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

V$_{(BR)DSS}$	R$_{DS(ON)}$ Max	I$_D$ Max T$_C$ = +25°C
60V	10mΩ @ V$_{GS}$ = 10V	34A
	11.7mΩ @ V$_{GS}$ = 4.5V	31.5A

Description

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

Applications

- Backlighting
- Power Management Functions
- DC-DC Converters

Features and Benefits

- Low R$_{DS(ON)}$ – Ensures On-State Losses Are Minimized
- Excellent Q$_{gd}$ x R$_{DS(ON)}$ Product (FOM)
- Advanced Technology for DC-DC Converters
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- 100% UIS (Avalanche) Rated

Mechanical Data

- Case: POWERDI[®]3333-8
- 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 @3
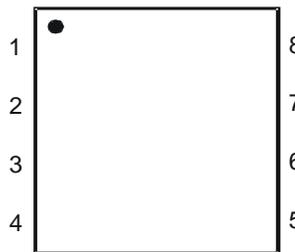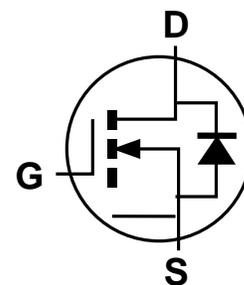- Weight: 0.008 grams (Approximate)

POWERDI3333-8
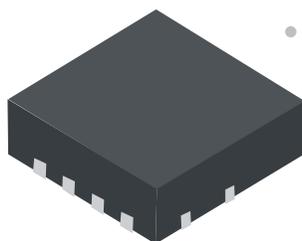
Top View
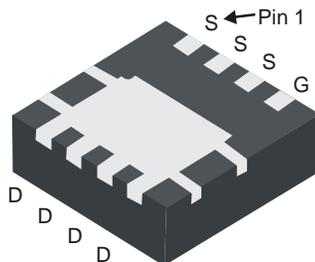
Bottom View

Top View
Internal Schematic

Equivalent Circuit

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

Characteristic		Symbol	Value	Unit
Drain-Source Voltage		V_{DSS}	60	V
Gate-Source Voltage		V_{GSS}	±16	V
Continuous Drain Current (Note 5) V_{GS} = 10V	T_C = +25°C T_C = +70°C	I_D	34 27	A
Continuous Drain Current (Note 5) V_{GS} = 10V	T_A = +25°C T_A = +70°C	I_D	11 9	A
Maximum Continuous Body Diode Forward Current (Note 5)		I_S	2.4	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I_{DM}	90	A
Avalanche Current, L=0.1mH		I_{AS}	28.6	A
Avalanche Energy, L=0.1mH		E_{AS}	40.8	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	2.08	W
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\theta JA}$	60	°C/W
Total Power Dissipation (Note 5)	T_C = +25°C	P_D	19.2	W
Thermal Resistance, Junction to Case (Note 5)		$R_{\theta JC}$	6.5	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Note: 5. $R_{\theta JA}$ is determined with the device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.

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}	60	—	—	V	V_{GS} = 0V, I_D = 250μA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	V_{DS} = 48V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±16V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.7	—	2	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	—	10	mΩ	V_{GS} = 10V, I_D = 13.5A
		—	—	11.7		V_{GS} = 4.5V, I_D = 11.5A
Diode Forward Voltage	V_{SD}	—	—	1.2	V	V_{GS} = 0V, I_S = 20A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	—	1,925	—	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	438	—		
Reverse Transfer Capacitance	C_{rss}	—	41	—		
Gate Resistance	R_g	—	1.7	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	15.6	—	nC	V_{DS} = 30V, I_D = 13.5A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	33.5	—		
Gate-Source Charge	Q_{gs}	—	4.7	—		
Gate-Drain Charge	Q_{gd}	—	5.3	—		
Turn-On Delay Time	$t_{D(ON)}$	—	4.5	—	ns	V_{DD} = 30V, V_{GS} = 10V, R_G = 6Ω, I_D = 13.5A
Turn-On Rise Time	t_R	—	8.6	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	35.9	—		
Turn-Off Fall Time	t_F	—	15.7	—		
Body Diode Reverse Recovery Time	t_{RR}	—	18.2	—	ns	I_F = 13.5A, di/dt = 400A/μs
Body Diode Reverse Recovery Charge	Q_{RR}	—	33.1	—	nC	

