# ICE15N73

## ICE15N73 N-Channel Enhancement Mode MOSFET

| Product Summary | | | |
|---|---|---|---|
| $I_D$ | $T_A$=25°C | 15A | Max |
| $V_{(BR)DSS}$ | $I_D$=250uA | 730V | Min |
| $r_{DS(on)}$ | $V_{GS}$=10V | 0.18Ω | Typ |
| $Q_g$ | $V_{DS}$=480V | 75nC | Typ |

### Features

• Low $r_{DS(on)}$
• Ultra Low Gate Charge
• High d$v$/d$t$ capability
• High Unclamped Inductive Switching (UIS) capability
• High peak current capability
• Increased transconductance performance
• Optimized design for high performance power systems
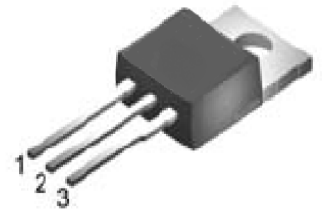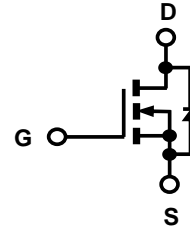
**T0220**

**Standard Metal Heatsink**

**1=Gate, 2=Drain, 3=Source.**

RoHS COMPLIANT RoHS (EU) 2015/863    CE    HALOGEN FREE ✓    Lead Free

ICEMOS AND ITS SISTER COMPANY 3D SEMI OWN THE FUNDAMENTAL PATENTS FOR SUPERJUNCTION MOSFETS. THE MAJORITY OF THESE PATENTS HAVE 17 to 20 YEARS OF REMAINING LIFE. THIS PORTFOLIO HAS GRANTED PATENTS ISSUED IN USA, CHINA, KOREA, JAPAN, TAIWAN & EUROPE.

## Maximum ratings at $T_j$=25°C, unless otherwise specified

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Continuous drain current [a] | $I_D$ | $T_c$=25°C <br> $T_c$=100°C | 15 <br> 9 | A |
| Pulsed drain current [a] | $I_{D, pulse}$ | $T_c$=25°C | 35 | A |
| Avalanche energy, single pulse | $E_{AS}$ | $I_D$=7.5A | 280 | mJ |
| Avalanche current, repetitive | $I_{AR}$ | limited by $T_j$max | 7.5 | A |
| MOSFET d$v$/d$t$ ruggedness | d$v$/d$t$ | $V_{DS}$=480V, $I_D$=15A, $T_j$=125°C | 50 | V/ns |
| Gate source voltage | $V_{GS}$ | static | ±20 | V |
| | | AC ($f$>1Hz) | ±30 | |
| Power dissipation | $P_{tot}$ | $T_c$=25°C | 171 | W |
| Operating and storage temperature | $T_j$, $T_{stg}$ | | -55 to +150 | °C |
| Mounting torque [b] | | M 3 & 3.5 screws | 60 | Ncm |

a Limited by Tjmax

b When mounted on 1inch square 2oz copper clad FR-4

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |

### Thermal characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Thermal resistance, junction-case [b] | $R_{thJC}$ | | - | - | 0.6 | $^{o}$C/W |
| Thermal resistance, junction-ambient [b] | $R_{thJA}$ | leaded | - | - | 62 | |
| Soldering temperature, wave soldering only allowed at leads | $T_{sold}$ | 1.6mm (0.063in.) from case for 10 s | - | - | 260 | $^{o}$C |

## Electrical characteristics at $T_{i}$=25$^{o}$C, unless otherwise specified

### Static characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$=0 V, $I_{D}$=250µA | 730 | 760 | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_{D}$=250µA | 2.5 | 3 | 3.5 | |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$=730V, $V_{GS}$=0V, $T_{j}$=25$^{o}$C | - | 0.4 | 5 | µA |
| | | $V_{DS}$=730V, $V_{GS}$=0V, $T_{j}$=150$^{o}$C | - | 135 | - | |
| Gate source leakage current | $I_{GSS}$ | $V_{GS}$=±20 V, $V_{DS}$=0V | - | - | 100 | nA |
| Drain-source on-state resistance | $r_{DS(on)}$ | $V_{GS}$=10V, $I_{D}$=7.5A, $T_{j}$=25$^{o}$C | - | 0.18 | 0.25 | Ω |
| | | $V_{GS}$=10V, $I_{D}$=7.5A, $T_{j}$=150$^{o}$C | - | 0.55 | - | |
| Gate resistance | $R_{G}$ | $f$=1 MHZ, open drain | - | 3.0 | - | Ω |

