



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

- $BV_{CEO} > 60V$
- Small Form Factor Thermally Efficient Package. Enables Higher Density End Products
- $I_c = 6A$  high Continuous Collector Current
- $I_{CM} = 20A$  Peak Pulse Current
- Low Saturation Voltage  $V_{CE(sat)} < 60mV @ 1A$
- $hFE$  Specified Up to 10A for a High Gain Hold Up
- Complementary PNP Type: NK-DXTP03060CFG
- Wettable Flank for Improved Optical Inspection

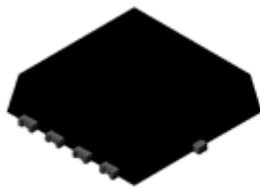
### Mechanical Data

- 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 Solderable per MIL-STD-202, Method 208 (G3)
- Weight: 0.03 grams (Approximate)

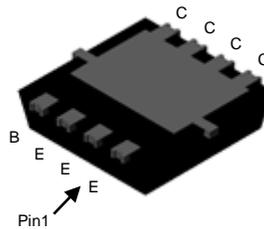
### Applications

- MOSFET & IGBT Gate Drivers
- Solenoid, Relay and Actuator Drivers
- DC to DC Converters
- Motor Control

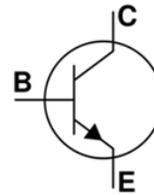
