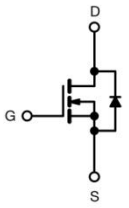
# N-channel Power MOSFET

| PRODUCT SUMMARY | | |
|---|---|---|
| $V_{DS}$ (V) at $T_J$ max. | 850 | |
| $R_{DS(on)}$ max. at 25°C (Ω) | $V_{GS}$=10V | 1.2 |
| $Q_g$ max. (nC) | 70 | |
| $Q_{gs}$ (nC) | 14 | |
| $Q_{gd}$ (nC) | 21 | |
| Configuration | single | |

## Features

- $I_D$=10A(Vgs=10V)
- Ultra Low Gate Charge
- Improved dv/dt Capability
- 100% Avalanche Tested
- RoHS compliant


TO-220F




Schematic diagram

## Applications

- Switching Mode Power Supplies (SMPS)
- PWM Motor Controls
- DC to DC Converters
- HID Lighting
- Bridge Circuits

| ORDERING INFORMATION | |
|---|---|
| Device | SPC10N80G |
| Device Package | TO-220F |
| Marking | 10N80G |

**ABSOLUTE MAXIMUM RATINGS** ($T_C$ = 25°C, unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain to Source Voltage | $V_{DSS}$ | 800 | V |
| Continuous Drain Current (@$T_C$=25°C) | $I_D$ | 10 (1) | A |
| Continuous Drain Current (@$T_C$=100°C) | | 6.2 (1) | A |
| Drain current pulsed (2) | $I_{DM}$ | 40 (1) | A |
| Gate to Source Voltage | $V_{GS}$ | 30 | V |
| Single pulsed Avalanche Energy (3) | $E_{AS}$ | 384 | mJ |
| Peak diode Recovery dv/dt (4) | dv/dt | 6 | V/ns |
| Total power dissipation (@$T_C$=25°C) | $P_D$ | 48 | W |
| Derating Factor above 25°C | | 0.384 | W/°C |
| Operating Junction Temperature & Storage Temperature | $T_{STG}$, $T_J$ | -55 to + 150 | °C |
| Maximum lead temperature for soldering purpose | $T_L$ | 260 | °C |
| Mounting torque (5) | | 0.4~0.6 | N.m |

Notes

1. Drain current is limited by maximum junction temperature.
2. Repetitive rating : pulse width limited by junction temperature.
3. L = 12mH, $I_{AS}$ =8A, $V_{DD}$ = 50V, $R_G$=25Ω, Starting at $T_J$ = 25°C
4. $I_{SD}$ ≤ 10A, di/dt = 100A/us, $V_{DD}$ ≤ $BV_{DSS}$, Starting at $T_J$ =25°C
5. Mounting consideration for TO220 Fullpack:
   M3 screw plus flat washer is suggested, free of burr between devices and contact area,
   the devices are to be mounted to a hole not larger than 3.6mm in contact diameter (chamfer included).



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| THERMAL CHARACTERISTICS | | | |
|---|---|---|---|
| **Parameter** | **Symbol** | **Value** | **Unit** |
| Thermal resistance, Junction to case | $R_{thjc}$ | 2.4 | °C/W |
| Thermal resistance, Junction to ambient | $R_{thja}$ | 43 | °C/W |

| ELECTRICAL CHARACTERISTICS ( $T_C$ = 25°C unless otherwise specified ) | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test conditions** | **Min.** | **Typ.** | **Max.** | **Unit** |
| **Off Characteristics** | | | | | | |
| Drain to source breakdown voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250uA | 800 | -- | -- | V |
| Breakdown voltage temperature coefficient | $\Delta BV_{DSS}$ / $\Delta TJ$ | $I_D$=250uA, referenced to 25°C | -- | 0.42 | -- | V/°C |
| Drain to source leakage current | $I_{DSS}$ | $V_{DS}$=800V, $V_{GS}$=0V | -- | -- | 1 | uA |
| | | $V_{DS}$=640V, $T_C$=125°C | -- | -- | 50 | uA |
| Gate to source leakage current, forward | $I_{GSS}$ | $V_{GS}$=30V, $V_{DS}$=0V | -- | -- | 100 | nA |
| Gate to source leakage current, reverse | | $V_{GS}$=-30V, $V_{DS}$=0V | -- | -- | -100 | nA |
| **On Characteristics** | | | | | | |
| Gate threshold voltage | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250uA | 2 | -- | 4 | V |
| Drain to source on state resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$ =5A | -- | 1.0 | 1.2 | Ω |
| Forward Transconductance | Gfs | $V_{DS}$ = 30 V, $I_D$ = 5 A | -- | 8.5 | -- | S |
| **Dynamic Characteristics** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=25V, f=1MHz | -- | 1996 | -- | pF |
| Output capacitance | $C_{oss}$ | | -- | 136 | -- | |
| Reverse transfer capacitance | $C_{rss}$ | | -- | 27 | -- | |
| Turn on delay time | $t_{d(on)}$ | $V_{DS}$=400V, $I_D$=10A , $R_G$=25Ω | -- | 16.2 | -- | ns |
| Rising time | tr | | -- | 39.6 | -- | |
| Turn off delay time | $t_{d(off)}$ | | -- | 62 | -- | |
| Fall time | $t_f$ | | -- | 48 | -- | |
| Total gate charge | $Q_g$ | $V_{DS}$=640V, $V_{GS}$=10V, $I_D$=10A | -- | 52 | -- | nC |
| Gate-source charge | $Q_{gs}$ | | -- | 13.5 | -- | |
| Gate-drain charge | $Q_{gd}$ | | ---- | 21.1 | -- | |

