

GENERAL DESCRIPTION

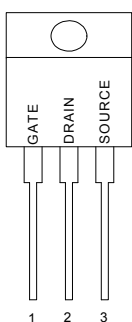
This advanced high voltage MOSFET is designed to withstand high energy in the avalanche mode and switch efficiently. This new high energy device also offers a drain-to-source diode with fast recovery time. Designed for high voltage, high speed switching applications such as power supplies, converters, power motor controls and bridge circuits.

FEATURES

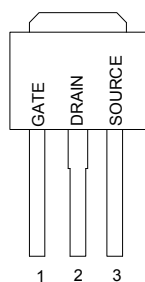
- ◆ Higher Current Rating
- ◆ Lower $R_{ds(on)}$
- ◆ Lower Capacitances
- ◆ Lower Total Gate Charge
- ◆ Tighter VSD Specifications
- ◆ Avalanche Energy Specified

PIN CONFIGURATION

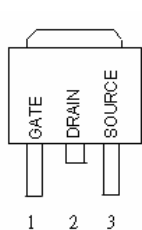
TO-220/TO-220FP
Top View



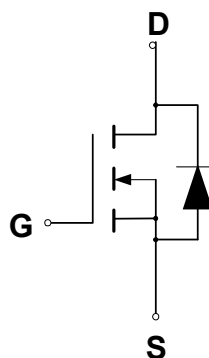
TO-251
Front View



TO-252
Front View



SYMBOL



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|----------------|------------|------|
| Drain to Current – Continuous | I_D | 1.5 | A |
| – Pulsed | I_{DM} | 4.5 | |
| Gate-to-Source Voltage – Continue | V_{GS} | ± 30 | V |
| Total Power Dissipation TO-251/TO-252 | $P_{D(TC)}$ | 38 | W |
| TO-220 | | 49 | |
| TO-220FP | | 19 | |
| Derate above 25°C TO-251/TO-252 | | 0.28 | |
| TO-220 | 0.36 | | |
| TO-220FP | 0.13 | | |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | °C |
| Single Pulse Drain-to-Source Avalanche Energy – $T_J = 25^\circ\text{C}$ ($V_{DD} = 100\text{V}, V_{GS} = 10\text{V}, I_L = 1.35\text{A}, L = 10\text{mH}, R_G = 25\Omega$) | E_{AS} | 9.11 | mJ |
| Thermal Resistance – Junction to Case TO-251/TO-252 | θ_{JC} | 3 | °C/W |
| TO-220 | | 2.76 | |
| TO220FP | | 5.9 | |
| – Junction to Ambient TO-251/TO-252 | θ_{JA} | 120 | |
| TO-220, TO-220FP | | 62.5 | |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds | T_L | 260 | °C |

ORDERING INFORMATION

| Part Number | Package |
|-------------------|---------------------|
| GPT02N65AGN220* | TO-220 |
| GPT02N65AGN220FP* | TO-220 Full Package |
| GPT02N65AGN251* | TO-251 |
| GPT02N65AGN252* | TO-252 |

*Note: G : Suffix for Pb Free Product

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, $T_J = 25^\circ\text{C}$.

