



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
- $I_C = 6A$ Continuous Collector Current
- $I_{CM} = 20A$ Peak Pulse Current
- Low Saturation Voltage $V_{CE(sat)} < 60mV @ 1A$
- h_{FE} Specified up to 10A for a High Gain Hold up
- Complementary PNP Type: NK-DXTP03060BFG
- Wettable Flank for Improved Optical Inspection

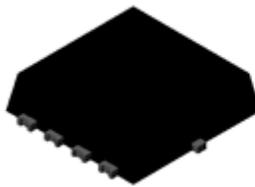
Mechanical Data

- Case: PowerDI[®]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 
- Weight: 0.03 grams (Approximate)

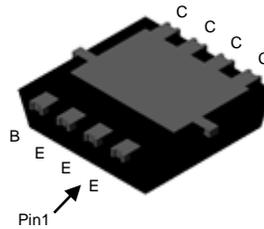
Applications

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

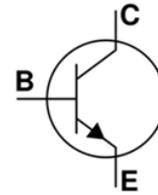
PowerDI3333-8 (SWP) (Type UX)



Top View



Bottom View



Device Symbol

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

| Characteristic | Symbol | Value | Unit |
|------------------------------|------------------|-------|------|
| Collector-Base Voltage | V _{CB0} | 100 | V |
