IceMOS Technology

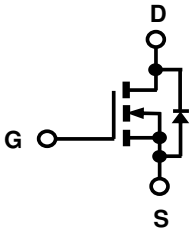
ICES15N60FP

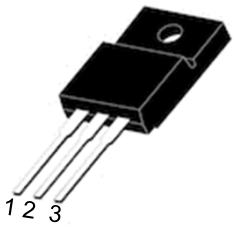
ICES15N60FP N-Channel Enhancement Mode MOSFET

Product Summary			
I_D	T_A=25°C	15A	Max
$V_{(BR)DSS}$	I_D=250uA	600V	Min
$r_{DS(on)}$	V_{GS}=10V	0.20	Typ
Q_g	V_{DS}=480V	48nC	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





T0220FP
Isolated (T0-220)
1=Gate, 2=Drain, 3=Source.

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

ICEMOS OWNS 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 [b] , at T_j=25°C, unless otherwise specified

Parameter	*Symbol*	*Conditions*	*Value*	*Unit*
Continuous drain current [a]	I_D	T_c=25°C	15	A
		T_c=100°C	9	
Pulsed drain current	$I_{D, pulse}$	T_c=25°C	45	A
Avalanche energy, single pulse	E_{AS}	I_D=8.9A	396	mJ
Avalanche current, repetitive	I_{AR}	limited by $T_j$max	8.9	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	35	W
Operating and storage temperature	T_j, T_{stg}		-55 to +150	°C
Mounting torque		M 3 screws	50	Ncm

a When mounted on 1inch square 2oz copper clad FR-4
b Pulse width limited by Tjmax

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	
Thermal characteristics						
Thermal resistance, junction-case [a]	R_{thJC}		-	-	3.5	°C/W
Thermal resistance, junction-ambient [a]	R_{thJA}	leaded	-	-	72	
Soldering temperature, wave soldering only allowed at leads	T_{sold}	1.6mm (0.063in.) from case for 10 s	-	-	260	°C

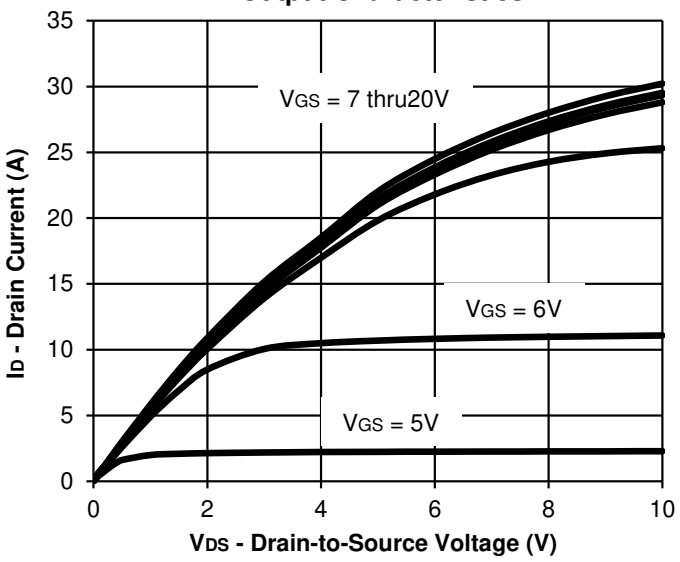
Electrical characteristics [b], at T_j=25°C, unless otherwise specified

Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0 V, I_D=250μA	600	640	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	2.1	3.0	3.9	
Zero gate voltage drain current	I_{DSS}	V_{DS}=600V, V_{GS}=0V, T_j=25°C	-	0.1	1	μA
		V_{DS}=600V, V_{GS}=0V, T_j=150°C	-	100	-	
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°C	-	0.20	0.24	Ω
		V_{GS}=10V, I_D=7.5A, T_j=150°C	-	0.53	-	
Gate resistance	R_G	f=1 MHZ, open drain	-	3.4	-	Ω