| Characteristic | | Symbol | GPT02N65A | | | Units |
|---|--|---------------|-----------|------|-----|---------------|
| | | | Min | Typ | Max | |
| Drain-Source Breakdown Voltage ($V_{GS} = 0\text{ V}$, $I_D = 250\ \mu\text{A}$) | | $V_{(BR)DSS}$ | 650 | | | V |
| Drain-Source Leakage Current ($V_{DS} = 650\text{ V}$, $V_{GS} = 0\text{ V}$) | | I_{DSS} | | | 1 | μA |
| Gate-Source Leakage Current-Forward ($V_{gsf} = 30\text{ V}$, $V_{DS} = 0\text{ V}$) | | I_{GSSF} | | | 100 | nA |
| Gate-Source Leakage Current-Reverse ($V_{gsr} = -30\text{ V}$, $V_{DS} = 0\text{ V}$) | | I_{GSSR} | | | 100 | nA |
| Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$) | | $V_{GS(th)}$ | 2.5 | 3.5 | 4.5 | V |
| Static Drain-Source On-Resistance ($V_{GS} = 10\text{ V}$, $I_D = 1\text{ A}$) * | | $R_{DS(on)}$ | | | 7.7 | Ω |
| Forward Transconductance ($V_{DS} = 15\text{ V}$, $I_D = 1\text{ A}$) * | | g_{FS} | | 1.8 | | S |
| Input Capacitance | $(V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$) | C_{iss} | | 205 | | pF |
| Output Capacitance | | C_{oss} | | 22 | | pF |
| Reverse Transfer Capacitance | | C_{rss} | | 2 | | pF |
| Turn-On Delay Time | $(V_{DD} = 325\text{ V}$, $I_D = 2.0\text{ A}$, $V_{GS} = 10\text{ V}$, $R_G = 9.1\Omega$) * | $t_{d(on)}$ | | 11.8 | | ns |
| Rise Time | | t_r | | 12 | | ns |
| Turn-Off Delay Time | | $t_{d(off)}$ | | 24.8 | | ns |
| Fall Time | | t_f | | 12 | | ns |
| Total Gate Charge | $(V_{DS} = 520\text{ V}$, $I_D = 2.0\text{ A}$, $V_{GS} = 10\text{ V}$) * | Q_g | | 7.56 | | nC |
| Gate-Source Charge | | Q_{gs} | | 1.65 | | nC |
| Gate-Drain Charge | | Q_{gd} | | 4 | | nC |
| SOURCE-DRAIN DIODE CHARACTERISTICS | | | | | | |
| Forward On-Voltage(1) | $(I_S = 2.0\text{ A}$, $dI_S/dt = 100\text{ A}/\mu\text{s})$ | V_{SD} | | | 1.5 | V |
| Forward Turn-On Time | | t_{on} | | ** | | ns |
| Reverse Recovery Time | | t_{rr} | | 130 | | ns |

* Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$

** Negligible, Dominated by circuit inductance

TYPICAL ELECTRICAL CHARACTERISTICS

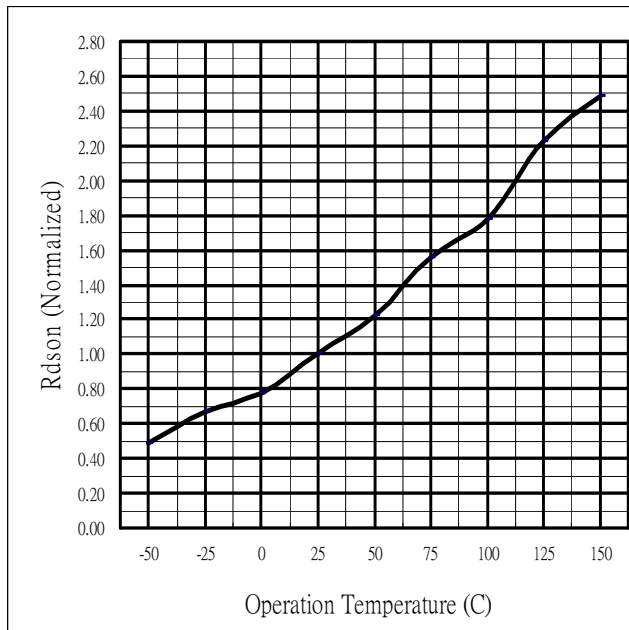


Fig 1. On-Resistance Variation with vs. Temperature

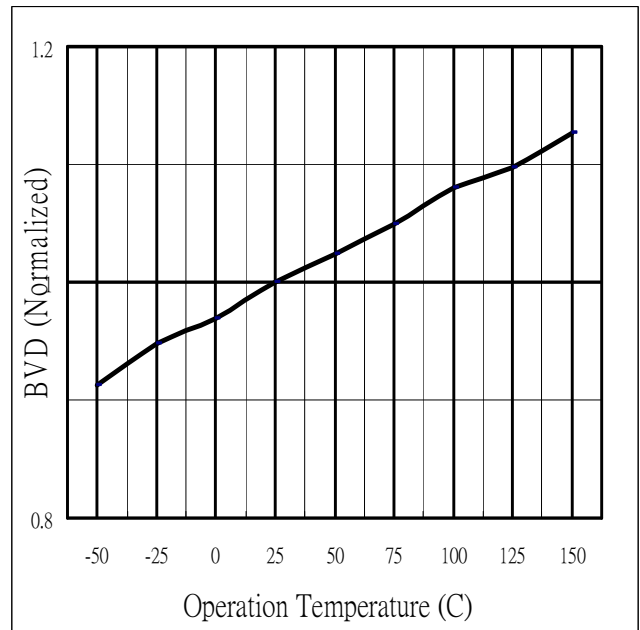


Fig.2 Breakdown Voltage Variation vs. Temperature

