

# FDFS2P753AZ

## Integrated P-Channel PowerTrench® MOSFET and Schottky Diode -30V, -3A, 115mΩ

### Features

- Max  $r_{DS(on)}$  = 115mΩ at  $V_{GS} = -10V$ ,  $I_D = -3.0A$
- Max  $r_{DS(on)}$  = 180mΩ at  $V_{GS} = -4.5V$ ,  $I_D = -1.5A$
- $V_F < 0.45V$  @ 2A  
 $V_F < 0.28V$  @ 100mA
- Schottky and MOSFET incorporated into single power surface mount SO-8 package
- Electrically independent Schottky and MOSFET pinout for design flexibility
- RoHS Compliant

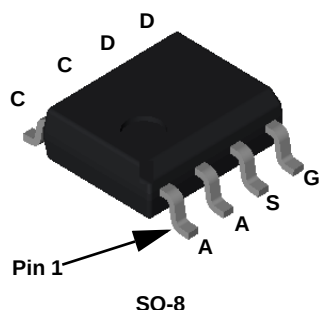


### General Description

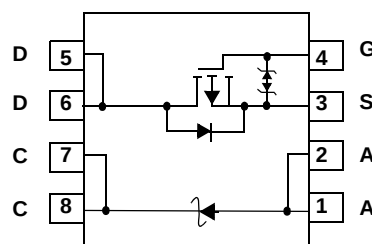
The FDFS2P753AZ offers a single package solution for DC/DC conversion. It combines an excellent Fairchild's PowerTrench MOSFET with a Schottky diode in an SO-8 package. The MOSFET features a low on-state resistance and an optimized gate charge to achieve fast switching. The independently connected Schottky diode has a low forward voltage drop to minimize power loss. This device is an Ideal DC-DC solution for up to 3A peak load current.

### Applications

- DC - DC Conversion



SO-8



### MOSFET Maximum Ratings $T_A = 25^\circ C$ unless otherwise noted

| Symbol         | Parameter                                        | Ratings     | Units      |
|----------------|--------------------------------------------------|-------------|------------|
| $V_{DS}$       | Drain to Source Voltage                          | -30         | V          |
| $V_{GS}$       | Gate to Source Voltage                           | $\pm 25$    | V          |
| $I_D$          | Drain Current -Continuous (Note 1a)              | -3          | A          |
|                | -Pulsed                                          | -16         |            |
| $P_D$          | Power Dissipation $T_C = 25^\circ C$             | 3.1         | W          |
|                | Power Dissipation $T_A = 25^\circ C$ (Note 1a)   | 1.6         |            |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 2)           | 6           | mJ         |
| $V_{RRM}$      | Schottky Repetitive Peak Reverse Voltage         | 30          | V          |
| $I_O$          | Schottky Average Forward Current                 | 2           | A          |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to +150 | $^\circ C$ |

### Thermal Characteristics

|                 |                                                   |    |              |
|-----------------|---------------------------------------------------|----|--------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case (Note 1)     | 40 | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 78 |              |

### Package Marking and Ordering Information

| Device Marking | Device      | Package | Reel Size | Tape Width | Quantity  |
|----------------|-------------|---------|-----------|------------|-----------|
| FDFS2P753AZ    | FDFS2P753AZ | SO-8    | 330mm     | 12mm       | 2500units |

**Electrical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

**Off Characteristics**

|                                      |                                           |                                                                            |     |     |            |                      |
|--------------------------------------|-------------------------------------------|----------------------------------------------------------------------------|-----|-----|------------|----------------------|
| $BV_{DSS}$                           | Drain to Source Breakdown Voltage         | $I_D = -250\mu\text{A}$ , $V_{GS} = 0\text{V}$                             | -30 |     |            | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$                 |     | -21 |            | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = -24\text{V}$ ,<br>$V_{GS} = 0\text{V}$ $T_J = 125^\circ\text{C}$ |     |     | -1<br>-100 | $\mu\text{A}$        |
| $I_{GSS}$                            | Gate to Source Leakage Current            | $V_{GS} = \pm 25\text{V}$ , $V_{DS} = 0\text{V}$                           |     |     | $\pm 10$   | $\mu\text{A}$        |