Notes: 6. Short duration pulse test used to minimize self-heating effect.
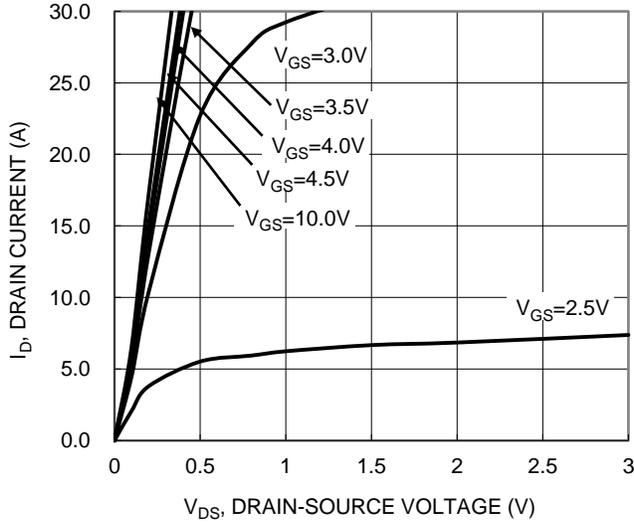7. Guaranteed by design. Not subject to product testing.
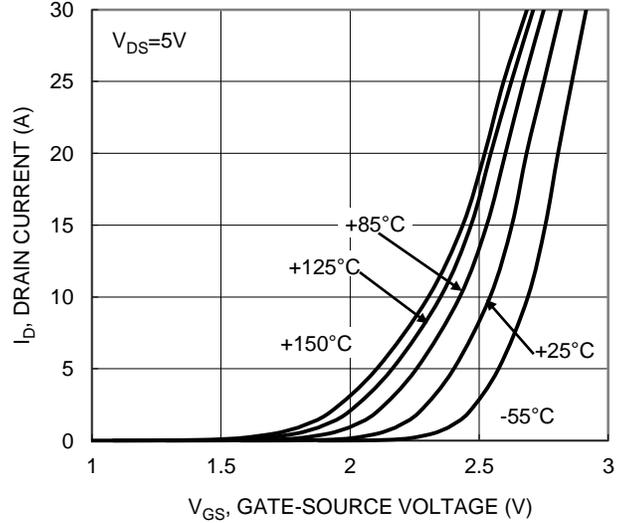
Figure 1. Typical Output Characteristic

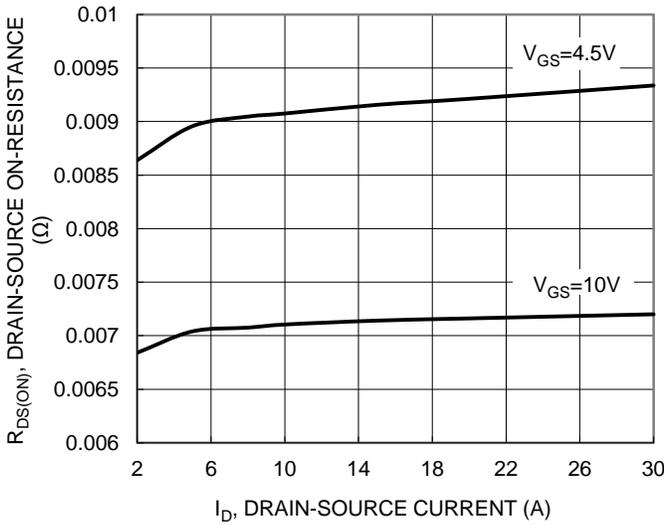Figure 2. Typical Transfer Characteristic

