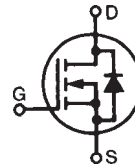


PolarHV™ Power MOSFET

IXTP 1R4N60P
IXTU 1R4N60P
IXTY 1R4N60P

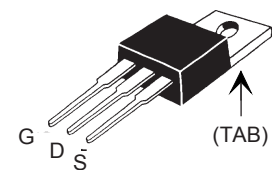
V_{DSS} = 600 V
I_{D25} = 1.4 A
R_{DS(on)} ≤ 9.0 Ω

N-Channel Enhancement Mode
Avalanche Rated

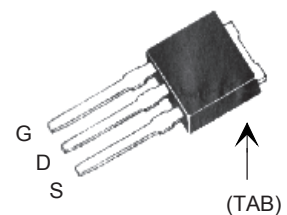


| Symbol | Test Conditions | Maximum Ratings | |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| V _{DSS} | T _J = 25° C to 175° C | 600 | V |
| V _{DGR} | T _J = 25° C to 175° C; R _{GS} = 1 MΩ | 600 | V |
| V _{GS} | Continuous | ±30 | V |
| V _{GSM} | Transient | ±40 | V |
| I _{D25} | T _C = 25° C | 1.4 | A |
| I _{DM} | T _C = 25° C, pulse width limited by T _{JM} | 2.1 | A |
| I _{AR} | T _C = 25° C | 1.4 | A |
| E _{AR} | T _C = 25° C | 5 | mJ |
| E _{AS} | T _C = 25° C | 75 | mJ |
| dv/dt | I _S ≤ I _{DM} , di/dt ≤ 100 A/μs, V _{DD} ≤ V _{DSS} , T _J ≤ 150° C, R _G = 20 Ω | 10 | V/ns |
| P _D | T _C = 25° C | 50 | W |
| T _J | | -55 ... +150 | °C |
| T _{JM} | | 150 | °C |
| T _{stg} | | -55 ... +150 | °C |
| T _L | 1.6 mm (0.062) from case for 10 s | 300 | °C |
| T _{SOLD} | Plastic body for 10 s | 260 | °C |
| Weight | TO-220 | 4.0 | g |
| | TO-252 | 0.35 | g |
| | TO-251 | 0.4 | g |

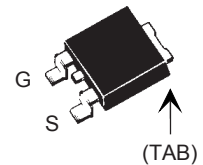
TO-220 (IXTP)



TO-251 (IXTU)



TO-252 (IXTY)



G = Gate D = Drain
S = Source TAB = Drain

| Symbol | Test Conditions (T _J = 25° C, unless otherwise specified) | Characteristic Values | | |
|---------------------|-------------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
| | | Min. | Typ. | Max. |
| BV _{DSS} | V _{GS} = 0 V, I _D = 25 μA | 600 | | V |
| V _{GS(th)} | V _{DS} = V _{GS} , I _D = 25 μA | 3.0 | | 5.5 V |
| I _{GSS} | V _{GS} = ±30 V _{DC} , V _{DS} = 0 | | | ±50 nA |
| I _{DSS} | V _{DS} = V _{DSS} , V _{GS} = 0 V, T _J = 125° C | | | 1 μA 20 μA |
| R _{DS(on)} | V _{GS} = 10 V, I _D = 0.5 I _{D25} Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 % | | | 9.0 Ω |

Features

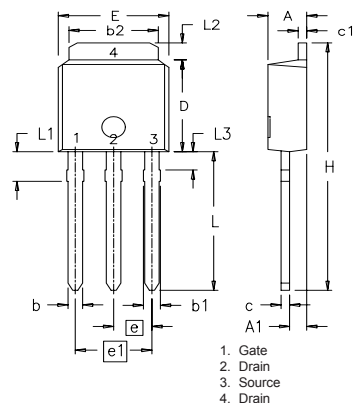
- † International standard packages
- † Unclamped Inductive Switching (UIS) rated
- † Low package inductance
- easy to drive and to protect

