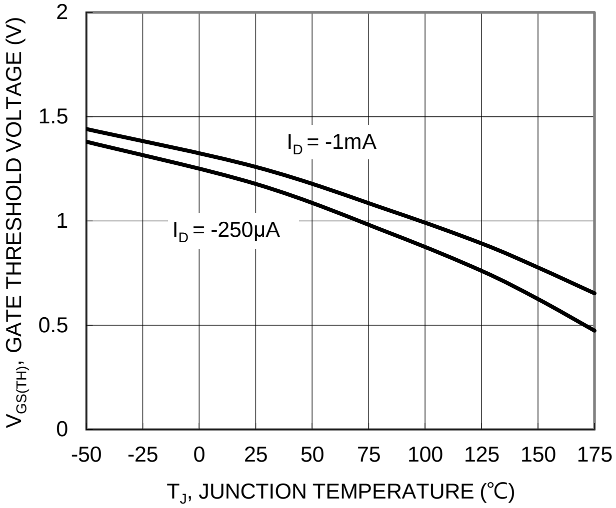


Figure 8. Gate Threshold Variation vs. Junction Temperature

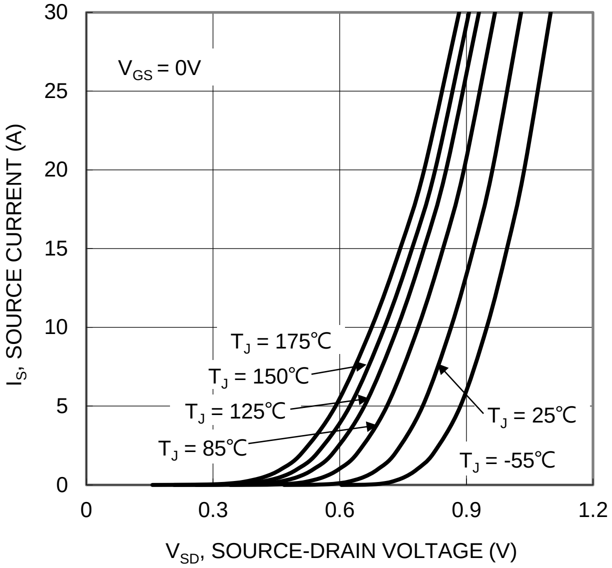


Figure 9. Diode Forward Voltage vs. Current

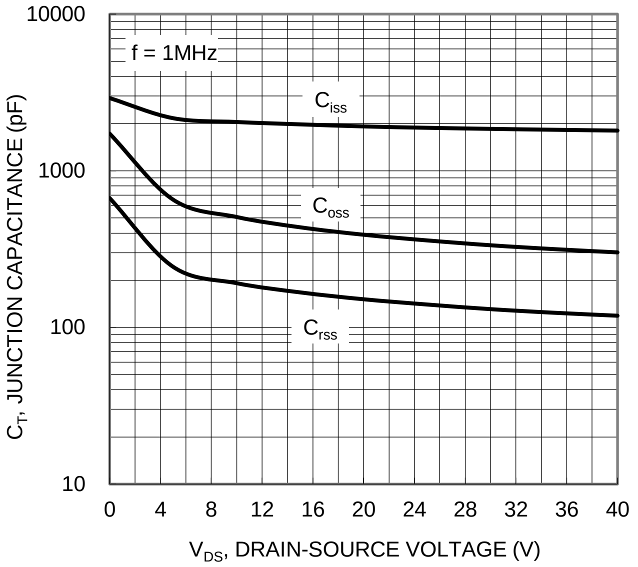


Figure 10. Typical Junction Capacitance

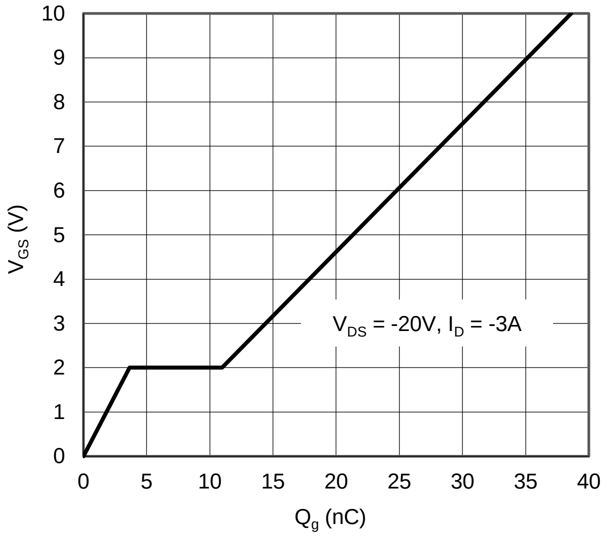


Figure 11. Gate Charge

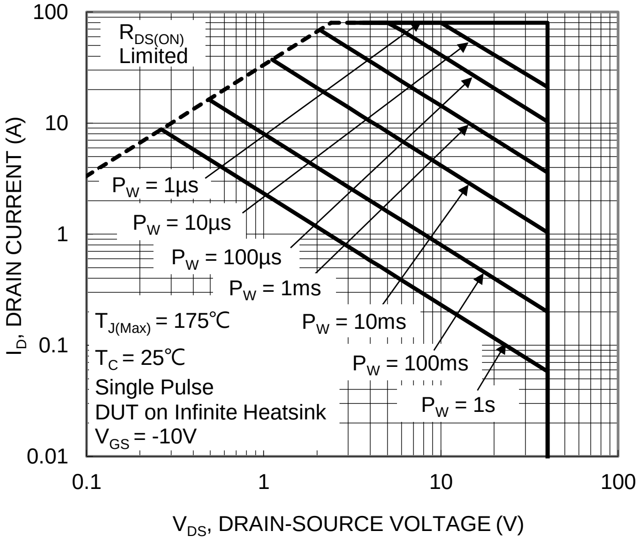


Figure 12. SOA, Safe Operation Area

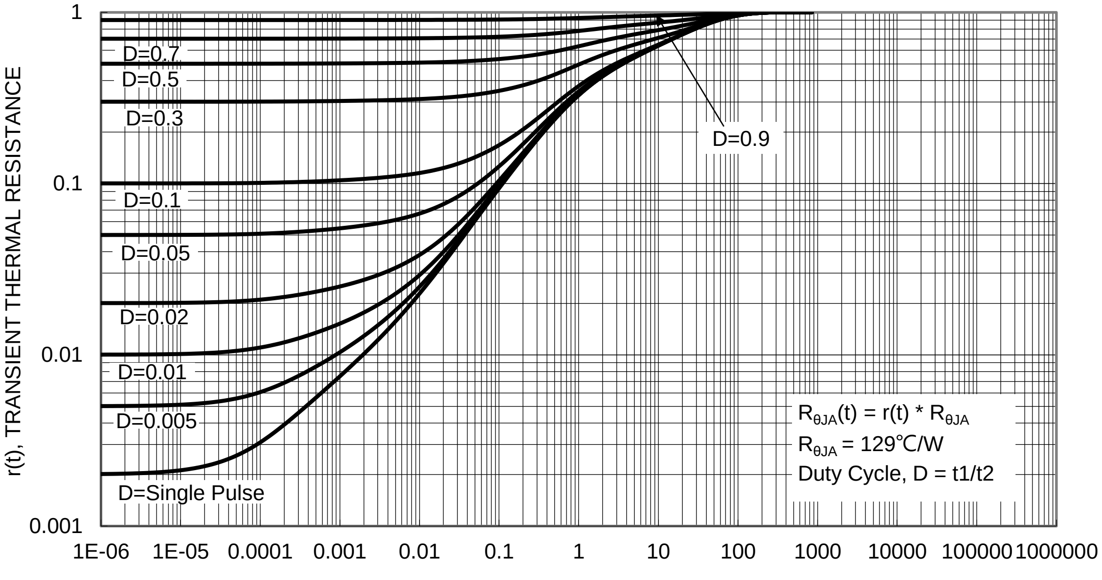