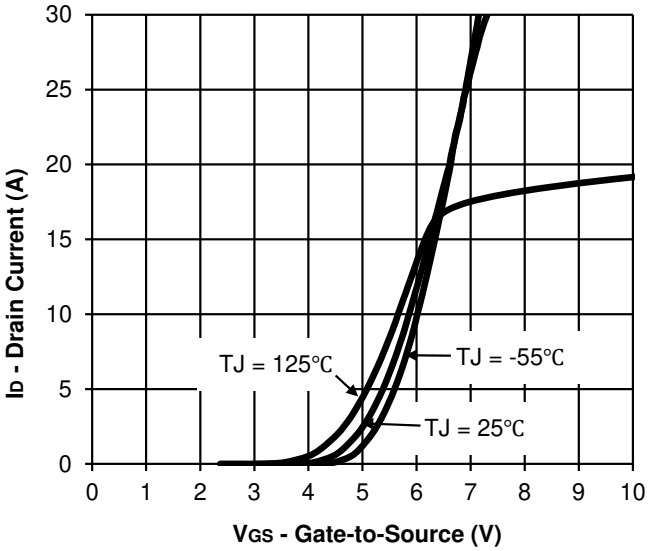
Dynamic characteristics							
Input capacitance	C_{iss}	V_{GS}=0 V, f=1 MHz	V_{DS}=25 V	-	1890	-	pF
Output capacitance	C_{oss}		V_{DS}=100 V	-	74	-	
Reverse transfer capacitance	C_{rss}		V_{DS}=25 V	-	7.6	-	
Transconductance	g_{fs}	V_{DS}>2*I_D*R_{DS}, I_D=7.5A		-	11	-	S
Turn-on delay time	$t_{d(on)}$	V_{DS}=380V, V_{GS}=10V, I_D=7.5A, R_G=4Ω (External)		-	16	-	ns
Rise time	t_r			-	21	-	
Turn-off delay time	$t_{d(off)}$			-	58	-	
Fall time	t_f			-	4.6	-	

Parameter	Symbol	Conditions	Values			Unit
			Min	Typ	Max	
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DS}=480 V, I_D=15A, V_{GS}=0 to 10 V	-	15	-	nC
Gate to drain charge	Q_{gd}		-	16.5	-	
Gate charge total	Q_g		-	48	-	
Gate plateau voltage	$V_{plateau}$		-	6.8	-	V
Reverse Diode						
Continuous forward current	I_S	V_{GS}=0V	-	-	15	A
Diode forward voltage	V_{SD}	V_{GS}=0V, $I_{S=}I_F$	-	0.9	1.2	V
Reverse recovery time	t_{rr}	V_{RR}=480V, $I_{S=}I_F$, d_{iF}/d_t=100 A/µS	-	318	-	ns
Reverse recovery charge	Q_{rr}		-	5.3	-	µC
Peak reverse recovery current	I_{rm}		-	34	-	A