| Collector-Emitter Voltage | V _{CE0} | 60 | V |
| Emitter-Base Voltage | V _{EBO} | 7 | V |
| Continuous Collector Current | I _C | 6 | A |
| Peak Pulse Current | I _{CM} | 20 | A |

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

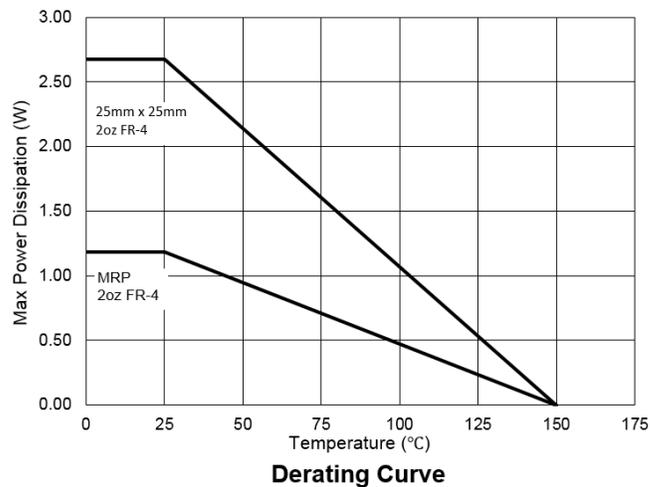
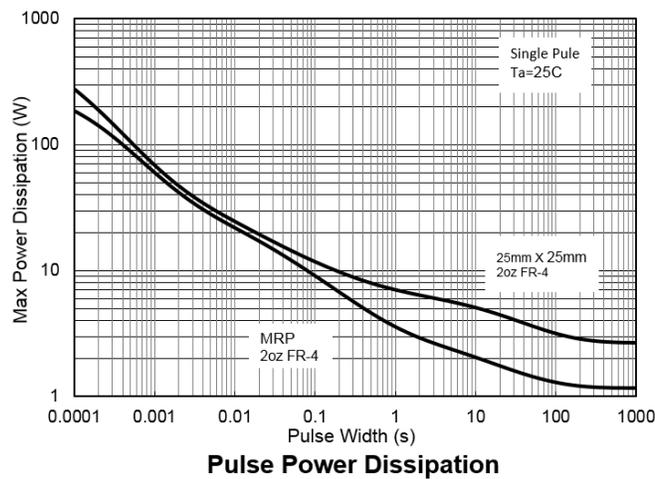
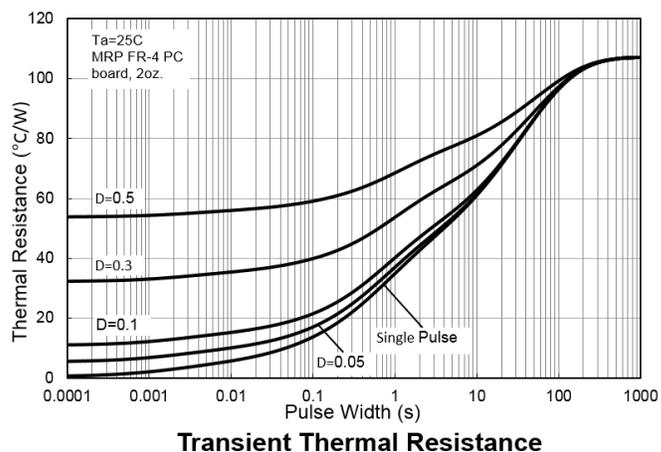
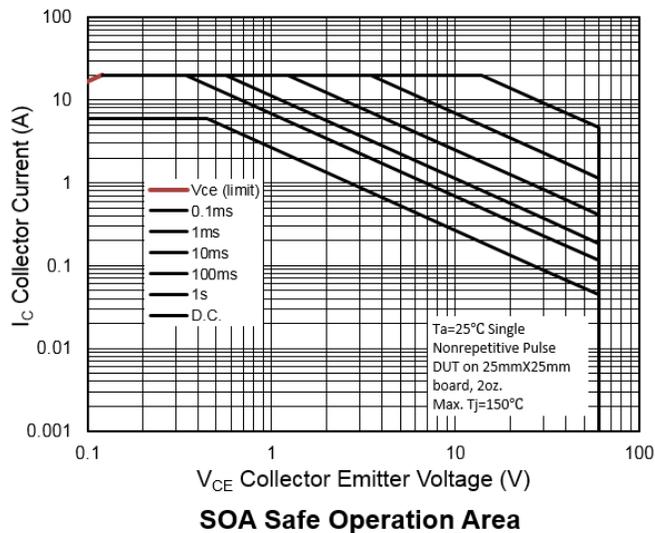
| Characteristic | Symbol | Value | Unit |
|--|-----------------------------------|-------------|------|
| Power Dissipation | P _D | 1.2 | W |
| | | 2.7 | W |
| Thermal Resistance, Junction to Ambient | R _{θJA} | 107 | °C/W |
| | | 48 | °C/W |
| Thermal Resistance, Junction to Leads (Note 7) | R _{θJL} | 8.5 | °C/W |
| Operating and Storage Temperature Range | T _J , T _{STG} | -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 |
| Charge Device Model | CDM | 1,000 | V | C5 |