### Dynamic characteristics

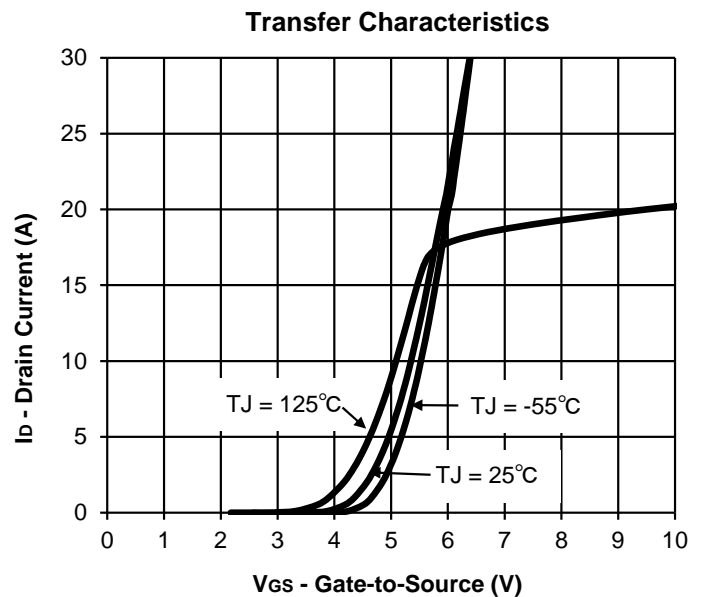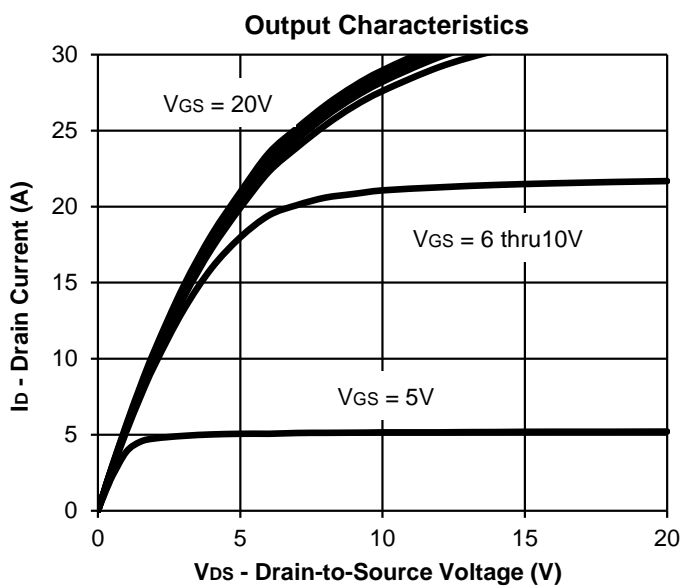| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input capacitance | $C_{iss}$ | $V_{GS}$=0 V, $V_{DS}$=100 V, $f$=1 MHz | - | 2816 | - | pF |
| Output capacitance | $C_{oss}$ | | - | 106 | - | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 0.4 | - | |
| Transconductance | $g_{fs}$ | $V_{DS}$>2*$I_{D}$*$R_{DS}$, $I_{D}$=7.5A | - | 14 | - | S |
| Turn-on delay time | $t_{d(on)}$ | $V_{DS}$=380V, $V_{GS}$=10V, $I_{D}$=15A, $R_{G}$=4Ω (External) | - | 50 | - | ns |
| Rise time | $t_{r}$ | | - | 11 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 140 | - | |
| Fall time | $t_{f}$ | | - | 6.5 | - | |

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |

### Gate charge characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Gate to source charge | $Q_{gs}$ | $V_{DS}$=480 V, $I_D$=15A, $V_{GS}$=0 to 10 V | - | 18 | - | nC |
| Gate to drain charge | $Q_{gd}$ | | - | 25 | - | |
| Gate charge total | $Q_g$ | | - | 75 | - | |
| Gate plateau voltage | $V_{plateau}$ | | - | 5.2 | - | V |

