

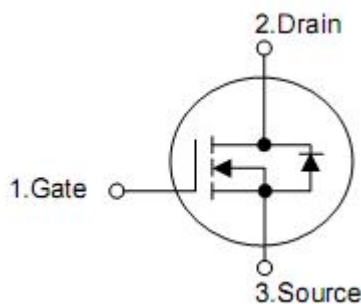
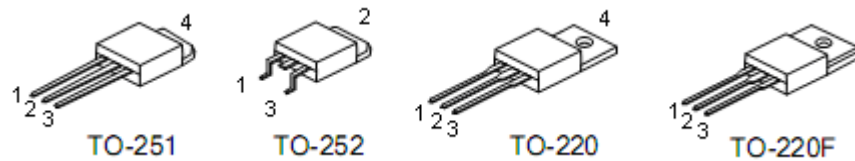
1. Description

This Power MOSFET is produced using KIA advanced planar stripe DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction based on half bridge topology.

2. Features

- $R_{DS(on)} = 2.5\Omega @ V_{GS} = 10V$
- Low gate charge (typical 16nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

3. Pin configuration



| Pin | Function |
|-----|----------|
| 1 | Gate |
| 2 | Drain |
| 3 | Source |
| 4 | Drain |

4. Absolute maximum ratings

(T_C=25°C , unless otherwise noted)

| Parameter | Symbol | Rating | | | | Units | |
|----------------------------------------------------------------------------------|-----------------------------------|-----------------------|-------|-------|--------|-------|------|
| | | TO251 | TO252 | TO220 | TO220F | | |
| Drain-source voltage | V _{DSS} | 650 | | | | V | |
| Drain current continuous | I _D | T _C =25°C | 3.0 | 3.0 | 4.0 | 4.0* | A |
| | | T _C =100°C | 1.8 | 1.8 | 2.4 | 2.4* | A |
| Drain current pulsed (note1) | I _{DM} | 12 | 12 | 16 | 16* | A | |
| Gate-source voltage | V _{GSS} | ±30 | | | | V | |
| Single Pulse avalanche energy (note2) | E _{AS} | 210 | 210 | 180 | 180 | mJ | |
| Repetitive avalanche energy (note1) | E _{AR} | 5.8 | 5.8 | 10 | 10 | mJ | |
| Peak diode recovery dv/dt (note3) | dv/dt | 4.5 | | | | V/ns | |
| Power dissipation | P _D | T _C =25°C | 58 | 58 | 104 | 34 | W |
| | | Derate above 25°C | 0.46 | 0.46 | 0.83 | 0.27 | W/°C |
| Operating and storage temperature range | T _J , T _{STG} | -55~+150 | | | | °C | |
| Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | T _L | 300 | | | | °C | |

*Drain current limited by maximum junction temperature.

5. Thermal characteristics

| Parameter | Symbol | TO251 | TO252 | TO220 | TO220F | Unit |
|---------------------------------------|-------------------|-------|-------|-------|--------|------|
| Thermal resistance junction-case | R _{thJC} | 2.16 | 2.16 | 1.2 | 3.65 | °C/W |
| Thermal resistance, case-to-sink typ. | R _{thJS} | 50 | 50 | 0.5 | 0.5 | |
| Thermal resistance junction-ambient | R _{thJA} | 110 | 110 | 62.5 | 62.5 | |

