

Complementary MOSFET

ELM16602EA-S

General Description

ELM16602EA-S uses advanced trench technology to provide excellent $R_{ds(on)}$ and low gate charge.

Features

- N-channel
- P-channel
- $V_{ds}=30V$
- $V_{ds}=-30V$
- $I_d=3.1A(V_{gs}=10V)$
- $I_d=-2.7A(V_{gs}=-10V)$
- $R_{ds(on)} < 75m\Omega (V_{gs}=10V)$
- $R_{ds(on)} < 100m\Omega (V_{gs}=-10V)$
- $R_{ds(on)} < 115m\Omega (V_{gs}=4.5V)$
- $R_{ds(on)} < 180m\Omega (V_{gs}=-4.5V)$

Maximum Absolute Ratings

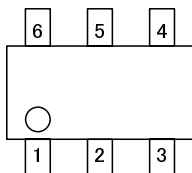
| Parameter | Symbol | N-ch (Max.) | P-ch (Max.) | Unit | Note | |
|--|----------------|------------------|-------------|------------|------|---|
| Drain-source voltage | V_{ds} | 30 | -30 | V | | |
| Gate-source voltage | V_{gs} | ± 20 | ± 20 | V | | |
| Continuous drain current | I_d | $T_a=25^\circ C$ | 3.1 | -2.7 | A | 1 |
| | | $T_a=70^\circ C$ | 2.4 | -2.1 | | |
| Pulsed drain current | I_{dm} | 12 | -12 | A | 2 | |
| Power dissipation | P_d | $T_a=25^\circ C$ | 1.15 | 1.15 | W | |
| | | $T_a=70^\circ C$ | 0.73 | 0.73 | | |
| Junction and storage temperature range | T_j, T_{stg} | -55 to 150 | -55 to 150 | $^\circ C$ | | |

Thermal Characteristics

| Parameter | Symbol | Device | Typ. | Max. | Unit | Note |
|-----------------------------|-----------------|--------|------|------|--------------|------|
| Maximum junction-to-ambient | $R_{\theta ja}$ | N-ch | 78 | 110 | $^\circ C/W$ | 1 |
| Maximum junction-to-ambient | $R_{\theta jk}$ | | 106 | 150 | $^\circ C/W$ | |
| Maximum junction-to-lead | $R_{\theta jl}$ | | 64 | 80 | $^\circ C/W$ | |
| Maximum junction-to-ambient | $R_{\theta ja}$ | P-ch | 78 | 110 | $^\circ C/W$ | 1 |
| Maximum junction-to-ambient | $R_{\theta jk}$ | | 106 | 150 | $^\circ C/W$ | |
| Maximum junction-to-lead | $R_{\theta jl}$ | | 64 | 80 | $^\circ C/W$ | |

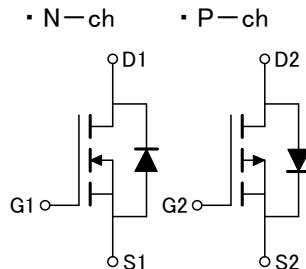
Pin Configuration

SOT-26 (TOP VIEW)



| Pin No. | Pin name |
|---------|----------|
| 1 | GATE1 |
| 2 | SOURCE2 |
| 3 | GATE2 |
| 4 | DRAIN2 |
| 5 | SOURCE1 |
| 6 | DRAIN1 |

Circuit



Complementary MOSFET

ELM16602EA-S

■ Electrical Characteristics (N-ch)