### Reverse Diode

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Continuous forward current | $I_S$ | $V_{GS}$=0V | - | - | 15 | A |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0V, $I_S$=$I_F$ | - | 1.0 | 1.2 | V |
| Reverse recovery time | $t_{rr}$ | $V_{RR}$=50V, $I_S$=$I_F$, $d_{iF}/d_t$=100 A/µS | - | 383 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 7.0 | - | µC |
| Peak reverse recovery current | $I_{rm}$ | | - | 37 | - | A |



Output Characteristics



Transfer Characteristics

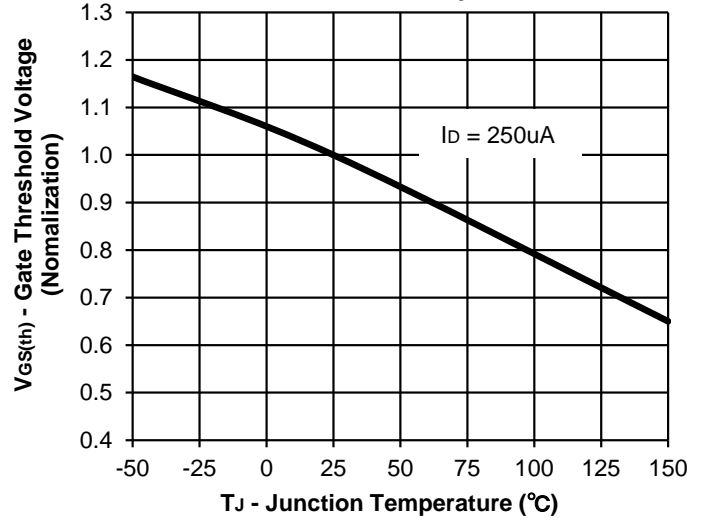**Drain - Source On-State Resistance
vs. Drain Current**
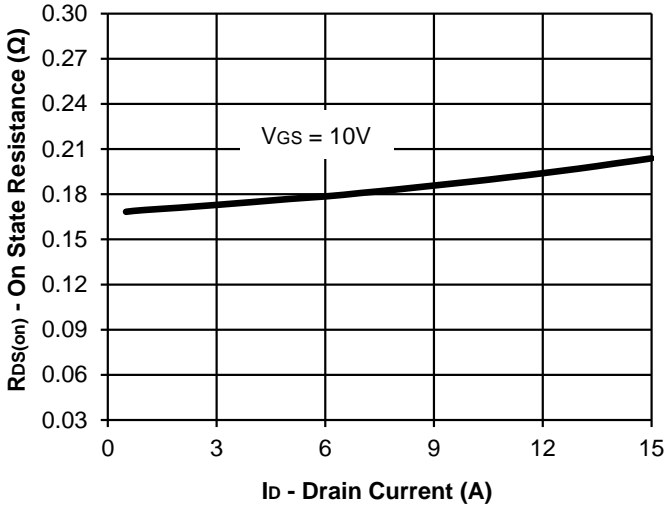


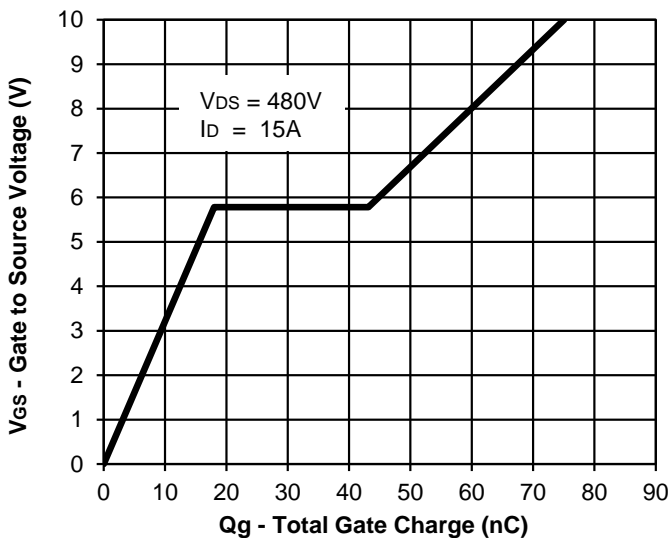**Drain-Source On-State Resistance
vs. Gate-to-Source Voltage**
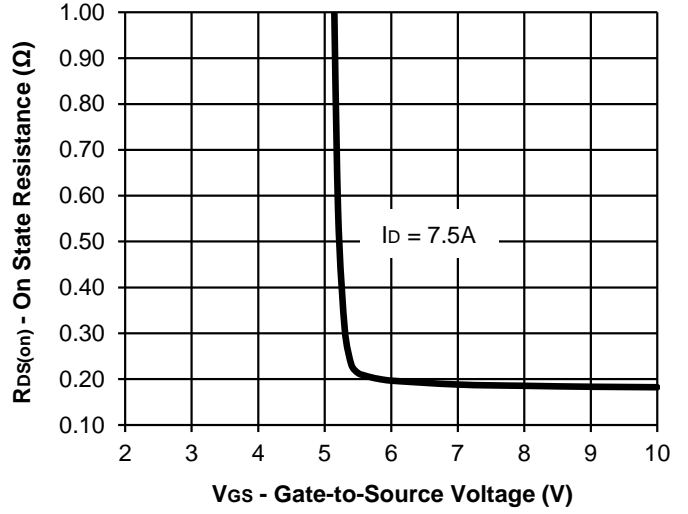


