



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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## Features

- $BV_{CEO} > -40V$
- Small Form Factor Thermally Efficient Package. Enables Higher Density End Products
- $I_C = -2A$  Continuous Collector Current
- $I_{CM} = -3A$  Peak Pulse Current
- Low Saturation Voltage  $V_{CE(sat)} < -225mV @ -1A$
- Complementary NPN Type: NK-DXTN22040CFG
- Rated to  $+175^\circ C$  – Ideal For High Temperature Environment
- Wettable Flank For Improved Optical Inspection

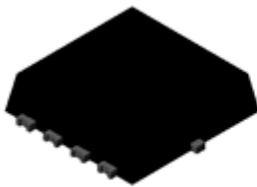
## Mechanical Data

- Case: PowerDI<sup>®</sup>3333-8
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads Solderable per MIL-STD-202, Method 208 <sup>(e3)</sup>
- Weight: 0.03 grams (Approximate)

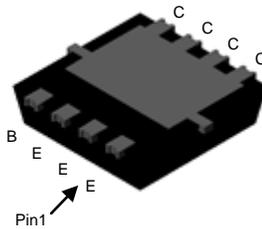
## Applications

- High-Side Switch
- Supply Line Switching
- Motor Driving

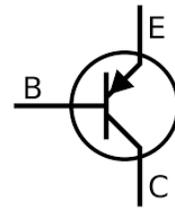
PowerDI3333-8 (SWP) (Type UX)



Top View



Bottom View



Device Symbol

**Absolute Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	-50	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-40	V
Emitter-Base Voltage	V <sub>EBO</sub>	-7	V
Continuous Collector Current	I <sub>C</sub>	-2	A
Peak Pulse Collector Current	I <sub>CM</sub>	-3	
Continuous Base Current	I <sub>B</sub>	-100	mA
Peak Pulse Base Current	I <sub>BM</sub>	-200	