T_a=25°C

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|------------------------------------|---------------------|--|------|------|------|------|
| STATIC PARAMETERS | | | | | | |
| Drain-source breakdown voltage | BV _{dss} | I _d =250 μA, V _{gs} =0V | 30 | | | V |
| Zero gate voltage drain current | I _{dss} | V _{ds} =24V V _{gs} =0V T _j =55°C | | | 1 | μA |
| | | | | | 5 | |
| Gate-body leakage current | I _{gss} | V _{ds} =0V, V _{gs} =±20V | | | 100 | nA |
| Gate threshold voltage | V _{gs(th)} | V _{ds} =V _{gs} , I _d =250 μA | 1.0 | 1.9 | 3.0 | V |
| On state drain current | I _{d(on)} | V _{gs} =10V, V _{ds} =5V | 10 | | | A |
| Static drain-source on-resistance | R _{ds(on)} | V _{gs} =10V I _d =3.1A V _{gs} =4.5V, I _d =2A T _j =125°C | | 54 | 75 | mΩ |
| | | | | 78 | | |
| | | | | 88 | 115 | |
| Forward transconductance | G _{fs} | V _{ds} =5V, I _d =3.1A | | 4.5 | | S |
| Diode forward voltage | V _{sd} | I _s =1A | | 0.79 | 1.00 | V |
| Max.body-diode continuous current | I _s | | | | 2.5 | A |
| DYNAMIC PARAMETERS | | | | | | |
| Input capacitance | C _{iss} | V _{gs} =0V, V _{ds} =15V, f=1MHz | | 200 | 240 | pF |
| Output capacitance | C _{oss} | | | 40 | | pF |
| Reverse transfer capacitance | C _{rss} | | | 20 | | pF |
| Gate resistance | R _g | | | 2.3 | 3.0 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Total gate charge (10V) | Q _g | V _{gs} =10V, V _{ds} =15V, I _d =3.1A | | 6.5 | 8.5 | nC |
| Total gate charge (4.5V) | Q _g | | | 3.1 | 4.0 | nC |
| Gate-source charge | Q _{gs} | | | 1.2 | | nC |
| Gate-drain charge | Q _{gd} | | | 1.6 | | nC |
| Turn-on delay time | t _{d(on)} | | | 3.3 | | ns |
| Turn-on rise time | t _r | V _{gs} =10V, V _{ds} =15V | | 2.5 | | ns |
| Turn-off delay time | t _{d(off)} | R _l =4.7 Ω, R _{gen} =3 Ω | | 13.2 | | ns |
| Turn-off fall time | t _f | | | 1.7 | | ns |
| Body-diode reverse recovery time | t _{rr} | I _f =3.1A, dI/dt=100A/μs | | 9.4 | 12.0 | ns |
| Body-diode reverse recovery charge | Q _{rr} | I _f =3.1A, dI/dt=100A/μs | | 3.5 | | nC |

NOTE :

1. The value of R_{θja} is measured with the device mounted on 1in² FR-4 board of 2oz. Copper, in still air environment with T_a=25°C. The value in any given applications depends on the user's specific board design, The current rating is based on the t_{≤10s} thermal resistance rating.
2. Repetitive rating, pulse width limited by junction temperature.
3. The R_{θja} is the sum of the thermal impedance from junction to lead R_{θjl} and lead to ambient.
4. The static characteristics in Figures 1 to 6 are obtained using 80 μs pulses, duty cycle 0.5%max.
5. These tests are performed with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_a=25°C. The SOA curve provides a single pulse rating.

Complementary MOSFET

ELM16602EA-S

Typical Electrical and Thermal Characteristics (N-ch)