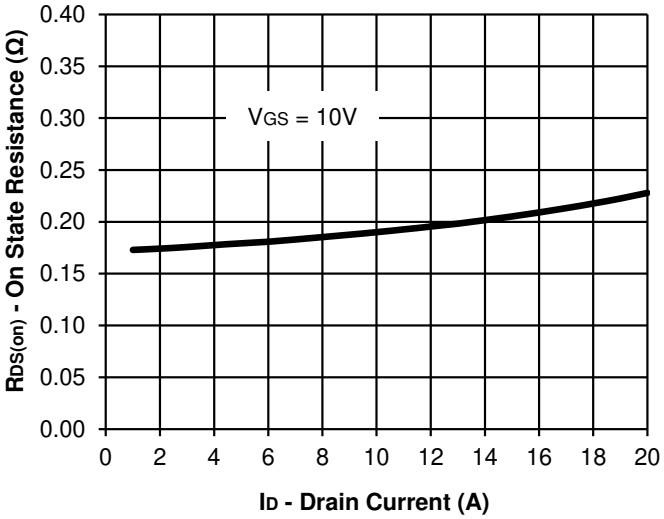
Output Characteristics



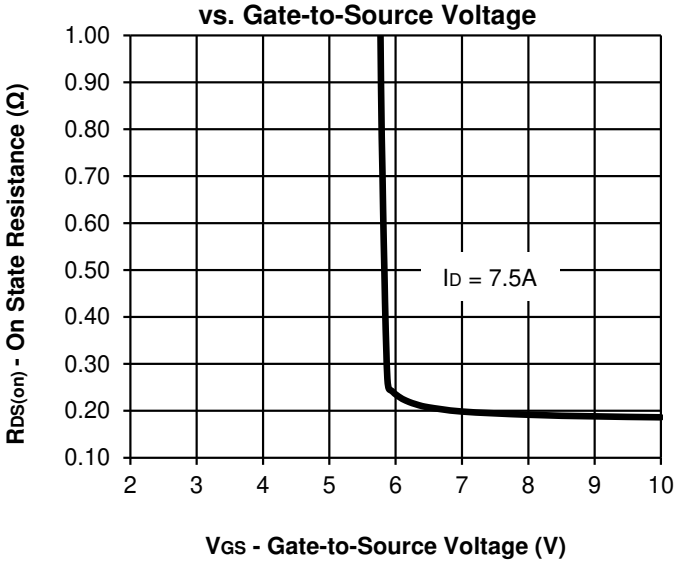
Transfer Characteristics



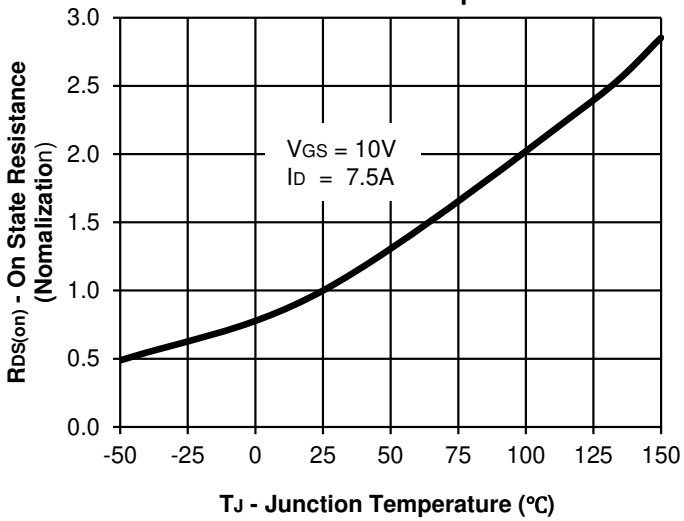
Drain - Source On-State Resistance vs. Drain Current



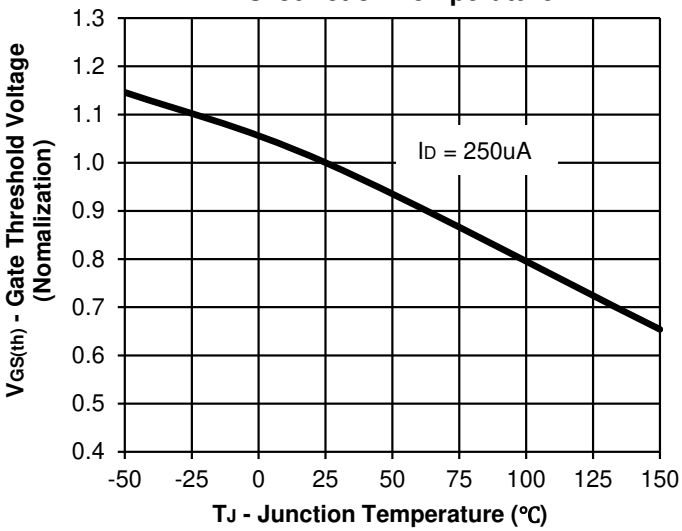
Drain-Source On-State Resistance vs. Gate-to-Source Voltage



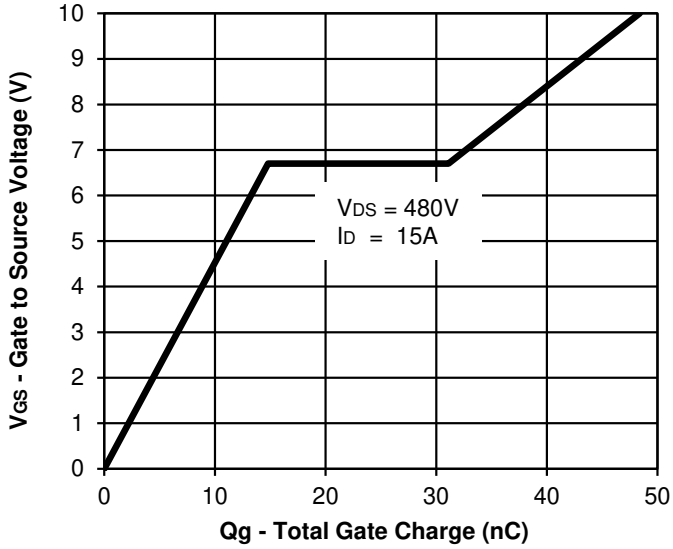
Drain - Source On State Resistance vs. Junction Temperature



