

7N65 7N65F 7N65D 7N65E 7N65M 7N65N

650V N-Channel Power MOSFET

FEATURES

- $R_{DS(ON)} < 1.5\Omega @ V_{GS} = 10V$
- Fast switching capability
- Low gate charge
- Lead free in compliance with EU RoHS directive.
- Green molding compound

MECHANICAL DATA

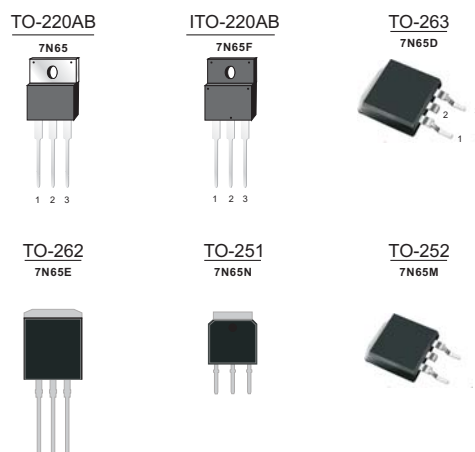
- Case: TO-220, ITO-220, TO-263, TO-262 Package
TO-251, TO-252 Package

Ordering Information

Part No.	Package	Packing
7N65-TU	TO-220	50pcs / Tube
7N65F-TU	ITO-220	50pcs / Tube
7N65E-TU	TO-262	50pcs / Tube
7N65D-TU	TO-263	50pcs / Tube
7N65D-TR	TO-263	800pcs / 13"Reel
7N65N-TU	TO-251	75pcs / Tube
7N65M-TU	TO-252	75pcs / Tube
7N65M-TR	TO-252	2.5Kpcs / 13"Reel

PRODUCT SUMMARY

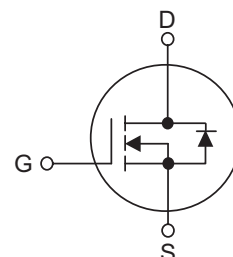
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
650	1.5 @ $V_{GS} = 10V$	7



Pin Definition:

1. Gate
2. Drain
3. Source

Block Diagram



ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ C}$, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V_{DSS}	650	V
Gate-Source Voltage	V_{GSS}	± 30	V
Continuous Drain Current	I_D	7	A
Pulsed Drain Current (Note 2)	I_{DM}	28	A
Avalanche Energy	E_{AS}	435	mJ
Power Dissipation	TO-220/TO-263/TO-262	142	W
	TO-251/TO-252	32	
	ITO-220	48	
Junction Temperature	T_J	+150	C
Storage Temperature	T_{STG}	-55 ~ +150	C

Notes: 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 T_J

3. $L = 30\text{mH}$, $I_{AS} = 5.25\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25\text{ C}$

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THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/ITO-220 TO-263/TO-262	$R_{\theta JA}$	62.5	C/W
	TO-251/TO-252		110	
Junction to Case	TO-220/TO-263/TO-262	$R_{\theta JC}$	2.35	C/W
	TO-251/TO-252		2.9	
	ITO-220		5.5	