| SOURCE TO DRAIN DIODE RATINGS CHARACTERISTICS | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test conditions** | **Min.** | **Typ.** | **Max.** | **Unit** |
| Continuous source current | $I_S$ | Integral reverse p-n Junction diode in the MOSFET | -- | -- | 7 | A |
| Pulsed source current | $I_{SM}$ | | -- | -- | 28 | A |
| Diode forward voltage drop. | $V_{SD}$ | $I_S$=10A, $V_{GS}$=0V | -- | -- | 1.2 | V |
| Reverse recovery time | $T_{rr}$ | $I_S$=10A, $V_{GS}$=0V, $dI_F/dt$=100A/us | -- | 578 | -- | ns |
| Reverse recovery Charge | Qrr | | -- | 6.5 | -- | uC |



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**Fig1. Output characteristics**

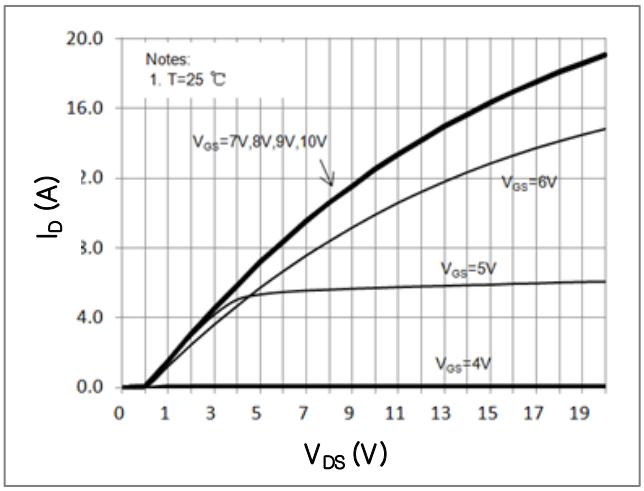


**Fig2. Drain-source on-state resistance**

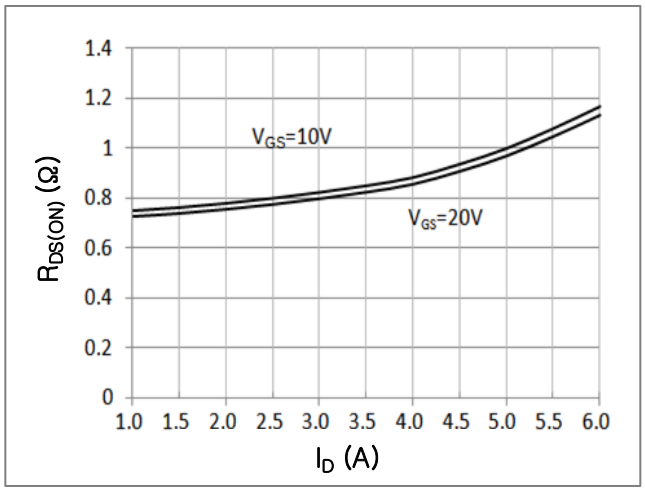


**Fig3. Gate charge characteristics**

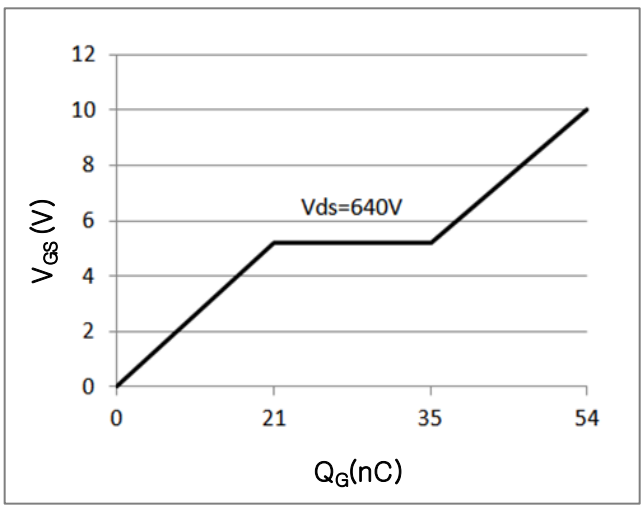


**Fig 4. Capacitance Characteristics**

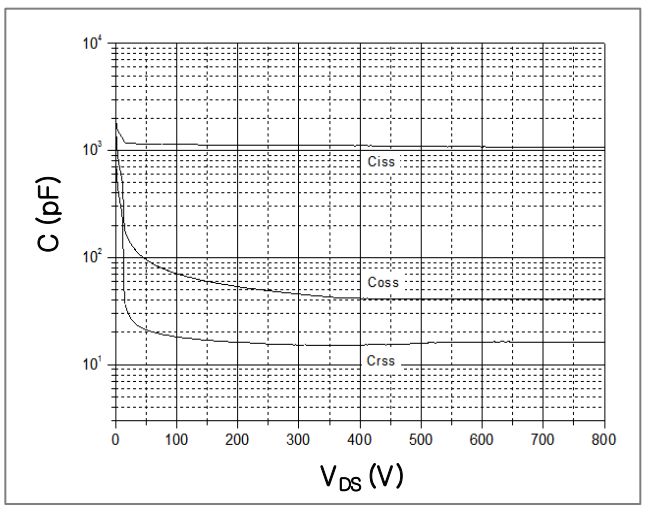


**Fig 5. $R_{DS(ON)}$ vs junction temperature**

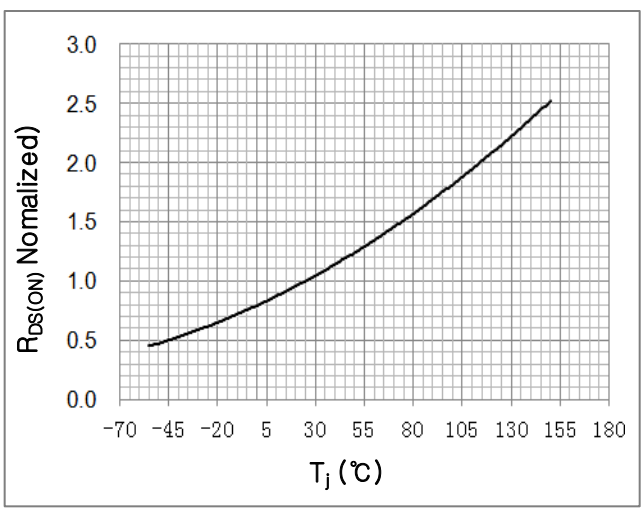


**Fig 6. $BV_{DSS}$ vs junction temperature**

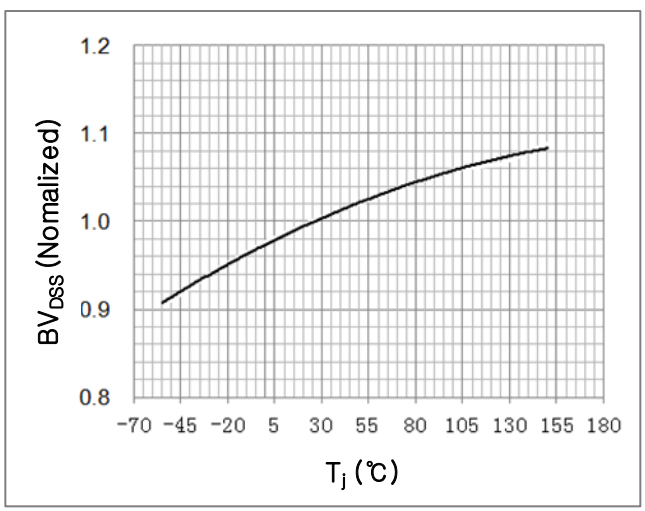



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**Fig 7 . Safe operating area**

