

ICE13N65

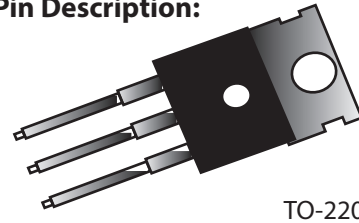
N-Channel Enhancement Mode MOSFET

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	$T_A = 25^\circ\text{C}$	13A	Max
$V_{(BR)DSS}$	$I_D = 250\mu\text{A}$	650V	Min
$r_{DS(ON)}$	$V_{GS} = 10\text{V}$	0.25 Ω	Typ
Q_g	$V_{DS} = 480\text{V}$	59nC	Typ

Pin Description:



TO-220

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

Symbol	Parameter	Value	Unit	Conditions
I_D	Continuous Drain Current	13	A	$T_C = 25^\circ\text{C}$
$I_{D, \text{pulse}}$	Pulsed Drain Current	39	A	$T_C = 25^\circ\text{C}$
E_{AS}	Avalanche Energy, Single Pulse	460	mJ	$I_D = 6.5\text{A}$
I_{AR}	Avalanche Current, Repetitive	6.5	A	Limited by $T_{j,max}$
dv/dt	MOSFET dv/dt Ruggedness	50	V/ns	$V_{DS} = 480\text{V}, I_D = 13\text{A}, T_j = 125^\circ\text{C}$
V_{GS}	Gate Source Voltage	± 20	V	Static
		± 30		AC (f>Hz)
P_{tot}	Power Dissipation	160	W	$T_C = 25^\circ\text{C}$
T_j, T_{stg}	Operating and Storage Temperature	-55 to +150	$^\circ\text{C}$	
	Mounting Torque	60	Ncm	M 3 & 3.5 screws

Symbol	Parameter	Values			Unit	Conditions
		Min	Typ	Max		

Thermal Characteristics

R_{thJC}	Thermal Resistance, Junction to Case	-	-	0.8	$^\circ\text{C/W}$	
R_{thJA}	Thermal Resistance, Junction to Ambient	-	-	62		Leaded
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

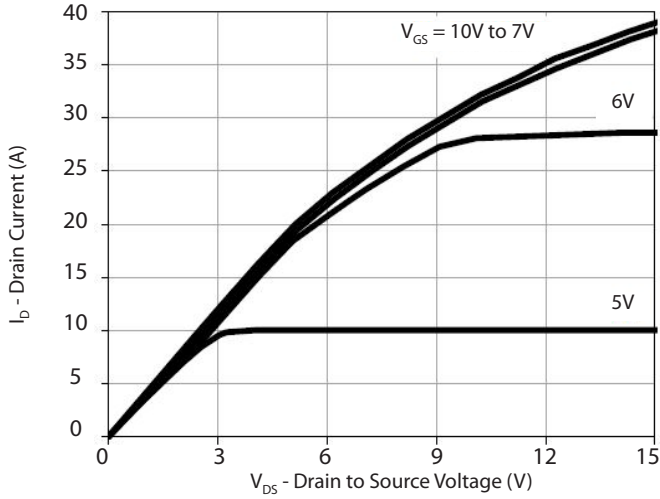
Static Characteristics						
$V_{(BR)DSS}$	Drain to Source Breakdown Voltage	650	675	-	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	2.1	-	3.9		$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
I_{DSS}	Zero Gate Voltage Drain Current	-	0.1	1	μA	$V_{DS} = 650\text{V}, V_{GS} = 0\text{V}, T_j = 25^\circ\text{C}$
		-	-	100		$V_{DS} = 650\text{V}, V_{GS} = 0\text{V}, T_j = 150^\circ\text{C}$
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	-	0.25	0.28	Ω	$V_{GS} = 10\text{V}, I_D = 6.5\text{A}, T_j = 25^\circ\text{C}$
		-	0.62	-		$V_{GS} = 10\text{V}, I_D = 6.5\text{A}, T_j = 150^\circ\text{C}$
R_{GS}	Gate Resistance	-	4.7	-	Ω	f = 1 MHz, open drain