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

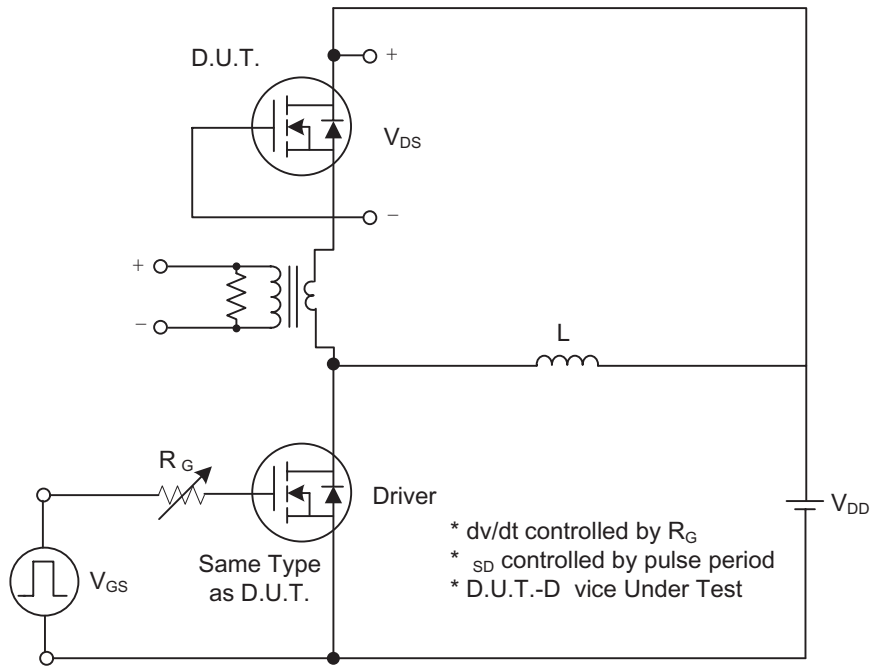
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	650			V
Drain-Source Leakage Current		I_{DSS}	$V_{DS}=650V, V_{GS}=0V$			1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	$V_G=30V, V_{DS}=0V$			100	nA
	Reverse		$V_{GS}=-30V, V_{DS}=0V$			-100	nA
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS} / \Delta T_J$	$I_D=250\mu A$, Referenced to 25°C		0.67		V/ C
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS}=10V, I_D=3.5A$		1.35	1.5	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1MHz$		1210	1400	pF
Output Capacitance		C_{OSS}			140	180	pF
Reverse Transfer Capacitance		C_{RSS}			40	50	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D(ON)}$	$V_{DD}=300V, I_D=7A,$ $R_G=25\Omega$ (Note 1, 2)		50	70	ns
Turn-On Rise Time		t_R			150	180	ns
Turn-Off Delay Time		$t_{D(OFF)}$			380	410	ns
Turn-Off Fall Time		t_F			180	220	ns
Total Gate Charge		Q_G	$V_{DS}=520V, I_D=7A,$ $V_{GS}=10V$ (Note 1, 2)		29	38	nC
Gate-Source Charge		Q_{GS}			9		nC
Gate-Drain Charge		Q_{GD}			19		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Drain-Source Diode Forward Voltage		V_{SD}	$V_{GS}=0V, I_S=7A$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current		I_S				7	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				28	A
Reverse Recovery Time		t_{rr}	$V_{GS}=0V, I_S=7A$		490		ns
Reverse Recovery Charge		Q_{RR}	$di/dt=100A/\mu s$ (Note 1)		3.2		μC

- Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.
2. Essentially independent of operating temperature.

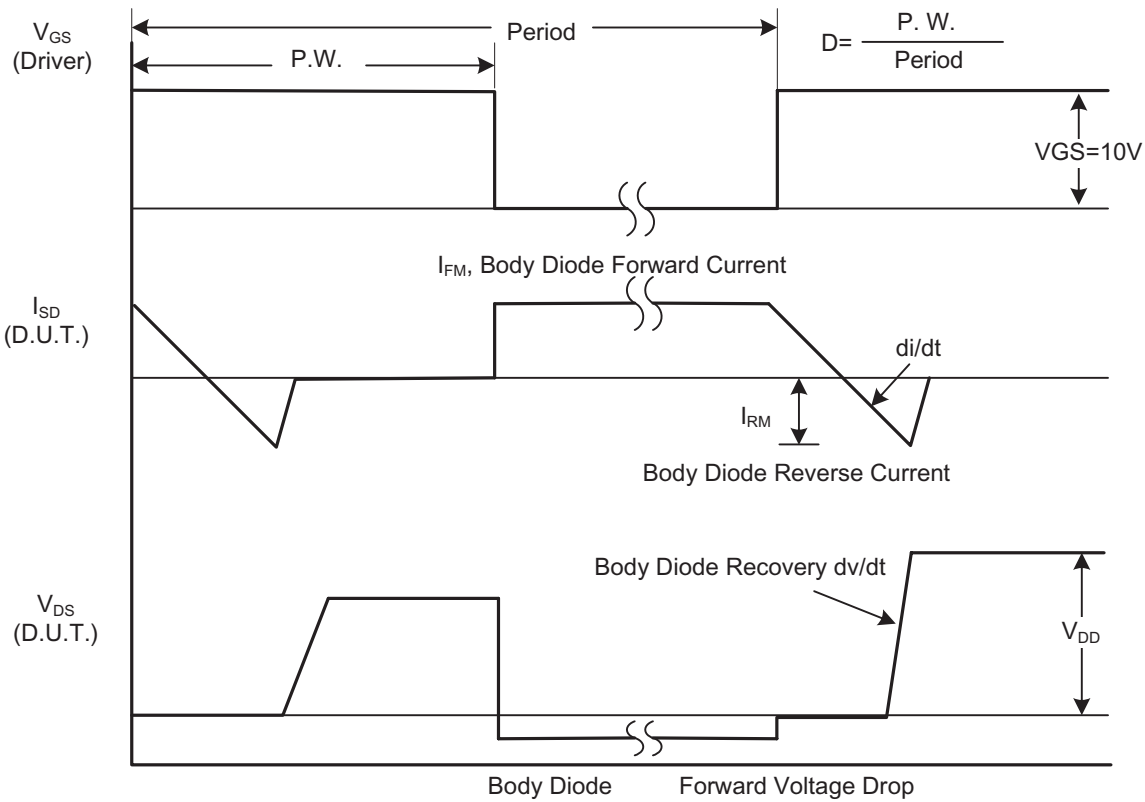
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TEST CIRCUITS AND WAVEFORMS