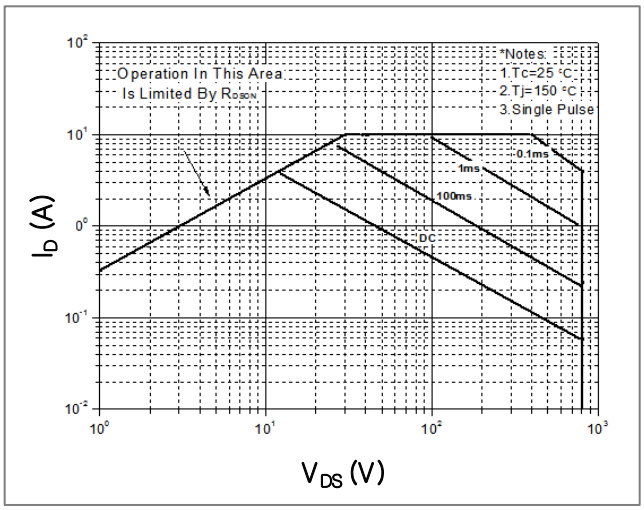



**Fig 8 . Transient thermal impedance**

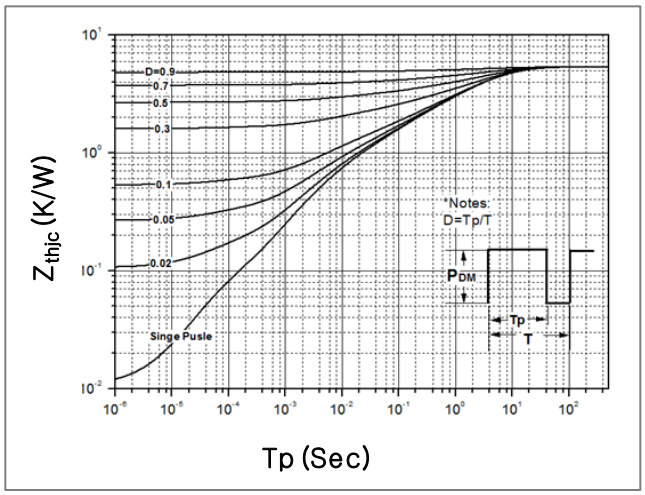



**Fig 9. Forward characteristics of reverse diode**

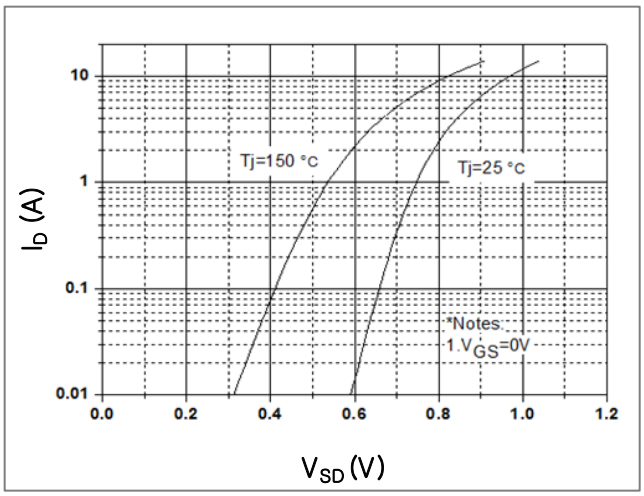
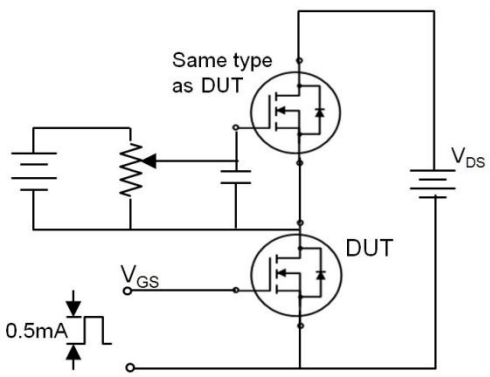



**Fig 10. Gate charge test circuit & waveform**



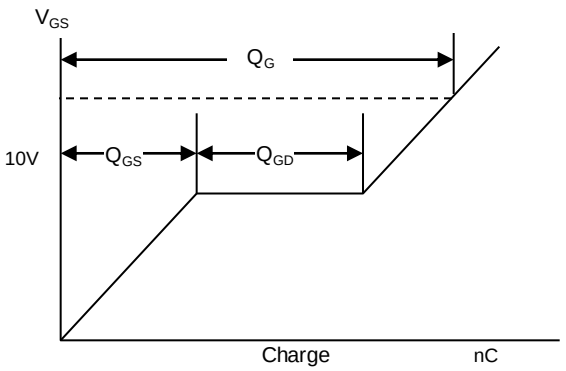





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**Fig 11. Switching time test circuit & waveform**

