

Features

- $V_{DS} = 60V$ $I_D = 12A$
 $R_{DS(ON)} < 85 \text{ m}\Omega @ V_{GS} = 10V$

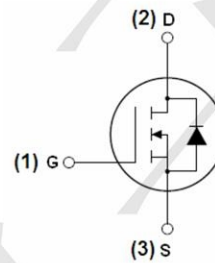
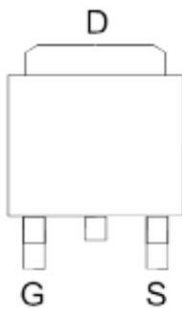
Application

- Battery protection
- Load switch
- Uninterruptible power supply

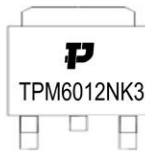
Package and Pin Configuration

(TO-252-3L)

Top View



Marking:



Absolute Maximum Ratings ($T_C = 25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Rating | Units |
|---------------------------------|--|------------|--------------------|
| V_{DS} | Drain-Source Voltage | 60 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| $I_D @ T_C = 25^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^1$ | 12 | A |
| $I_D @ T_C = 100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^1$ | 10 | A |
| $I_D @ T_A = 25^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^1$ | 5 | A |
| $I_D @ T_A = 70^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^1$ | 4 | A |
| I_{DM} | Pulsed Drain Current ² | 40 | A |
| EAS | Single Pulse Avalanche Energy ³ | 22 | mJ |
| I_{AS} | Avalanche Current | 21 | A |
| $P_D @ T_C = 25^\circ\text{C}$ | Total Power Dissipation ⁴ | 31.3 | W |
| $P_D @ T_A = 25^\circ\text{C}$ | Total Power Dissipation ⁴ | 2 | W |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ\text{C}$ |
| T_J | Operating Junction Temperature Range | -55 to 150 | $^\circ\text{C}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient ¹ | 62 | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case ¹ | 4 | $^\circ\text{C/W}$ |

Electrical Characteristics (T_A=25°C unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|--|---|------|-------|------|-------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =250uA | 60 | --- | --- | V |
| ΔBV _{DSS} /ΔT _J | BVDSS Temperature Coefficient | Reference to 25°C, I _D =1mA | --- | 0.044 | --- | V/°C |
| R _{DS(ON)} | Static Drain-Source On-Resistance ² | V _{GS} =10V, I _D =12A | --- | 65 | 85 | mΩ |
| | | V _{GS} =4.5V, I _D =7A | --- | 80 | 100 | |
| V _{GS(th)} | Gate Threshold Voltage | | 1.0 | --- | 2.5 | V |
| ΔV _{GS(th)} | V _{GS(th)} Temperature Coefficient | V _{GS} =V _{DS} , I _D =250uA | --- | -4.8 | --- | mV/°C |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} =48V, V _{GS} =0V, T _J =25°C | --- | --- | 1 | uA |
| | | V _{DS} =48V, V _{GS} =0V, T _J =55°C | --- | --- | 5 | |
| I _{GSS} | Gate-Source Leakage Current | V _{GS} =±20V, V _{DS} =0V | --- | --- | ±100 | nA |
| g _{fs} | Forward Transconductance | V _{DS} =5V, I _D =10A | --- | 25.3 | --- | S |
| R _g | Gate Resistance | V _{DS} =0V, V _{GS} =0V, f=1MHz | --- | 2.5 | --- | Ω |
| Q _g | Total Gate Charge (10V) | | --- | 19 | --- | nC |
| Q _{gs} | Gate-Source Charge | V _{DS} =48V, V _{GS} =10V, I _D =12A | --- | 2.5 | --- | |
| Q _{gd} | Gate-Drain Charge | | --- | 5 | --- | |
| T _{d(on)} | Turn-On Delay Time | | --- | 2.8 | --- | ns |
| T _r | Rise Time | V _{DD} =30V, V _{GS} =10V, R _G =3.3 | --- | 16.6 | --- | |
| T _{d(off)} | Turn-Off Delay Time | I _D =12A | --- | 21.2 | --- | |
| T _f | Fall Time | | --- | 5.6 | --- | |
| C _{iss} | Input Capacitance | | --- | 560 | --- | pF |
| C _{oss} | Output Capacitance | V _{DS} =15V, V _{GS} =0V, f=1MHz | --- | 65 | --- | |
| C _{rss} | Reverse Transfer Capacitance | | --- | 46 | --- | |
| I _S | Continuous Source Current ^{1,6} | V _G =V _D =0V, Force Current | --- | --- | 12 | A |
| I _{SM} | Pulsed Source Current ^{2,6} | | --- | --- | 40 | A |
| V _{SD} | Diode Forward Voltage ² | V _{GS} =0V, I _S =1A, T _J =25°C | --- | --- | 1.2 | V |
| t _{rr} | Reverse Recovery Time | I _F =12A, dl/dt=100A/μs, T _J =25°C | --- | 12.2 | --- | nS |
| Q _{rr} | Reverse Recovery Charge | | --- | 7.3 | --- | nC |