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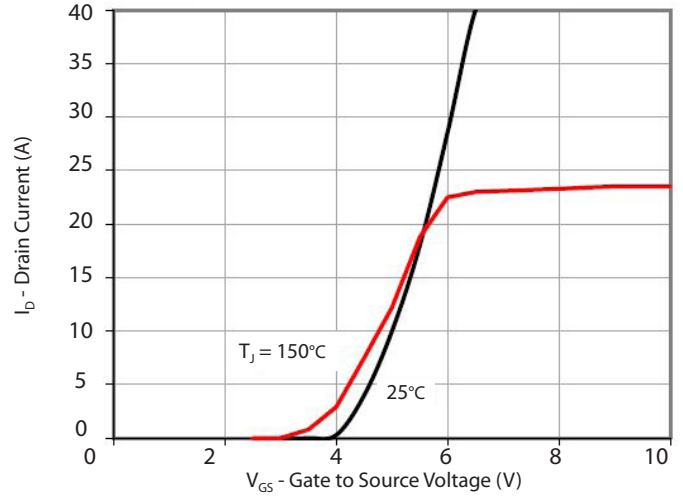
Symbol	Parameter	Values			Unit	Conditions
		Min	Typ	Max		
Dynamic Characteristics						
C_{iss}	Input Capacitance	-	1800	-	pF	$V_{GS} = 0V, V_{DS} = 25V, f = 1\text{ MHz}$
C_{oss}	Output Capacitance	-	600	-		
C_{rss}	Reverse Transfer Capacitance	-	5	-		
g_{fs}	Transconductance	-	15	-	S	$V_{DS} > 2 \cdot I_D \cdot R_{DS}, I_D = 6.5A$
$t_{d(on)}$	Turn-on Delay Time	-	39	-	nS	$V_{DS} = 380V, V_{GS} = 10V, I_D = 13A, R_G = 4\Omega$ (External)
T_r	Rise Time	-	10	-		
$t_{d(off)}$	Turn-off Delay Time	-	55	-		
t_f	Fall Time	-	6	-		
Gate Charge Characteristics						
Q_{gs}	Gate to Source Charge	-	11	-	nC	$V_{DS} = 480V, I_D = 13A, V_{GS} = 0\text{ to }10V$
Q_{gd}	Gate to Drain Charge	-	18	-		
Q_g	Gate Charge Total	-	59	-		
$V_{plateau}$	Gate Plateau Voltage	-	5.5	-	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	-	400	-	ns	$V_{RR} = 480V, I_S = I_F, d_{IF}/d_t = 100\text{ A}/\mu\text{S}$
Q_{rr}	Reverse Recovery Charge	-	6	-	μC	
I_{rm}	Peak Reverse Recovery Current	-	35	-	A	

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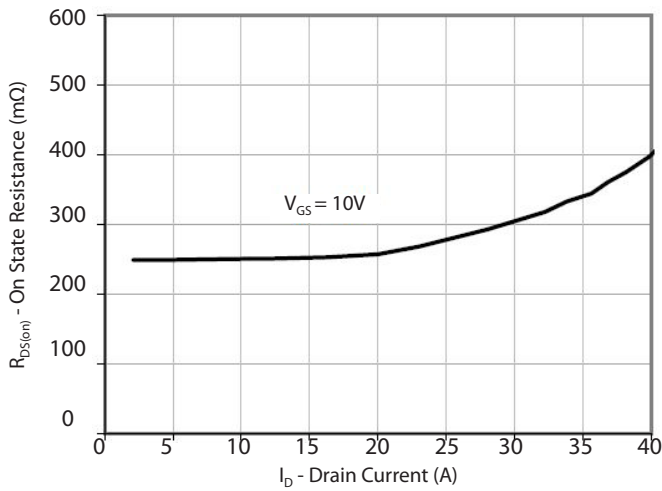
Output Characteristics



