

# ICE20N170FP

## N-Channel Enhancement Mode MOSFET

### Features:

- Low  $r_{DS(on)}$
- Ultra Low Gate Charge
- High dv/dt Capability
- High Unclamped Inductive Switching (UIS) Capability
- High Peak Current Capability
- Increased Transconductance Performance
- Optimized Design For High Performance Power Systems

### Maximum Ratings @ $T_j = 25^\circ\text{C}$ , Unless Otherwise Specified

Symbol	Parameter	Value	Unit	Conditions
$I_D$	Continuous Drain Current	20	A	$T_C = 25^\circ\text{C}$
$I_{D, \text{pulse}}$	Pulsed Drain Current	62	A	$T_C = 25^\circ\text{C}$
$E_{AS}$	Avalanche Energy, Single Pulse	520	mJ	$I_D = 10\text{A}$
$I_{AR}$	Avalanche Current, Repetitive	20	A	Limited by $T_{j, \text{max}}$
dv/dt	MOSFET dv/dt Ruggedness	50	V/ns	$V_{DS} = 480\text{V}$ , $I_D = 20\text{A}$ , $T_j = 125^\circ\text{C}$
$V_{GS}$	Gate Source Voltage	$\pm 20$	V	Static
		$\pm 30$		AC (f>Hz)
$P_{\text{tot}}$	Power Dissipation	35	W	$T_C = 25^\circ\text{C}$
$T_j, T_{\text{stg}}$	Operating and Storage Temperature	-55 to +150	$^\circ\text{C}$	
	Mounting Torque	50	Ncm	M 2.5 screws

Symbol	Parameter	Values			Unit	Conditions
		Min	Typ	Max		

### Thermal Characteristics

$R_{\text{thJC}}$	Thermal Resistance, Junction to Case	-	-	3.5	$^\circ\text{C/W}$	Leaded
$R_{\text{thJA}}$	Thermal Resistance, Junction to Ambient	-	-	72		
$T_{\text{sold}}$	Soldering Temperature, Wave Soldering Only Allowed At Leads	-	-	260	$^\circ\text{C}$	1.6mm (0.063in.) from Case for 10s

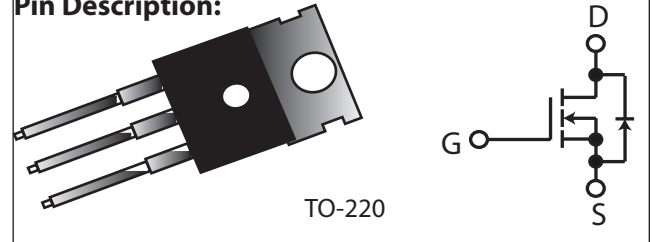
### Electrical Characteristics @ $T_j = 25^\circ\text{C}$ , Unless Otherwise Specified

#### Static Characteristics

$V_{(BR)DSS}$	Drain to Source Breakdown Voltage	600	640	-	V	$V_{GS} = 0\text{V}$ , $I_D = 250\mu\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	2.1	3	3.9		$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$
$I_{DSS}$	Zero Gate Voltage Drain Current	-	0.1	1	$\mu\text{A}$	$V_{DS} = 600\text{V}$ , $V_{GS} = 0\text{V}$ , $T_j = 25^\circ\text{C}$
		-	-	100		$V_{DS} = 600\text{V}$ , $V_{GS} = 0\text{V}$ , $T_j = 150^\circ\text{C}$
$I_{GSS}$	Gate Source Leakage Current	-	-	100	nA	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$
$R_{DS(on)}$	Drain to Source On-State Resistance	-	0.17	0.199	$\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 10\text{A}$ , $T_j = 25^\circ\text{C}$
		-	0.52	-		$V_{GS} = 10\text{V}$ , $I_D = 10\text{A}$ , $T_j = 150^\circ\text{C}$
$R_{GS}$	Gate Resistance	-	4.3	-	$\Omega$	f = 1 MHz, open drain

Product Summary			
$I_D$	$T_A = 25^\circ\text{C}$	20A	Max
$V_{(BR)DSS}$	$I_D = 250\mu\text{A}$	600V	Min
$r_{DS(on)}$	$V_{GS} = 10\text{V}$	0.17 $\Omega$	Typ
$Q_g$	$V_{DS} = 480\text{V}$	62nC	Typ