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

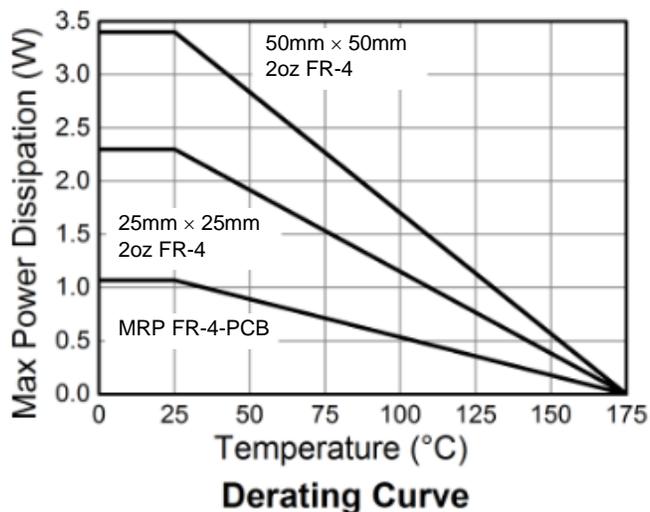
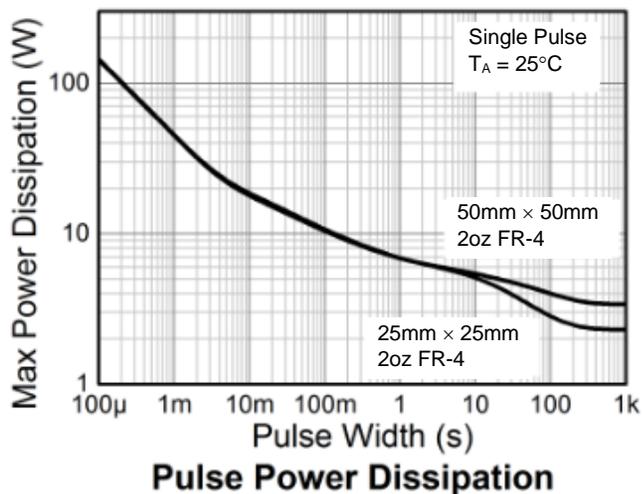
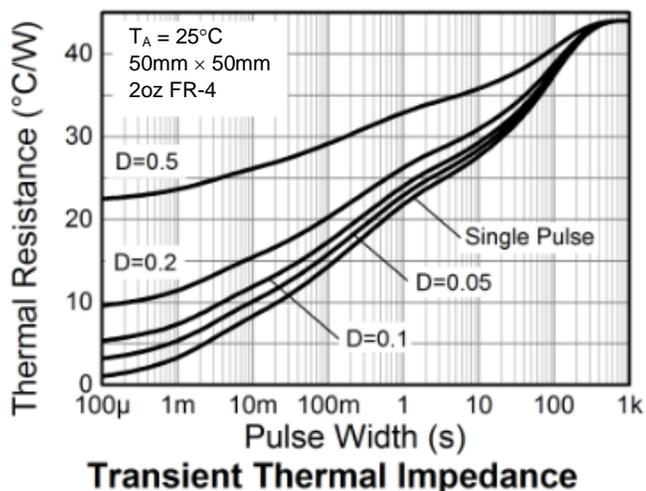
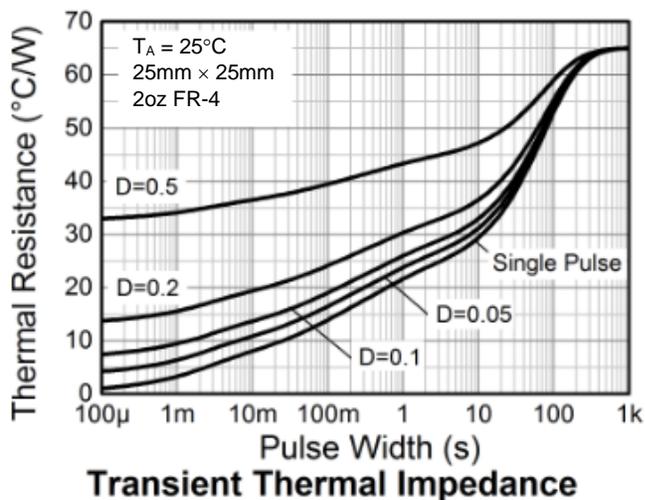
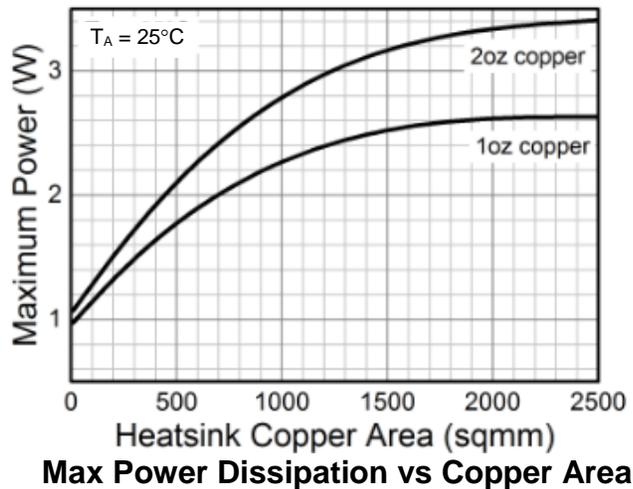
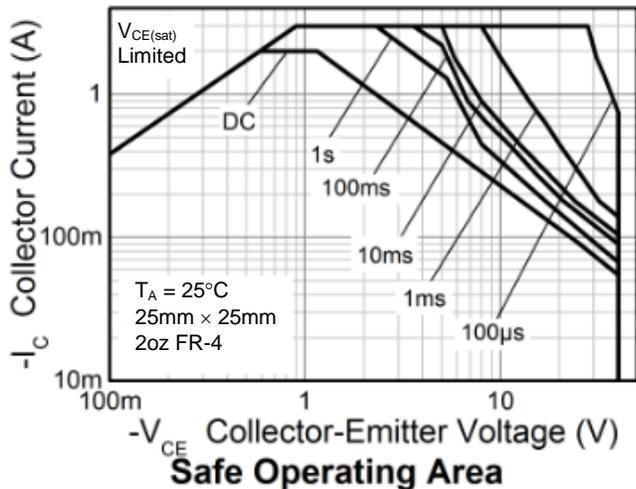
Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	(Note 5)	1.07
		(Note 6)	2.3
		(Note 7)	3.4
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	(Note 5)	140
		(Note 6)	65
		(Note 7)	44
Thermal Resistance, Junction to Leads (Note 8)	R <sub>θJL</sub>	11	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +175	°C