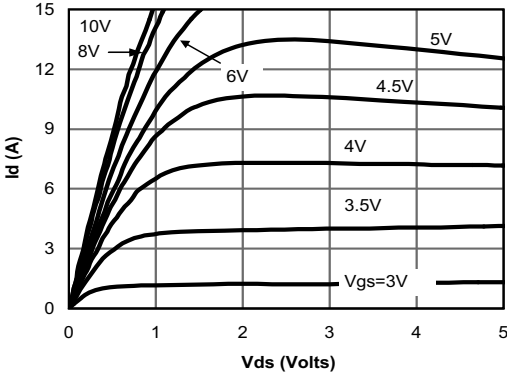


Fig 1: On-Region Characteristics

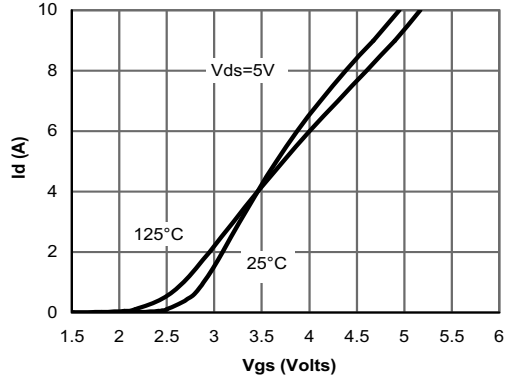


Figure 2: Transfer Characteristics

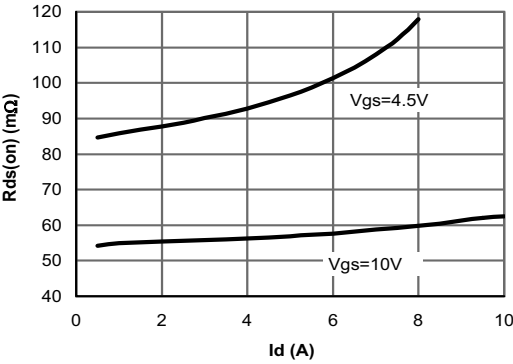


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

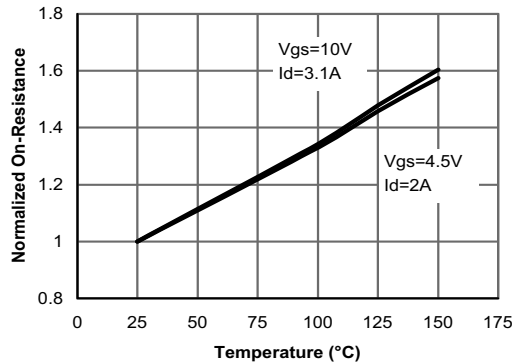


Figure 4: On-Resistance vs. Junction Temperature

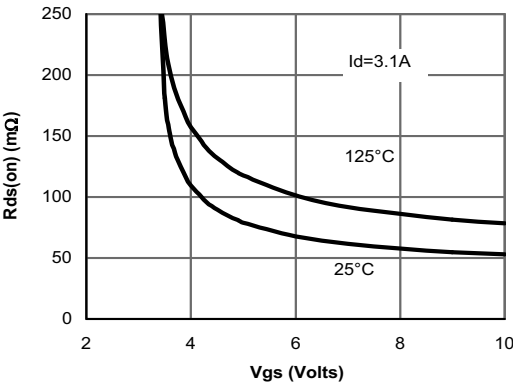


Figure 5: On-Resistance vs. Gate-Source Voltage

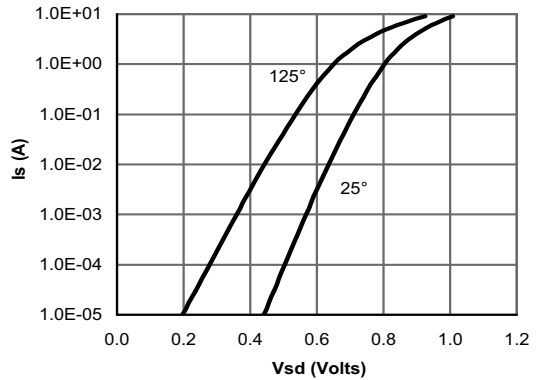


Figure 6: Body-Diode Characteristics

Complementary MOSFET