6. Electrical characteristics

(T_J=25°C, unless otherwise noted)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|-------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|------|-------|
| Off characteristics | | | | | | |
| Drain-source breakdown voltage | BV _{DSS} | V _{GS} =0V, I _D =250μA | 650 | - | - | V |
| Breakdown voltage temperature coefficient | ΔBV _{DSS} /ΔT _J | I _D =250μA, Referenced to 25°C | - | 0.65 | - | V/°C |
| Zero gate voltage drain current | I _{DSS} | V _{DS} =650V, V _{GS} =0V | - | - | 1 | μA |
| | | V _{DS} =520V, T _C =125°C | - | - | 10 | μA |
| Gate-body leakage current | Forward | I _{GSS} | - | - | 100 | nA |
| | Reverse | | | | -100 | nA |
| On characteristics | | | | | | |
| Gate threshold voltage | V _{GS(TH)} | V _{DS} =V _{GS} , I _D =250μA | 2.0 | - | 4.0 | V |
| Static drain-source on-resistance | R _{DS(ON)} | V _{GS} =10V, I _D =1.5A(TO251, TO252) I _D =2.0A(TO220, TO220F) | - | 2.5 | 3.0 | Ω |
| Dynamic characteristics | | | | | | |
| Input capacitance | C _{ISS} | V _{DS} =25V, V _{GS} =0V, f=1MHz | - | 560 | - | pF |
| Output capacitance | C _{OSS} | | - | 55 | - | pF |
| Reverse transfer capacitance | C _{RSS} | | - | 7 | - | pF |
| Switching characteristics | | | | | | |
| Turn-on delay time | t _{D(ON)} | V _{DD} =300V, I _D =4.5A (TO251, TO252), V _{DD} =325V, I _D =4.0A (TO220, TO220F) R _G =25Ω, (note4,5) | - | 10 | - | ns |
| Rise time | t _R | | - | 40 | - | ns |
| Turn-off delay time | t _{D(OFF)} | | - | 40 | - | ns |
| Fall time | t _F | | - | 50 | - | ns |
| Total gate charge | Q _G | V _{DS} =480V, I _D =4.5A (TO251, TO252) V _{DS} =520V, I _D =4.0A (TO220, TO220F) V _{GS} =10V (note4,5) | - | 16 | - | nC |
| Gate-source charge | Q _{GS} | | - | 2.5 | - | nC |
| Gate-drain charge | Q _{GD} | | - | 6.5 | - | nC |
| Drain-source diode characteristics | | | | | | |
| Continuous drain-source current | I _S | TO251, TO252 | - | - | 3.0 | A |
| | | TO220, TO220F | - | - | 4.0 | |
| Pulsed drain-source current | I _{SM} | TO251, TO252 | - | - | 12 | A |
| | | TO220, TO220F | - | - | 16 | |
| Drain-source diode forward voltage | V _{SD} | V _{GS} =0V, I _S =3.0A (TO251, TO252) I _S =4.0A (TO220, TO220F) | - | - | 1.4 | V |
| Reverse recovery time | t _{RR} | V _{GS} =0V, di _F /dt=100A/μs I _S =4.5A, (TO251, TO252) I _S =4.0A (TO220, TO220F) | - | 300 | - | ns |
| Reverse recovery charge | Q _{RR} | (note 4) | - | 2.0 | - | μC |