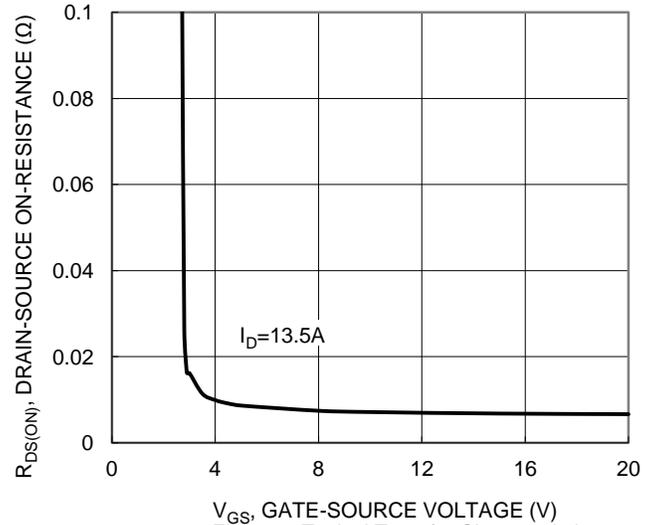Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

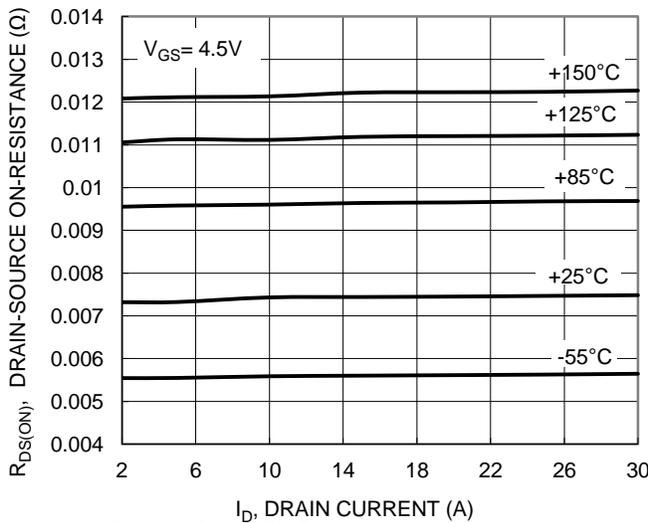Figure 4. Typical Transfer Characteristic

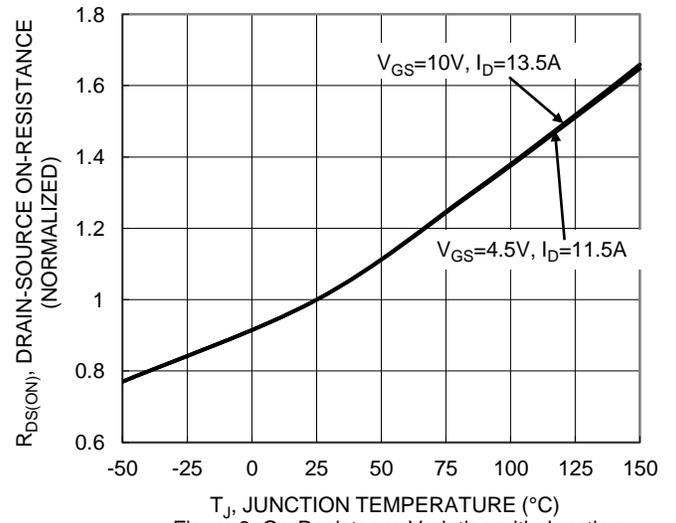Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