- 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

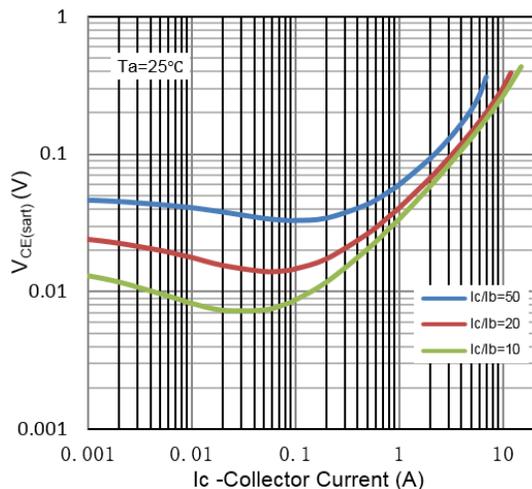


Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

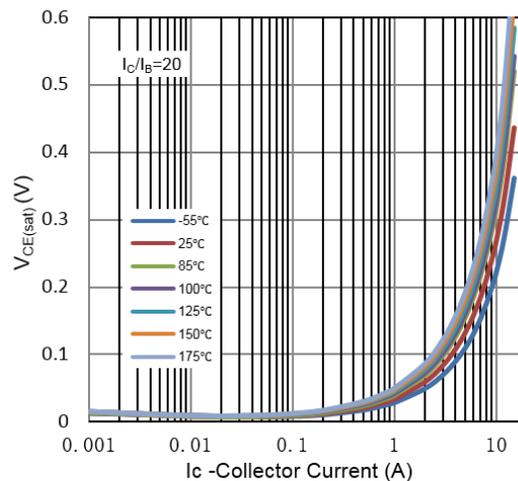
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|-----|------|------|---------------|---|
| Collector-Base Breakdown Voltage | BV_{CBO} | 100 | 198 | — | V | $I_C = 100\mu\text{A}$ |
| Collector-Emitter Breakdown Voltage (Note 9) | BV_{CEO} | 60 | 79 | — | V | $I_C = 10\text{mA}$ |
| Emitter-Base Breakdown Voltage | BV_{EBO} | 7 | 8.4 | — | V | $I_E = 100\mu\text{A}$ |
| Collector Cut-off Current | I_{CBO} | — | 2 | 50 | nA | $V_{CB} = 100\text{V}$ |
| | | — | 0.05 | 10 | μA | $V_{CB} = 100\text{V}, T_A = +125^\circ\text{C}$ |
| Collector Cut-off Current | I_{CER} $R_B \leq 1\text{k}\Omega$ | — | 5 | 100 | nA | $V_{CB} = 60\text{V}$ |
| | | — | 0.2 | 10 | μA | $V_{CB} = 60\text{V}, T_A = +125^\circ\text{C}$ |
| Emitter Cut-off Current | I_{EBO} | — | 1 | 20 | nA | $V_{EB} = 6\text{V}$ |
| DC Current Gain (Note 9) | h_{FE} | 100 | 197 | — | — | $I_C = 10\text{mA}, V_{CE} = 2\text{V}$ |
| | | 100 | 195 | 400 | — | $I_C = 1\text{A}, V_{CE} = 2\text{V}$ |
| | | 100 | 194 | 300 | — | $I_C = 2\text{A}, V_{CE} = 2\text{V}$ |
| | | 55 | 117 | — | — | $I_C = 5\text{A}, V_{CE} = 2\text{V}$ |
| | | 20 | 50 | — | — | $I_C = 10\text{A}, V_{CE} = 2\text{V}$ |
| Collector-Emitter Saturation Voltage (Note 9) | $V_{CE(sat)}$ | — | 15 | 30 | mV | $I_C = 100\text{mA}, I_B = 5\text{mA}$ |
| | | — | 35 | 60 | mV | $I_C = 1\text{A}, I_B = 100\text{mA}$ |
| | | — | 42 | 70 | mV | $I_C = 1\text{A}, I_B = 50\text{mA}$ |
| | | — | 86 | 135 | mV | $I_C = 2\text{A}, I_B = 50\text{mA}$ |
| | | — | 176 | 260 | mV | $I_C = 6\text{A}, I_B = 300\text{mA}$ |
| Base-Emitter Saturation Voltage (Note 9) | $V_{BE(sat)}$ | — | 986 | 1100 | mV | $I_C = 6\text{A}, I_B = 300\text{mA}$ |
| Base-Emitter Turn-On Voltage (Note 9) | $V_{BE(on)}$ | — | 916 | 1000 | mV | $I_C = 6\text{A}, V_{CE} = 1\text{V}$ |
| Input Capacitance | C_{ibo} | — | 563 | — | pF | $V_{EB} = 0.5\text{V}, f = 1\text{MHz}$ |
| Output Capacitance | C_{obo} | — | 26 | — | 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} | — | 17.9 | — | ns | $I_C = 1\text{A}, V_{CC} = 10\text{V}, I_{B1} = -I_{B2} = 100\text{mA}$ |
| | t_{rise} | — | 6.1 | — | ns | |
| | $t_{storage}$ | — | 1256 | — | ns | |
| | t_{fall} | — | 27.6 | — | ns | |

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

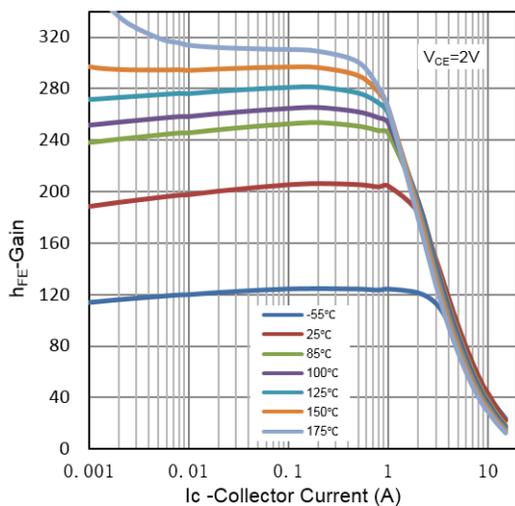
Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