ELM16602EA-S

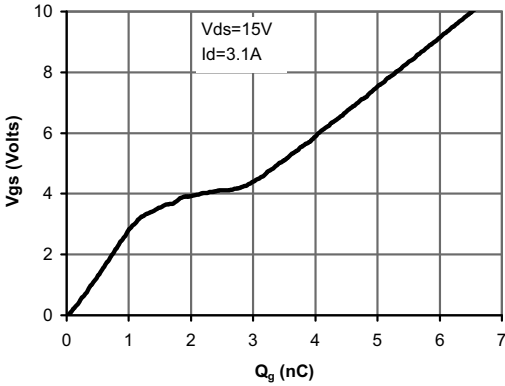


Figure 7: Gate-Charge Characteristics

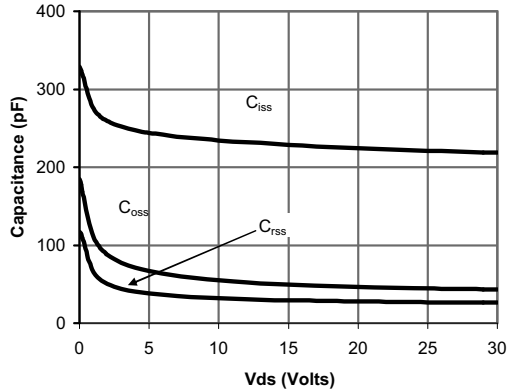


Figure 8: Capacitance Characteristics

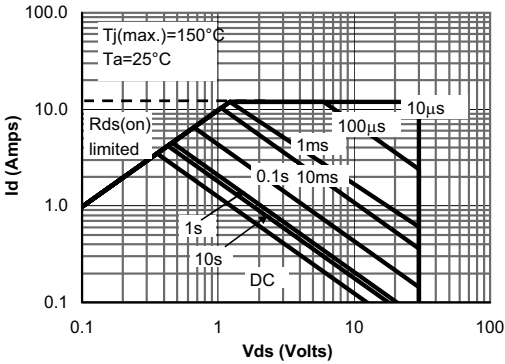


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

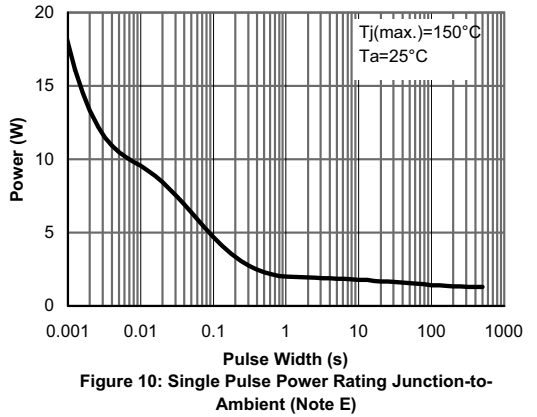


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

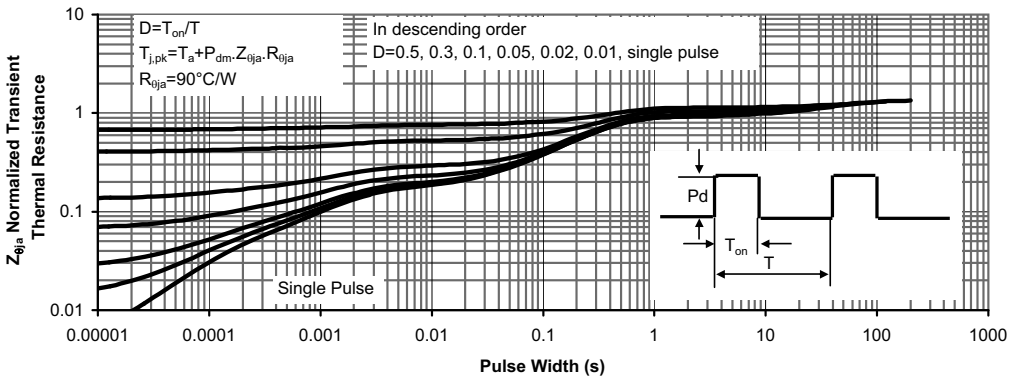


Figure 11: Normalized Maximum Transient Thermal Impedance

Complementary MOSFET

ELM16602EA-S

Electrical Characteristics (P-ch)