Typical Characteristics

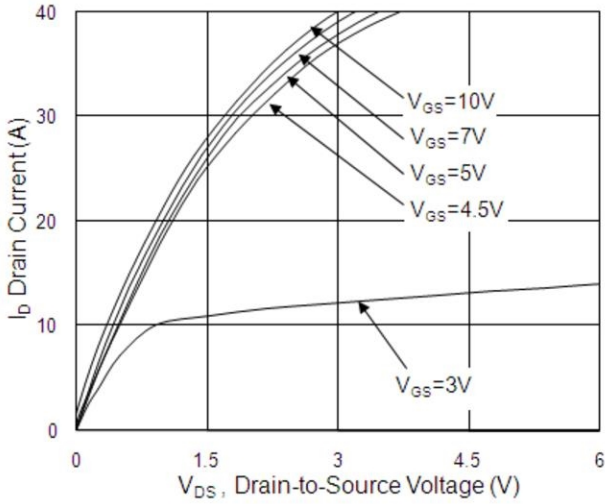


Fig.1 Typical Output Characteristics

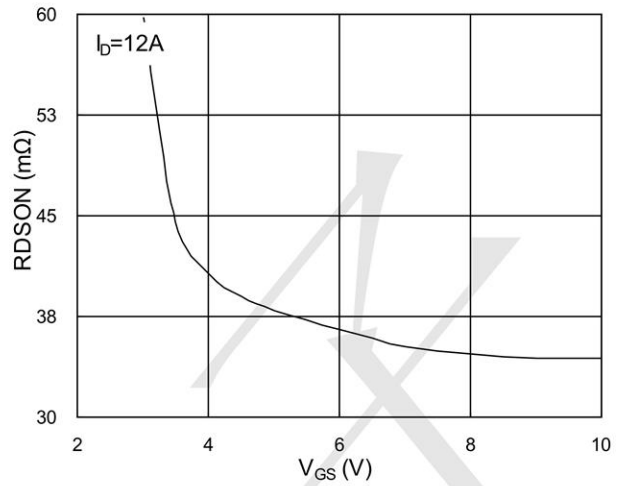


Fig.2 On-Resistance vs. Gate-Source

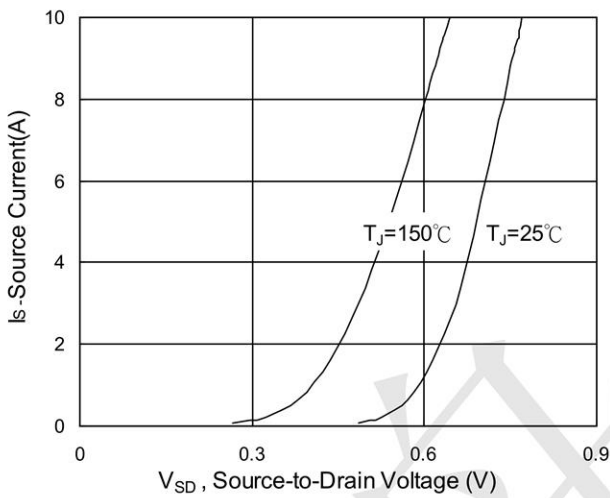


Fig.3 Forward Characteristics Of Reverse

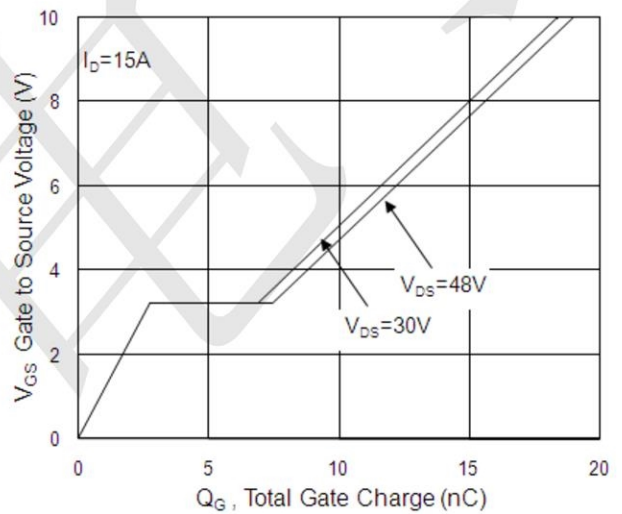


Fig.4 Gate-Charge Characteristics

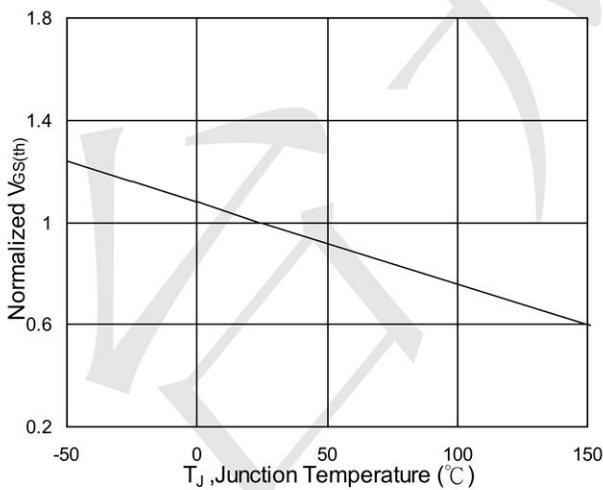


Fig.5 Normalized $V_{GS(th)}$ vs T_J

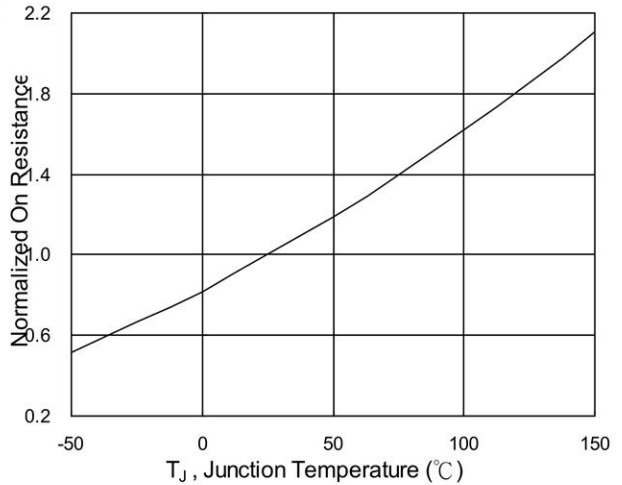