PowerDI3333-8 (SWP) (Type UX)



Top View



Bottom View



Device Symbol

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CB0</sub>	100	V
Collector-Emitter Voltage	V <sub>CEO</sub>	60	V
Emitter-Base Voltage	V <sub>EBO</sub>	7	V
Continuous Collector Current	I <sub>C</sub>	6	A
Peak Pulse Current	I <sub>CM</sub>	20	A

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

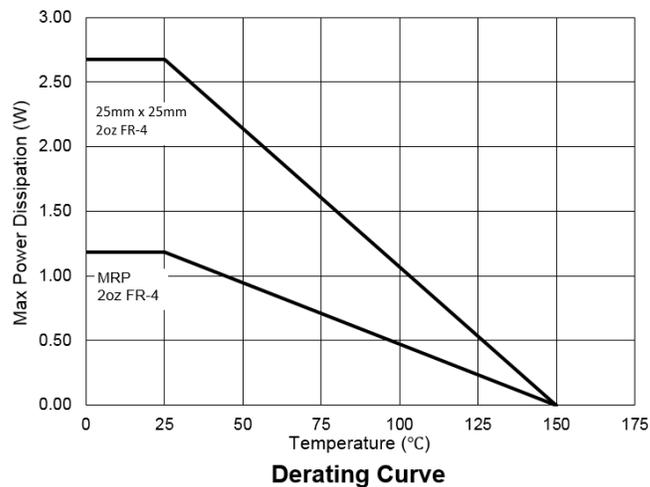
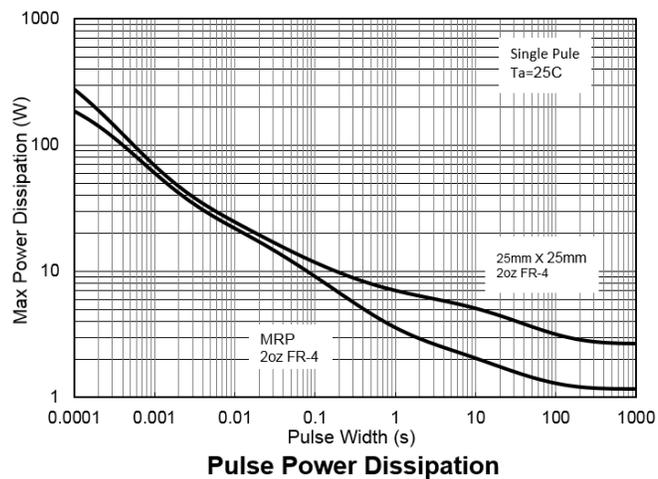
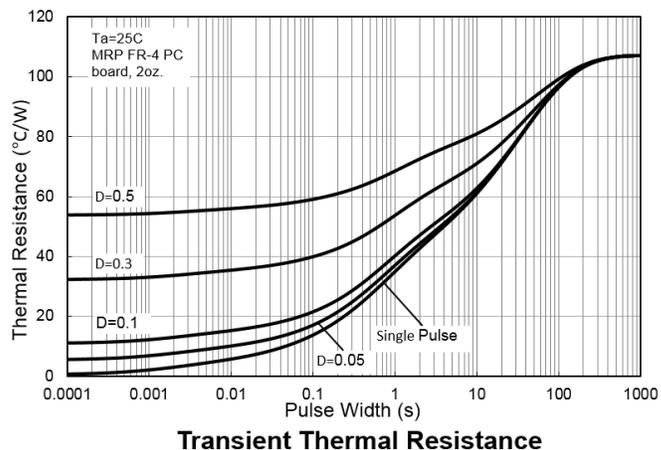
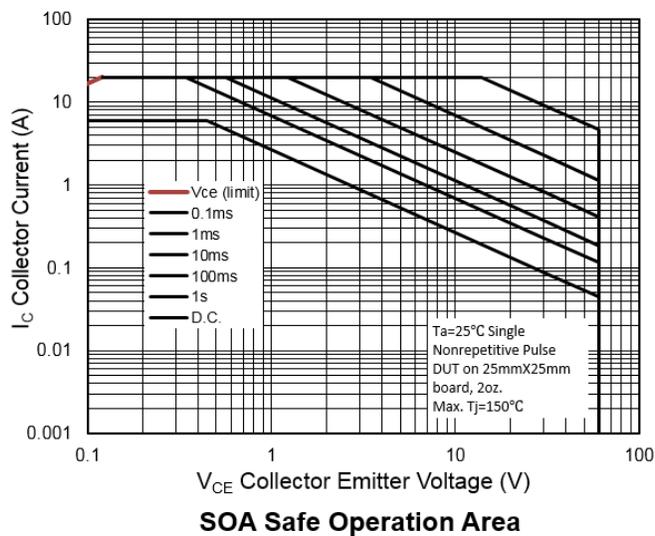
Characteristic	Symbol	Value	Unit	
Power Dissipation	P <sub>D</sub>	(Note 5)	1.2	W
		(Note 6)	2.7	W
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	(Note 5)	107	°C/W
		(Note 6)	48	°C/W
Thermal Resistance, Junction to Leads (Note 7)	R <sub>θJL</sub>	8.5	°C/W	
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C	

