

## Isc N-Channel MOSFET Transistor

## MS4N1350

## • FEATURES

- With TO-3PML package
- Low input capacitance and gate charge
- Low gate input resistance
- 100% avalanche tested
- Minimum Lot-to-Lot variations for robust device performance and reliable operation

## • APPLICATIONS

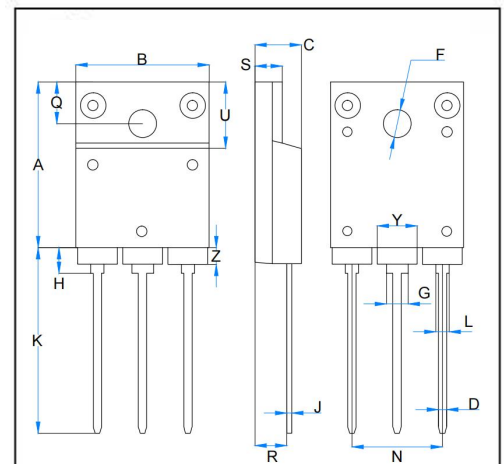
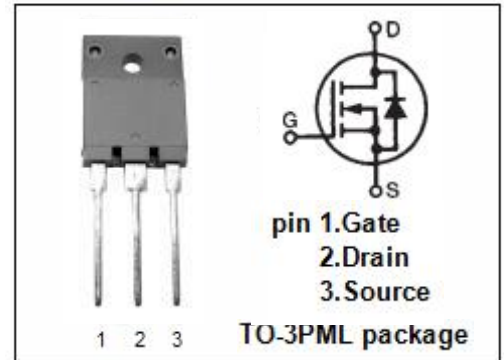
- Switching applications
- Load switch
- Power management

## • ABSOLUTE MAXIMUM RATINGS(TC=25°C)

| SYMBOL    | PARAMETER                                       | VALUE    | UNIT             |
|-----------|-------------------------------------------------|----------|------------------|
| $V_{DSS}$ | Drain-Source Voltage                            | 1500     | V                |
| $V_{GSS}$ | Gate-Source Voltage                             | $\pm 30$ | V                |
| $I_D$     | Drain Current-Continuous $T_c=25^\circ\text{C}$ | 4        | A                |
| $I_{DM}$  | Drain Current-Single Pulsed                     | 10       | A                |
| $P_D$     | Total Dissipation @ $T_c=25^\circ\text{C}$      | 140      | W                |
| $T_j$     | Max. Operating Junction Temperature             | 150      | $^\circ\text{C}$ |
| $T_{stg}$ | Storage Temperature                             | -55~150  | $^\circ\text{C}$ |

## • THERMAL CHARACTERISTICS

| SYMBOL         | PARAMETER                          | MAX | UNIT               |
|----------------|------------------------------------|-----|--------------------|
| $R_{th(ch-c)}$ | Channel-to-case thermal resistance | 2.0 | $^\circ\text{C/W}$ |



| DIM | mm        |       |
|-----|-----------|-------|
|     | Min       | Max   |
| A   | 19.90     | 20.10 |
| B   | 15.75     | 16.10 |
| C   | 5.50      | 5.70  |
| D   | 0.90      | 1.10  |
| F   | 3.30      | 3.50  |
| G   | 2.60±0.05 |       |
| H   | 2.70±0.05 |       |
| J   | 0.60      | 0.70  |
| K   | 21.10     | 22.50 |
| L   | 1.60±0.05 |       |
| N   | 10.80     | 11.00 |
| Q   | 4.90      | 5.10  |
| R   | 3.75      | 3.95  |
| S   | 3.20      | 3.60  |
| U   | 9.90      | 10.10 |
| Y   | 4.20      | 4.90  |
| Z   | 1.90      | 2.10  |

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## ELECTRICAL CHARACTERISTICS

 $T_C=25^{\circ}\text{C}$  unless otherwise specified

| SYMBOL       | PARAMETER                      | CONDITIONS                            | MIN  | Typ | MAX       | UNIT          |
|--------------|--------------------------------|---------------------------------------|------|-----|-----------|---------------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage | $V_{GS}=0V$ ; $I_D=1\text{mA}$        | 1500 | --  | --        | V             |
| $V_{GS(th)}$ | Gate Threshold Voltage         | $V_{DS}=V_{GS}$ ; $I_D=0.25\text{mA}$ | 3.0  | --  | 6.0       | V             |
| $R_{DS(on)}$ | Drain-Source On-Resistance     | $V_{GS}=10V$ ; $I_D=1.3\text{A}$      | --   | --  | 9         | $\Omega$      |
| $I_{GSS}$    | Gate-Source Leakage Current    | $V_{GS}=\pm 30V$ ; $V_{DS}=0V$        | --   | --  | $\pm 100$ | nA            |
| $I_{DSS}$    | Drain-Source Leakage Current   | $V_{DS}=1500V$ ; $V_{GS}=0V$ ;        | --   | --  | 10        | $\mu\text{A}$ |