T_a=25°C

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|------------------------------------|---------------------|--|--|-------|-------|------|
| STATIC PARAMETERS | | | | | | |
| Drain-source breakdown voltage | BV _{dss} | I _d =-250 μA, V _{gs} =0V | -30 | | | V |
| Zero gate voltage drain current | I _{dss} | V _{ds} =-24V | | | -1 | μA |
| | | V _{gs} =0V | | | -5 | |
| | | T _j =55°C | | | | |
| Gate-body leakage current | I _{gss} | V _{ds} =0V, V _{gs} =±20V | | | ±100 | nA |
| Gate threshold voltage | V _{gs(th)} | V _{ds} =V _{gs} , I _d =-250 μA | -1.0 | -1.9 | -3.0 | V |
| On state drain current | I _{d(on)} | V _{gs} =-4.5V, V _{ds} =-5V | -5 | | | A |
| Static drain-source on-resistance | R _{ds(on)} | V _{gs} =-10V | | 77 | 100 | mΩ |
| | | I _d =-2.7A | | 110 | | |
| | | | T _j =125°C | | | |
| | | V _{gs} =-4.5V, I _d =-2A | | 130 | 180 | mΩ |
| Forward transconductance | G _{fs} | V _{ds} =-5V, I _d =-2.7A | | 4.1 | | S |
| Diode forward voltage | V _{sd} | I _s =-1A, V _{gs} =0V | | -0.81 | -1.00 | V |
| Max. body-diode continuous current | I _s | | | | -2 | A |
| DYNAMIC PARAMETERS | | | | | | |
| Input capacitance | C _{iss} | V _{gs} =0V, V _{ds} =-15V, f=1MHz | | 260 | 312 | pF |
| Output capacitance | C _{oss} | | | 55 | | pF |
| Reverse transfer capacitance | C _{rss} | | | 44 | | pF |
| Gate resistance | R _g | V _{gs} =0V, V _{ds} =0V, f=1MHz | | 4.3 | 5.0 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Total gate charge (10V) | Q _g | V _{gs} =-10V, V _{ds} =-15V | | 5.80 | 7.00 | nC |
| Total gate charge (4.5V) | Q _g | | | 3.00 | 4.00 | nC |
| Gate-source charge | Q _{gs} | | I _d =-2.7A | | 0.78 | |
| Gate-drain charge | Q _{gd} | | | 1.60 | | nC |
| Turn-on delay time | t _{d(on)} | V _{gs} =-10V, V _{ds} =-15V | | 7.0 | | ns |
| Turn-on rise time | t _r | | | 6.0 | | ns |
| Turn-off delay time | t _{d(off)} | | R _l =5.6 Ω, R _{gen} =3 Ω | | 15.0 | |
| Turn-off fall time | t _f | | | 7.5 | | ns |
| Body diode reverse recovery time | t _{rr} | I _f =-2.7A, dI/dt=100A/μs | | 12.5 | 15.0 | ns |
| Body diode reverse recovery charge | Q _{rr} | I _f =-2.7A, dI/dt=100A/μs | | 5.5 | | nC |

NOTE :

1. The value of R_{θja} is measured with the device mounted on 1in² FR-4 board of 2oz. Copper, in still air environment with T_a=25°C. The value in any given applications depends on the user's specific board design, The current rating is based on the t_{≤10s} thermal resistance rating.
2. Repetitive rating, pulse width limited by junction temperature.
3. The R_{θja} is the sum of the thermal impedance from junction to lead R_{θjl} and lead to ambient.
4. The static characteristics in Figures 1 to 6 are obtained using 80μs pulses, duty cycle 0.5%max.
5. These tests are performed with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_a=25°C. The SOA curve provides a single pulse rating.