### ESD Ratings (Note 8)

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 x 25mm 2oz copper.
  7. Thermal resistance from junction to solder-point (at the collector tab).
  8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

## Thermal Characteristics and Derating Information

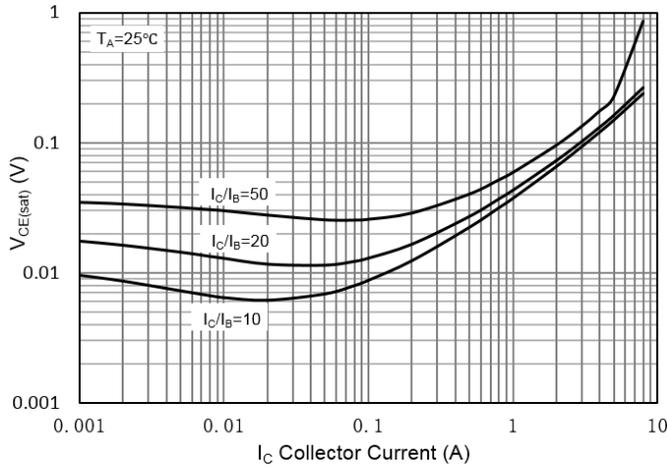


**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

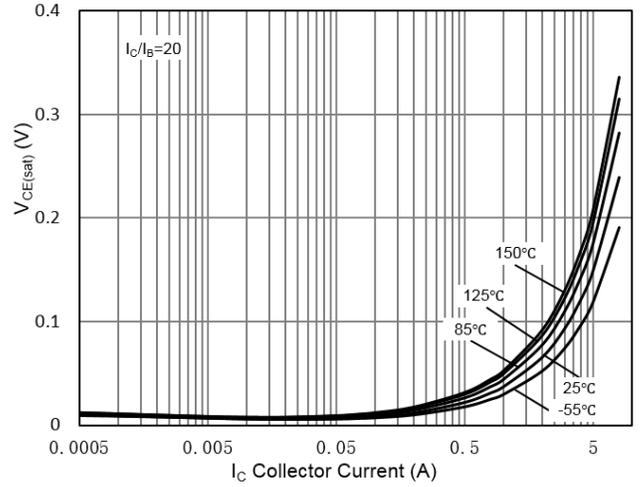
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	100	201	—	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 9)	$BV_{CEO}$	60	78	—	V	$I_C = 10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	7	8.9	—	V	$I_E = 100\mu\text{A}$
Collector Cut-off Current	$I_{CBO}$	—	3	50	nA	$V_{CB} = 100\text{V}$
		—	0.2	10	$\mu\text{A}$	$V_{CB} = 100\text{V}, T_A = +125^\circ\text{C}$
Collector Cut-off Current	$I_{CER}$ $R_B \leq 1\text{k}\Omega$	—	8	50	nA	$V_{CB} = 80\text{V}$
		—	0.3	10	$\mu\text{A}$	$V_{CB} = 80\text{V}, T_A = +125^\circ\text{C}$
Emitter Cut-off Current	$I_{EBO}$	—	1	20	nA	$V_{EB} = 6\text{V}$
DC Current Gain (Note 9)	$h_{FE}$	200	354	—	—	$I_C = 10\text{mA}, V_{CE} = 2\text{V}$
		200	357	—	—	$I_C = 100\text{mA}, V_{CE} = 2\text{V}$
		200	343	800	—	$I_C = 1\text{A}, V_{CE} = 2\text{V}$
		200	325	—	—	$I_C = 2\text{A}, V_{CE} = 2\text{V}$
		75	133	—	—	$I_C = 5\text{A}, V_{CE} = 2\text{V}$
Collector-Emitter Saturation Voltage (Note 9)	$V_{CE(sat)}$	—	13	30	mV	$I_C = 100\text{mA}, I_B = 5\text{mA}$
		—	37	60	mV	$I_C = 1\text{A}, I_B = 100\text{mA}$
		—	43	70	mV	$I_C = 1\text{A}, I_B = 50\text{mA}$
		—	88	135	mV	$I_C = 2\text{A}, I_B = 50\text{mA}$
		—	194	260	mV	$I_C = 6\text{A}, I_B = 300\text{mA}$
Base-Emitter Saturation Voltage (Note 9)	$V_{BE(sat)}$	—	1000	1100	mV	$I_C = 6\text{A}, I_B = 300\text{mA}$
Base-Emitter Turn-On Voltage (Note 9)	$V_{BE(on)}$	—	930	1050	mV	$I_C = 6\text{A}, V_{CE} = 1\text{V}$
Input Capacitance	$C_{ibo}$	—	509	—	pF	$V_{EB} = 0.5\text{V}, f = 1\text{MHz}$
Output Capacitance	$C_{obo}$	—	290	—	pF	$V_{CB} = 10\text{V}, f = 1\text{MHz}$
Current Gain-Bandwidth Product	$f_T$	—	140	—	MHz	$V_{CE} = 5\text{V}, I_C = 100\text{mA}, f = 100\text{MHz}$
Switching Time	$t_{delay}$	—	16.5	—	ns	$I_C = 1\text{A}, V_{CC} = 10\text{V}, I_{B1} = -I_{B2} = 100\text{mA}$
	$t_{rise}$	—	5.8	—	ns	
	$t_{storage}$	—	1273	—	ns	
	$t_{fall}$	—	27.5	—	ns	

 Note: 9. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

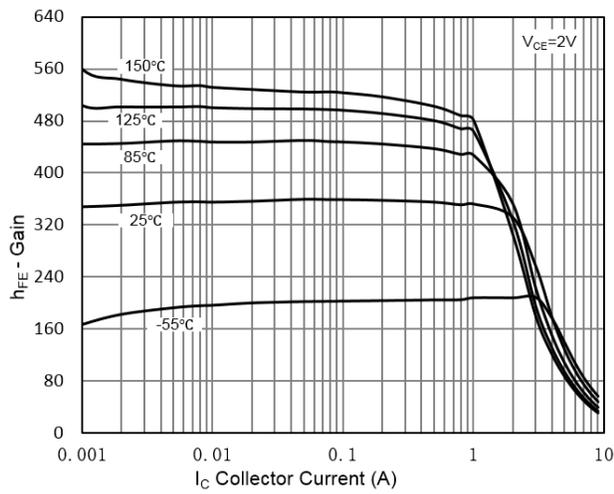
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