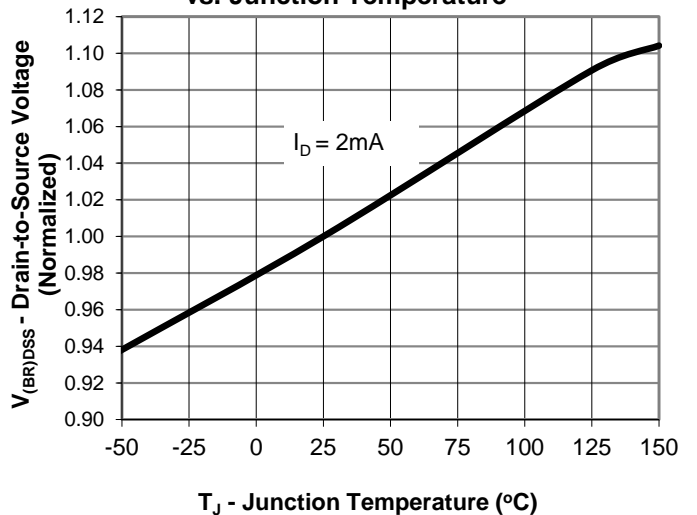**Drain - Source On State Resistance
vs. Junction Temperature**
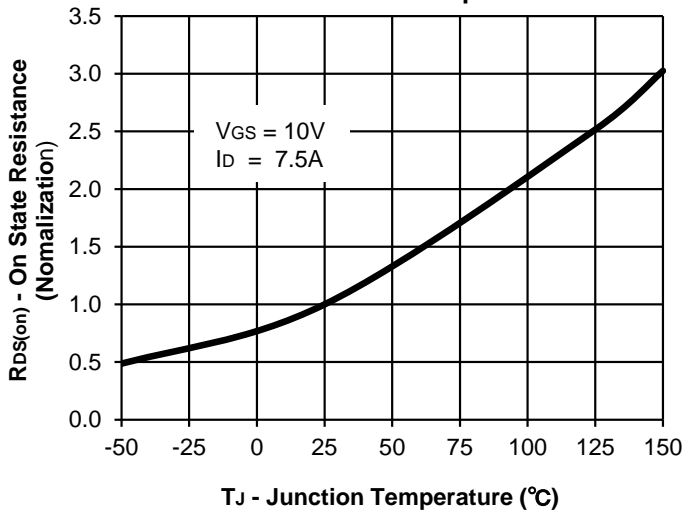