Fig.6 Normalized $R_{DS(on)}$ vs T_J

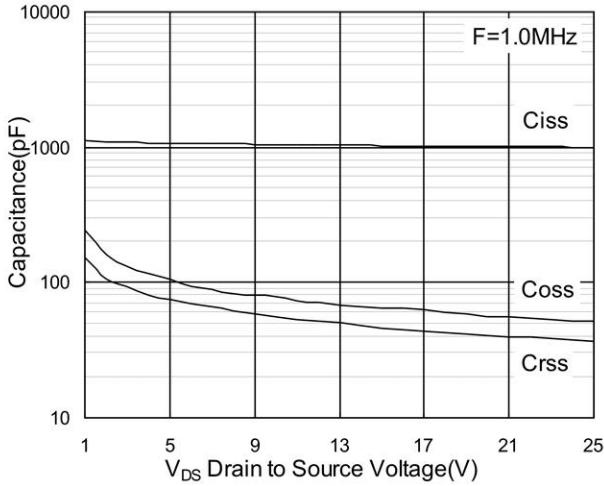


Fig.7 Capacitance

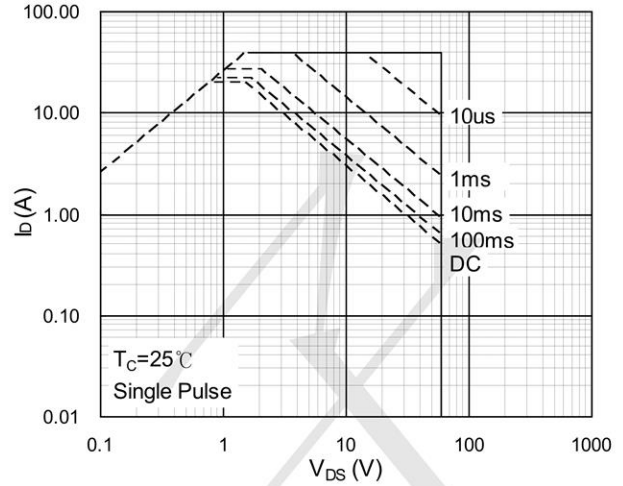


Fig.8 Safe Operating Area

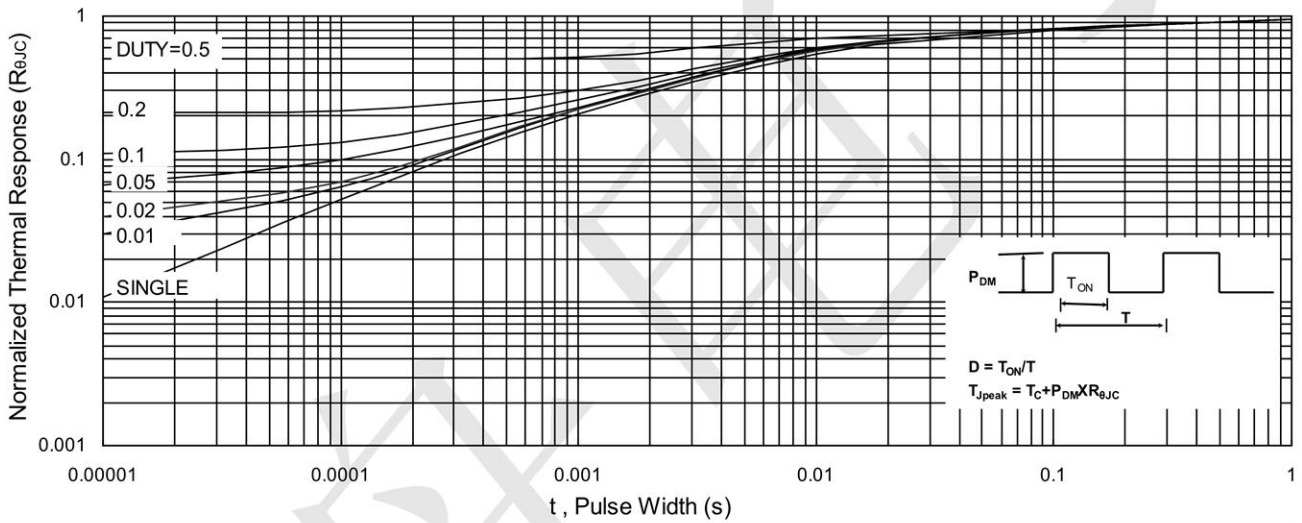


Fig.9 Normalized Maximum Transient Thermal Impedance

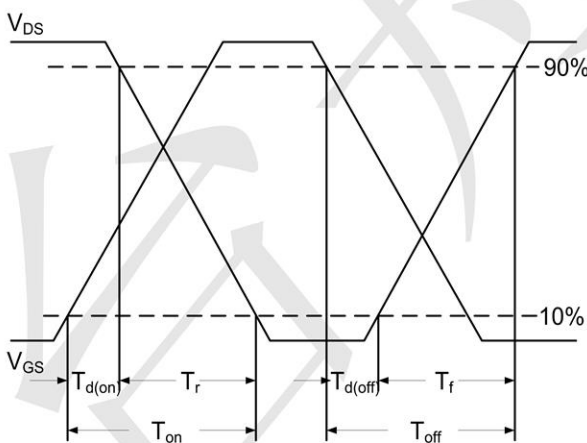


Fig.10 Switching Time Waveform

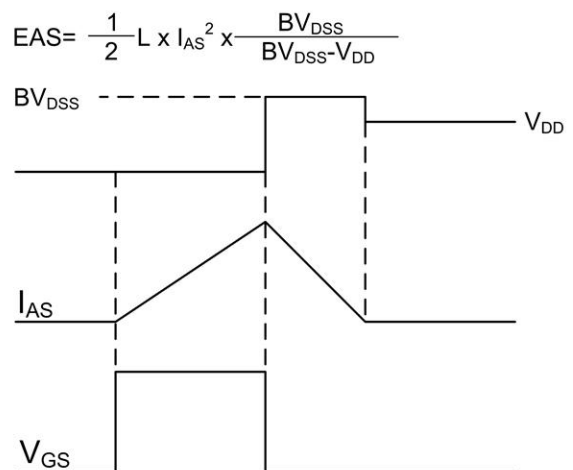
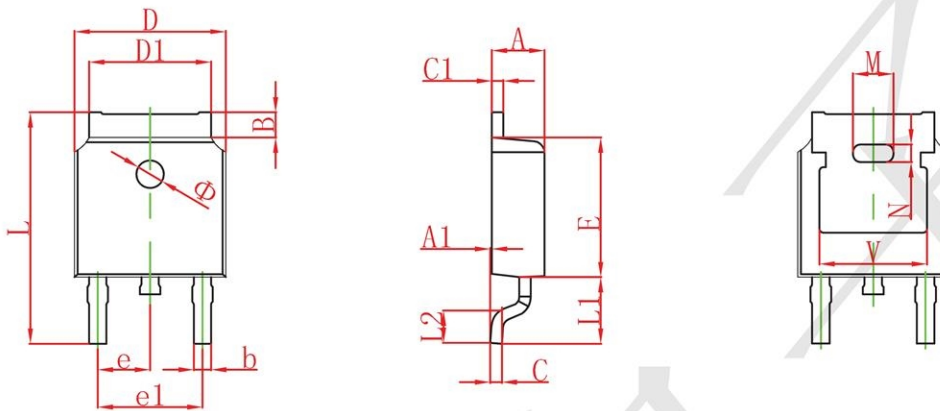