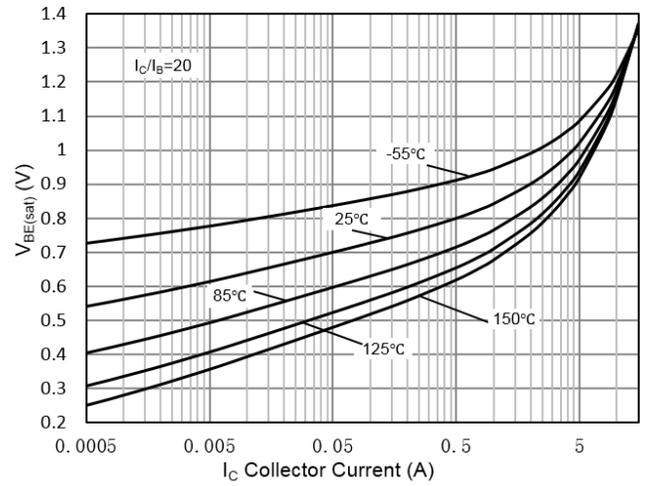
**$V_{CE(sat)}$  vs  $I_C$**



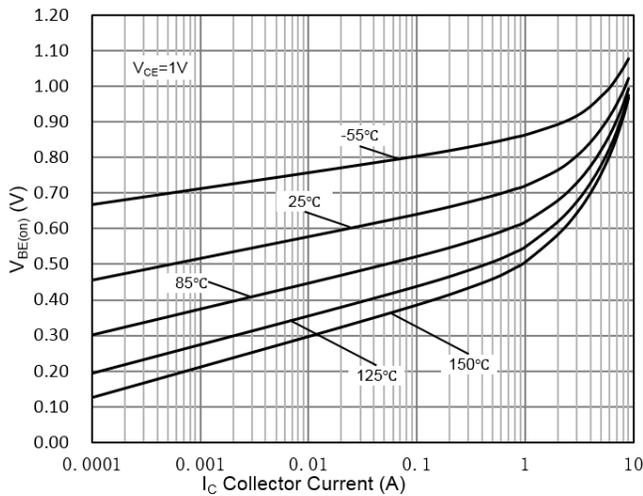
**$V_{CE(sat)}$  vs  $I_C$**



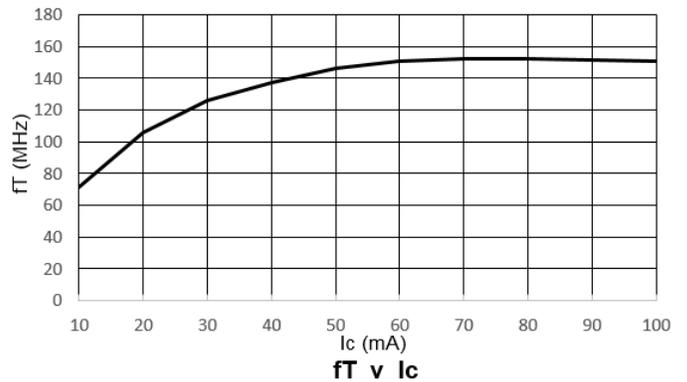
**$h_{FE}$  vs  $I_C$**



**$V_{BE(sat)}$  vs  $I_C$**

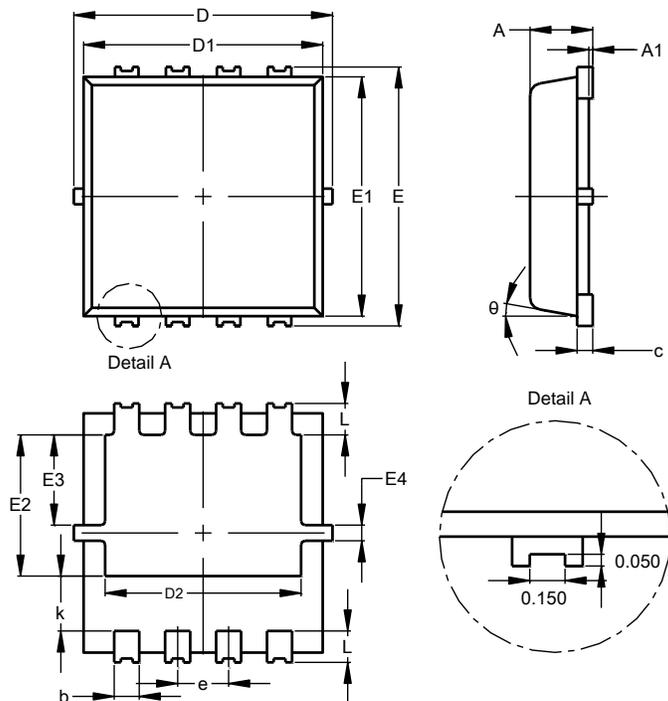


**$V_{BE(on)}$  vs  $I_C$**



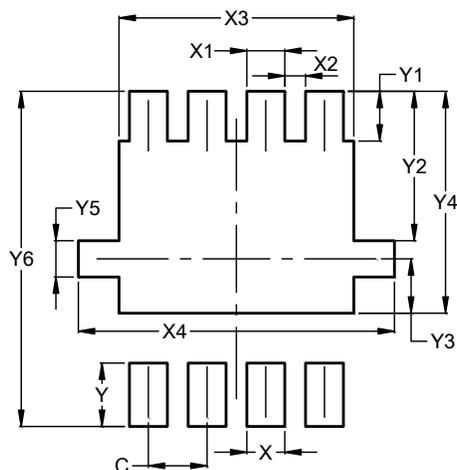
**$f_T$  vs  $I_C$**

## 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
$\theta$	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

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device terminals and PCB tracking.