Peak Diode Recovery dv/dt Test Circuit

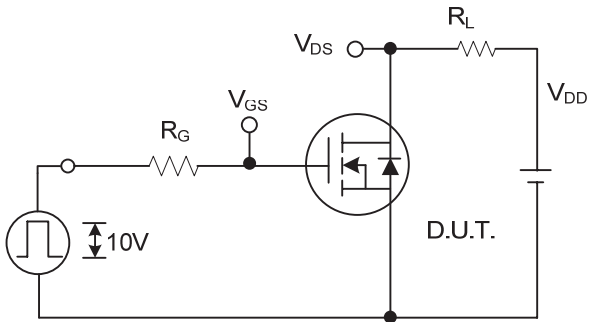


Peak Diode Recovery dv/dt Waveforms

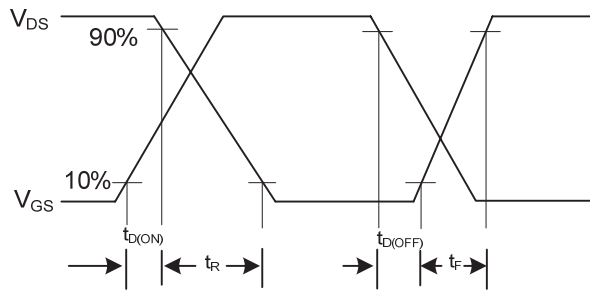
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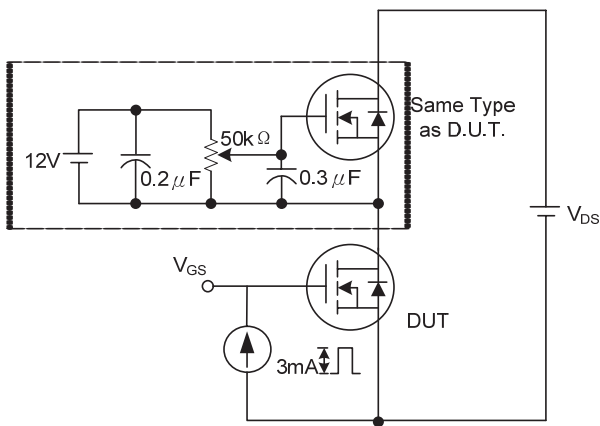
TEST CIRCUITS AND WAVEFORMS(Cont.)