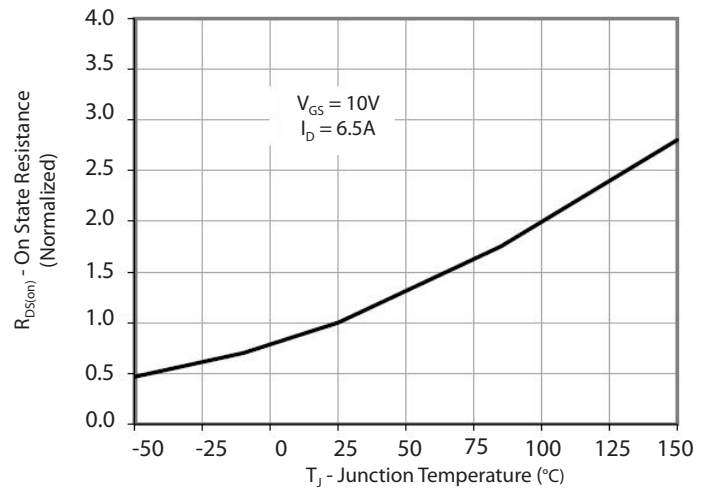
Transfer Characteristics



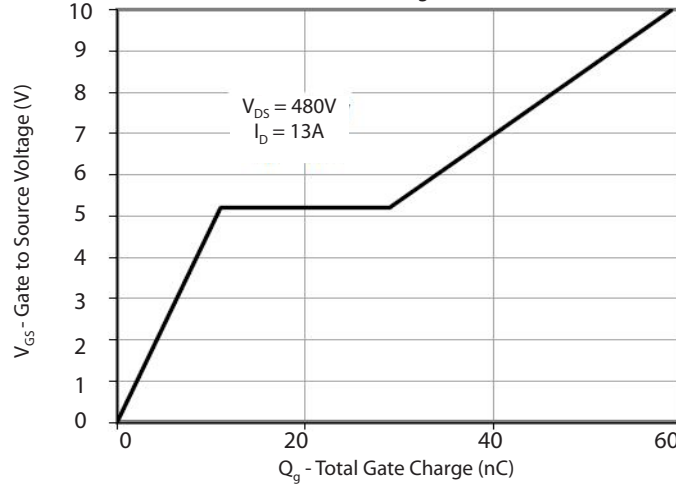
On State Resistance vs Drain Current



On Resistance vs Junction Temperature

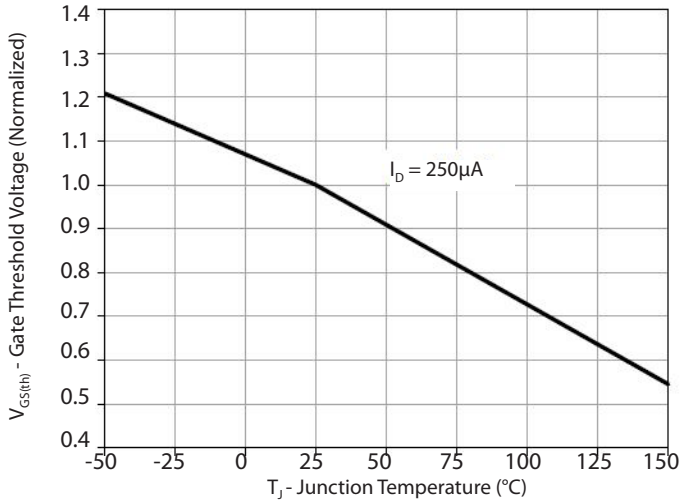


Gate Charge

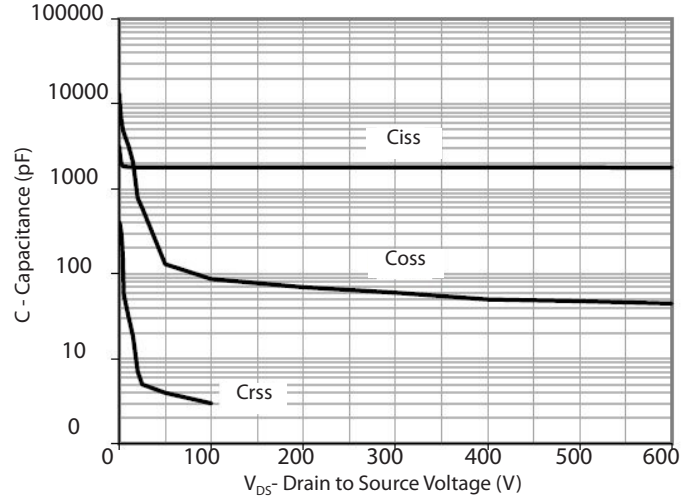


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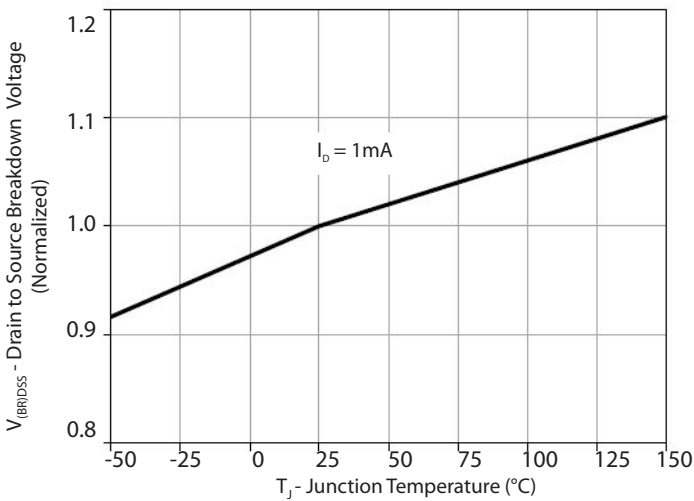
Gate Threshold Voltage vs. Junction Temperature



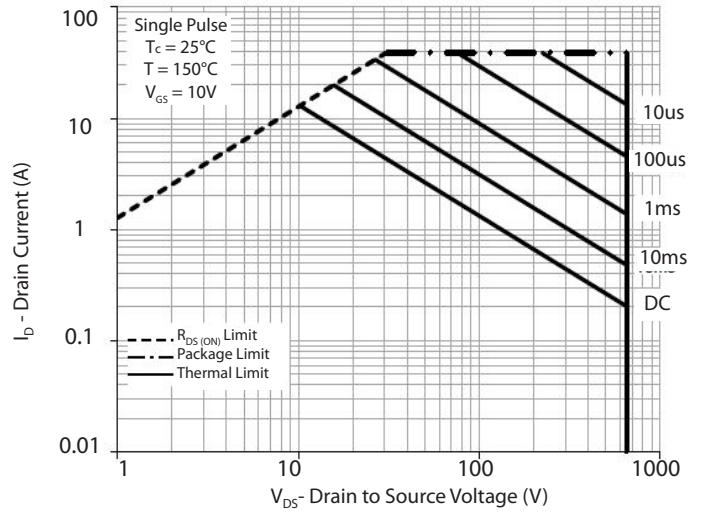
Capacitance



Drain to Source Breakdown Voltage vs. Junction Temperature



Maximum Rate Forward Biased Safe Operating Area



Transient Thermal Response - Junction to Case

