

NJ4N65 POWER MOSFET



4.0A 650V N-CHANNEL POWER MOSFET

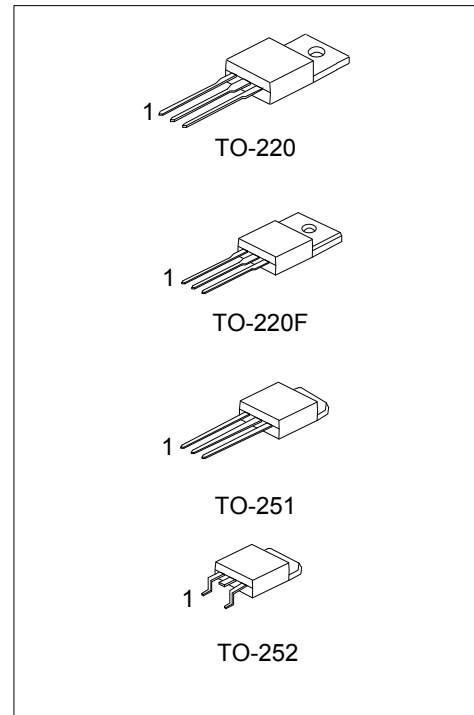
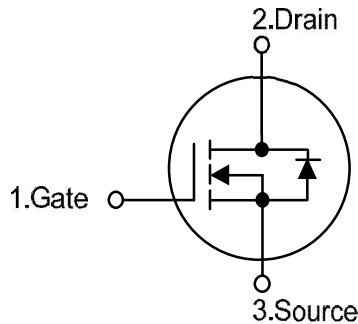
DESCRIPTION

The NJ4N65 is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

FEATURES

- * $V_{DS} = 650V$
- * $I_D = 4.0A$
- * $R_{DS(ON)} = 2.5\Omega @ V_{GS} = 10V$.
- * Ultra Low gate charge (typical 15nC)
- * Low reverse transfer capacitance ($C_{RSS} =$ typical 8.0 pF)
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL



ORDERING INFORMATION

Ordering Number	Package	Pin Assignment			Packing
		1	2	3	
NJ4N65-LI	TO-220	G	D	S	Tape Box
NJ4N65-BL	TO-220	G	D	S	Bulk
NJ4N65F-LI	TO-220F	G	D	S	Tube
NJ4N65A-LI	TO-251	G	D	S	Tube
NJ4N65D-TR	TO-252	G	D	S	Tape Ree
NJ4N65D-LI	TO-252	G	D	S	Tube

Note: Pin Assignment: G: Gate D: Drain S: Source

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■ ABSOLUTE MAXIMUM RATINGS (T_C = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V _{DSS}	650	V
Gate-Source Voltage		V _{GSS}	±30	V
Avalanche Current (Note2)		I _{AR}	4.4	A
Drain Current	Continuous	I _D	4.0	A
	Pulsed (Note2)	I _{DM}	16	A
Avalanche Energy Single Pulsed (Note3)	4N65-E	E _{AS}	200	mJ
	Repetitive (Note2)	E _{AR}	10.6	mJ
Peak Diode Recovery dv/dt (Note4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	P _D	106	W
	TO-220F		36	
	TO-251		50	
	TO-252		50	
Junction Temperature		T _J	+150	°C
Operating Temperature		T _{OPR}	-55 ~ +150	°C
Storage Temperature		T _{STG}	-55 ~ +150	°C

Note: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating : Pulse width limited by maximum junction temperature

3. L = 30mH, I_{AS} = 4A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C

4. I_{SD} ≤ 4.4A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER	PACKAGE	SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ _{JA}	62.5	°C/W
	TO-220F			
	TO-251			
	TO-252			
Junction to Case	TO-220	θ _{Jc}	1.18	°C/W
	TO-220F		3.47	
	TO-251		2.5	
	TO-252		2.5	