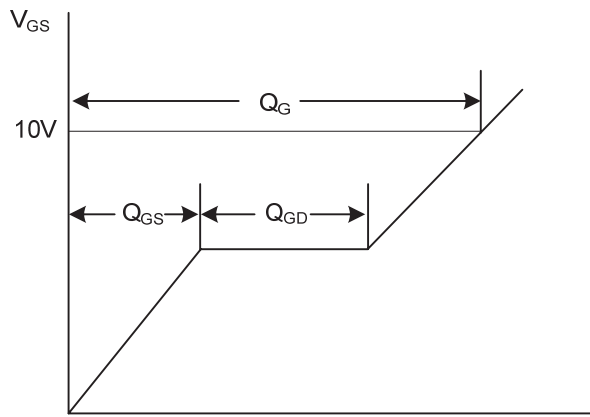
Switching Test Circuit



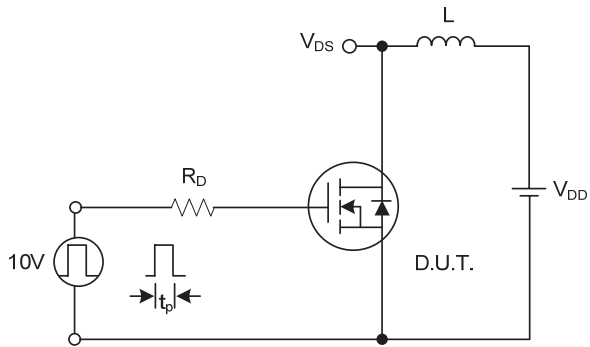
Switching Waveforms



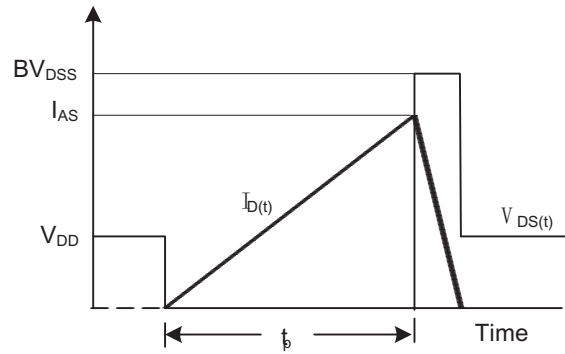
Gate Charge Test Circuit



Charge
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



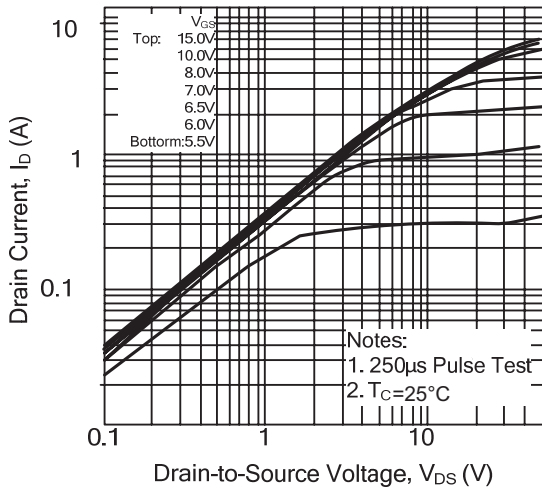
Unclamped Inductive Switching Waveforms

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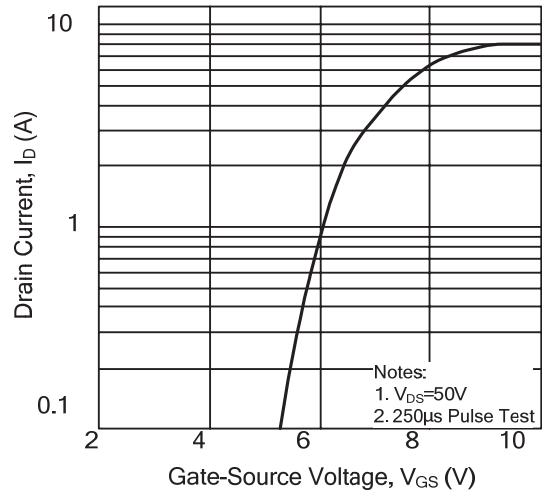
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TYPICAL CHARACTERISTICS

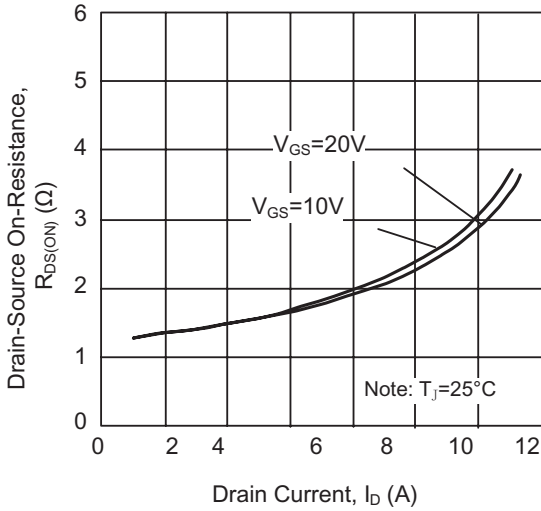
On-State Characteristics



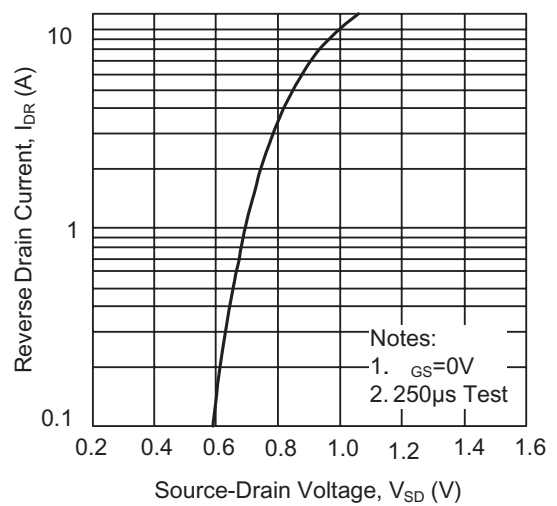
Transfer Characteristics



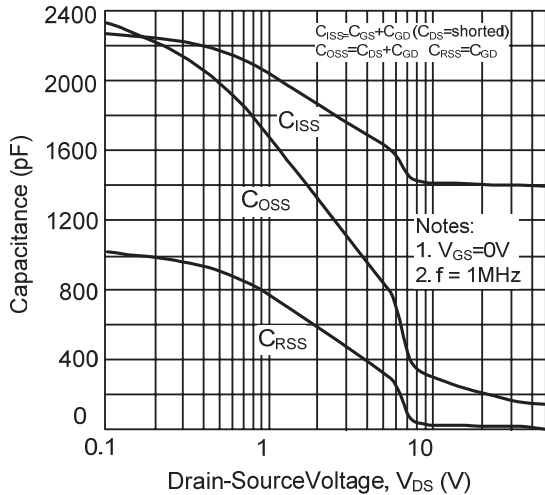
On-Resistance Variation vs. Drain Current and Gate Voltage