Note:1. Repetitive rating: pulse width limited by maximum junction temperature

2. I_{AS}=4.5A, V_{DD}=50V, (TO251, TO252), I_{AS}=4.0A, V_{DD}=25V (TO220, TO220F), R_G=25Ω, starting T_J=25°C

3. I_{SD}≤4.5A, (TO251, TO252), I_{SD}≤4.0A (TO220, TO220F), di/dt ≤200A/μs, V_{DD}≤BV_{DSS}, starting T_J=25°C

4. Pulse test: pulse width ≤300μs, duty cycle ≤2%

5. Essentially independent of operating temperature

7. Test circuits and waveforms

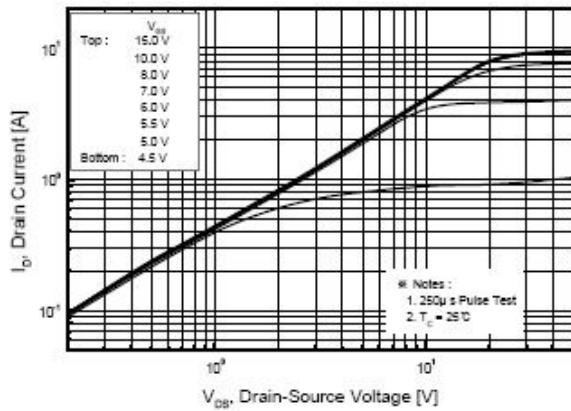


Figure 1. On-Region Characteristics