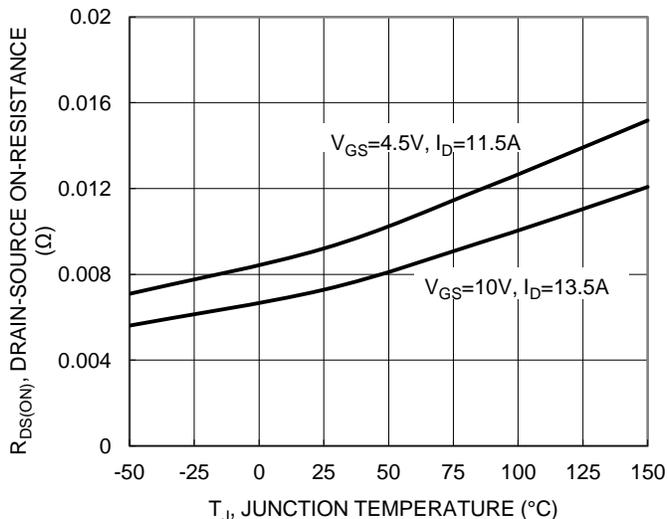Figure 6. On-Resistance Variation with Junction Temperature

Figure 7. On-Resistance Variation with Junction Temperature
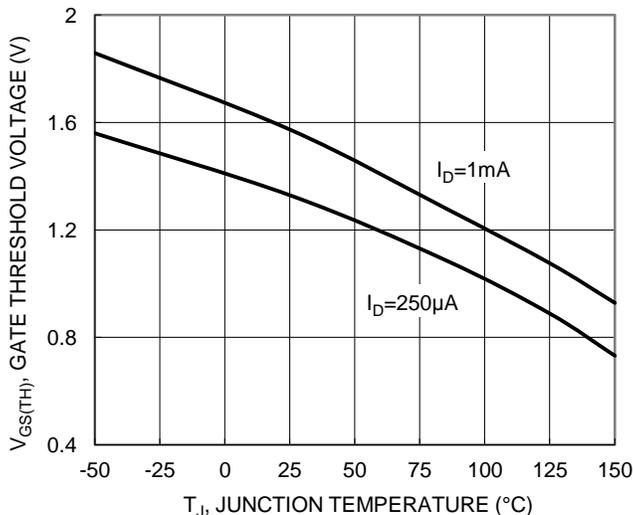

Figure 8. Gate Threshold Variation vs. Junction Temperature
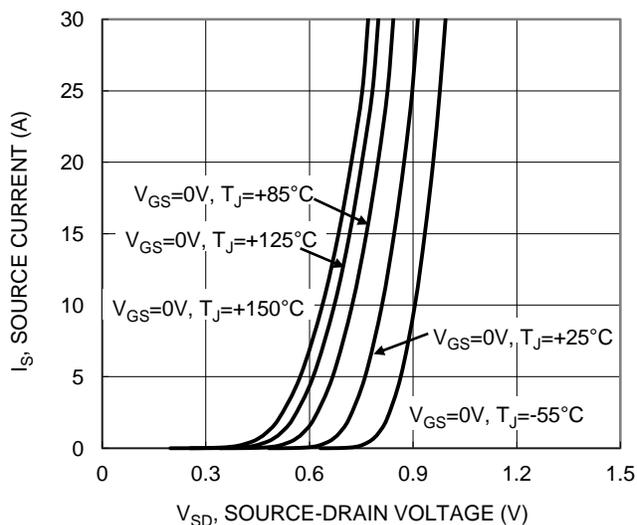