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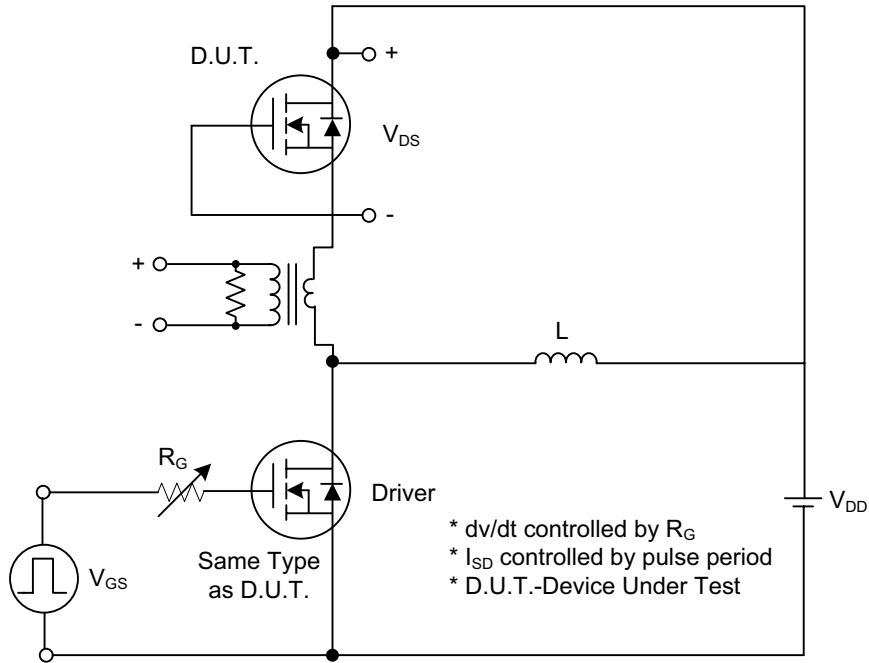
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0 V, I _D = 250μA	650			V	
Drain-Source Leakage Current	I _{DSS}	V _{DS} = 650 V, V _{GS} = 0 V			10	μA	
Gate-Source Leakage Current	Forward	V _{GS} = 30 V, V _{DS} = 0 V			100	nA	
	Reverse	V _{GS} = -30 V, V _{DS} = 0 V			-100	nA	
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D =250μA, Referenced to 25°C		0.6		V/°C	
ON CHARACTERISTICS							
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} = V _{GS} , I _D = 250μA	2.0		4.0	V	
Static Drain-Source On-State Resistance	4N65	V _{GS} = 10 V, I _D = 2.2A		2.4	2.5	Ω	
	4N65-E			2.4	2.5		
	4N65-N			2.9	3.1		
	4N65-Q			2.9	3.1		
DYNAMIC CHARACTERISTICS							
Input Capacitance	C _{ISS}	V _{DS} = 25 V, V _{GS} = 0V, f = 1MHz		520	670	pF	
Output Capacitance	C _{OSS}			70	90	pF	
Reverse Transfer Capacitance	C _{RSS}			8	11	pF	
SWITCHING CHARACTERISTICS							
Turn-On Delay Time	t _{D(ON)}	V _{DS} = 325V, I _D = 4.0A, R _G = 25Ω (Note 1, 2)		13	35	ns	
Turn-On Rise Time	4N65		t _R		70	100	ns
	4N65-E				60	100	
	4N65-N				70	100	
	4N65-Q				45	100	
Turn-Off Delay Time	t _{D(OFF)}			25	60	ns	
Turn-Off Fall Time	4N65		t _F		100	120	ns
	4N65-E				70	120	
	4N65-N				100	120	
	4N65-Q				35	120	
Total Gate Charge	Q _G	V _{DS} = 520V, I _D = 4.0A, V _{GS} = 10V (Note 1, 2)		15	20	nC	
Gate-Source Charge	Q _{GS}			3.4		nC	
Gate-Drain Charge	Q _{GD}			7.1		nC	
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} = 0 V, I _S = 4.4A			1.4	V	
Maximum Continuous Drain-Source Diode Forward Current	I _S				4.4	A	
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				17.6	A	
Reverse Recovery Time	t _{rr}	V _{GS} = 0V, I _S = 4.4A,		250		ns	
Reverse Recovery Charge	Q _{RR}	di _F /dt = 100 A/μs (Note 1)		1.5		μC	