**On Characteristics**

|                                        |                                                          |                                                                           |      |      |      |                      |
|----------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------|------|------|------|----------------------|
| $V_{GS(th)}$                           | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}$ , $I_D = -250\mu\text{A}$                               | -1.0 | -2.1 | -3.0 | V                    |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$                |      | 5    |      | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$                           | Static Drain to Source On Resistance                     | $V_{GS} = -10\text{V}$ , $I_D = -3.0\text{A}$                             |      | 69   | 115  | m $\Omega$           |
|                                        |                                                          | $V_{GS} = -4.5\text{V}$ , $I_D = -1.5\text{A}$                            |      | 115  | 180  |                      |
|                                        |                                                          | $V_{GS} = -10\text{V}$ , $I_D = -3.0\text{A}$ , $T_J = 125^\circ\text{C}$ |      | 97   | 162  |                      |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{DD} = -5\text{V}$ , $I_D = -3.0\text{A}$                              |      | 6    |      | S                    |

**Dynamic Characteristics**

|           |                              |                                                                      |  |     |     |          |
|-----------|------------------------------|----------------------------------------------------------------------|--|-----|-----|----------|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = -15\text{V}$ , $V_{GS} = 0\text{V}$ ,<br>$f = 1\text{MHz}$ |  | 330 | 455 | pF       |
| $C_{oss}$ | Output Capacitance           |                                                                      |  | 60  | 110 | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                                      |  | 55  | 100 | pF       |
| $R_g$     | Gate Resistance              | $f = 1\text{MHz}$                                                    |  | 18  |     | $\Omega$ |

**Switching Characteristics**

|              |                               |                                                                                                 |                                                  |     |      |    |
|--------------|-------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------|-----|------|----|
| $t_{d(on)}$  | Turn-On Delay Time            | $V_{DD} = -15\text{V}$ , $I_D = -3.0\text{A}$ ,<br>$V_{GS} = -10\text{V}$ , $R_{GEN} = 6\Omega$ |                                                  | 6   | 12   | ns |
| $t_r$        | Rise Time                     |                                                                                                 |                                                  | 4   | 10   | ns |
| $t_{d(off)}$ | Turn-Off Delay Time           |                                                                                                 |                                                  | 19  | 34   | ns |
| $t_f$        | Fall Time                     |                                                                                                 |                                                  | 15  | 27   | ns |
| $Q_g$        | Total Gate Charge             | $V_{GS} = 0\text{V}$ to $-10\text{V}$                                                           | $V_{DD} = -15\text{V}$ ,<br>$I_D = -3.0\text{A}$ | 7.9 | 11.0 | nC |
| $Q_g$        | Total Gate Charge             | $V_{GS} = 0\text{V}$ to $-4.5\text{V}$                                                          |                                                  | 4.1 | 5.7  | nC |
| $Q_{gs}$     | Gate to Source Charge         |                                                                                                 |                                                  | 1.3 |      | nC |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |                                                                                                 |                                                  | 2.0 |      | nC |

**Drain-Source Diode Characteristics**

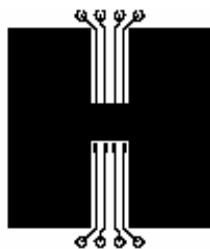
|          |                                       |                                                          |  |      |      |    |
|----------|---------------------------------------|----------------------------------------------------------|--|------|------|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{V}$ , $I_S = -2.0\text{A}$ (Note 3)     |  | -0.9 | -1.2 | V  |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = -3.0\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$ |  | 20   | 30   | ns |
| $Q_{rr}$ | Reverse Recovery Charge               |                                                          |  | 14   | 21   | nC |