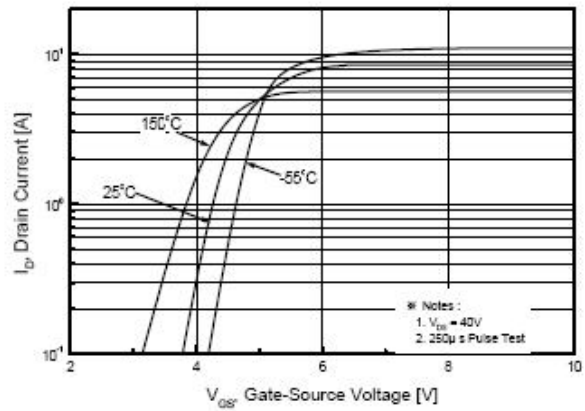


Figure 2. Transfer Characteristics

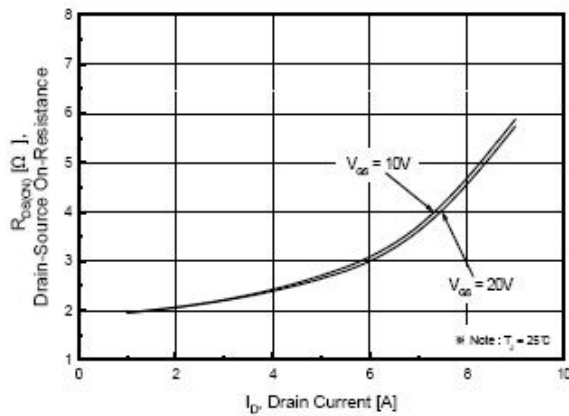


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

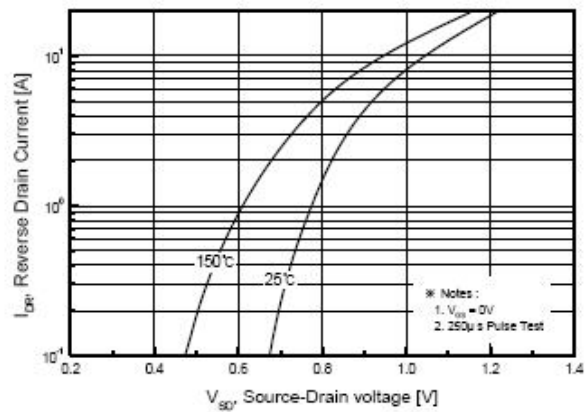


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

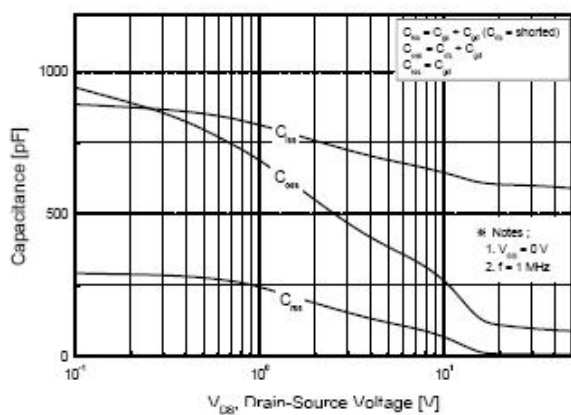


Figure 5. Capacitance Characteristics

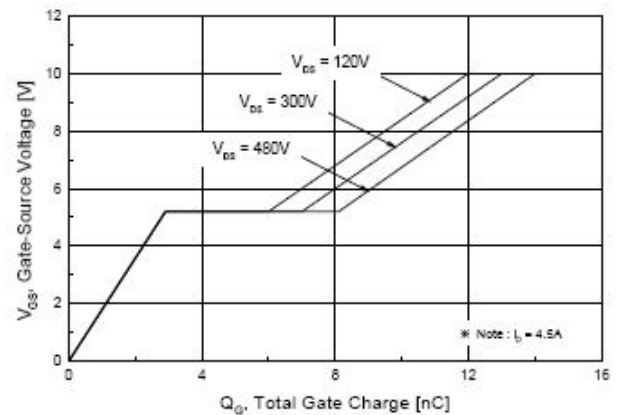


Figure 6. Gate Charge Characteristics

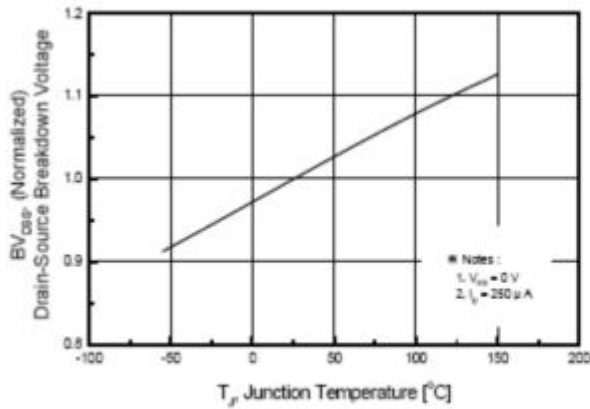


Figure 7. Breakdown Voltage Variation vs Temperature