Complementary MOSFET

ELM16602EA-S

Typical Electrical and Thermal Characteristics (P-ch)

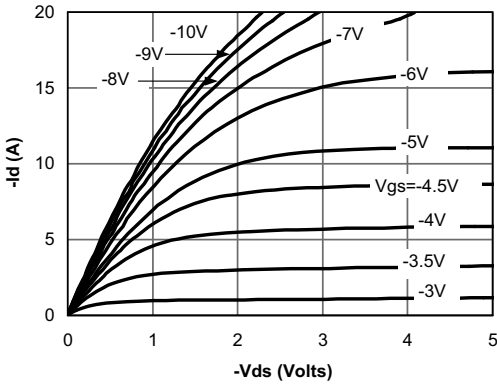


Fig 1: On-Region Characteristics

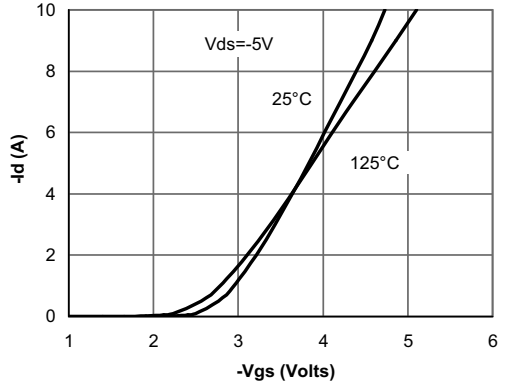


Figure 2: Transfer Characteristics

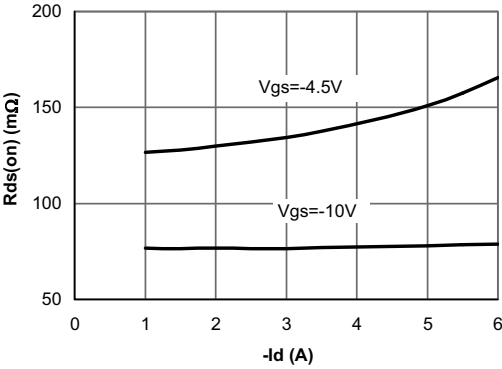


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

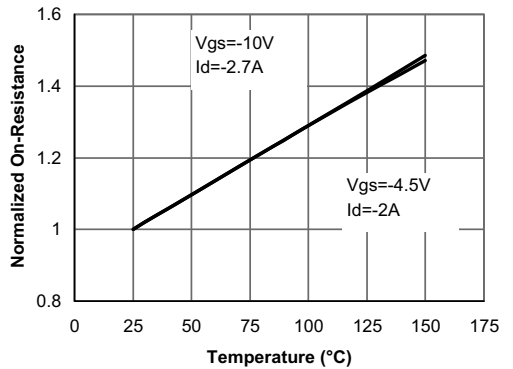


Figure 4: On-Resistance vs. Junction Temperature

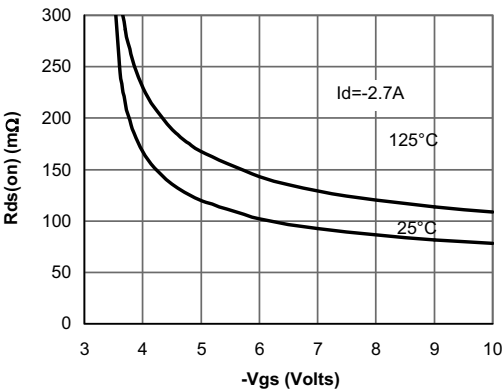


Figure 5: On-Resistance vs. Gate-Source Voltage

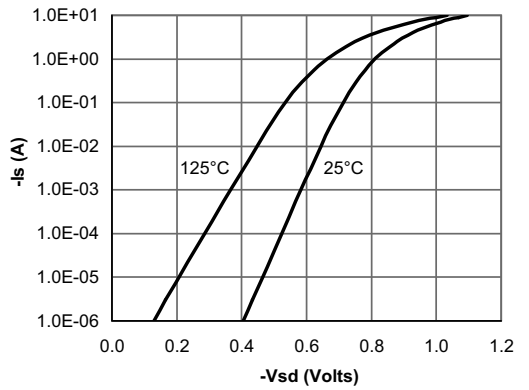