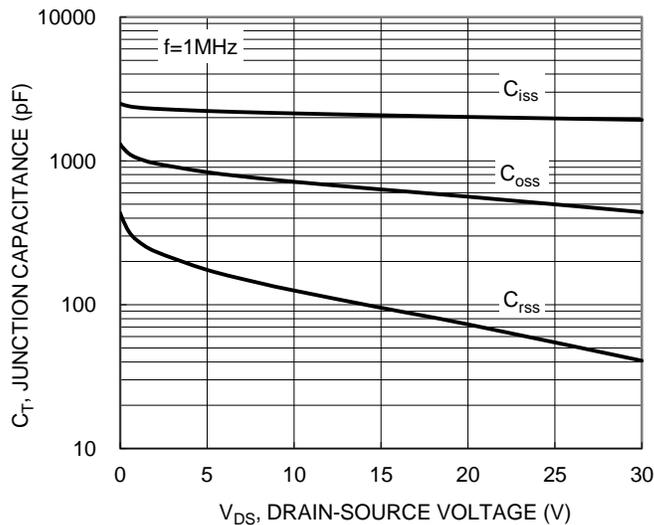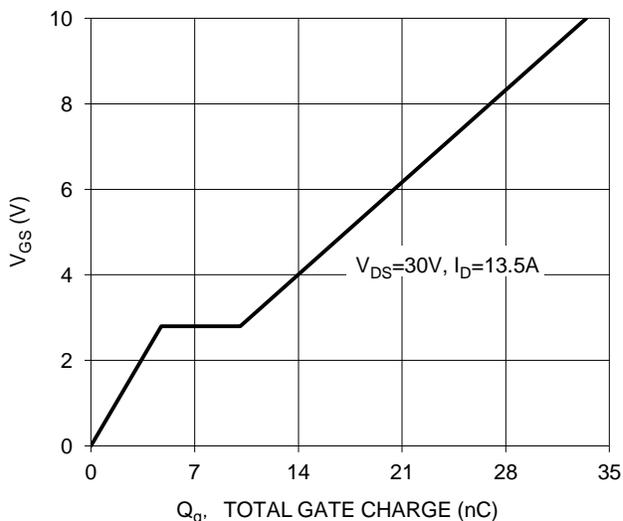Figure 9. Diode Forward Voltage vs. Current

Figure 10. Typical Junction Capacitance

Figure 11. Gate Charge
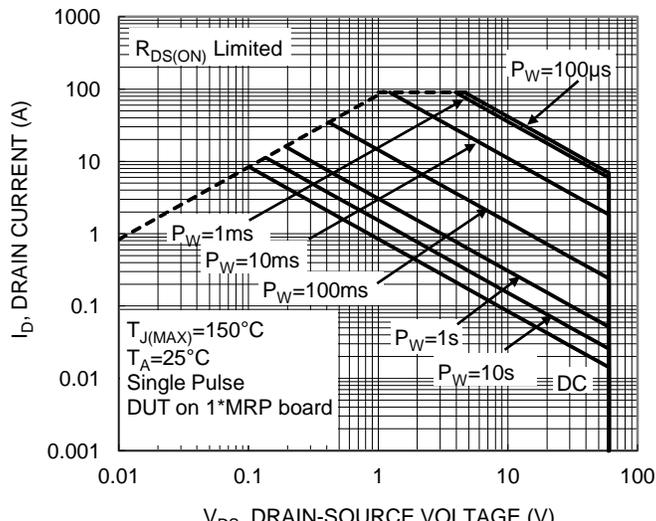
Figure 12. SOA, Safe Operation Area
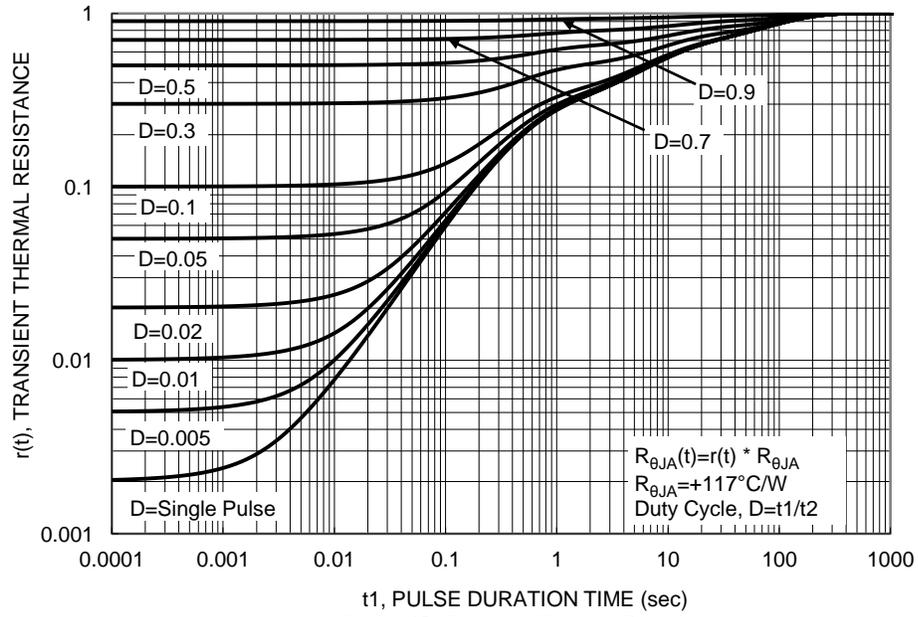
Figure 13. Transient Thermal Resistance