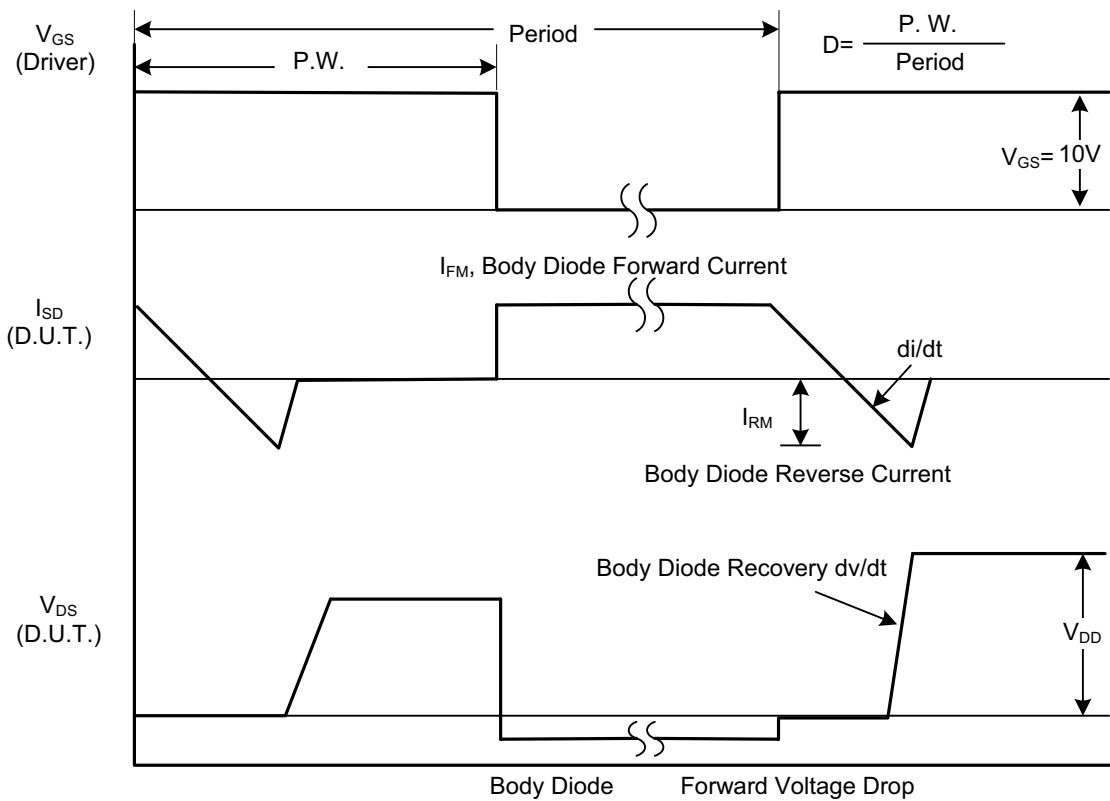
Note: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%
2. Essentially independent of operating temperature

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■ TEST CIRCUITS AND WAVEFORMS