### Pin Description:

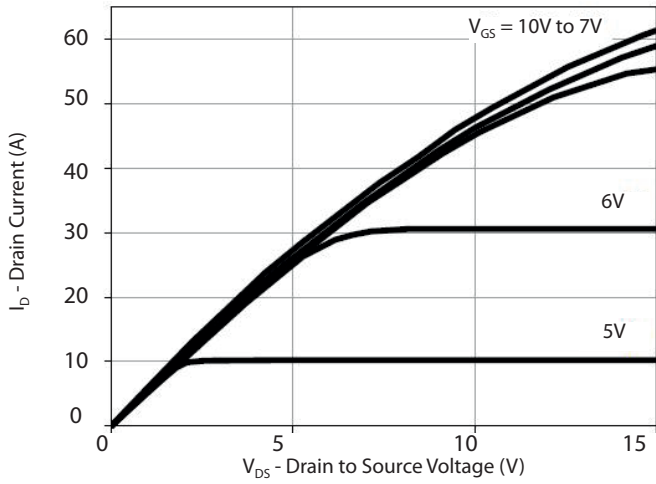


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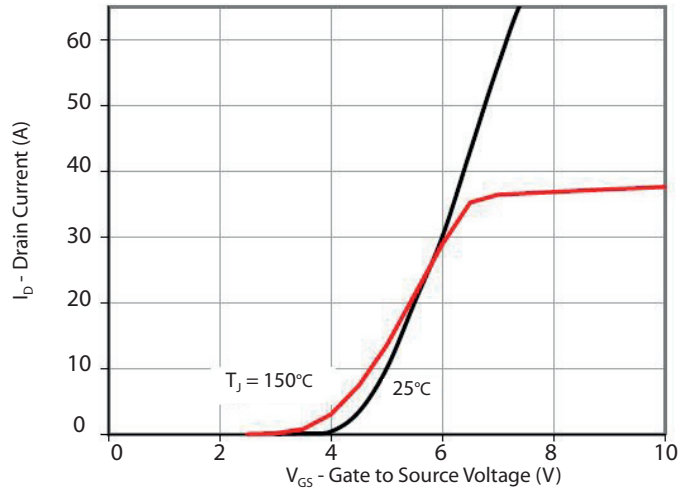
Symbol	Parameter	Values			Unit	Conditions
		Min	Typ	Max		
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	-	2020	-	pF	$V_{GS} = 0V, V_{DS} = 25V, f = 1 \text{ MHz}$
$C_{oss}$	Output Capacitance	-	980	-		
$C_{rss}$	Reverse Transfer Capacitance	-	9	-		
$g_{fs}$	Transconductance	-	19	-	S	$V_{DS} = >2 \cdot I_D \cdot R_{DS}, I_D = 2A$
$t_{d(on)}$	Turn-on Delay Time	-	39	-	nS	$V_{DS} = 480V, V_{GS} = 10V, I_D = 4A, R_G = 4\Omega$ (External)
$T_r$	Rise Time	-	3.5	-		
$t_{d(off)}$	Turn-off Delay Time	-	55	-		
$t_f$	Fall Time	-	7	-		
<b>Gate Charge Characteristics</b>						
$Q_{gs}$	Gate to Source Charge	-	13	-	nC	$V_{DS} = 480V, I_D = 20A, V_{GS} = 10V$
$Q_{gd}$	Gate to Drain Charge	-	23	-		
$Q_g$	Gate Charge Total	-	62	-		
$V_{plateau}$	Gate Plateau Voltage	-	5.8	-	V	
<b>Reverse Diode</b>						
$V_{SD}$	Diode Forward Voltage	-	0.9	1.2	V	$V_{GS} = 0V, I_S = I_F$
$t_{rr}$	Reverse Recovery Time	-	407	-	ns	$V_{RR} = 480V, I_S = I_F, d_{IF}/d_t = 100 \text{ A}/\mu\text{S}$
$Q_{rr}$	Reverse Recovery Charge	-	6.7	-	$\mu\text{C}$	
$I_{rm}$	Peak Reverse Recovery Current	-	32	-	A	