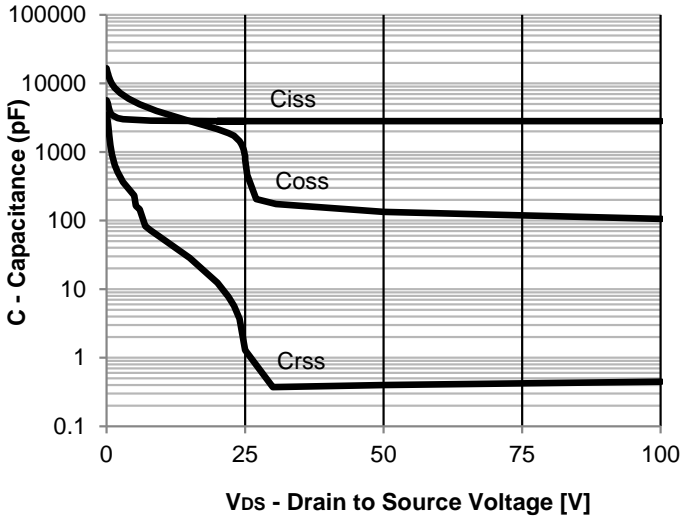**Gate Threshold Voltage
vs. Junction Temperature**
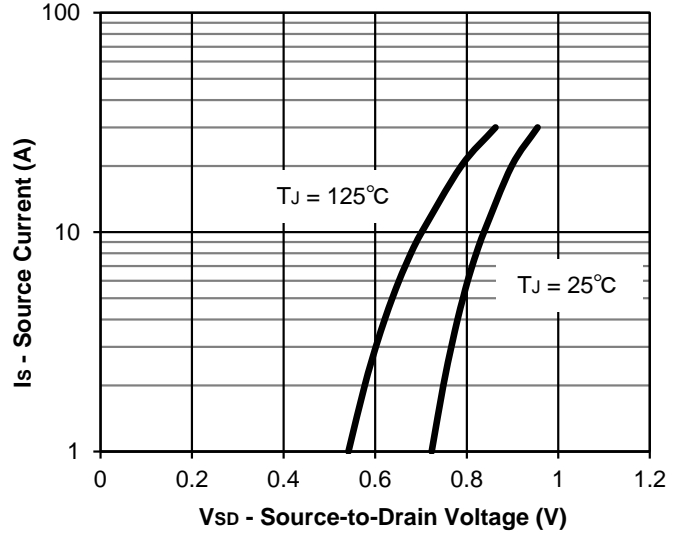


**Gate Charge**



**Drain-to Source Breakdown Voltage
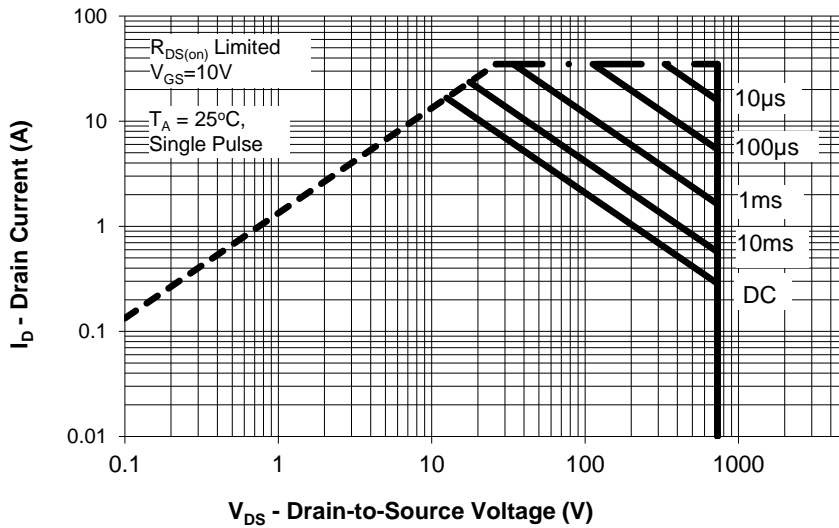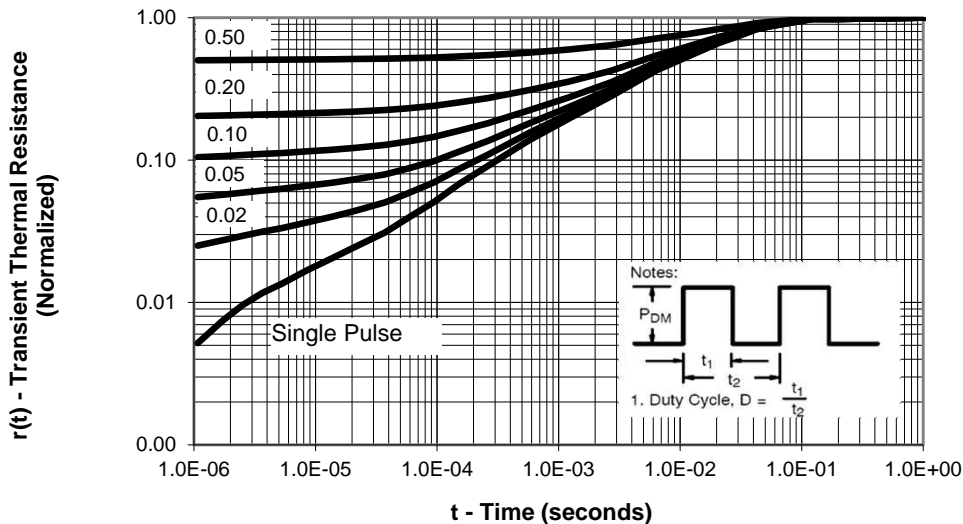vs. Junction Temperature**