Advantages

- † Easy to mount
- † Space savings
- † High power density

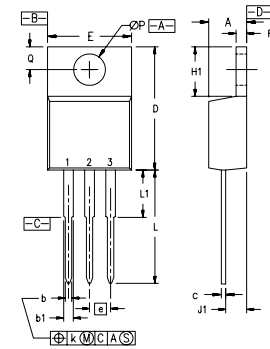
| Symbol | Test Conditions | Characteristic Values | | |
|--------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|------|-----------------------|
| | | $(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$ | | |
| | | Min. | Typ. | Max. |
| g_{fs} | $V_{DS} = 20\text{ V}; I_D = 0.5 I_{D25}, \text{ pulse test}$ | 0.7 | 1.1 | S |
| C_{iss} | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$ | | 140 | pF |
| C_{oss} | | | 17 | pF |
| C_{rss} | | | 2.4 | pF |
| $t_{d(on)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$ $R_G = 50\ \Omega \text{ (External)}$ | | 10 | ns |
| t_r | | | 16 | ns |
| $t_{d(off)}$ | | | 25 | ns |
| t_f | | | 16 | ns |
| $Q_{g(on)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$ | | 5.2 | nC |
| Q_{gs} | | | 1.34 | nC |
| Q_{gd} | | | 5.2 | nC |
| R_{thJC} | | | | 2.5°C/W |
| R_{thCS} | (TO-220) | | 0.25 | $^\circ\text{C/W}$ |
| R_{thCS} | (TO-251) | | 1.0 | $^\circ\text{C/W}$ |

| Symbol | Test Conditions | Characteristic Values | | |
|----------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|------|-------|
| | | $(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$ | | |
| | | Min. | Typ. | Max. |
| I_s | $V_{GS} = 0\text{ V}$ | | | 1.4 A |
| I_{SM} | Repetitive | | | 4 A |
| V_{SD} | $I_F = I_s, V_{GS} = 0\text{ V},$ Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $d \leq 2\%$ | | | 1.5 V |
| t_{rr} | $I_F = 1.5\text{ A}, -di/dt = 100\text{ A}/\mu\text{s}$ $V_R = 100\text{ V}, V_{GS} = 0\text{ V}$ | | 500 | ns |

TO-251 (IXTU) Outline


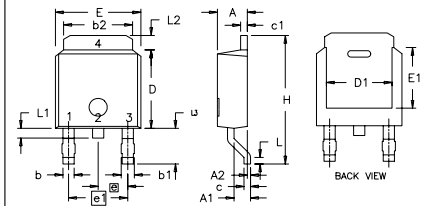
| Dim. | Millimeter | | Inches | |
|------|------------|-------|--------|------|
| | Min. | Max. | Min. | Max. |
| A | 2.19 | 2.38 | .086 | .094 |
| A1 | 0.89 | 1.14 | 0.35 | .045 |
| b | 0.64 | 0.89 | .025 | .035 |
| b1 | 0.76 | 1.14 | .030 | .045 |
| b2 | 5.21 | 5.46 | .205 | .215 |
| c | 0.46 | 0.58 | .018 | .023 |
| c1 | 0.46 | 0.58 | .018 | .023 |
| D | 5.97 | 6.22 | .235 | .245 |
| E | 6.35 | 6.73 | .250 | .265 |
| e | 2.28 | BSC | .090 | BSC |
| e1 | 4.57 | BSC | .180 | BSC |
| H | 17.02 | 17.78 | .670 | .700 |
| L | 8.89 | 9.65 | .350 | .380 |
| L1 | 1.91 | 2.28 | .075 | .090 |
| L2 | 0.89 | 1.27 | .035 | .050 |