**Schottky Diode Characteristics**

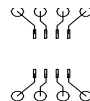
|       |                           |                      |                           |     |     |               |
|-------|---------------------------|----------------------|---------------------------|-----|-----|---------------|
| $V_R$ | Reverse Breakdown Voltage | $I_R = 1\text{mA}$   | 30                        |     |     | V             |
| $I_R$ | Reverse Leakage           | $V_R = 10\text{V}$   | $T_J = 25^\circ\text{C}$  | 39  | 250 | $\mu\text{A}$ |
|       |                           |                      | $T_J = 125^\circ\text{C}$ | 18  |     | mA            |
| $V_F$ | Forward Voltage           | $I_F = 100\text{mA}$ | $T_J = 25^\circ\text{C}$  | 225 | 280 | mV            |
|       |                           |                      | $T_J = 125^\circ\text{C}$ | 140 |     |               |
|       |                           | $I_F = 2\text{A}$    | $T_J = 25^\circ\text{C}$  | 364 | 450 |               |
|       |                           |                      | $T_J = 125^\circ\text{C}$ | 290 |     |               |

NOTES:

1.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a. 78°C/W when mounted on a 0.5 in² pad of 2 oz copper.



b. 135°C/W when mounted on a minimum pad of 2 oz copper.

2. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3 \text{ mH}$ ,  $I_{AS} = -2\text{A}$ ,  $V_{DD} = -27\text{V}$ ,  $V_{GS} = -10\text{V}$ .
3. Pulse Test: Pulse Width  $< 300\mu\text{s}$ , Duty cycle  $< 2.0\%$ .

# Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

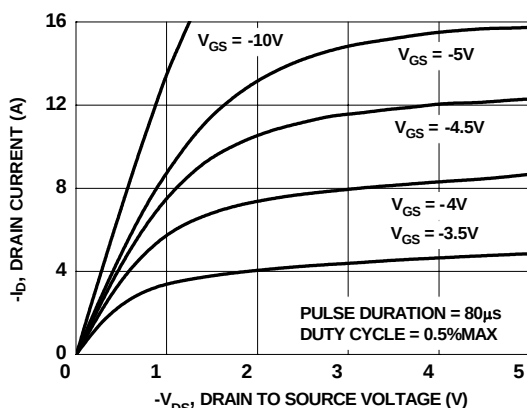


Figure 1. On-Region Characteristics

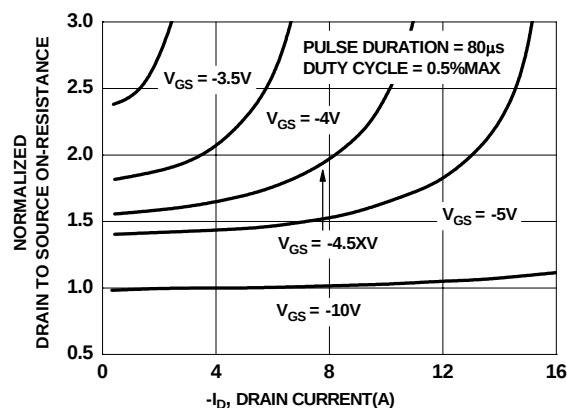


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

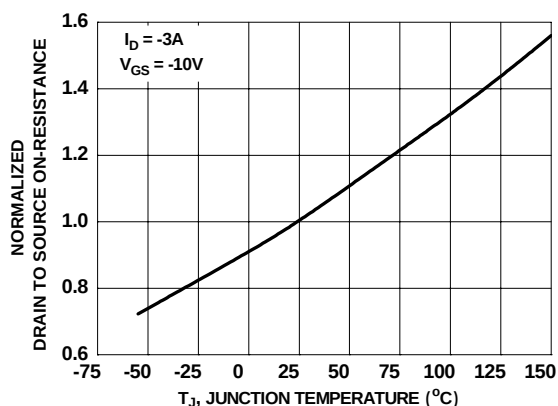


Figure 3. Normalized On-Resistance vs Junction Temperature

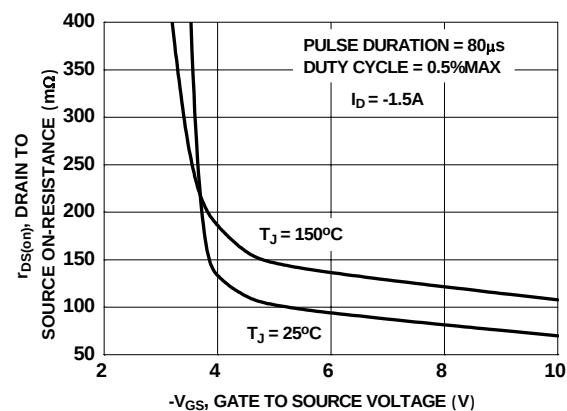


Figure 4. On-Resistance vs Gate to Source Voltage

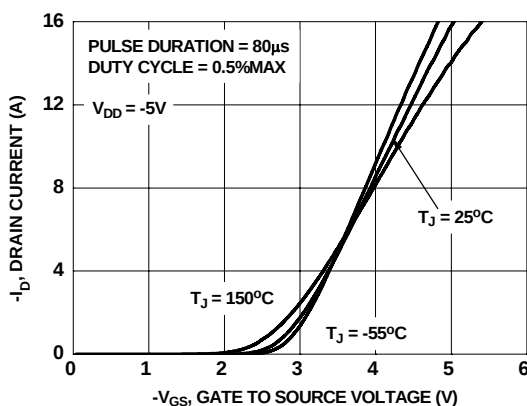


Figure 5. Transfer Characteristics

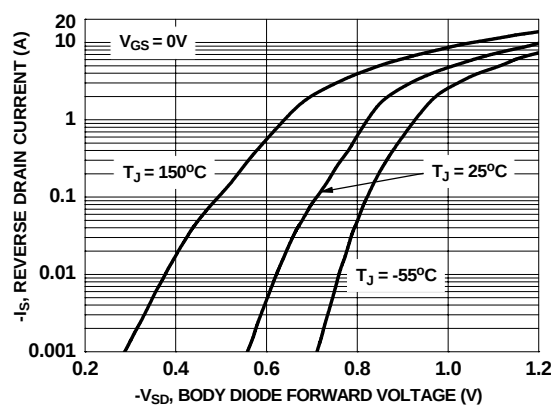