**ESD Ratings** (Note 9)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

- Notes:
5. For a device mounted with the collector tab on MRP FR4-PCB; device is measured under still air conditions whilst operating in a steady-state.
  6. Same as Note 5, except the device is mounted on 25mm × 25mm 2oz copper.
  7. Same as Note 5, except the device is mounted on 50mm × 50mm 2oz copper.
  8. Thermal resistance from junction to solder-point (at the collector tab).
  9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

**Thermal Characteristics and Derating Information**



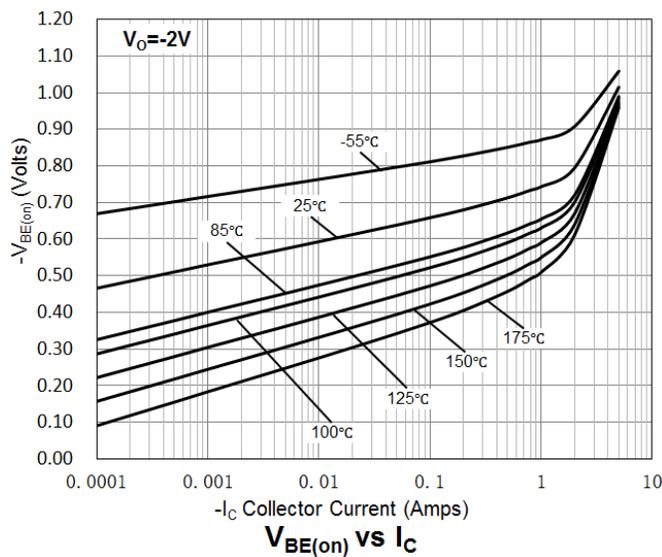
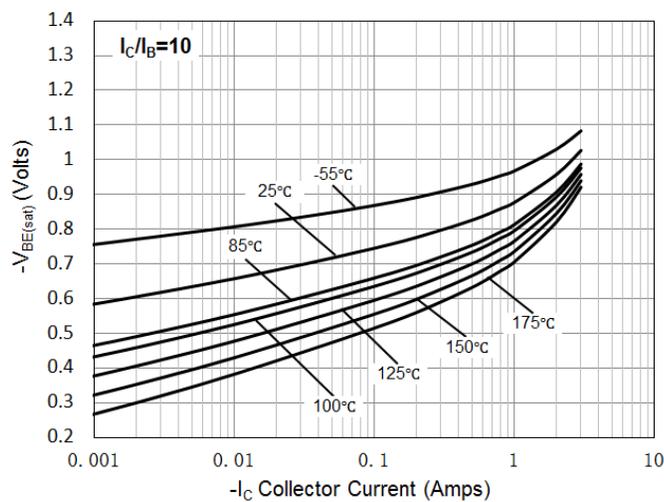
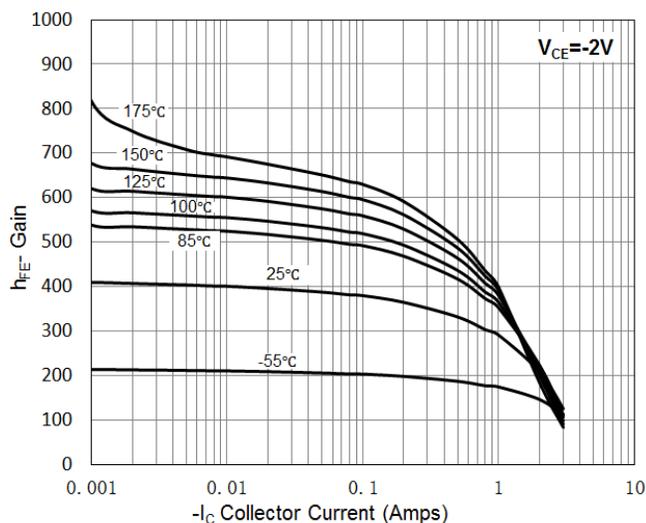
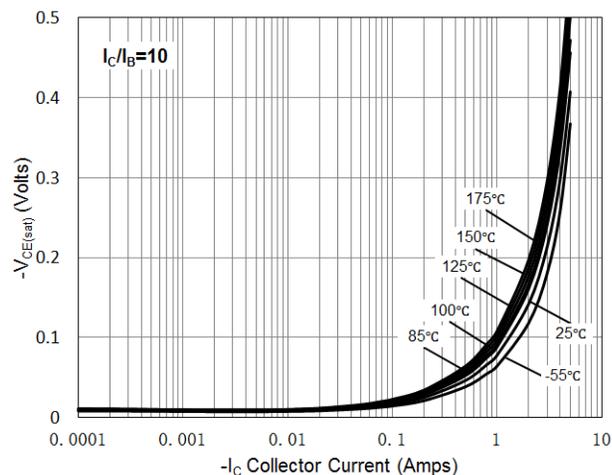
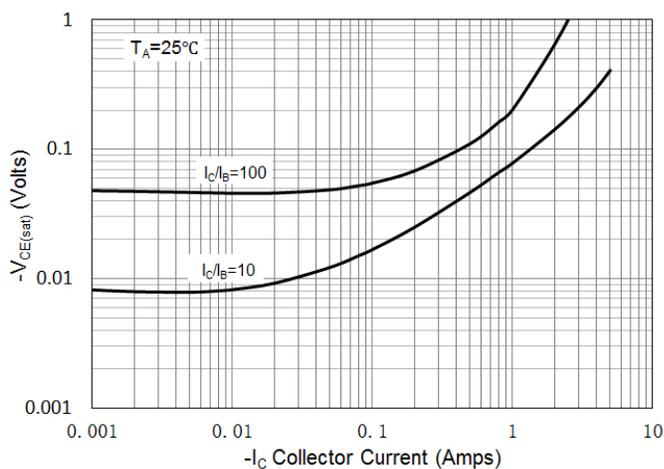
**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	-50	-71	—	V	$I_C = -100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 10)	$BV_{CEO}$	-40	-50	—	V	$I_C = -10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	-7	-8.6	—	V	$I_E = -100\mu\text{A}$
Collector-Base Cut-Off Current	$I_{CBO}$	—	-1	-20	nA	$V_{CB} = -50\text{V}$
Emitter-Base Cut-Off Current	$I_{EBO}$	—	-1	-20	nA	$V_{EB} = -6\text{V}$
Collector-Emitter Cut-Off Current	$I_{CES}$	—	-1	-20	nA	$V_{CE} = -40\text{V}, V_{BE} = 0\text{V}$
