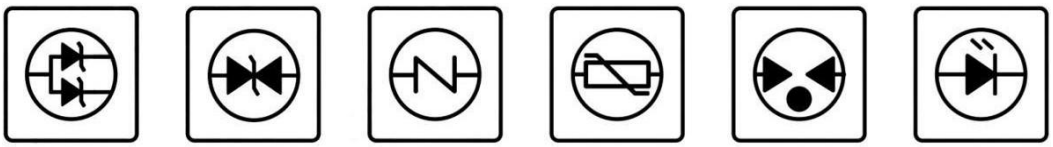
MSKSEMI 美森科
SEMICONDUCTOR




# MS20N65F

## Product specification

## Description

The MS20N65F uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gat e charge. It can be used in a wide variety of applications.

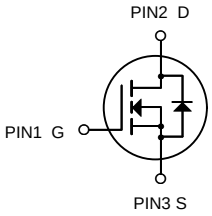
## General Features

- $V_{DS}$=650V,$I_D$=20A
- $R_{DS(ON)}$< 0.47Ω @ $V_{GS}$=10V

## Application

- High efficiency switch mode power supplies
- Power factor correction
- Electronic lamp ballast

## Reference News

| PACKAGE OUTLINE | N-Channel MOSFET | Marking |
|---|---|---|
|  |   |   |
| TO-220F | | MS20N65F |

Note : ****Representative production cycle

## Absolute Maximum Ratings@$T_j$=25℃(unless otherwise specified)

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| VDS | Drain-Source Voltage | 650 | V |
| VGS | Gate-Source Voltage | +30 | V |
| $I_D$@$T_C$=25℃ | Drain Current, $V_{GS}$ @ 4.5V | 20 | A |
| IDM | Pulsed Drain Current[1] | 80 | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation | 32 | W |
| TSTG | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |

## Electrical Characteristics(Tc=25°C, unless otherwise specified)

| PARAMETER | | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain-Source Breakdown Voltage | | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250μA | 650 | | | V |
| Drain-Source Leakage Current | | $I_{DSS}$ | $V_{DS}$=650V, $V_{GS}$=0V | | | 1 | μA |
| Gate- Source Leakage Current | Forward | $I_{GSS}$ | $V_G$=30V, $V_{DS}$=0V | | | 100 | nA |
| | Reverse | | $V_{GS}$=-30V, $V_{DS}$=0V | | | -100 | nA |
| **ON CHARACTERISTICS** | | | | | | | |
| Gate Threshold Voltage | | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 2.0 | | 4.0 | V |
| Static Drain-Source On-State Resistance | | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=6A | | 0.4 | 0.47 | Ω |
| **DYNAMIC CHARACTERISTICS** | | | | | | | |
| Input Capacitance | | $C_{ISS}$ | $V_{DS}$=25V, $V_{GS}$=0V, f=1.0 MHz | | 3234 | | pF |
| Output Capacitance | | $C_{OSS}$ | | | 266 | | pF |
| Reverse Transfer Capacitance | | $C_{RSS}$ | | | 34 | | pF |
| **SWITCHING CHARACTERISTICS** | | | | | | | |
| Turn-On Delay Time | | $t_{D(ON)}$ | $V_{DD}$ =325V, $I_D$ =20A, $R_G$ =25Ω (Note 1, 2) | | 45 | | ns |
| Turn-On Rise Time | | $t_R$ | | | 64 | | ns |
| Turn-Off Delay Time | | $t_{D(OFF)}$ | | | 218 | | ns |
| Turn-Off Fall Time | | $t_F$ | | | 84 | | ns |
| Total Gate Charge | | $Q_G$ | $V_{DS}$=480V, $I_D$=20A, $V_{GS}$=10V (Note 1, 2) | | 73 | | nC |
| Gate-Source Charge | | $Q_{GS}$ | | | 17 | | nC |
| Gate-Drain Charge | | $Q_{GD}$ | | | 29 | | nC |
| **DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS** | | | | | | | |
| Drain-Source Diode Forward Voltage | | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = 12A | | | 1.2 | V |
| Maximum Continuous Drain-Source Diode Forward Current | | $I_S$ | | | | 20 | A |
| Maximum Pulsed Drain-Source Diode Forward Current | | $I_{SM}$ | | | | 80 | A |
| Reverse Recovery Time | | $t_{rr}$ | $V_{GS}$=0V, $I_S$=12A, $dI_F/dt$ = 100 A/μs (Note 1) | | 494 | | ns |
| Reverse Recovery Charge | | $Q_{RR}$ | | | 7.9 | | μC |

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating temperature.