## DYNAMIC CHARACTERISTICS

|           |                               |                                                                        |    |      |    |          |
|-----------|-------------------------------|------------------------------------------------------------------------|----|------|----|----------|
| $C_{iss}$ | Input Capacitance             | $V_{GS}=0V$ ,<br>$V_{DS}=25V$ ,<br>$f=1.0\text{MHz}$                   | -- | 1600 | -- | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance  |                                                                        | -- | 33   | -- |          |
| $C_{oss}$ | Output Capacitance            |                                                                        | -- | 100  | -- |          |
| $R_g$     | Gate input resistance         | $f=1\text{MHz}$ Gate DC Bias=0<br>Test signal level=20mV<br>open drain | -- | 4.5  | -- | $\Omega$ |
| $Q_g$     | Total Gate Charge             | $V_{DD}=750V$ ,<br>$I_D=3A$ , $V_{GS}=0$ to $10V$                      | -- | 36   | -- | nC       |
| $Q_{gs}$  | Gate-to-Source Charge         |                                                                        | -- | 9.5  | -- |          |
| $Q_{gd}$  | Gate-to-Drain (Miller) Charge |                                                                        | -- | 12   | -- |          |

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## RESISTIVE SWITCHING CHARACTERISTICS

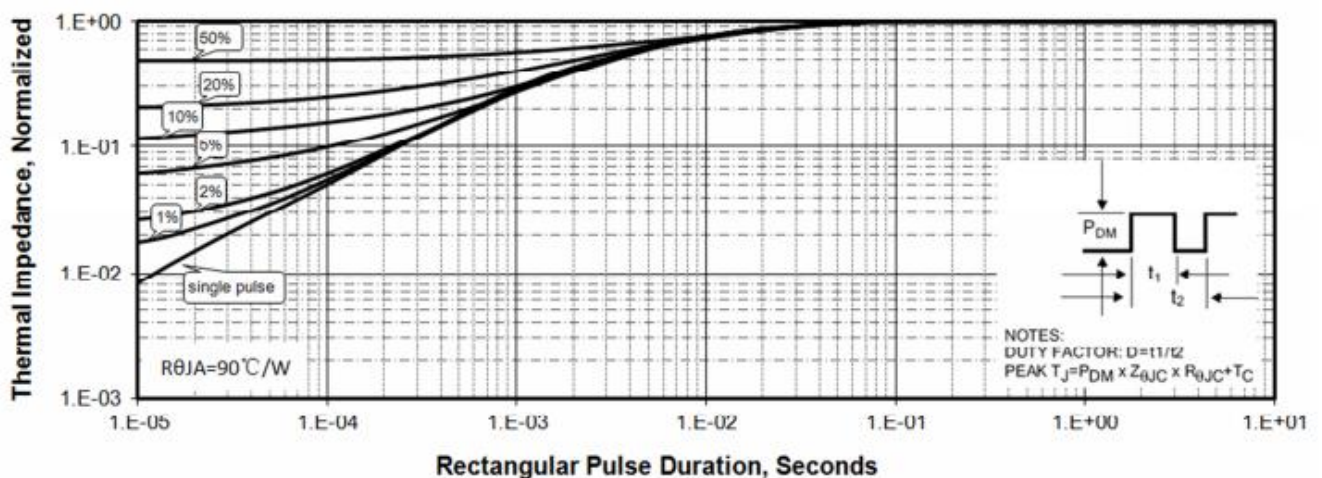
| SYMBOL       | PARAMETER           | CONDITIONS                                                       | MIN | Typ | MAX | UNIT |
|--------------|---------------------|------------------------------------------------------------------|-----|-----|-----|------|
| $t_{d(ON)}$  | Turn-on Delay Time  | $V_{DD}=750V$ ,<br>$I_D=3A$ ,<br>$V_{GS}=10V$<br>$R_g=4.7\Omega$ | --  | 25  | --  | ns   |
| $t_r$        | Rise Time           |                                                                  | --  | 48  | --  |      |
| $t_{d(OFF)}$ | Turn-Off Delay Time |                                                                  | --  | 57  | --  |      |
| $t_f$        | Fall Time           |                                                                  | --  | 52  | --  |      |