1. Gate
2. Drain
3. Source
4. Drain

TO-220 (IXTP) Outline


- Pins: 1 - Gate 2,4 - Drain
3 - Source

| SYM | INCHES | | MILLIMETERS | |
|-----|--------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .170 | .190 | 4.32 | 4.83 |
| b | .025 | .040 | 0.64 | 1.02 |
| b1 | .045 | .065 | 1.15 | 1.65 |
| c | .014 | .022 | 0.35 | 0.56 |
| D | .580 | .630 | 14.73 | 16.00 |
| E | .390 | .420 | 9.91 | 10.66 |
| e | .100 | BSC | 2.54 | BSC |
| F | .045 | .055 | 1.14 | 1.40 |
| H1 | .230 | .270 | 5.85 | 6.85 |
| J1 | .090 | .110 | 2.29 | 2.79 |
| k | 0 | .015 | 0 | 0.38 |
| L | .500 | .550 | 12.70 | 13.97 |
| L1 | .110 | .230 | 2.79 | 5.84 |
| ØP | .139 | .161 | 3.53 | 4.08 |
| Q | .100 | .125 | 2.54 | 3.18 |

TO-252 AA (IXTY) Outline


| Dim. | Millimeter | | Inches | |
|------|------------|-------|--------|-------|
| | Min. | Max. | Min. | Max. |
| A | 2.19 | 2.38 | 0.086 | 0.094 |
| A1 | 0.89 | 1.14 | 0.035 | 0.045 |
| A2 | 0 | 0.13 | 0 | 0.005 |
| b | 0.64 | 0.89 | 0.025 | 0.035 |
| b1 | 0.76 | 1.14 | 0.030 | 0.045 |
| b2 | 5.21 | 5.46 | 0.205 | 0.215 |
| c | 0.46 | 0.58 | 0.018 | 0.023 |
| c1 | 0.46 | 0.58 | 0.018 | 0.023 |
| D | 5.97 | 6.22 | 0.235 | 0.245 |
| D1 | 4.32 | 5.21 | 0.170 | 0.205 |
| E | 6.35 | 6.73 | 0.250 | 0.265 |
| E1 | 4.32 | 5.21 | 0.170 | 0.205 |
| e | 2.28 | BSC | 0.090 | BSC |
| e1 | 4.57 | BSC | 0.180 | BSC |
| H | 9.40 | 10.42 | 0.370 | 0.410 |
| L | 0.51 | 1.02 | 0.020 | 0.040 |
| L1 | 0.64 | 1.02 | 0.025 | 0.040 |
| L2 | 0.89 | 1.27 | 0.035 | 0.050 |
| L3 | 2.54 | 2.92 | 0.100 | 0.115 |

IXYS reserves the right to change limits, test conditions, and dimensions.

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4,881,106 5,034,796 5,187,117 5,486,715 6,306,728 B1 6,583,505 6,710,463 6,771,478 B2