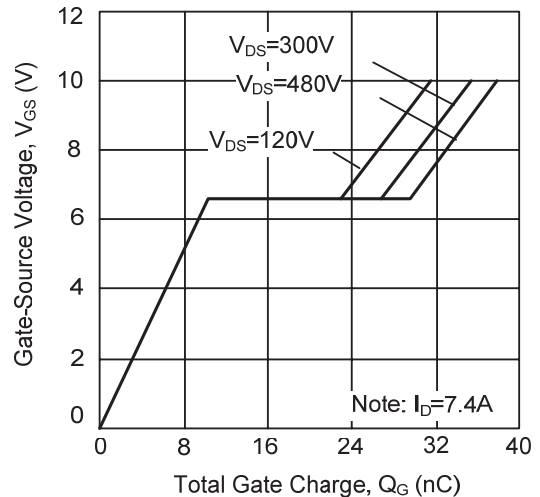
On State Current vs. Allowable Case Temperature



Capacitance Characteristics (Non-Repetitive)



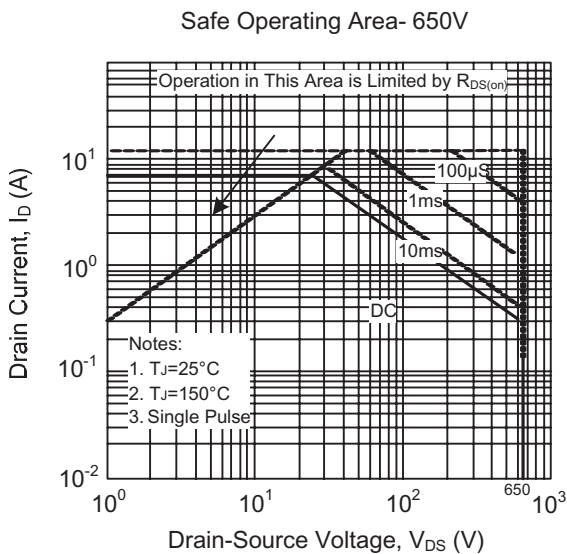
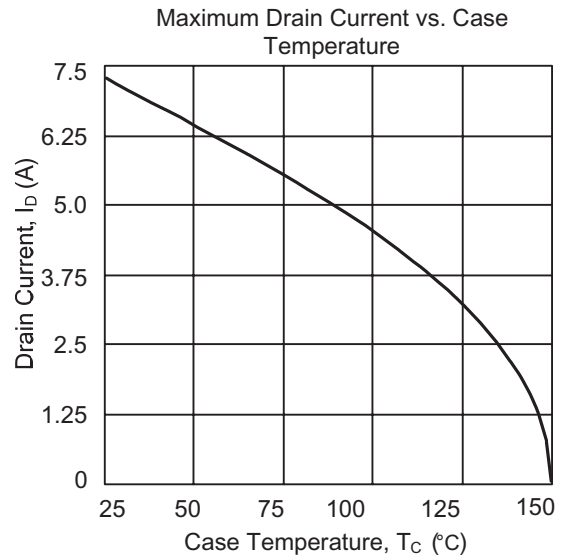
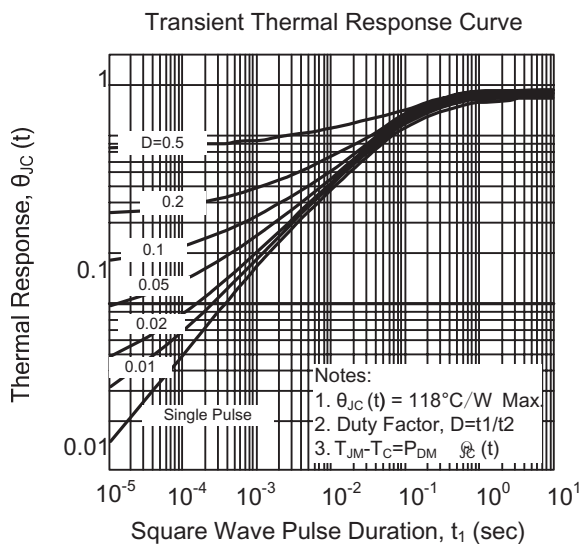
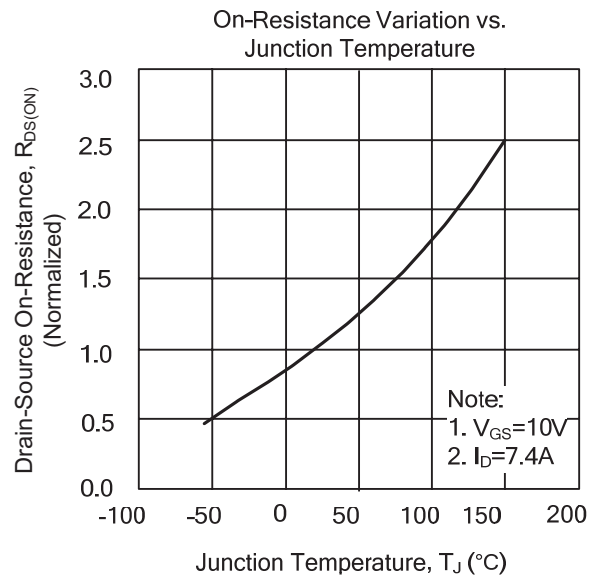
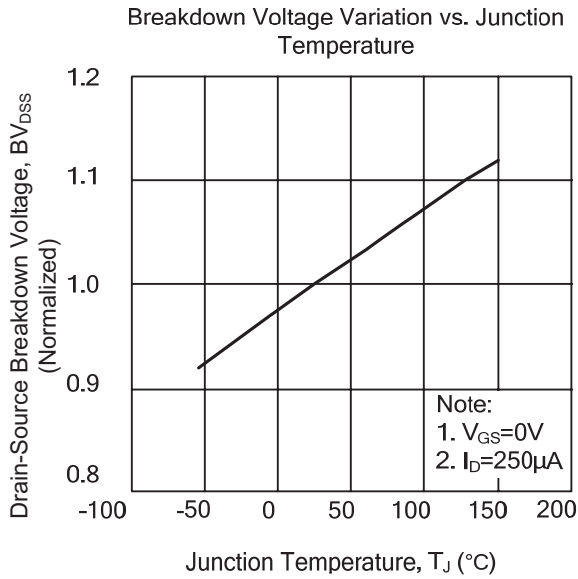
Gate Charge Characteristics