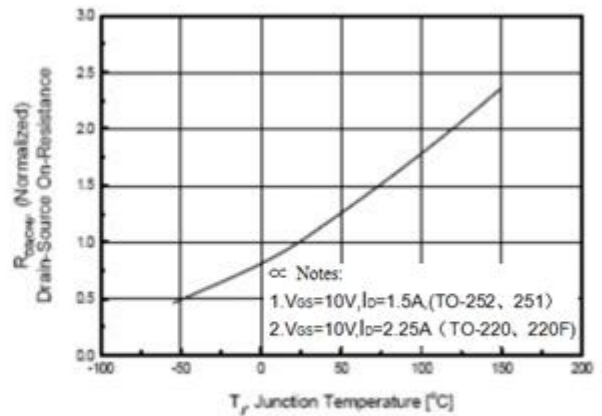


Figure 8. On-Resistance Variation vs Temperature

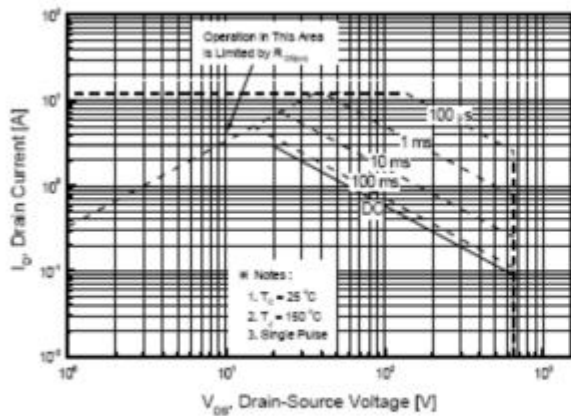


Figure 9. Maximum Safe Operating Area

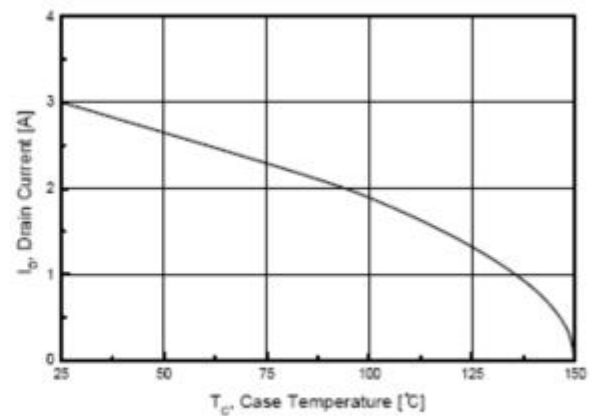


Figure 10. Maximum Drain Current vs Case Temperature

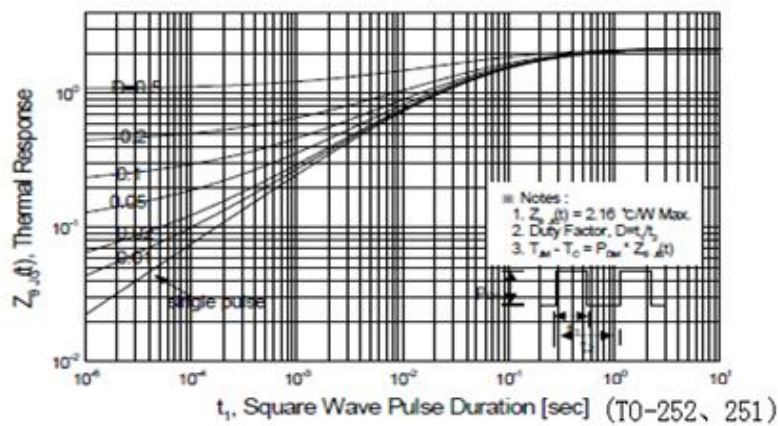


Figure 11. Transient Thermal Response Curve

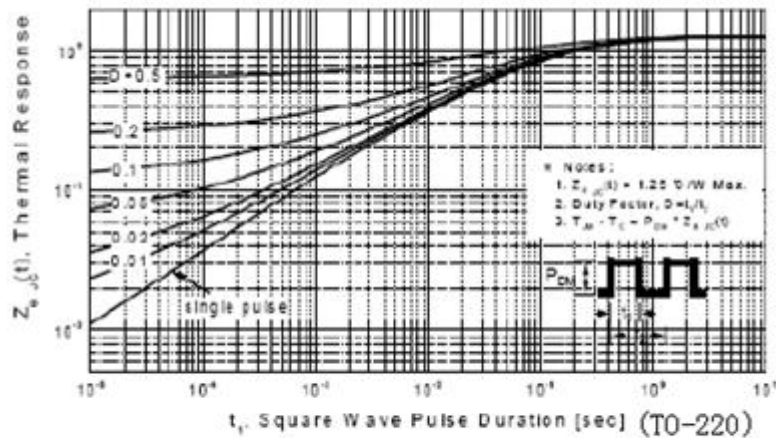


Figure 11-1. Transient Thermal Response Curve

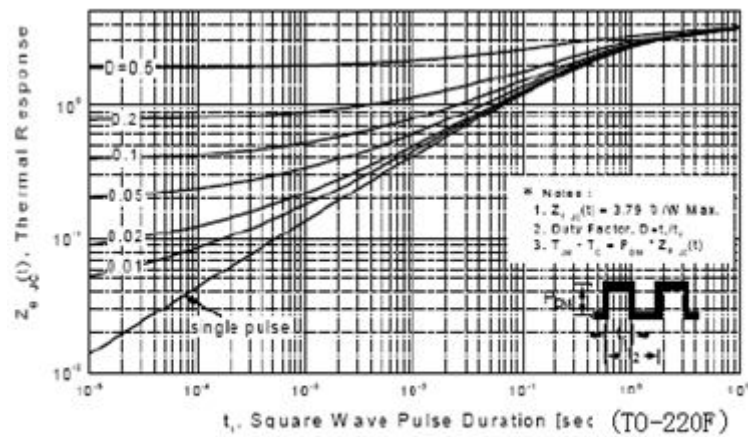


Figure 11-2. Transient Thermal Response Curve