## Typical Characteristics

Figure 1: Output Characteristics

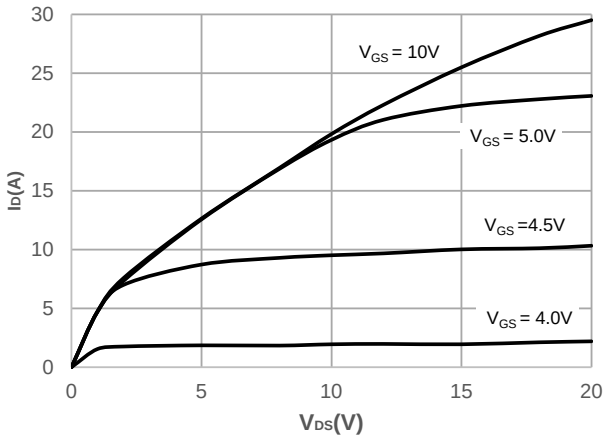



Figure 2: Typical Transfer Characteristics

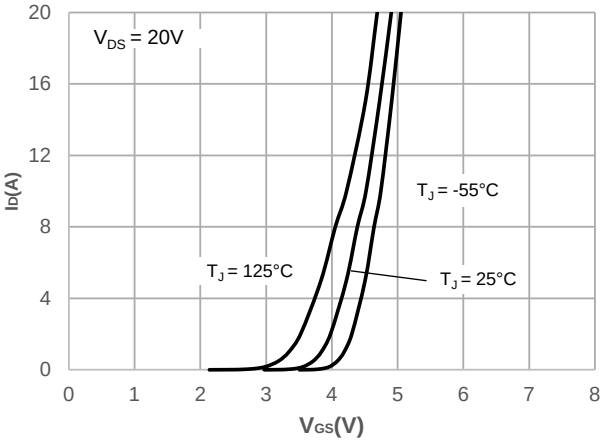



Figure 3: On-resistance vs. Drain Current

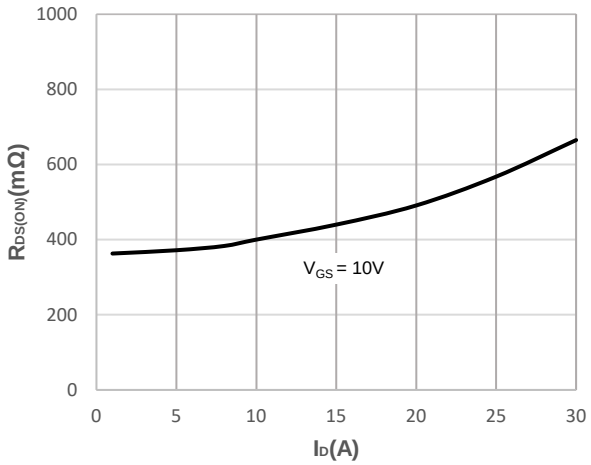



Figure 4: Body Diode Characteristics

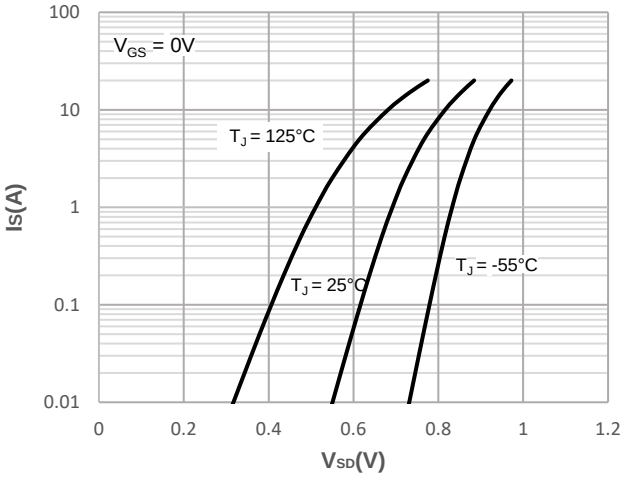