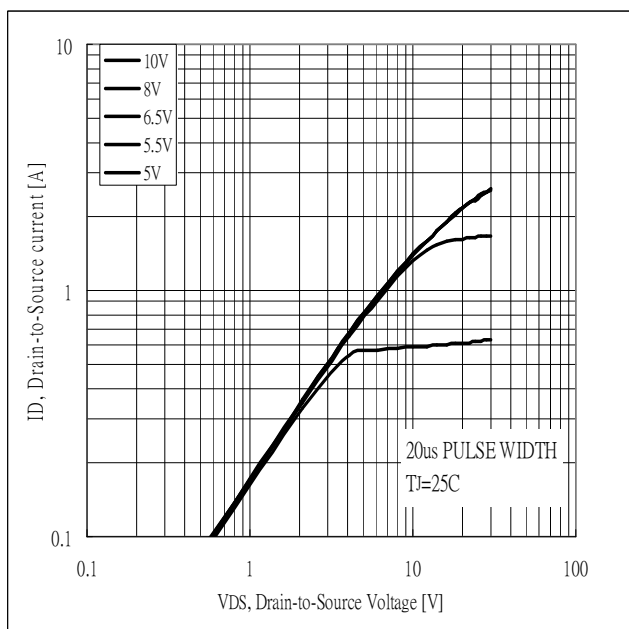


Fig 3. Typical Output Characteristics

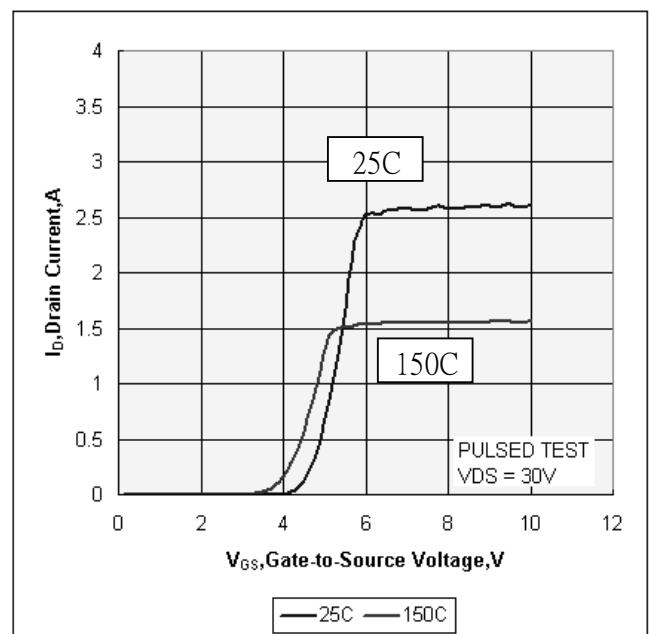


Fig 4. Typical Transfer Characteristics

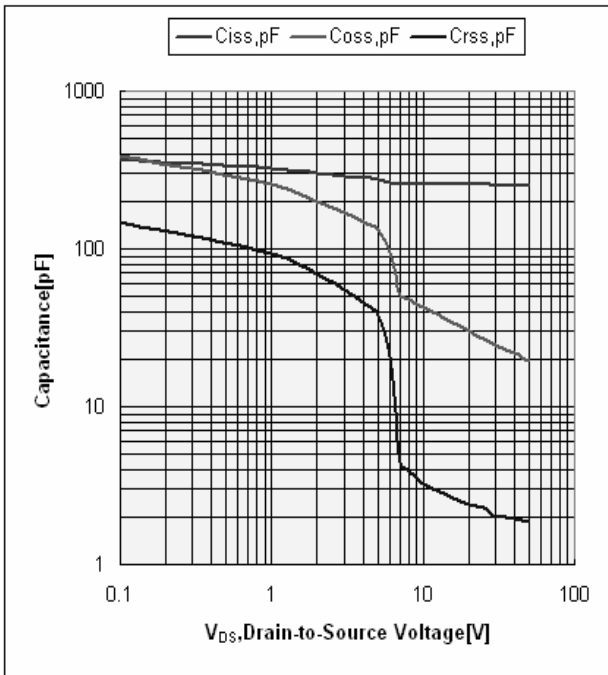


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

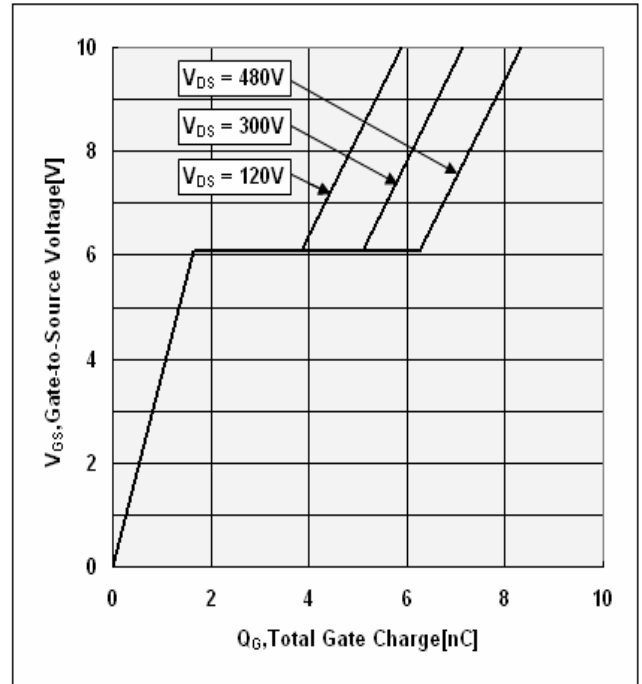
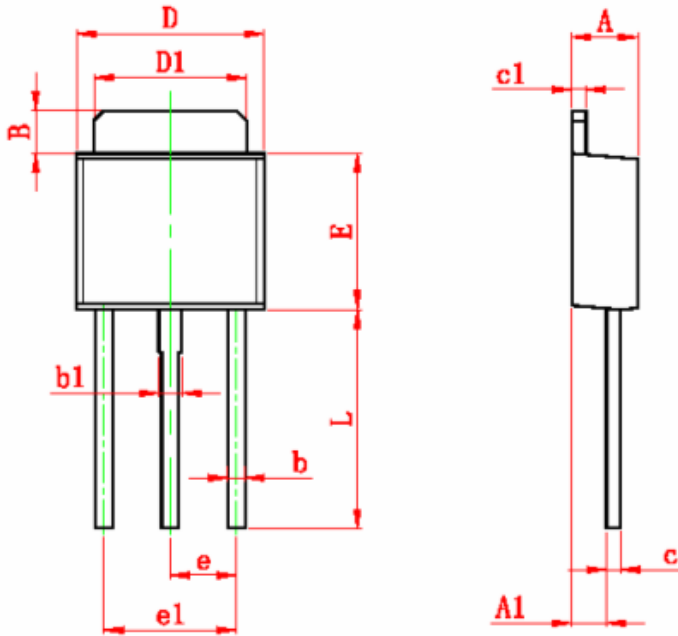