## Capacitance



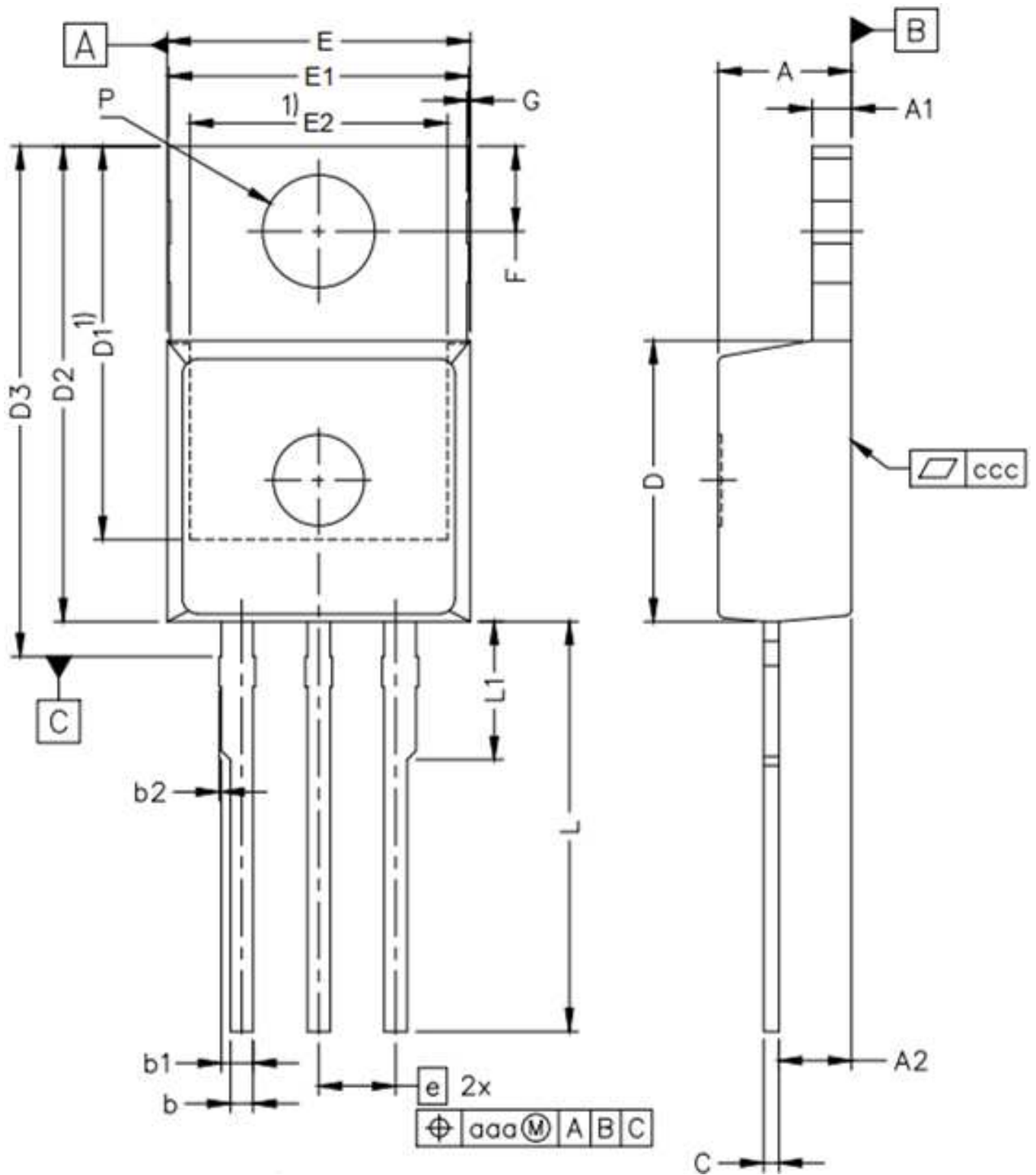## Source-Drain Diode Forward Voltage



## Maximum Rated Forward Biased Safe Operating Area



## Transient Thermal Response  Junction-to-Ambient

## Package Outline: TO-220

# Package Outline: TO-220

NOTE ;
1). TYPICAL METAL SURFACE Min. X=7.25 / Y=12.3
   ALL METAL SURFACES: TIN PLATED,EXCEPT AREA OF CUT
2. DIMENSIONING & TOLERANCEING CONFIRM TO
   ASME Y14.5M-1994.
3. ALL DIMENSIONS ARE IN MILLIMETERS.
   ANGLES ARE IN DEGREES.
4. RADIUS ON TERMINAL IS OPTIONAL.
5. GENERAL TOLERANCES - LINEAR ±0.05
6. PLASTIC BODY ANGLES: 5° UNLESS OTHERWISE SPECIFIED.
7. PLASTIC BODY RADIUS: MAX. 0.25 UNLESS OTHERWISE SPECIFIED.
8. PLASTIC BODY FINISHIN: MATT FINISHING Ra=1.7~2 MICRONS
9. MISMATCH MAX.=0.05 (CAVITY TO HOLE AXIS)}
10. ASTERISKED QUOTES ARE SUBJECTED TO THE SPC CALCULATION
   (Cp,K,Cpk).

| SYMBOL | MIN | MAX |
|---|---|---|
| A | 4.20 | 4.60 |
| A1 | 1.20 | 1.40 |
| A2 | 2.20 | 2.60 |
| b | 0.65 | 0.85 |
| b1 | 0.95 | 1.15 |
| b2 | - | 0.15 |
| C | 0.40 | 0.60 |
| D | 9.05 | 9.45 |
| D1 | 12.95 REF. | |
| D2 | 15.35 | 15.95 |
| D3 | 16.50 | 17.10 |
| E | 9.80 | 10.20 |
| E1 | 9.70 | 10.10 |
| E2 | 8.50 REF. | |
| e | 2.54 BSC | |
| F | 2.60 | 3.00 |