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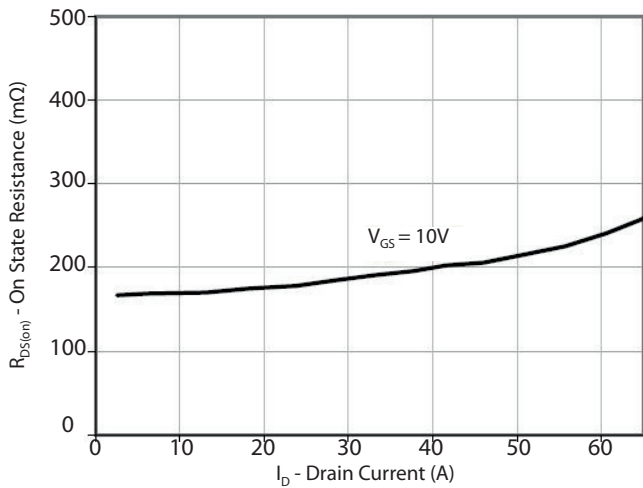
Output Characteristics



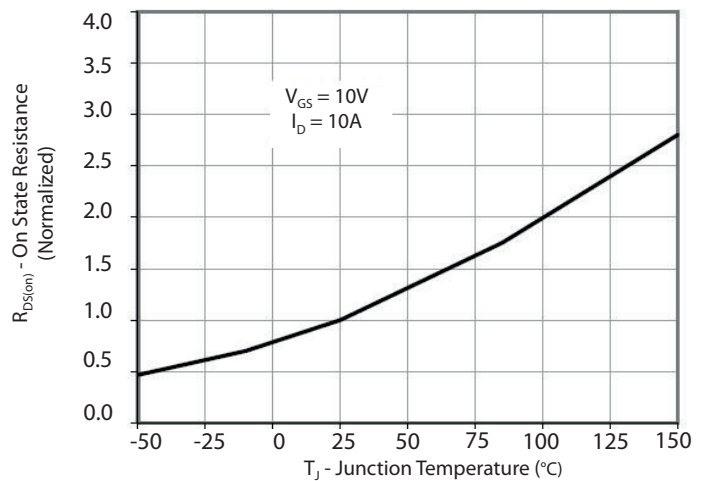
Transfer Characteristics



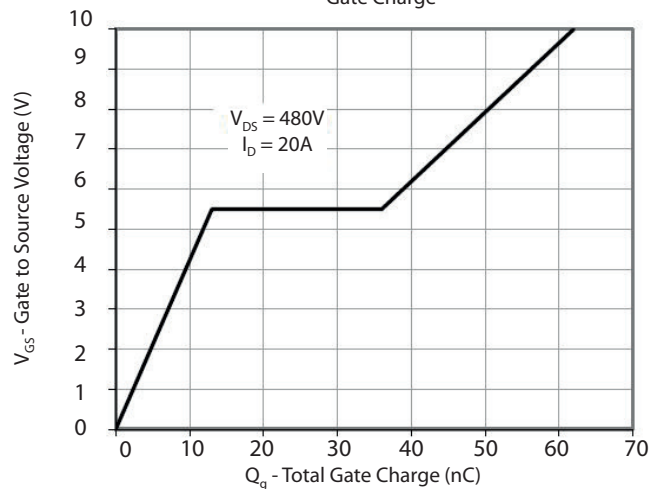
On State Resistance vs Drain Current



On Resistance vs Junction Temperature

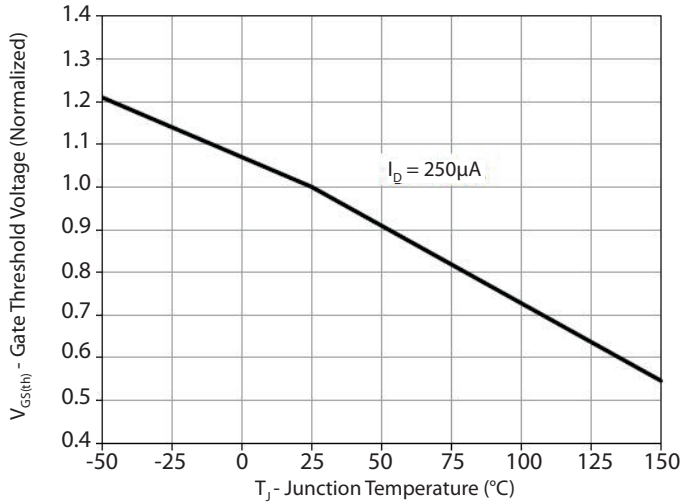


Gate Charge