Figure 5: Gate Charge Characteristics

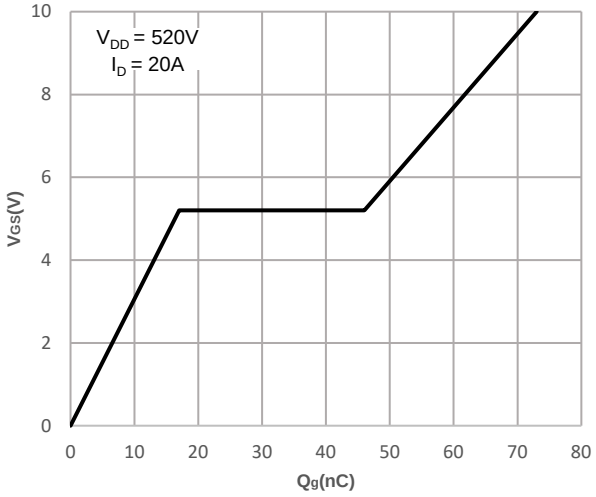



Figure 6: Capacitance Characteristics

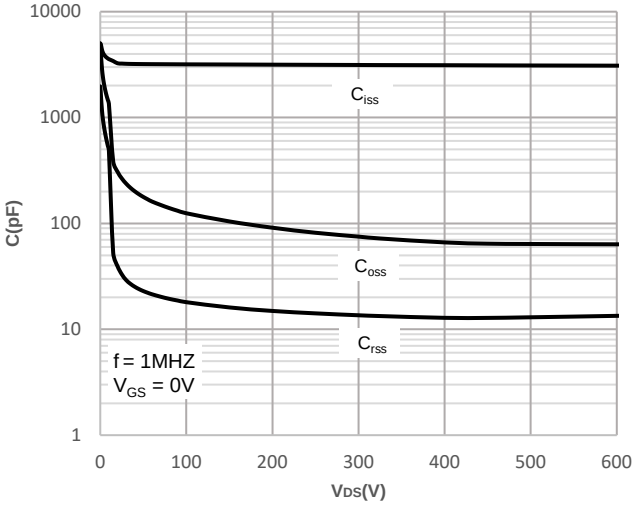


Figure 7: Normalized Breakdown voltage vs. Junction Temperature

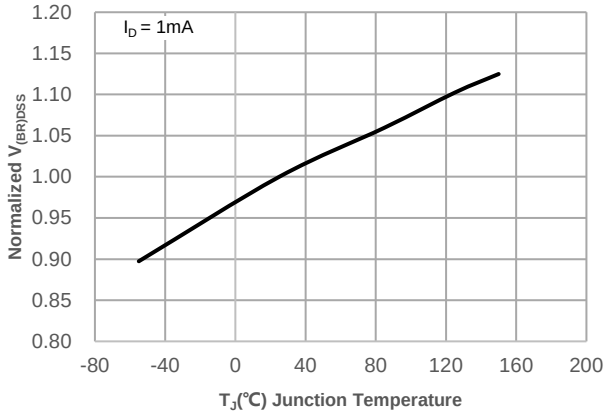



Figure 8: Normalized on Resistance vs. Junction Temperature