| G | 0.10 REF. | |
| L | 13.00 | 14.00 |
| L1 | 4.35 | 4.75 |
| P | 3.55 | 3.85 |
| aaa | 0.25 | |
| ccc | 0.05 | |

# ICEMOS SUPERJUNCTION PATENT PORTFOLIO

### ICEMOS GRANTED PATENTS
**US7,429,772**
**US7,439,178**
**US7,446,018**
**US7,579,607**
**US7,723,172**
**US7,795,045**
**US7,846,821**
**US7,944,018**
**US8,012,806**
**US8,030,133**

### 3D SEMI PATENTS LICENSED TO ICEMOS
**US7,041,560B2**
**US7,023,069B2**
**US7,364,994**
**US7,227,197B2**
**US7,304,944B2**
**US7,052,982B2**
**US7,339,252**
**US7,410,891**
**US7,439,583**
**US7,227,197B2**
**US6,635,906**
**US6,936,867**
**US7,015,104**
**US9,109,110**
**US7,271,067**
**US7,354,818**
**US7,052,982,**
**US7,199,006B2**

**Note: additional patents in China, Korea, Japan, Taiwan, Europe have also been granted to IceMOS and 3D Semi for Superjunction MOSFETs with 70 additional Patent applications in process in the USA and the above listed countries.**
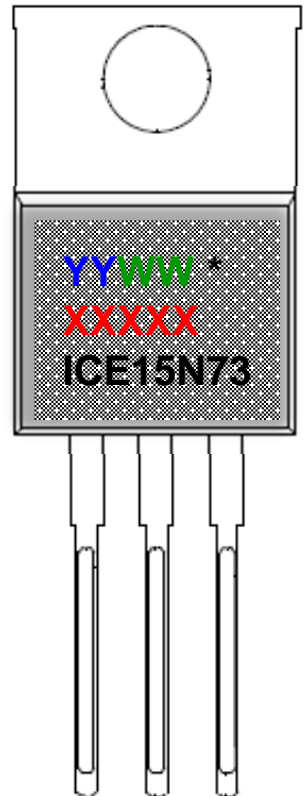
# Marking Information

**YY** = Last two digits of the year

**WW** = Work week

**\*** = Site ID

**XXXXX** = Lot ID

**ICE15N73** = ICE is IceMOS logo and 15N73 is a designated device part number



# Disclaimer

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