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

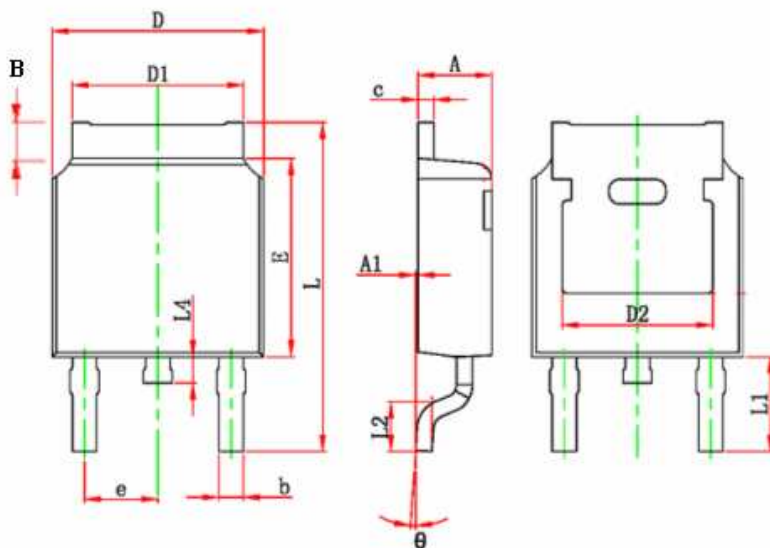
PACKAGE DIMENSION

TO-251



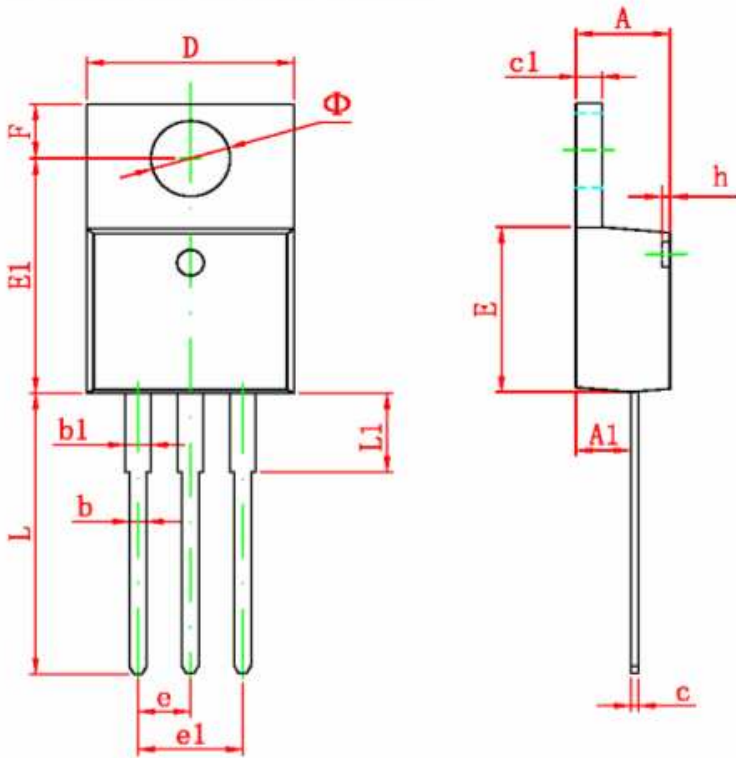
| Symbol | Dimensions In Millimeters | |
|--------|---------------------------|------|
| | Min. | Max |
| A | 2.10 | 2.50 |
| A1 | 0.90 | 1.35 |
| B | 0.90 | 1.65 |
| b | 0.45 | 0.75 |
| b1 | 0.65 | 0.95 |
| c | 0.40 | 0.60 |
| c1 | 0.40 | 0.60 |
| D | 6.30 | 6.80 |
| D1 | 5.00 | 5.50 |
| E | 5.40 | 6.30 |
| e | 2.3 TYP. | |
| e1 | 4.40 | 4.80 |
| L | 7.40 | 8.00 |

