

ICE20N170

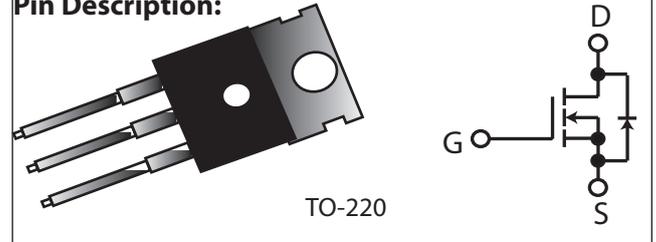
N-Channel Enhancement Mode MOSFET

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

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 Ω	Typ
Q_g	$V_{DS} = 480\text{V}$	62nC	Typ

Pin Description:



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	± 20	V	Static
		± 30		AC (f>Hz)
P_{tot}	Power Dissipation	180	W	$T_C = 25^\circ\text{C}$
$T_{j, \text{stg}}$	Operating and Storage Temperature	-55 to +150	$^\circ\text{C}$	
	Mounting Torque	60	Ncm	M 2.5 screws

Symbol	Parameter	Values			Unit	Conditions
		Min	Typ	Max		

Thermal Characteristics

R_{thJC}	Thermal Resistance, Junction to Case	-	-	0.7	$^\circ\text{C}/\text{W}$	Leaded
R_{thJA}	Thermal Resistance, Junction to Ambient	-	-	62		
T_{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

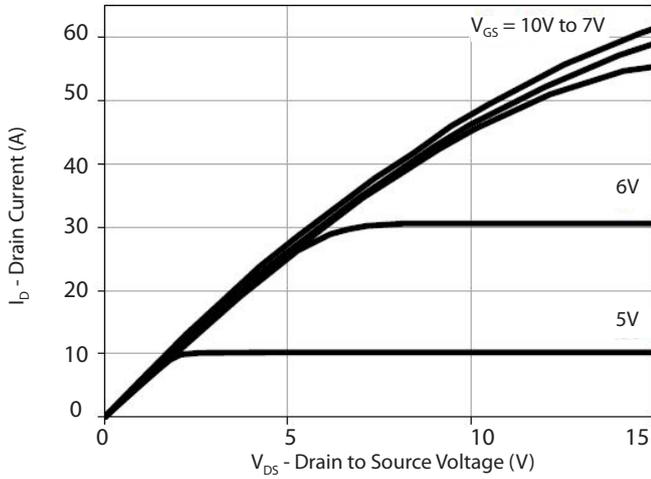
Static Characteristics						
$V_{(BR)DSS}$	Drain to Source Breakdown Voltage	600	640	-	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	2.1	3	3.9		$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
I_{DSS}	Zero Gate Voltage Drain Current	-	0.1	1	μA	$V_{DS} = 600\text{V}, V_{GS} = 0\text{V}, T_j = 25^\circ\text{C}$
		-	-	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	Ω	$V_{GS} = 10\text{V}, I_D = 10\text{A}, T_j = 25^\circ\text{C}$
		-	0.52	-		$V_{GS} = 10\text{V}, I_D = 10\text{A}, T_j = 150^\circ\text{C}$
R_{GS}	Gate Resistance	-	4.3	-	Ω	$f = 1\text{MHz}$, open drain

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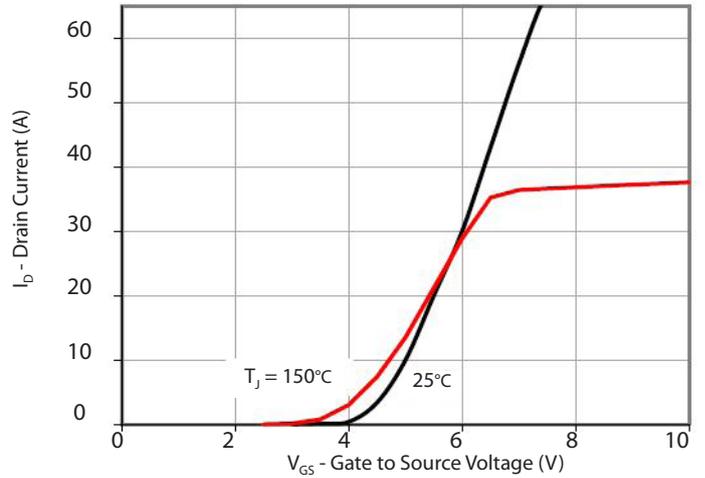
Symbol	Parameter	Values			Unit	Conditions
		Min	Typ	Max		
Dynamic Characteristics						
C_{iss}	Input Capacitance	-	2020	-	pF	$V_{GS} = 0V, V_{DS} = 25V, f = 1\text{ MHz}$
C_{oss}	Output Capacitance	-	980	-		
C_{rss}	Reverse Transfer Capacitance	-	9	-		
g_{fs}	Transconductance	-	19	-	S	$V_{DS} > 2 \cdot I_D \cdot R_{DS}, I_D = 10A$
$t_{d(on)}$	Turn-on Delay Time	-	39	-	nS	$V_{DS} = 480V, V_{GS} = 10V, I_D = 20A, R_G = 4\Omega$ (External)
T_r	Rise Time	-	3.5	-		
$t_{d(off)}$	Turn-off Delay Time	-	55	-		
t_f	Fall Time	-	7	-		
Gate Charge Characteristics						
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	
Reverse Diode						
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	-	μC	
I_{rm}	Peak Reverse Recovery Current	-	32	-	A	