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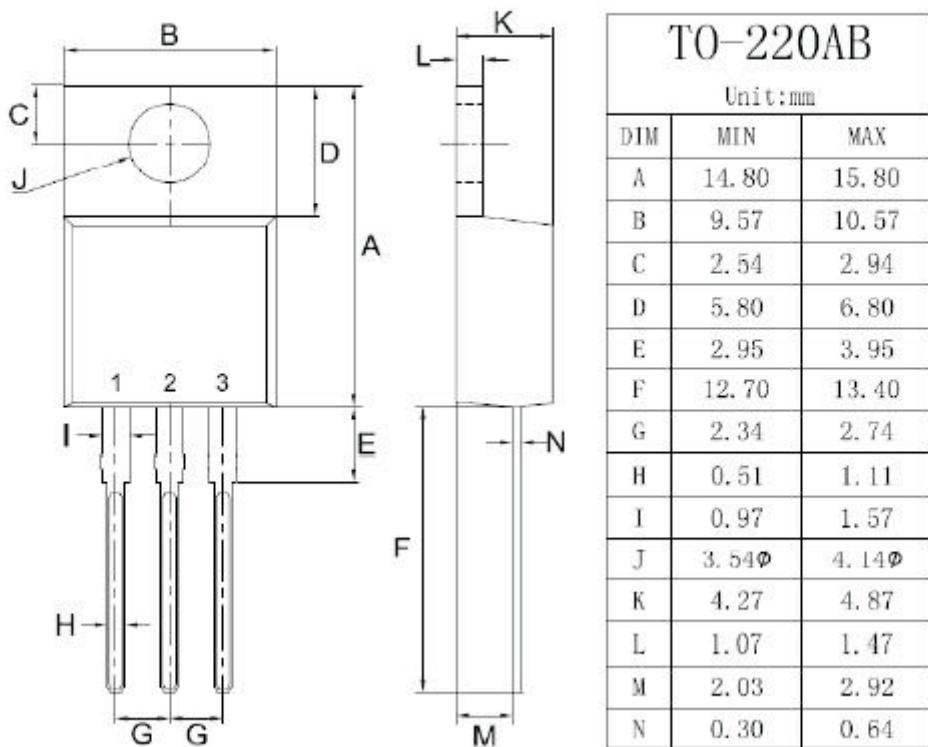
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TYPICAL CHARACTERISTICS