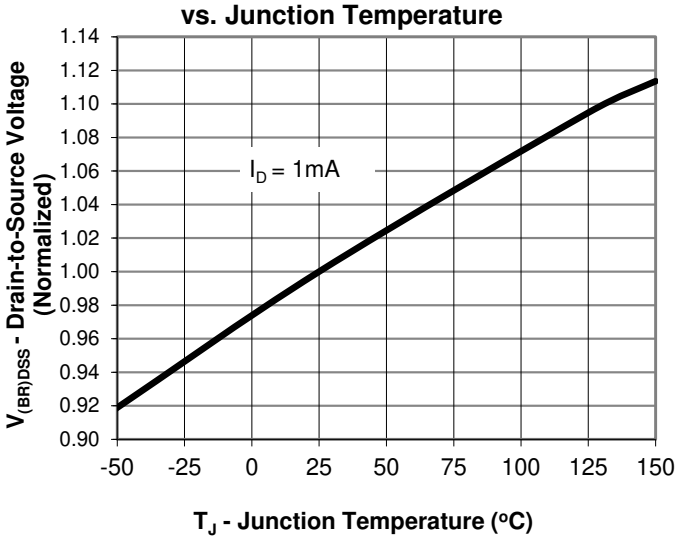
Gate Threshold Voltage vs. Junction Temperature



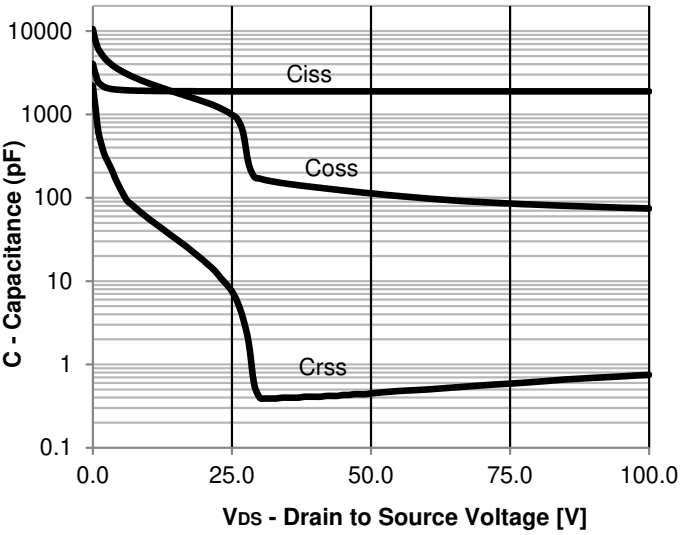
Gate Charge



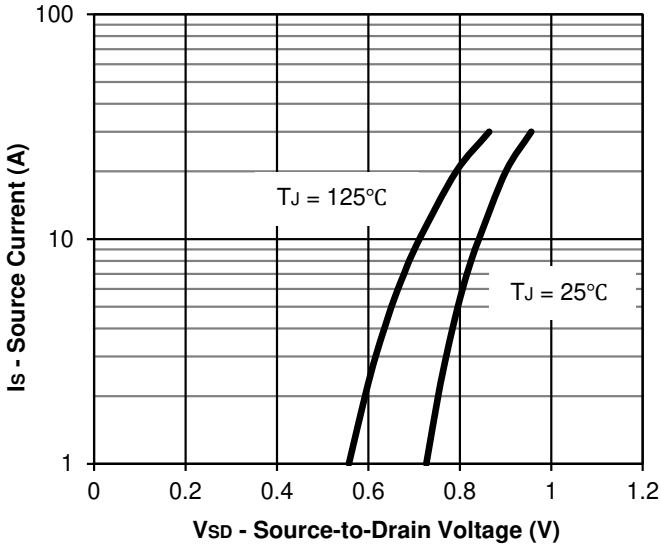
Drain-toSource Breakdown Voltage vs. Junction Temperature