Static Forward Current Transfer Ratio (Note 10)	$h_{FE}$	200	340	—	—	$I_C = -100\text{mA}, V_{CE} = -2\text{V}$
		200	299	600		$I_C = -500\text{mA}, V_{CE} = -2\text{V}$
		150	261	—		$I_C = -1\text{A}, V_{CE} = -2\text{V}$
		80	196	—		$I_C = -2\text{A}, V_{CE} = -2\text{V}$
Collector-Emitter Saturation Voltage (Note 10)	$V_{CE(sat)}$	—	-52 -42 -71 -129 -189	-100 -130 -225 -350 -600	mV	$I_C = -100\text{mA}, I_B = -1\text{mA}$ $I_C = -500\text{mA}, I_B = -50\text{mA}$ $I_C = -1\text{A}, I_B = -100\text{mA}$ $I_C = -2\text{A}, I_B = -200\text{mA}$ $I_C = -3\text{A}, I_B = -300\text{mA}$
Collector-Emitter Saturation Resistance (Note 10)	$R_{CE(sat)}$	—	—	225	m $\Omega$	$I_C = -1\text{A}, I_B = -100\text{mA}$
Base-Emitter Saturation Voltage (Note 10)	$V_{BE(sat)}$	—	-0.88	-1	V	$I_C = -1\text{A}, I_B = -100\text{mA}$
Base-Emitter Turn-On Voltage (Note 10)	$V_{BE(on)}$	—	-0.77	-0.9	V	$I_C = -1\text{A}, V_{CE} = -2\text{V}$
Transition Frequency	$f_T$	—	120	—	MHz	$I_C = -50\text{mA}, V_{CE} = -10\text{V}$ $f = 100\text{MHz}$
Output Capacitance	$C_{obo}$	—	12	—	pF	$V_{CB} = -10\text{V}, f = 1\text{MHz}$
Switching Characteristics	$t_{delay}$	—	11.6	—	ns	$V_{CC} = -10\text{V}, I_C = -500\text{mA}$ $I_{B1} = -I_{B2} = -50\text{mA}$
	$t_{rise}$	—	128	—	ns	
	$t_{storage}$	—	524	—	ns	
	$t_{fall}$	—	69.4	—	ns	