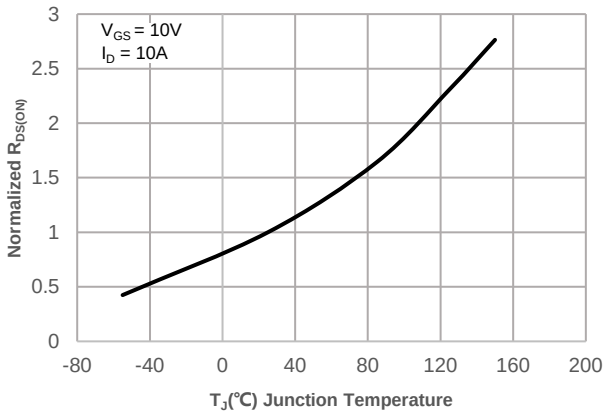



Figure 9: Maximum Safe Operating Area

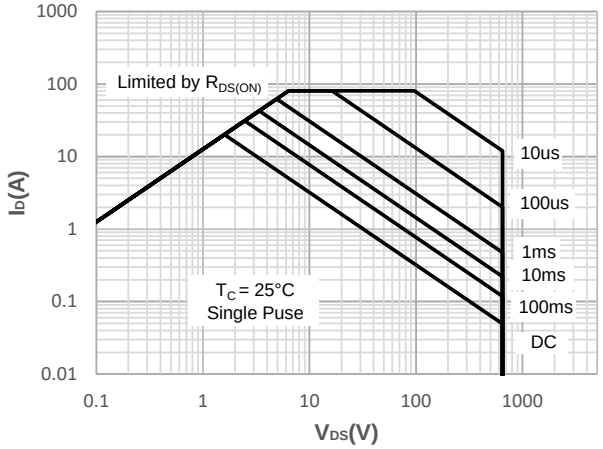



Figure 10: Maximum Continuous Drian Current vs. Case Temperature

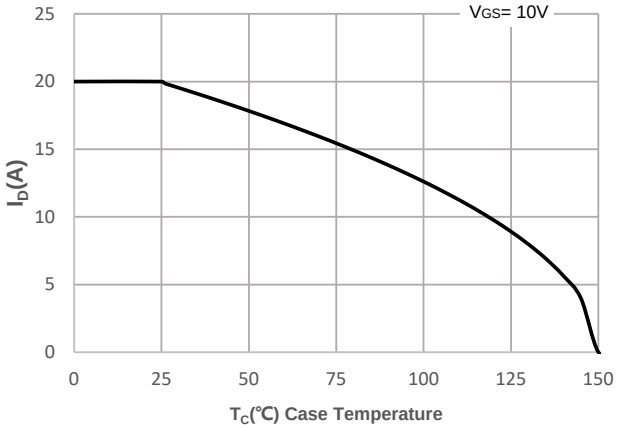



Figure 11: Normalized Maximum Transient Thermal Impedance

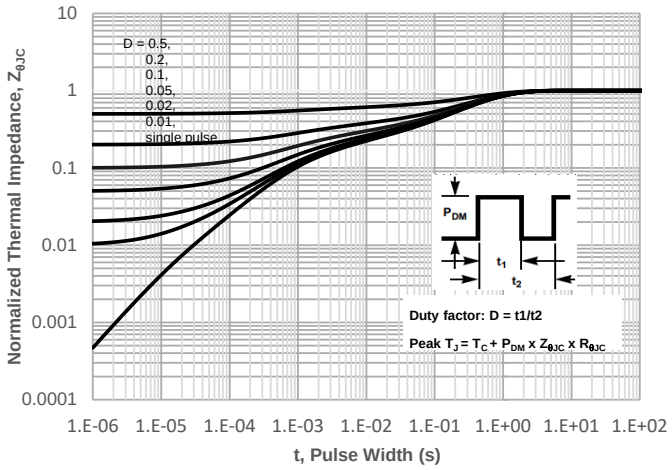
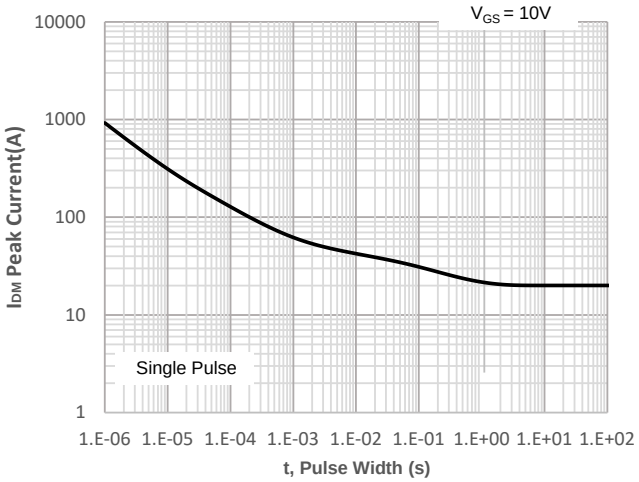