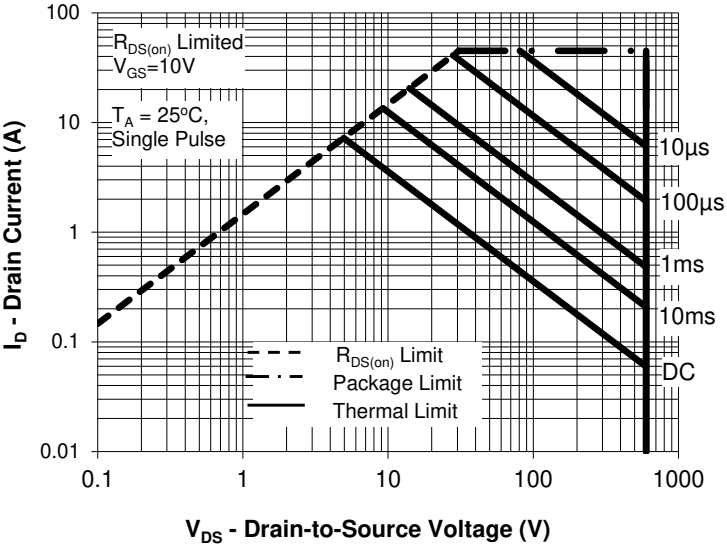
Capacitance



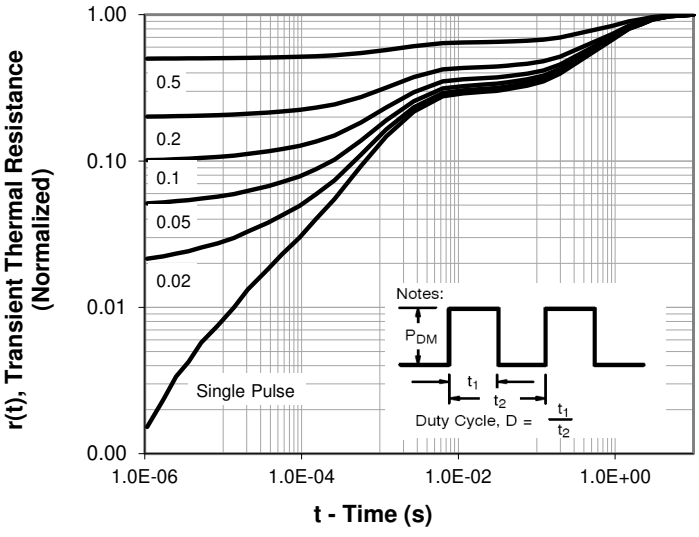
Source-Drain Diode Forward Voltage



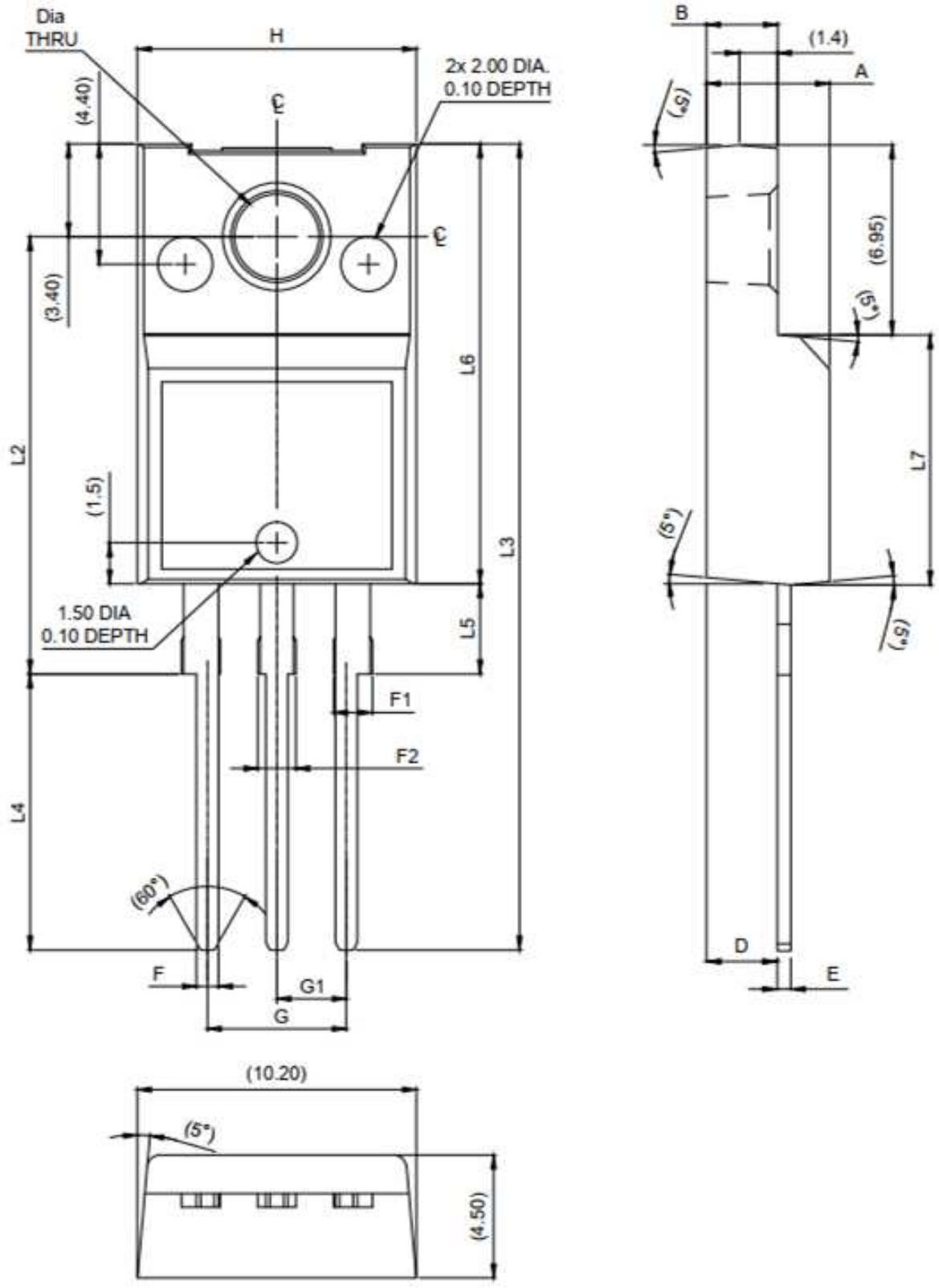
Maximum Rated Forward Biased Safe Operating Area



Transient Thermal Response, Junction-to-Case



Package Outline: TO-220 FullPAK



SYMBOL	MIN	NOM	MAX	NOTES
A	4.4		4.6	1.0 DIMENSIONING & TOLERANCEING CONFIRM TO ASME Y14.5M-1994.
B	2.5		2.7	2.0 ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