Fig. 1. Output Characteristics
@ 25°C

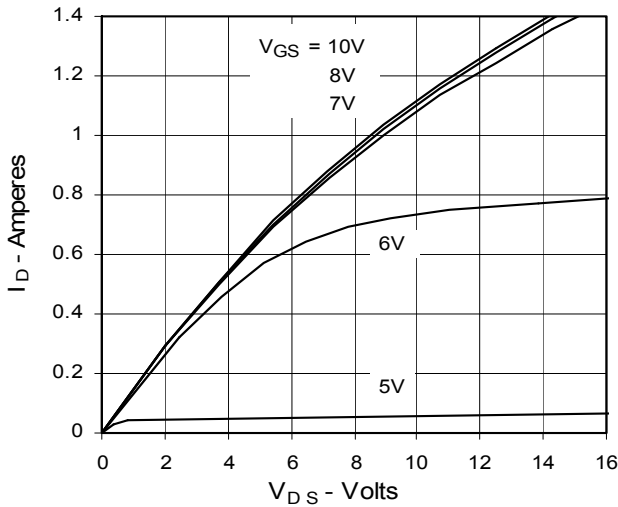


Fig. 2. Extended Output Characteristics
@ 25°C

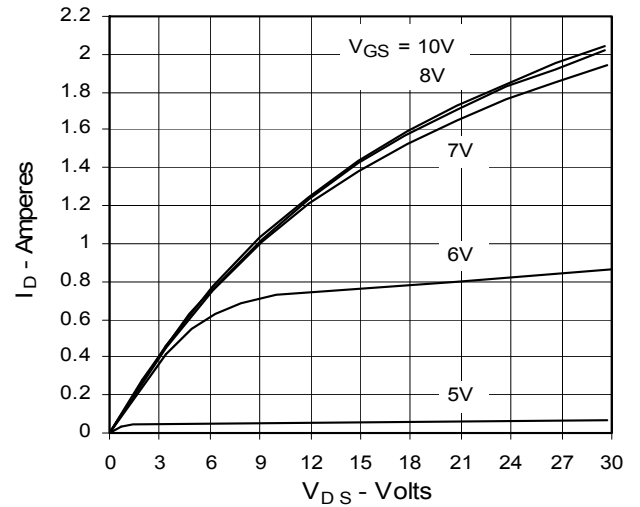


Fig. 3. Output Characteristics
@ 125°C

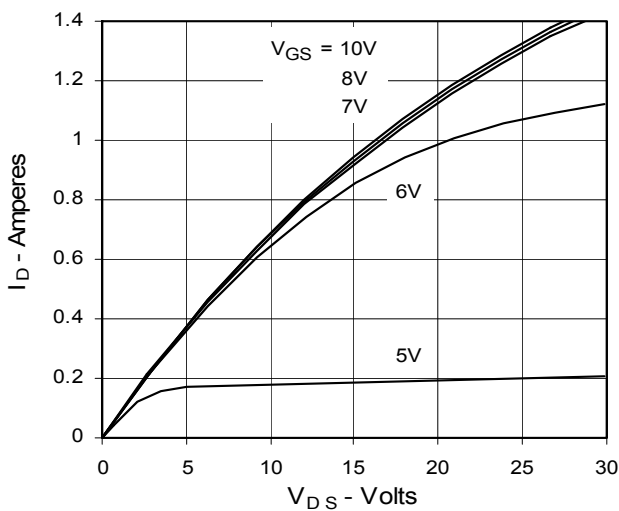


Fig. 4. $R_{DS(on)}$ Normalized to 0.5 I_{D25} Value vs. Junction Temperature

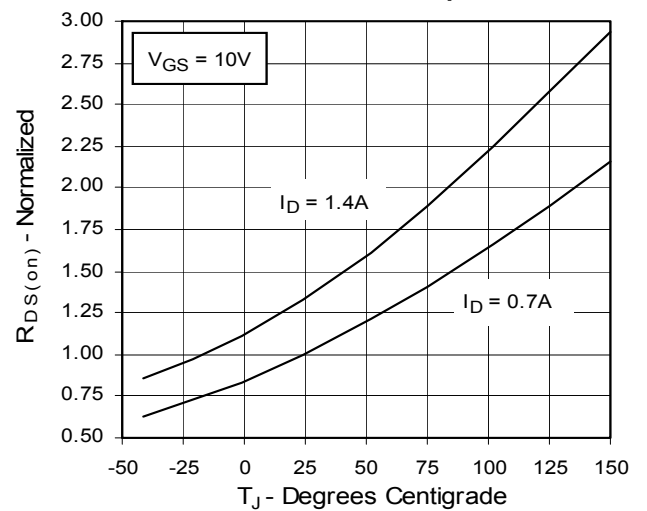