 Note: 10. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

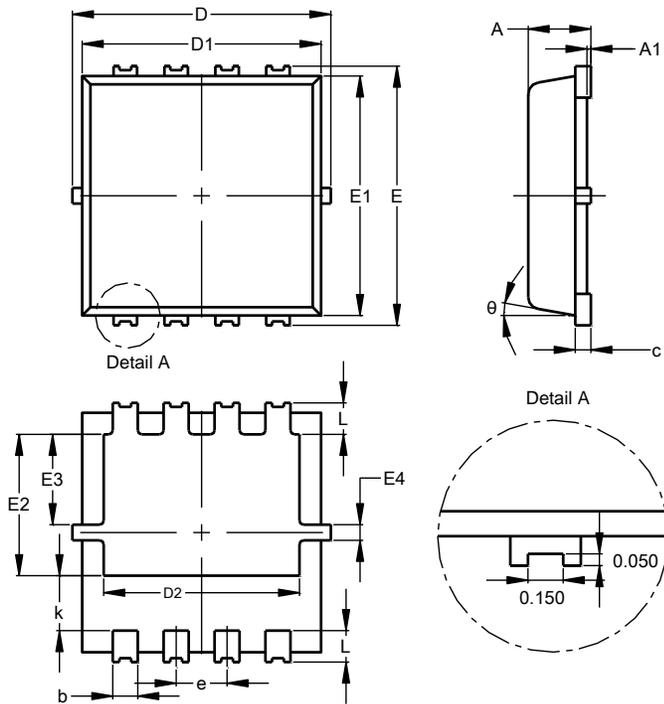
**Typical Electrical Characteristics**

(@T<sub>A</sub> = +25°C, unless otherwise specified.)



### Package Outline Dimensions

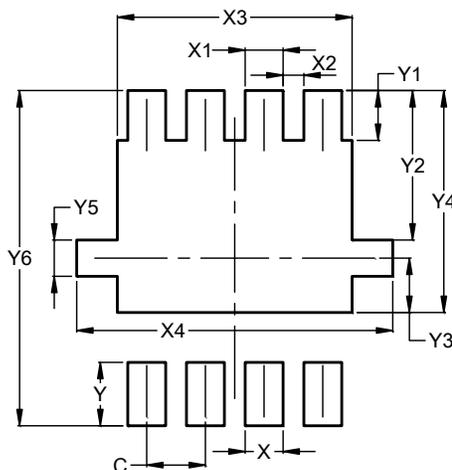
PowerDI3333-8 (SWP) (Type UX)



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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