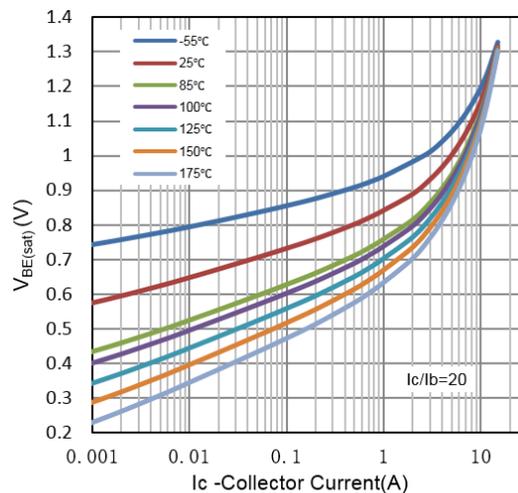
$V_{CE(sat)}$ vs I_C



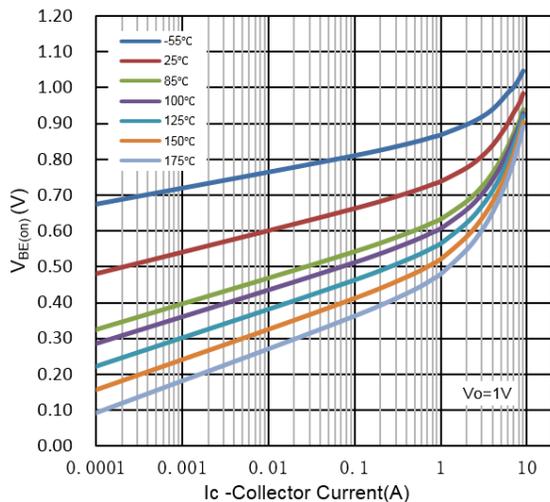
$V_{CE(sat)}$ vs I_C



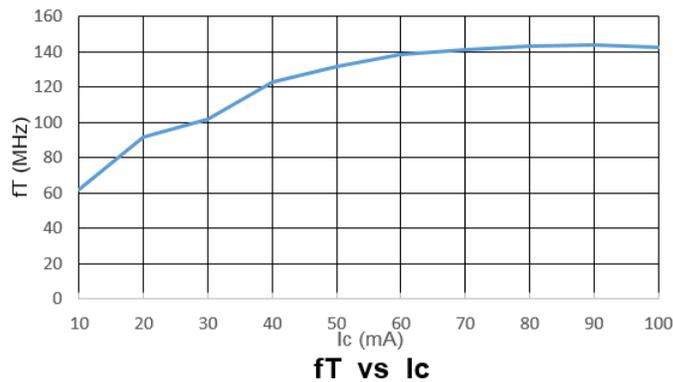
h_{FE} vs I_C



$V_{BE(sat)}$ vs I_C

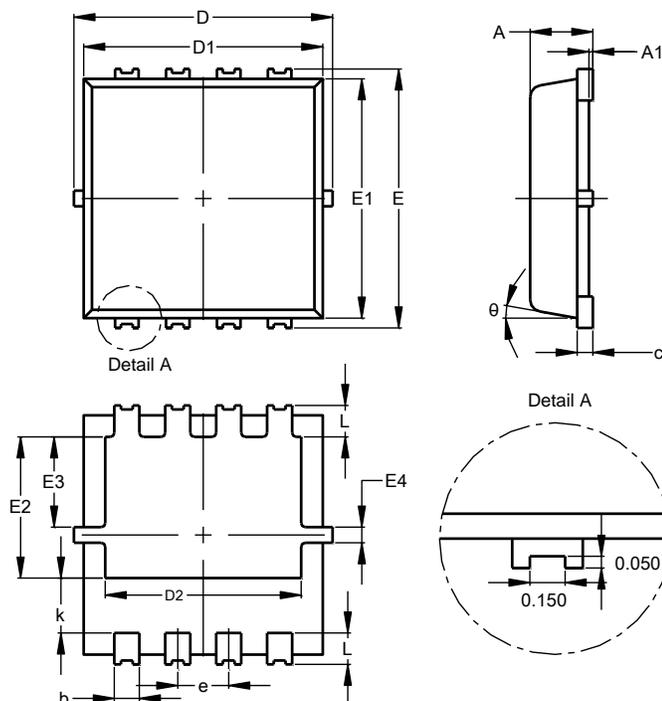


$V_{BE(on)}$ vs I_C



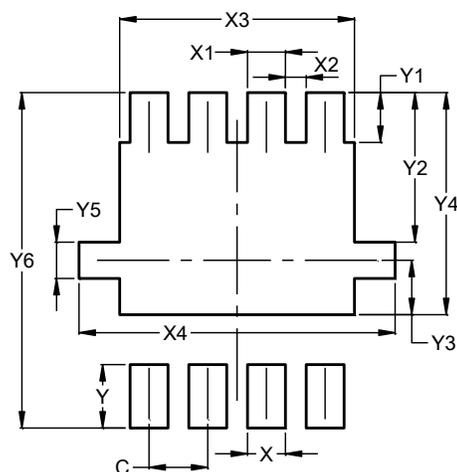
f_T vs I_C

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 |
| 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 |

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.