Fig. 5. $R_{DS(on)}$ Normalized to 0.5 I_{D25} Value vs. I_D

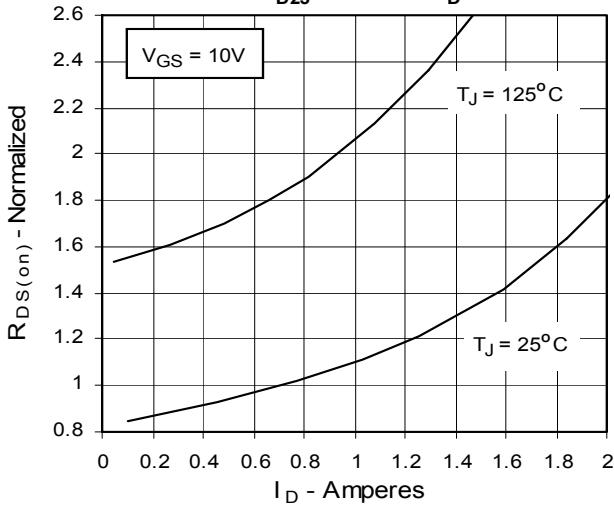


Fig. 6. Drain Current vs. Case Temperature

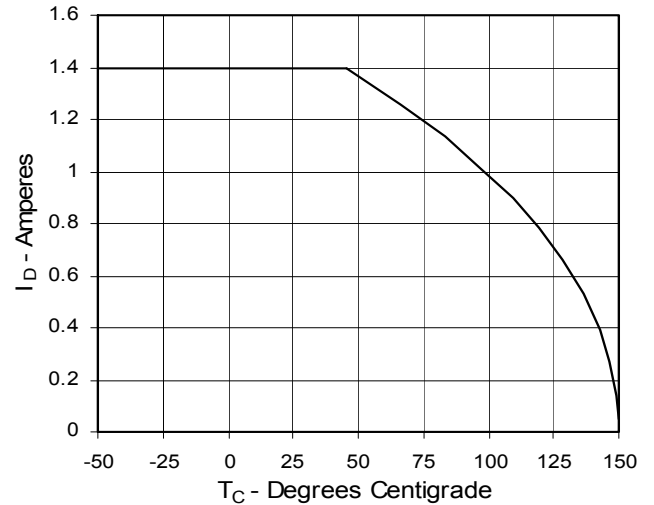


Fig. 7. Input Admittance

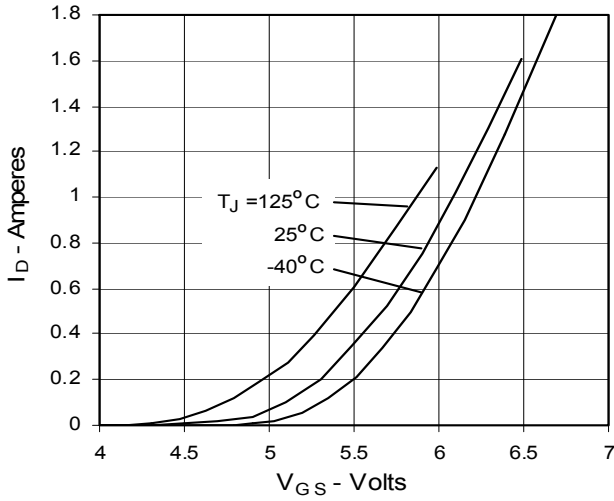


Fig. 8. Transconductance

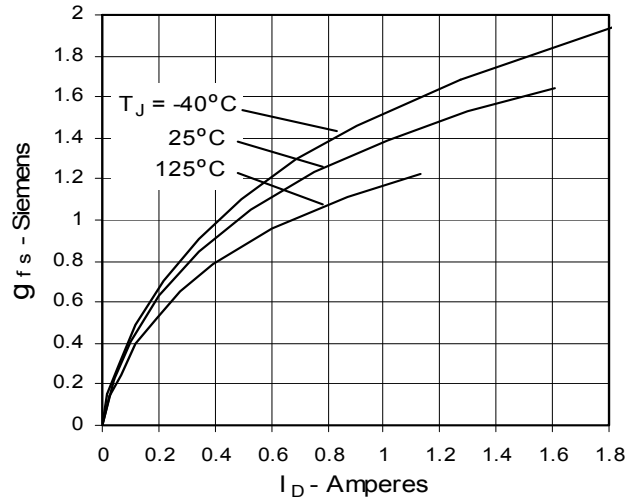