## SOURCE-DRAIN BODY DIODE CHARACTERISTICS

|          |                           |                                              |    |     |      |         |
|----------|---------------------------|----------------------------------------------|----|-----|------|---------|
| $I_{SD}$ | Continuous Source Current | Integral pn-diode<br>in MOSFET               | -- | --  | 4    | A       |
| $I_{SM}$ | Pulsed Source Current     |                                              | -- | --  | 10   |         |
| $V_{SD}$ | Diode Forward Voltage     | $I_{SD}=4A$ , $V_{GS}=0V$                    | -- | --  | 1.63 | V       |
| $t_{rr}$ | Reverse Recovery Time     | $V_{GS}=0V$<br>$I_F=4A$ , $di/dt=100A/\mu s$ | -- | 255 | --   | ns      |
| $Q_{rr}$ | Reverse Recovery Charge   |                                              | -- | 1.1 | --   | $\mu C$ |

## TYPICAL CHARACTERISTICS

Figure 1. Maximum Transient Thermal Impedance



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Figure 2 . Max. Power Dissipation vs Case Temperature

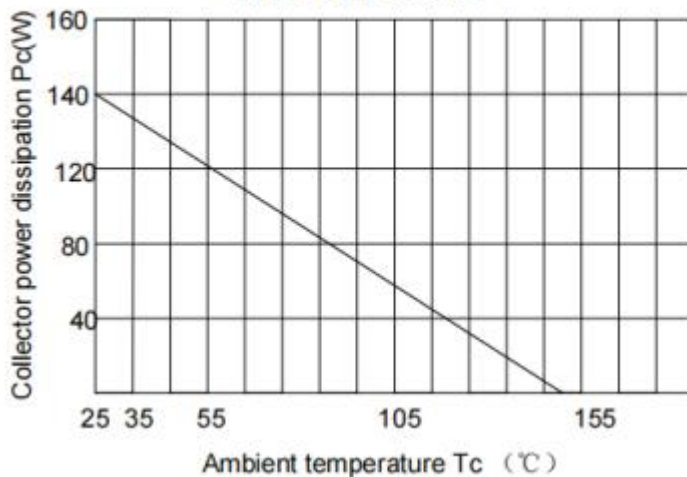


Figure 3 . Output Characteristics

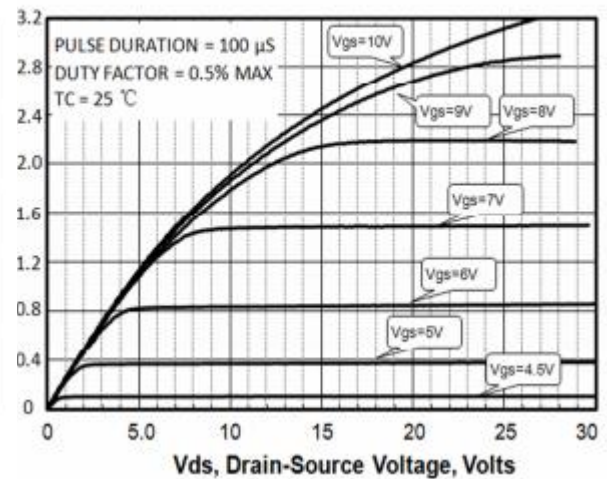
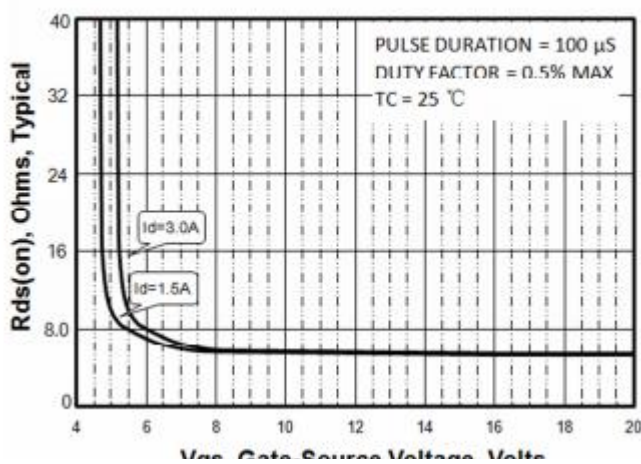
Figure 4.  $R_{ds(on)}$  vs Gate Voltage