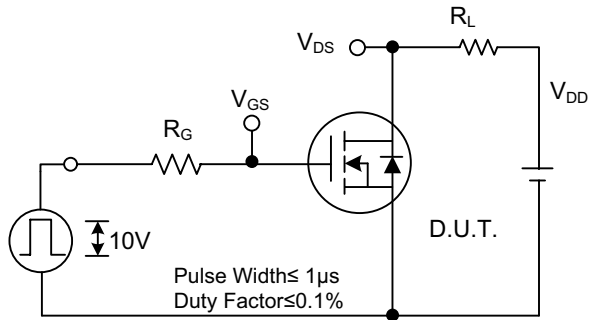
Peak Diode Recovery dv/dt Test Circuit



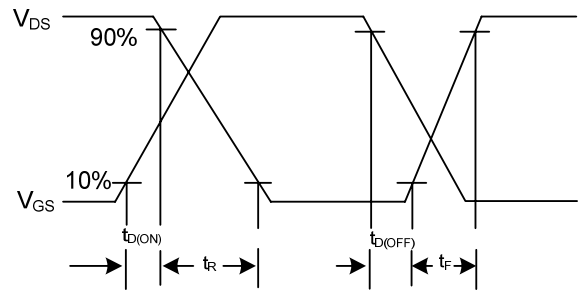
Peak Diode Recovery dv/dt Waveforms

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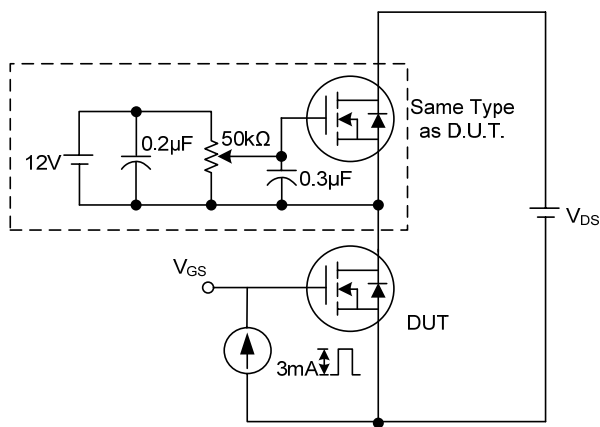
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