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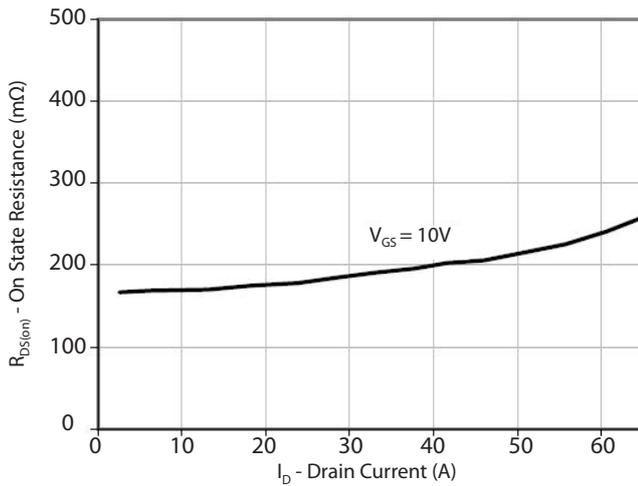
Output Characteristics



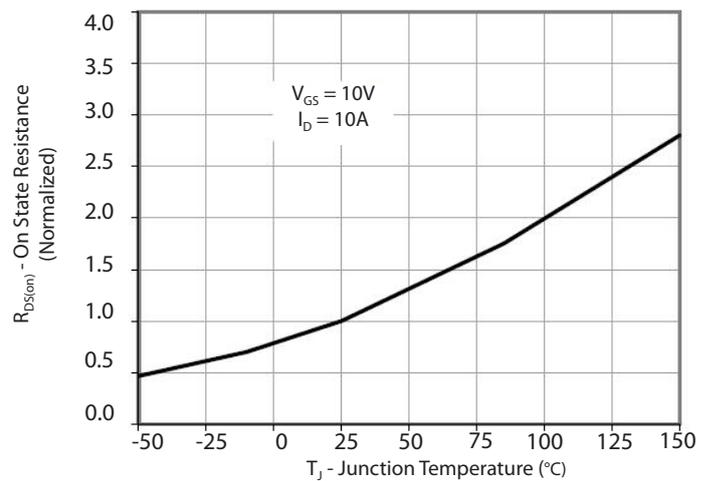
Transfer Characteristics



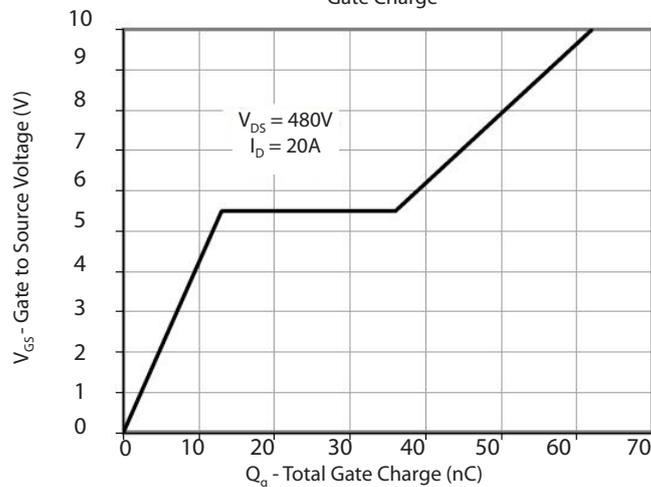
On State Resistance vs Drain Current



On Resistance vs Junction Temperature

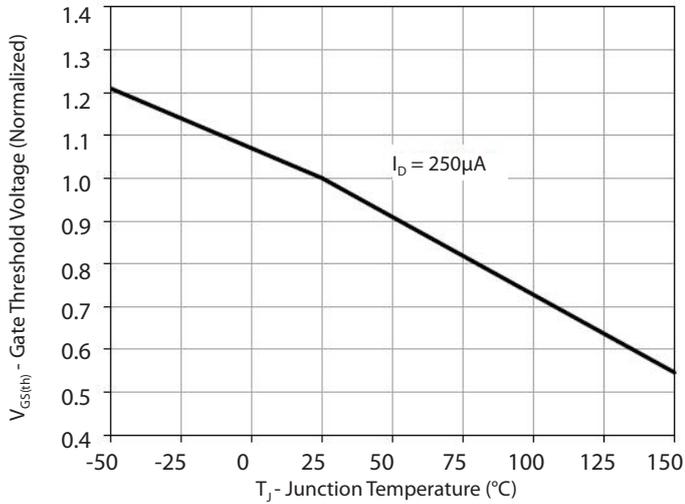


Gate Charge