Figure 5. Drain to Source ON Resistance vs Drain Current

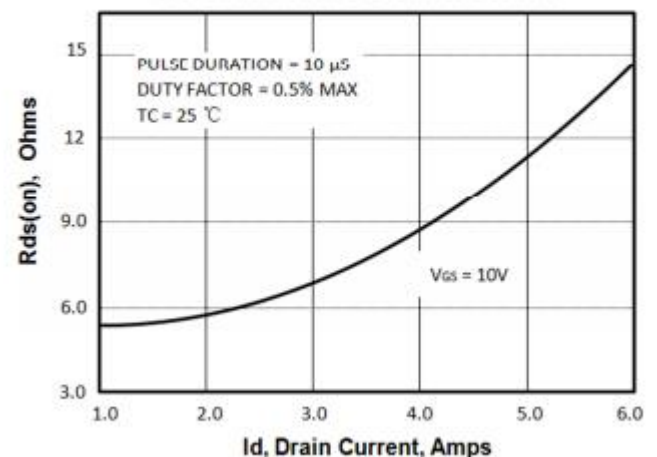
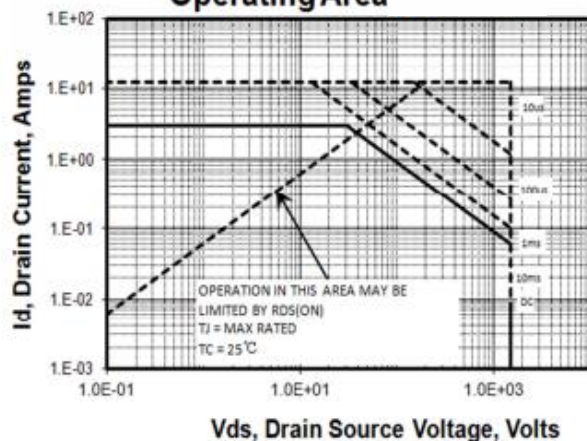
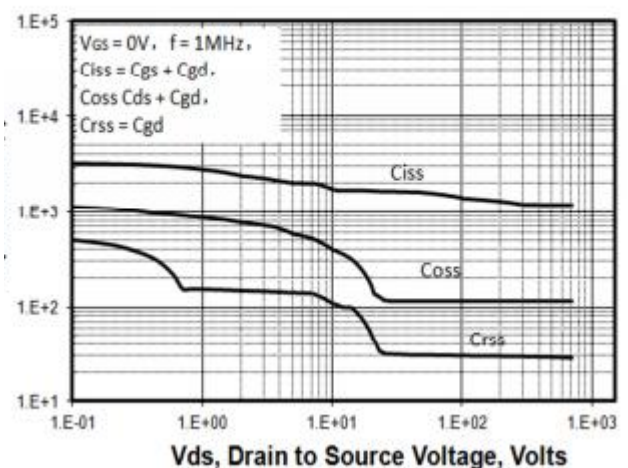


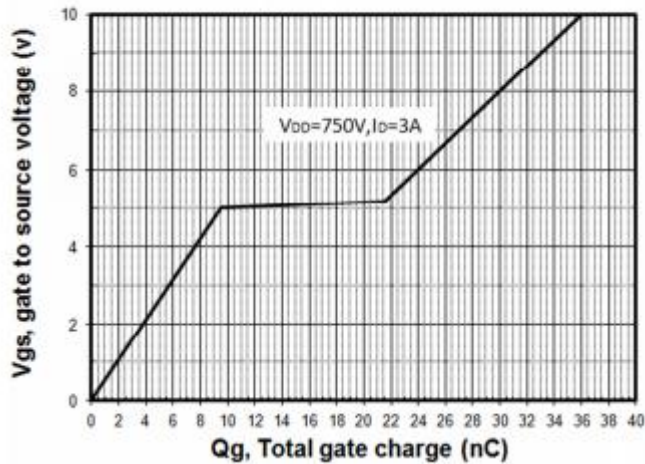
Figure 6. Maximum Safe Operating Area

Figure 7. Capacitance vs  $V_{ds}$ 

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Figure 8. Typical Gate Charge

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