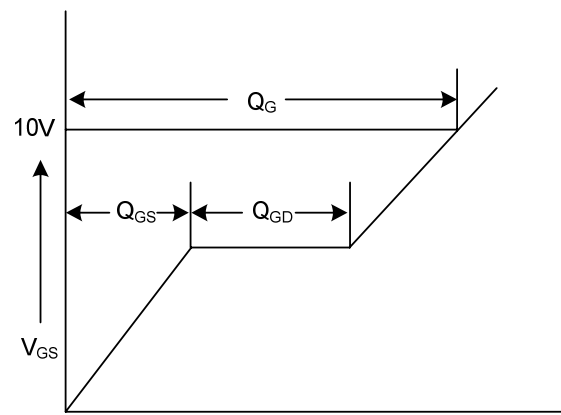
Switching Test Circuit



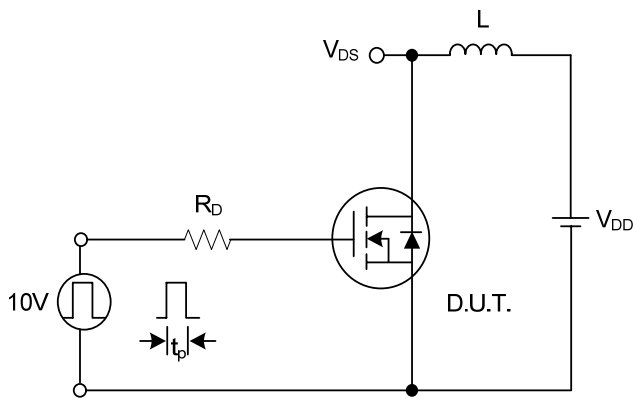
Switching Waveforms



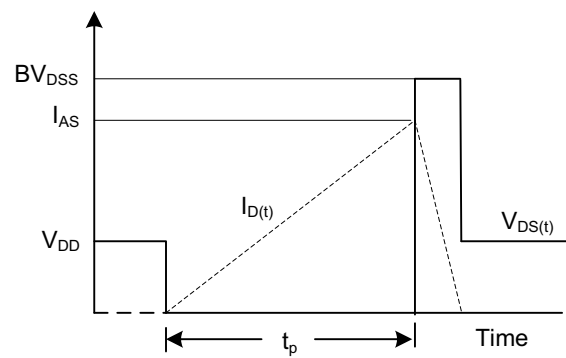
Gate Charge Test Circuit



Charge Gate Charge Waveform



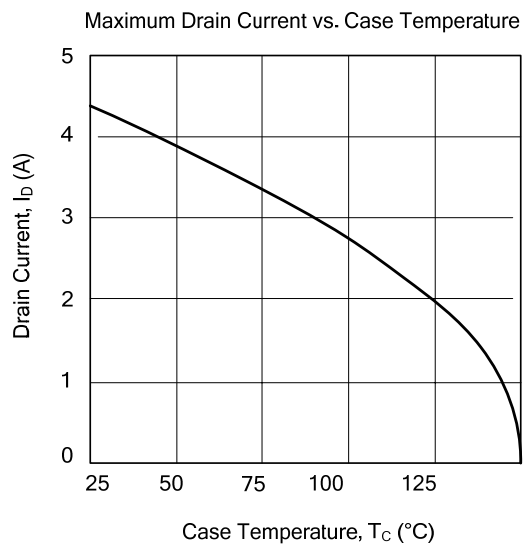
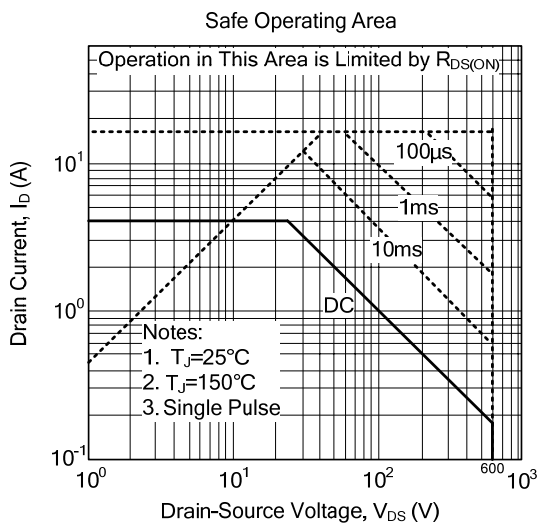
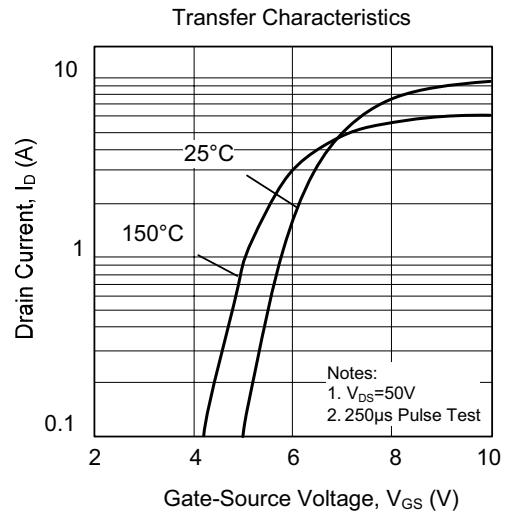
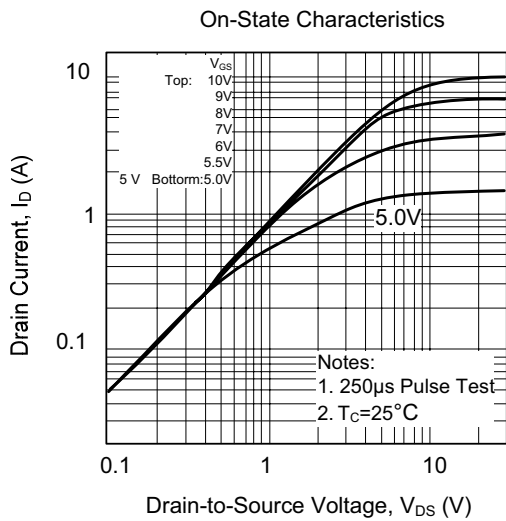
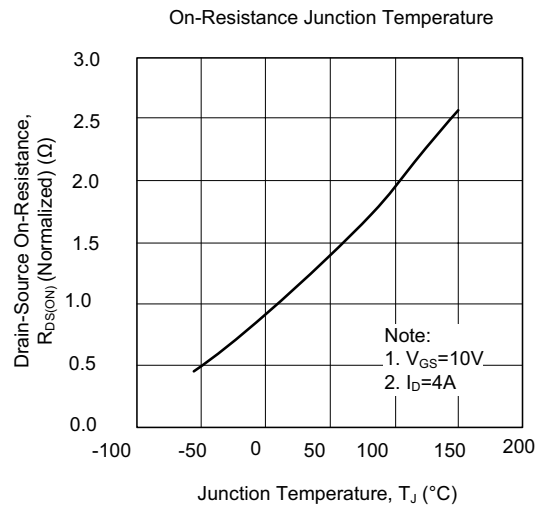
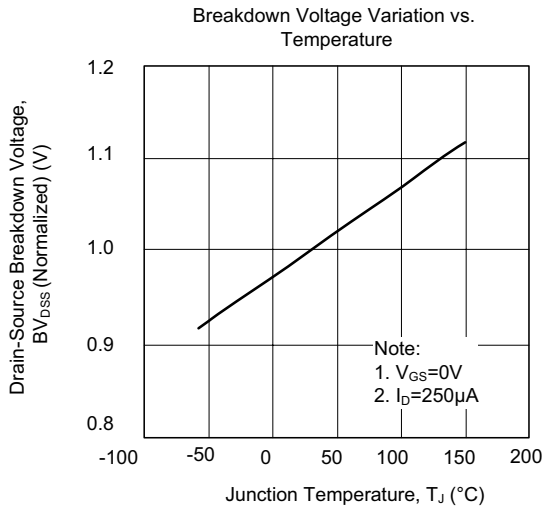
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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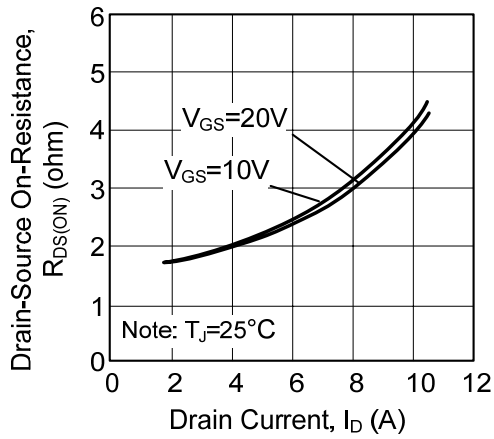
TYPICAL CHARACTERISTICS