TO-252



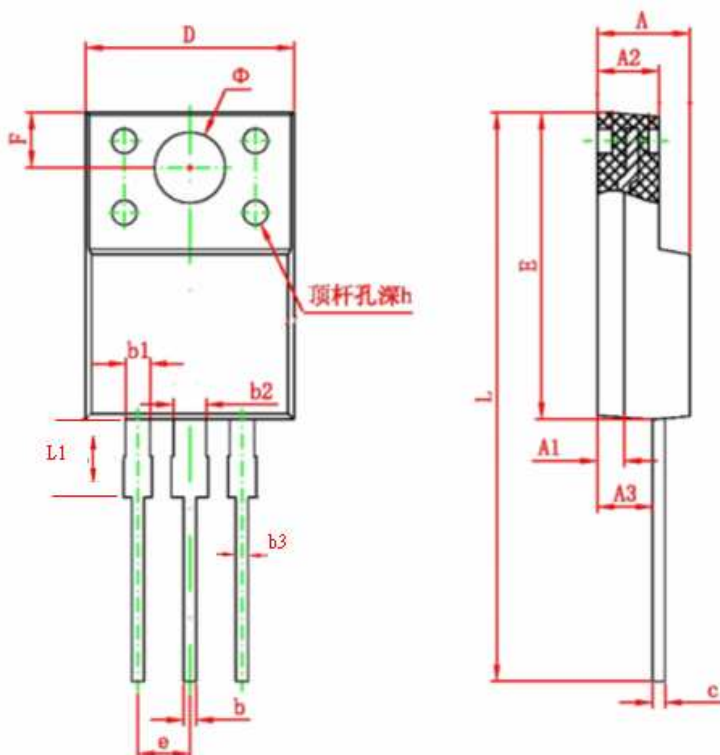
| Symbol | Dimensions In Millimeters | |
|--------|---------------------------|-------|
| | Min. | Max |
| A | 2.10 | 2.50 |
| A1 | 0.90 | 1.35 |
| B | 0.90 | 1.65 |
| b | 0.45 | 0.90 |
| c | 0.40 | 0.60 |
| D | 6.30 | 6.80 |
| D1 | 5.00 | 5.50 |
| D2 | 4.83 TYP. | |
| E | 5.90 | 6.30 |
| e | 2.3 TYP. | |
| L | 9.30 | 10.50 |
| L2 | 1.20 | 1.80 |
| L4 | 0.60 | 1.00 |
| θ | 0.00 | 10.00 |

TO-220



| Symbol | Dimensions In Millimeters | |
|--------|---------------------------|-------|
| | Min. | Max |
| A | 4.40 | 4.80 |
| A1 | 2.10 | 2.84 |
| b | 0.71 | 0.91 |
| b1 | 1.17 | 1.37 |
| c | 0.30 | 0.60 |
| c1 | 1.17 | 1.47 |
| D | 9.40 | 10.60 |
| E | 8.40 | 9.60 |
| e | 2.54 TYP. | |
| e1 | 4.90 | 5.60 |
| F | 3.00 REF. | |
| Φ | 3.50 REF. | |
| h | 0.00 | 0.30 |
| L | 12.50 | 14.00 |
| L1 | 3.50 | 4.00 |

TO-220FP



| Symbol | Dimensions In Millimeters | |
|--------|---------------------------|-------|
| | Min. | Max |
| A | 3.80 | 4.70 |
| A1 | 1.3 REF. | |
| A2 | 2.20 | 3.20 |
| A3 | 2.10 | 3.20 |
| b | 0.30 | 0.95 |
| b1 | 1.00 | 1.75 |
| b2 | 1.00 | 1.75 |
| b3 | 0.50 | 0.80 |
| c | 0.30 | 0.90 |
| D | 9.90 | 10.40 |
| E | 14.60 | 16.20 |
| e | 2.54 TYP. | |
| F | 3.00 REF. | |
| Φ | 3.50 REF. | |
| h | 0.00 | 0.30 |
| L | 28.00 | 30.00 |
| L1 | 3.20 | 3.55 |

IMPORTANT NOTICE

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