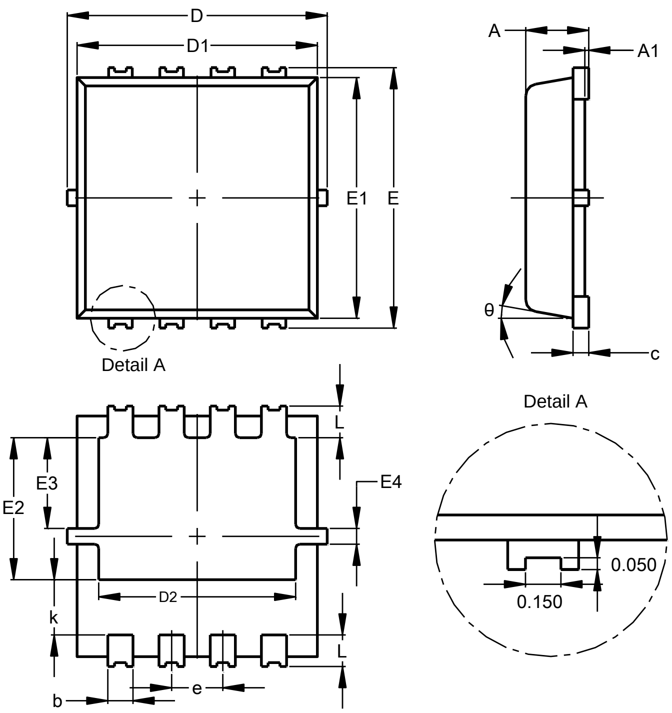


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

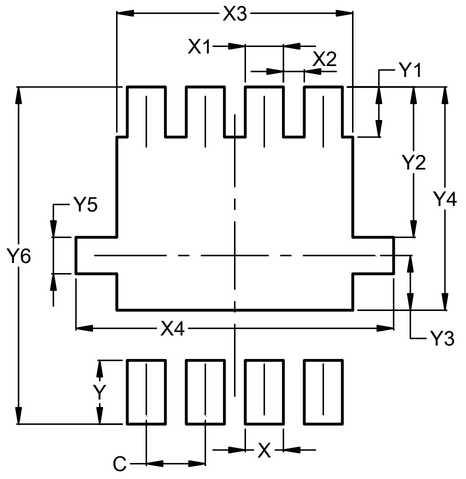
PowerDI3333-8/SWP (Type UX)



PowerDI3333-8/SWP (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
E3	0.95	1.35	1.15
E4	0.10	0.30	0.20
e	–	–	0.65
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/SWP (Type UX)



Dimensions	Value (in mm)
C	0.650
X	0.420
X1	0.420
X2	0.230
X3	2.600
X4	3.500
Y	0.700
Y1	0.550
Y2	1.650
Y3	0.600
Y4	2.450
Y5	0.400
Y6	3.700