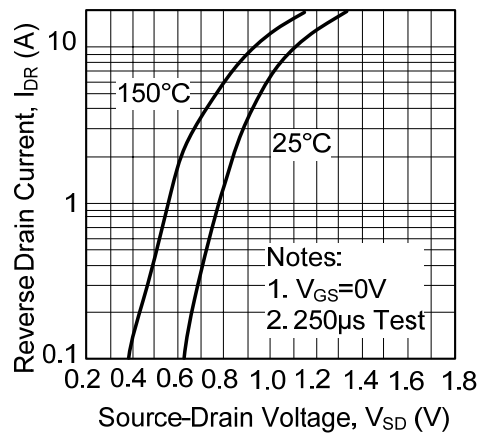
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■ TYPICAL CHARACTERISTICS(Cont.)

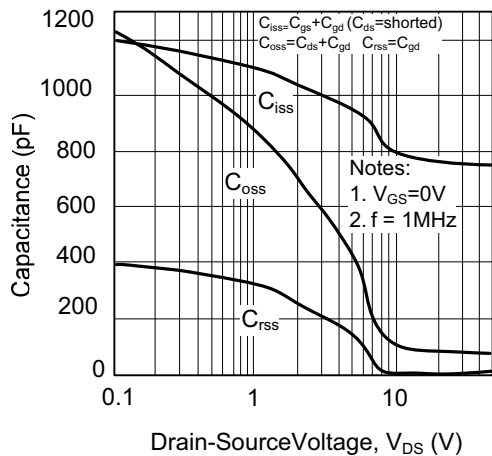
On-Resistance Variation vs. Drain Current and Gate Voltage



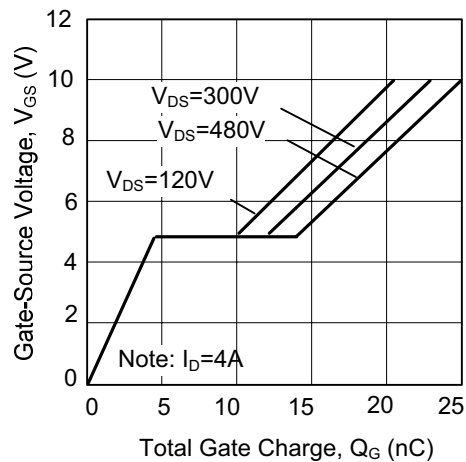
On State Current vs. Allowable Case Temperature



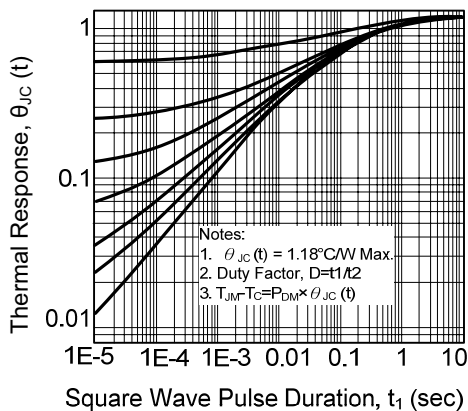
Capacitance Characteristics (Non-Repetitive)



Gate Charge Characteristics



Transient Thermal Response Curve



Power Dissipation