Graph labels:
- y-axis: r(t), TRANSIENT THERMAL RESISTANCE
- x-axis: t1, PULSE DURATION TIME (sec)
- D=0.5, D=0.3, D=0.1, D=0.05, D=0.02, D=0.01, D=0.005, D=Single Pulse
- D=0.9, D=0.7

$R_{\theta JA}(t)=r(t) * R_{\theta JA}$
$R_{\theta JA}=+117°C/W$
Duty Cycle, D=t1/t2

Package Outline Dimensions

POWERDI3333-8
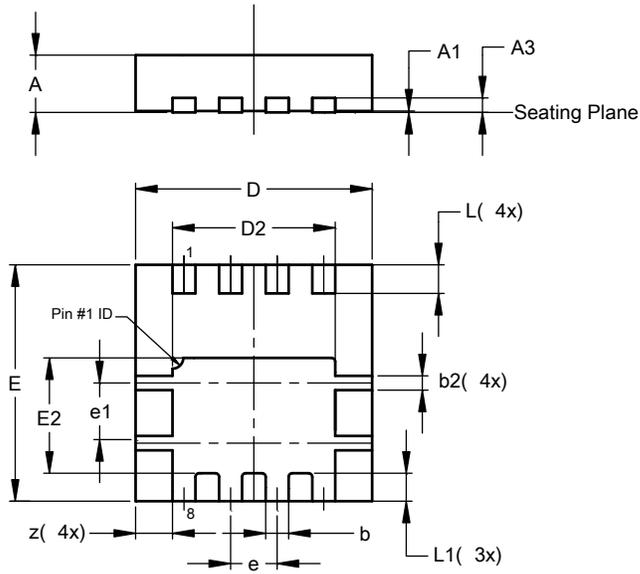
POWERDI3333-8			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0.00	0.05	0.02
A3	–	–	0.203
b	0.27	0.37	0.32
b2	–	–	0.20
D	3.25	3.35	3.30
D2	2.22	2.32	2.27
E	3.25	3.35	3.30
E2	1.56	1.66	1.61
e	–	–	0.65
e1	0.79	0.89	0.84
L	0.35	0.45	0.40
L1	–	–	0.39
z	–	–	0.515
All Dimensions in mm			

Suggested Pad Layout

POWERDI3333-8
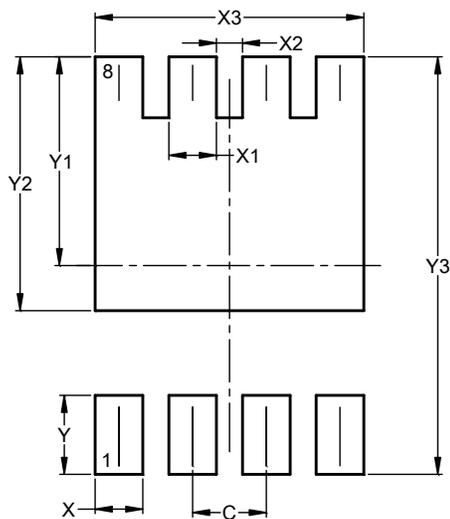
Dimensions	Value (in mm)
C	0.650
X	0.420
X1	0.420
X2	0.230
X3	2.370
Y	0.700
Y1	1.850
Y2	2.250
Y3	3.700