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

## Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

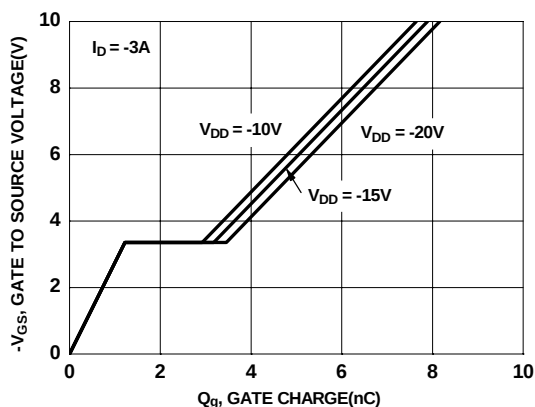


Figure 7. Gate Charge Characteristics

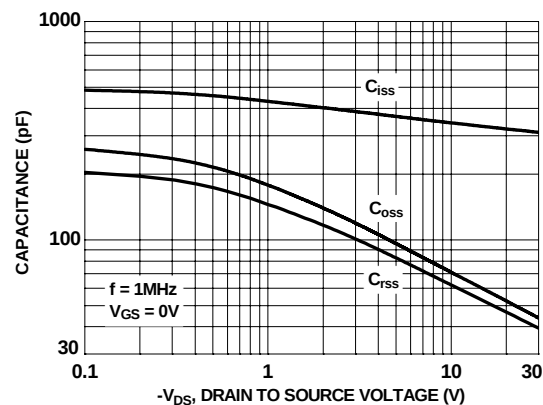


Figure 8. Capacitance vs Drain to Source Voltage

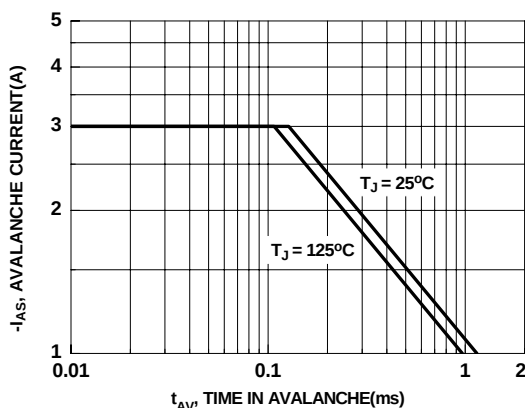


Figure 9. Unclamped Inductive Switching Capability

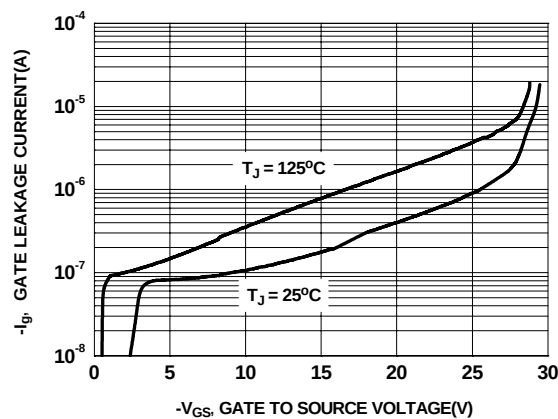


Figure 10. Gate Leakage Current vs Gate to Source Voltage

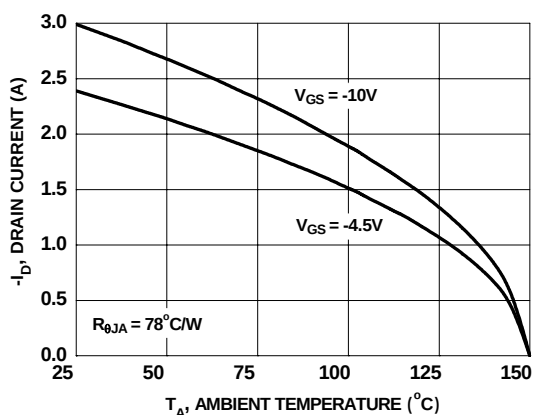


Figure 11. Maximum Continuous Drain Current vs Ambient Temperature