D	2.5		2.75	
E	0.45		0.7	
F	0.75		1	
F1	1.15		1.5	
F2	1.15		1.5	
G	4.95		5.2	
G1	2.4		2.7	
H	10		10.4	
L2		16		
L3	28.6		30.6	
L4	9.8		10.6	
L5	2.9		3.6	
L6	15.9		16.4	
L7	9		9.3	
Dia	3		3.2	

Marking Information

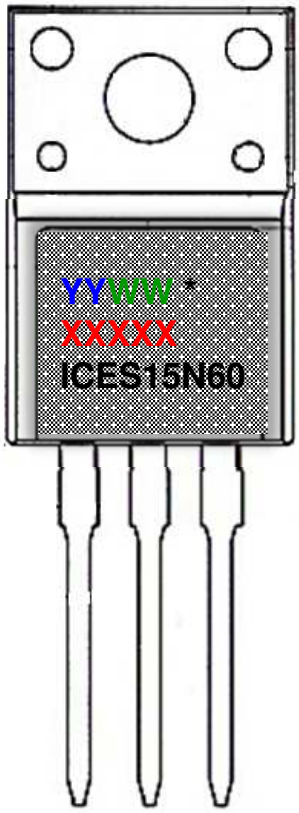
YY = Last two digits of the year

WW = Work week

* = Site ID

XXXXX = Lot ID

ICES15N60 = ICE is IceMOS logo and S15N60 is a designated device part number



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