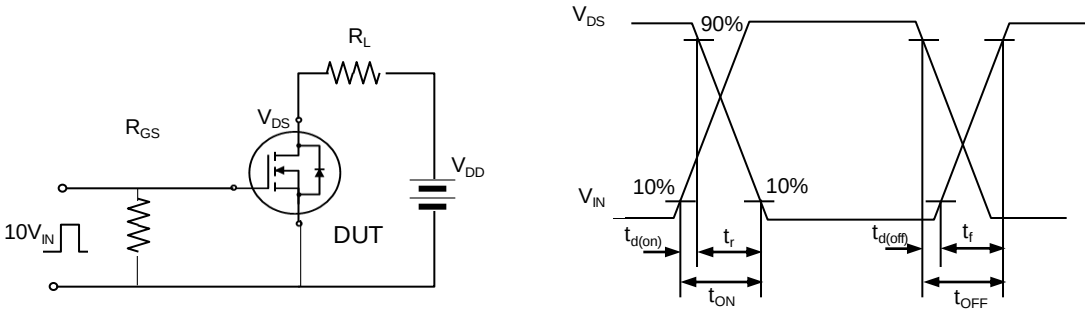



**Fig 12. Unclamped Inductive switching test circuit & waveform**

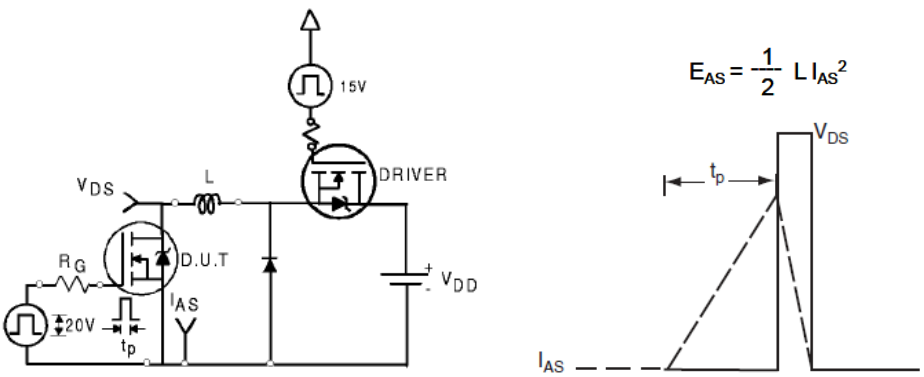
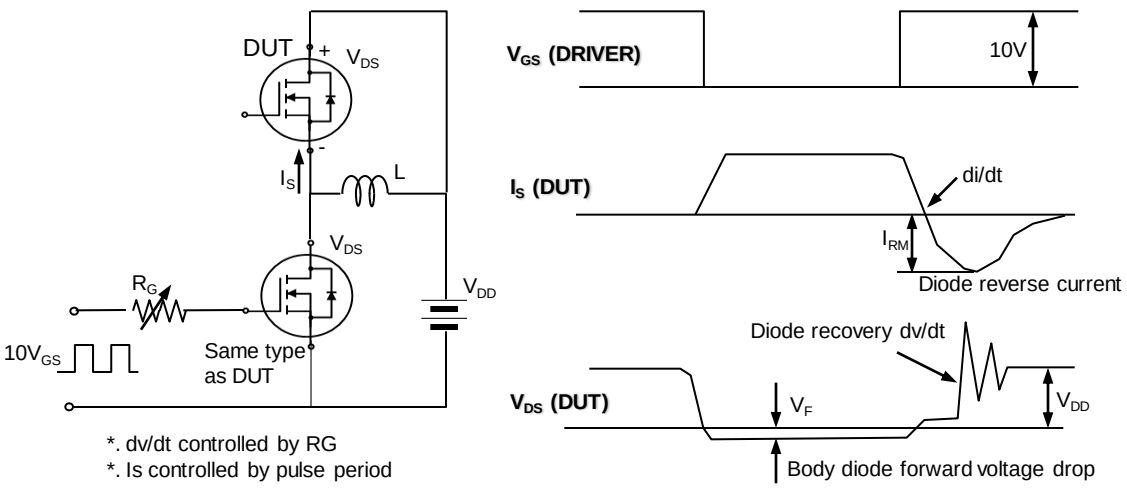



**Fig 13. Peak diode recovery dv/dt test circuit & waveform**





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