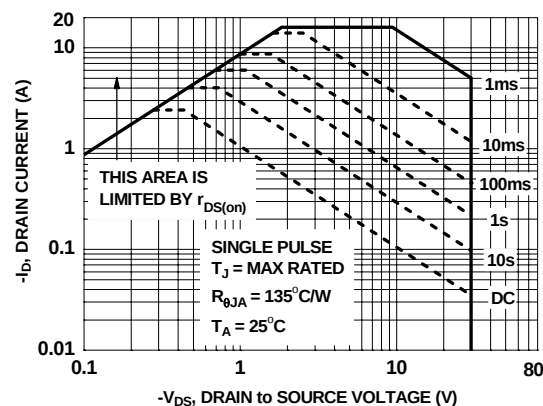


Figure 12. Forward Bias Safe Operating Area

# Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

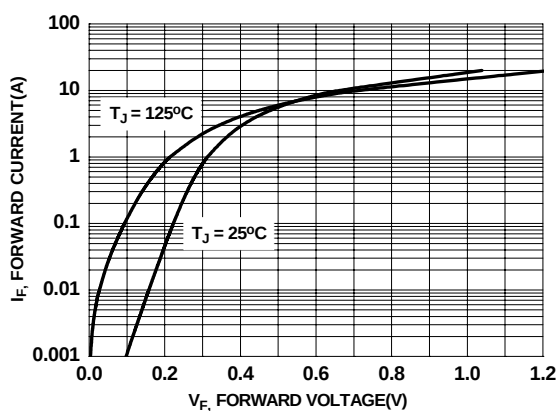


Figure 13. Schottky Diode Forward Voltage

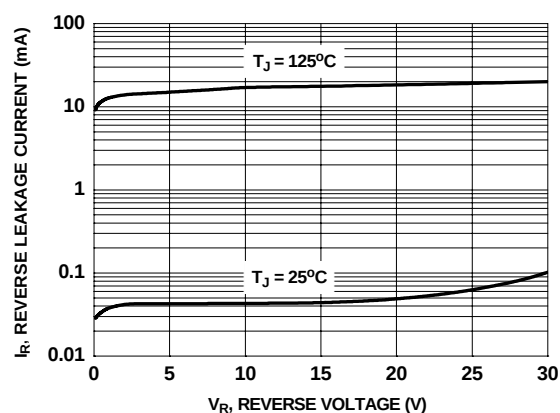


Figure 14. Schottky Diode Reverse Current

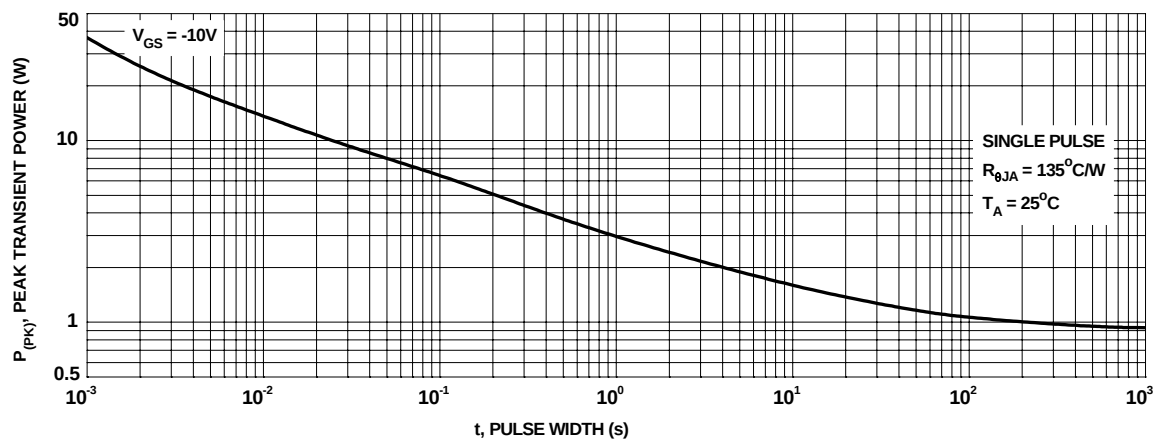


Figure 15. Single Pulse Maximum Power Dissipation

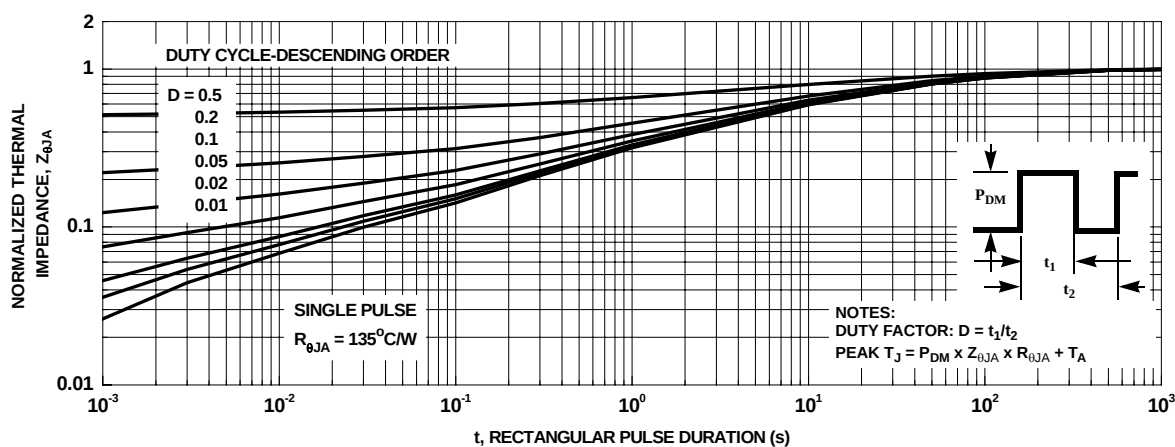


Figure 16. Transient Thermal Response Curve



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