Fig. 9. Source Current vs. Source-To-Drain Voltage

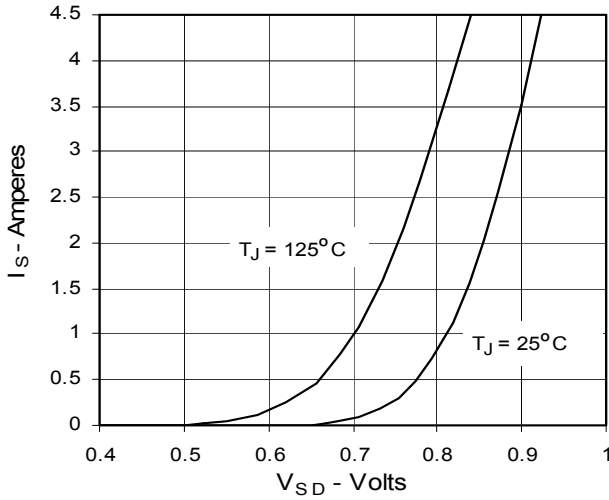


Fig. 10. Gate Charge

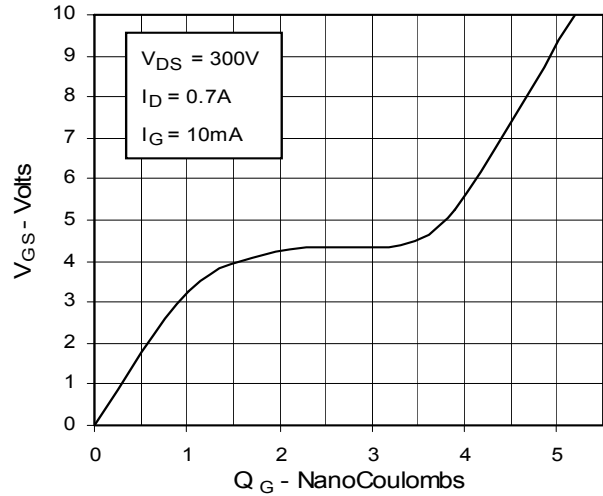


Fig. 11. Capacitance

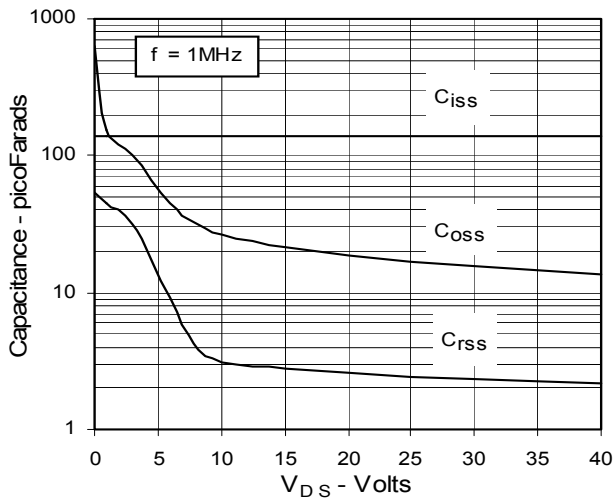
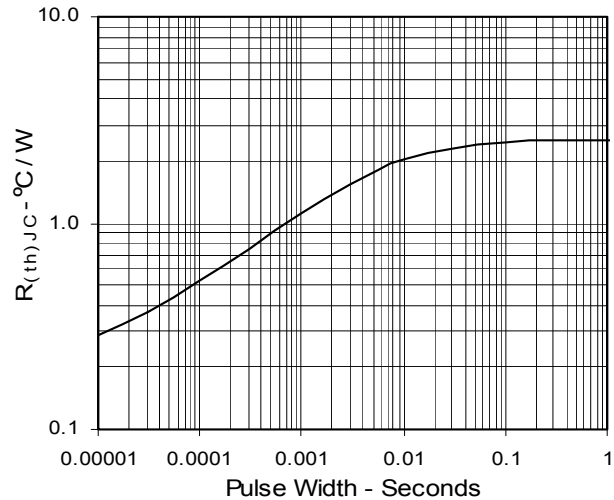


Fig. 12. Maximum Transient Thermal Resistance



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