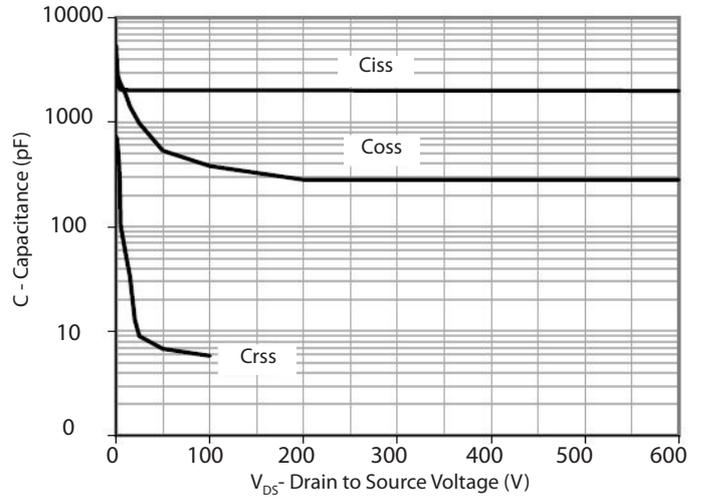


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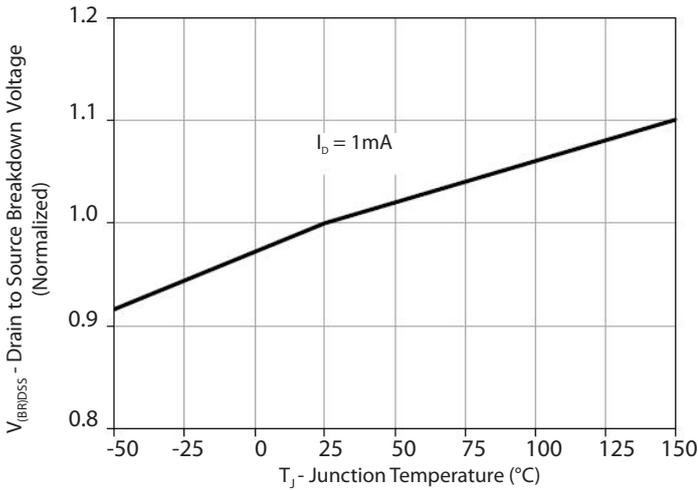
Gate Threshold Voltage vs. Junction Temperature



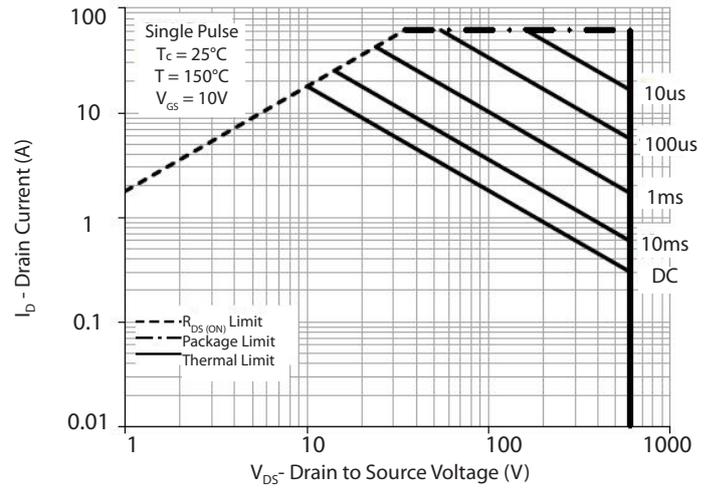
Capacitance



Drain to Source Breakdown Voltage vs. Junction Temperature



Maximum Rate Forward Biased Safe Operating Area



Transient Thermal Response - Junction to Case