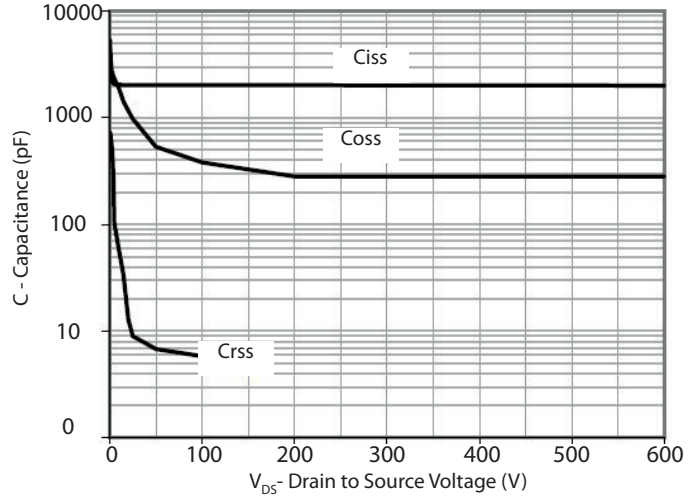


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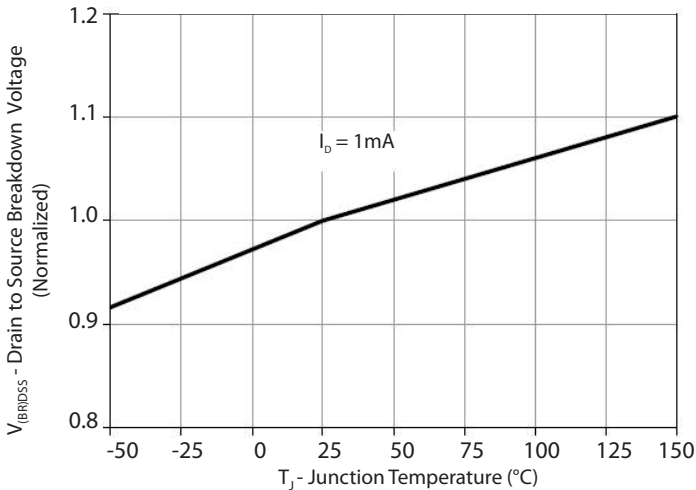
Gate Threshold Voltage vs. Junction Temperature



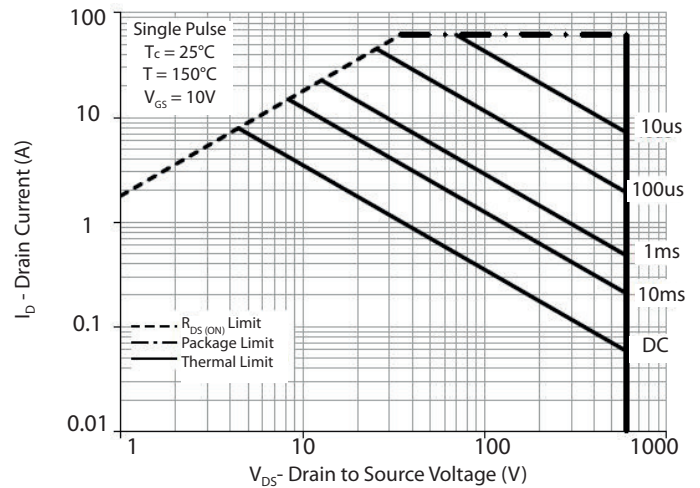
Capacitance



Drain to Source Breakdown Voltage vs. Junction Temperature



Maximum Rate Forward Biased Safe Operating Area



Transient Thermal Response - Junction to Case