Figure 12: Peak Current Capacity



## Test Circuit

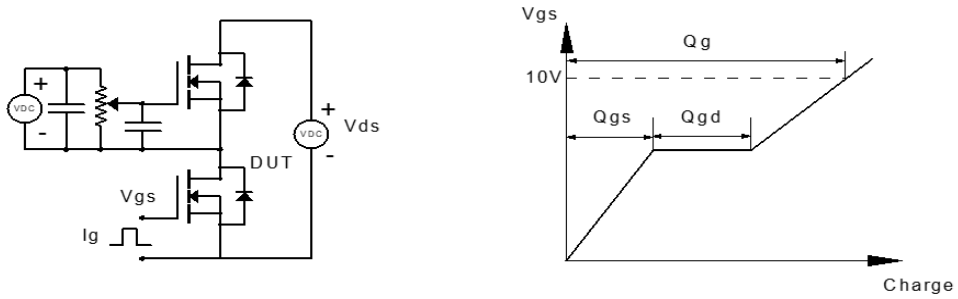



**Figure 1: Gate Charge Test Circuit & Waveform**

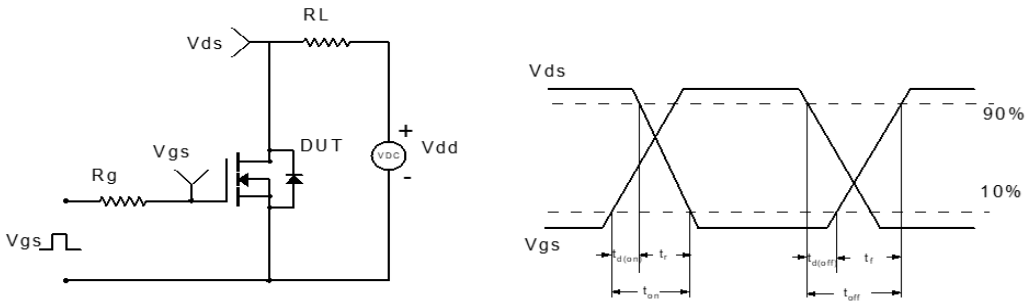



**Figure 2: Resistive Switching Test Circuit & Waveform**

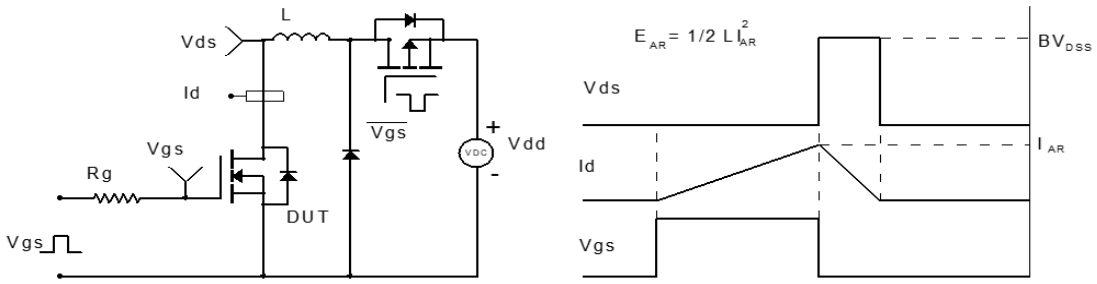



**Figure 3: Unclamped Inductive Switching Test Circuit& Waveform**

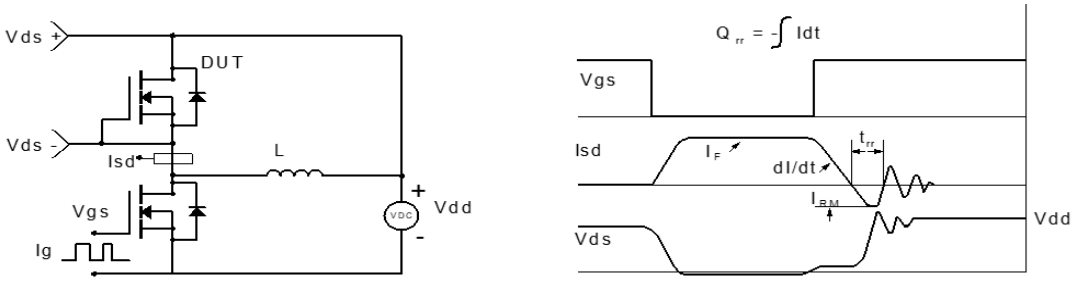
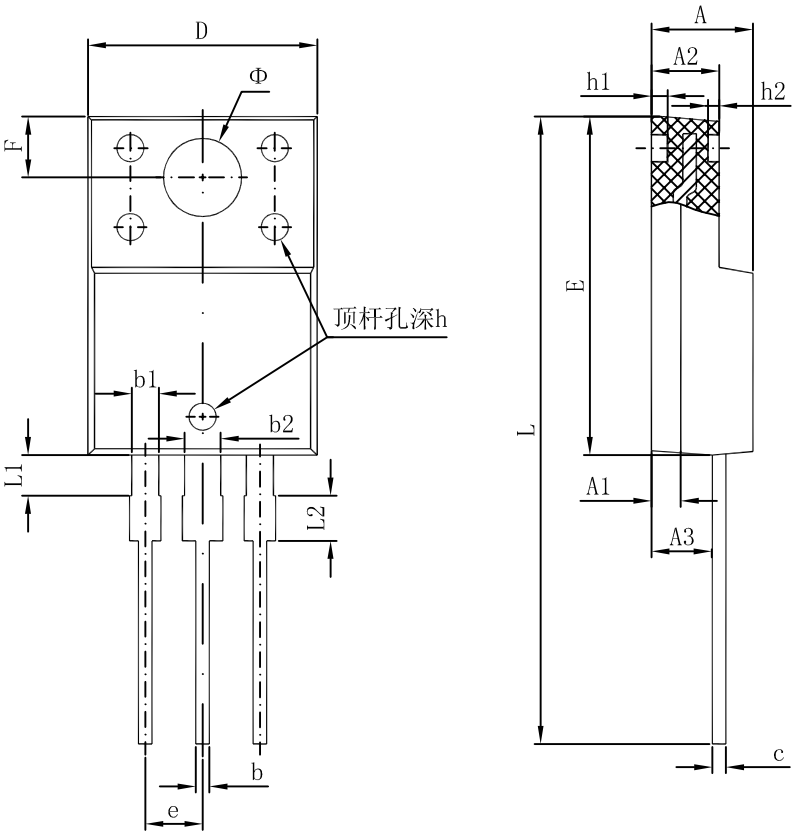



**Figure 4: Diode Recovery Test Circuit & Waveform**

## Package Dimension TO-220F




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 4.300 | 4.700 | 0.169 | 0.185 |
| A1 | 1.300 REF. | | 0.051 REF. | |
| A2 | 2.800 | 3.200 | 0.110 | 0.126 |
| A3 | 2.500 | 2.900 | 0.098 | 0.114 |
| b | 0.500 | 0.750 | 0.020 | 0.030 |
| b1 | 1.100 | 1.350 | 0.043 | 0.053 |
| b2 | 1.500 | 1.750 | 0.059 | 0.069 |
| c | 0.500 | 0.750 | 0.020 | 0.030 |
| D | 9.960 | 10.360 | 0.392 | 0.408 |
| E | 14.800 | 15.200 | 0.583 | 0.598 |
| e | 2.540 TYP. | | 0.100 TYP. | |
| F | 2.700 REF. | | 0.106 REF. | |
| Φ | 3.500 REF. | | 0.138 REF. | |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| h1 | 0.800 REF. | | 0.031 REF. | |
| h2 | 0.500 REF. | | 0.020 REF. | |
| L | 28.000 | 28.400 | 1.102 | 1.118 |
| L1 | 1.700 | 1.900 | 0.067 | 0.075 |
| L2 | 1.900 | 2.100 | 0.075 | 0.083 |

## REEL SPECIFICATION

| P/N | PKG | QTY |
|---|---|---|
| MS20N65F | TO-220F | 1 tube of 50pcs/1 box of 1000pcs |

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