Figure 6: Body-Diode Characteristics

Complementary MOSFET

ELM16602EA-S

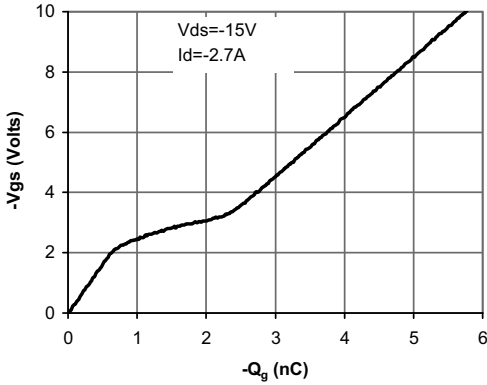


Figure 7: Gate-Charge Characteristics

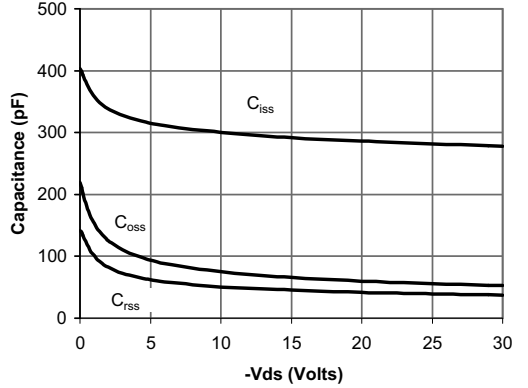


Figure 8: Capacitance Characteristics

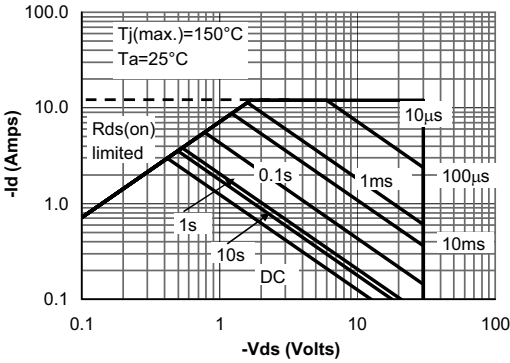


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

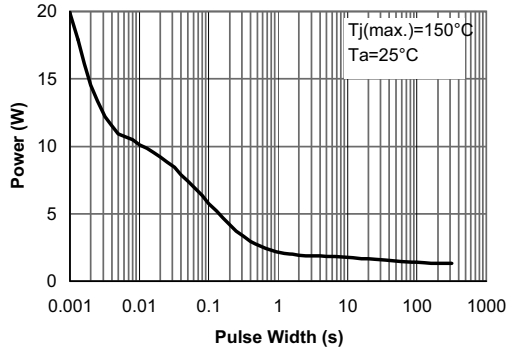


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

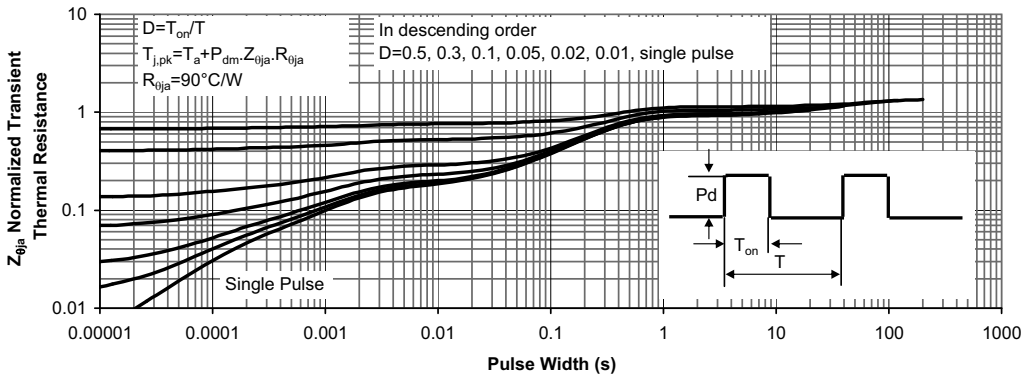


Figure 11: Normalized Maximum Transient Thermal Impedance