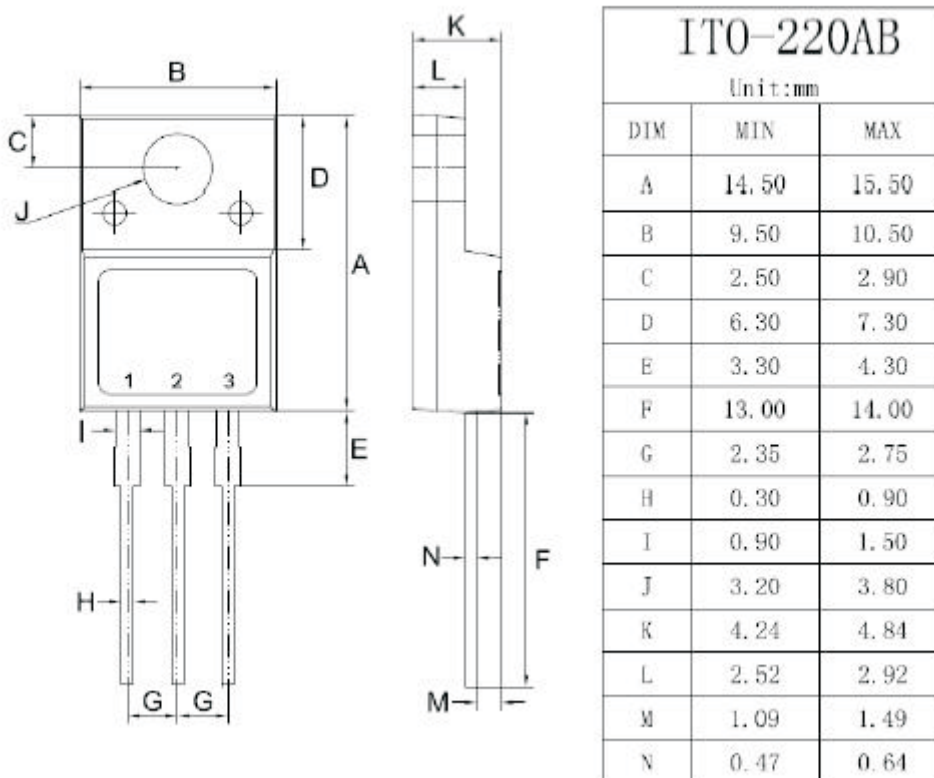


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TO-220 Mechanical Drawing

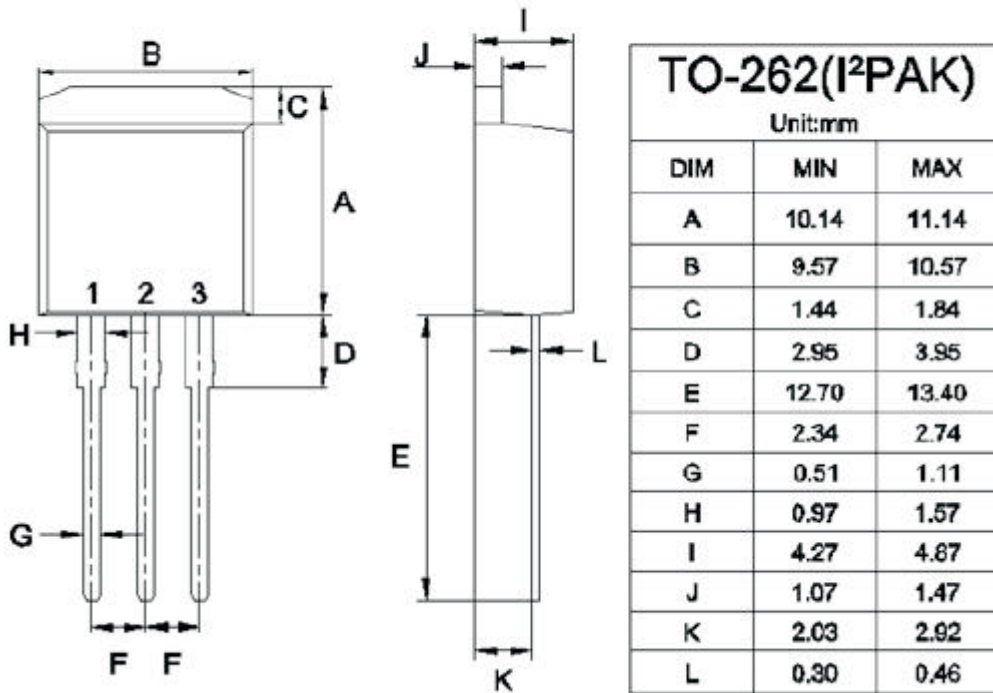


ITO-220 Mechanical Drawing

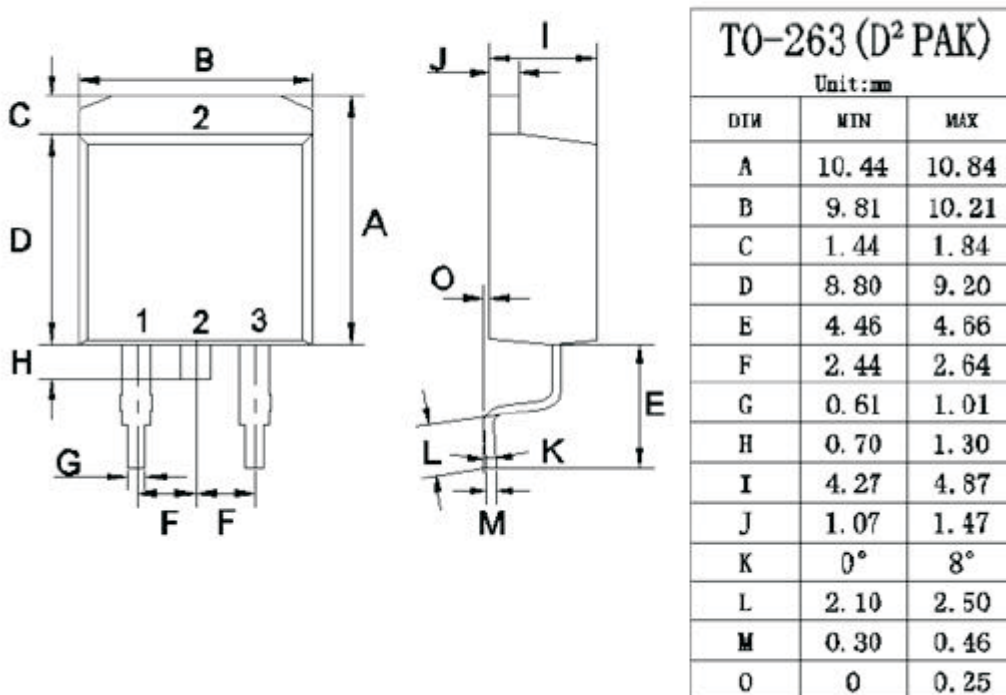


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 650V N-Channel Power MOSFET

TO-262 Mechanical Drawing

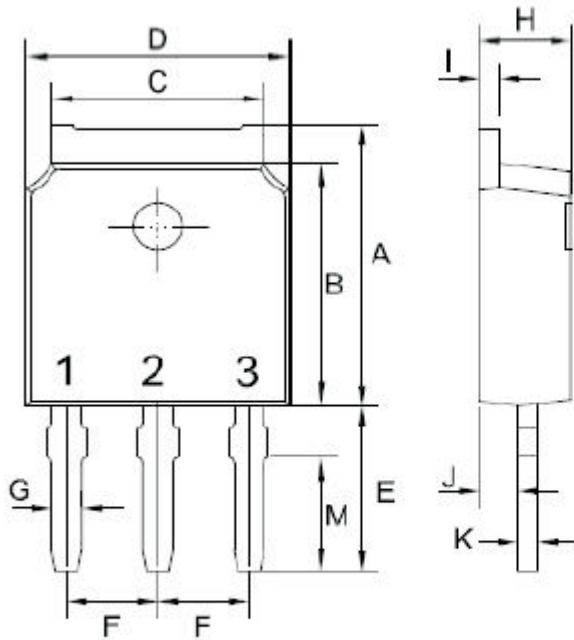


TO-263 Mechanical Drawing



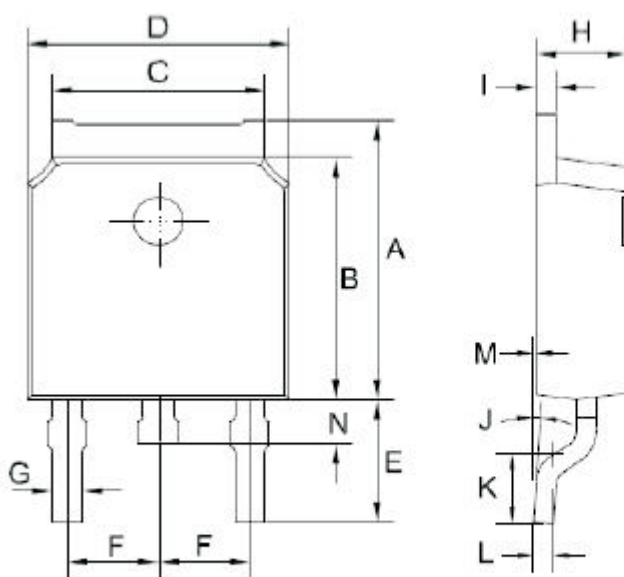
7N65 7N65F 7N65D 7N65E 7N65M 7N65N
 650V N-Channel Power MOSFET

TO-251 Mechanical Drawing



TO-251(IPAK)		
Unit:mm		
DIM	MIN	MAX
A	6.85	7.25
B	5.90	6.30
C	5.13	5.53
D	6.40	6.80
E	3.95	4.35
F	2.19	2.39
G	0.45	0.85
H	2.20	2.40
I	0.41	0.61
J	0.71	1.31
K	0.41	0.61
M	2.96	3.16

TO-252 Mechanical Drawing



TO-252 (DPAK)		
Unit:mm		
DTM	MIN	MAX
A	6.85	7.25
B	5.90	6.30
C	5.13	5.53
D	6.40	6.80
E	2.90	3.30
F	2.19	2.39
G	0.45	0.85
H	2.20	2.40
I	0.41	0.61
J	0°	8°
K	1.45	1.85
L	0.41	0.61
M	0.00	0.12
N	0.60	1.00