Fig.11 Unclamped Inductive Switching Waveform

$$EAS = \frac{1}{2} L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

TO252 Package Information



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 2.200 | 2.380 | 0.087 | 0.094 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| B | 0.800 | 1.400 | 0.031 | 0.055 |
| b | 0.710 | 0.810 | 0.028 | 0.032 |
| c | 0.460 | 0.560 | 0.018 | 0.022 |
| c1 | 0.460 | 0.560 | 0.018 | 0.022 |
| D | 6.500 | 6.700 | 0.256 | 0.264 |
| D1 | 5.130 | 5.460 | 0.202 | 0.215 |
| E | 6.000 | 6.200 | 0.236 | 0.244 |
| e | 2.286 TYP. | | 0.090 TYP. | |
| e1 | 4.327 | 4.727 | 0.170 | 0.186 |
| M | 1.778REF. | | 0.070REF. | |
| N | 0.762REF. | | 0.018REF. | |
| L | 9.800 | 10.400 | 0.386 | 0.409 |
| L1 | 2.9REF. | | 0.114REF. | |
| L2 | 1.400 | 1.700 | 0.055 | 0.067 |
| V | 4.830 REF. | | 0.190 REF. | |
| Φ | 1.100 | 1.300 | 0.043 | 0.051 |

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