

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

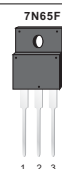
PRODUCT SUMMARY

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

TO-220AB



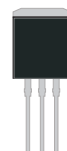
ITO-220AB



TO-263



TO-262
7N65E



TO-251
7N65N



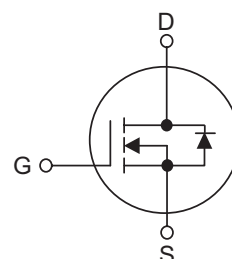
TO-252
7N65M



Pin Definition:

1. Gate
2. Drain
3. Source

Block Diagram



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

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	±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 = 30mH, $I_{AS} = 5.25A$, $V_{DD} = 50V$, $R_G = 25 \Omega$, Starting $T_J = 25 C$

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

650V N-Channel Power MOSFET

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	

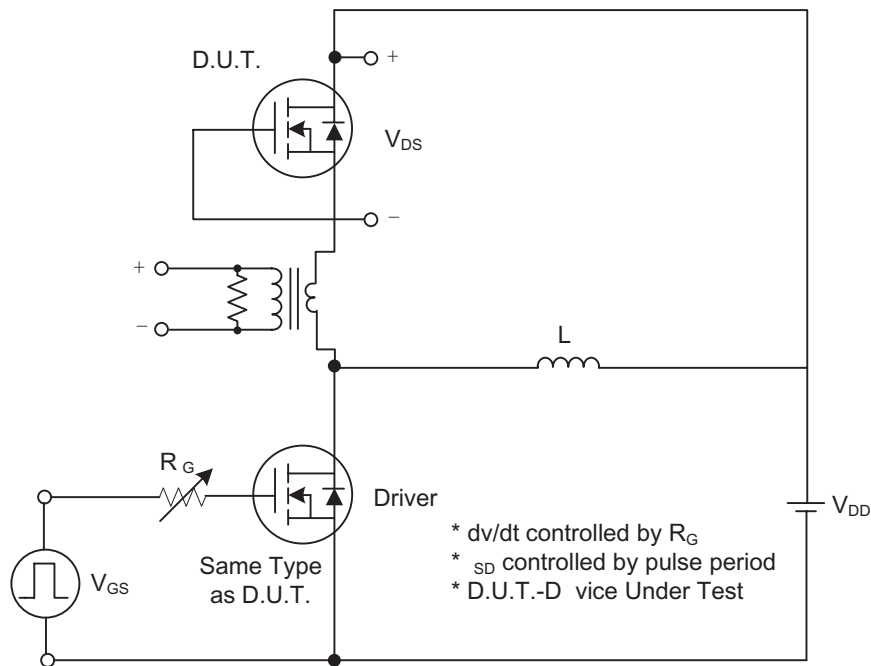
ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	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		ΔBV _{DSS} /ΔT _J	I _D =250μA, Referenced to 25°C		0.67		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		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 =25Ω(Note1, 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(Note1, 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}	dlF/dt=100A/μs (Note 1)		3.2		μC

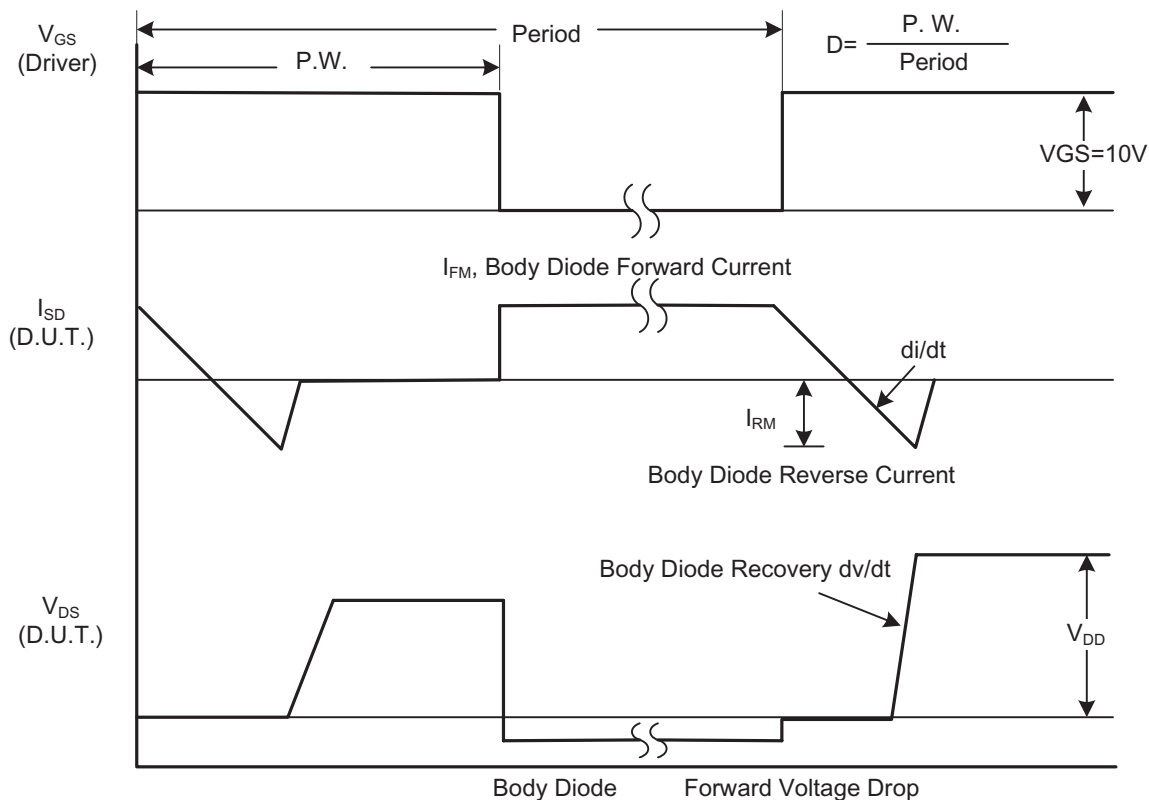
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.
2. Essentially independent of operating temperature.

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

TEST CIRCUITS AND WAVEFORMS



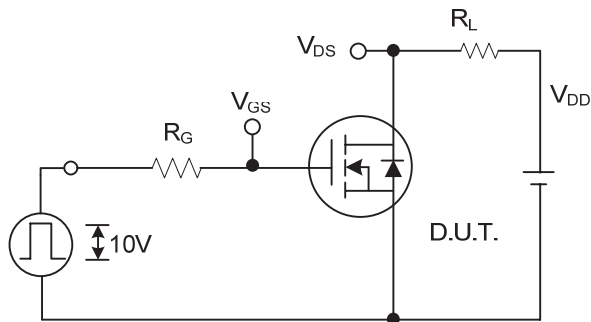
Peak Diode Recovery dv/dt Test Circuit



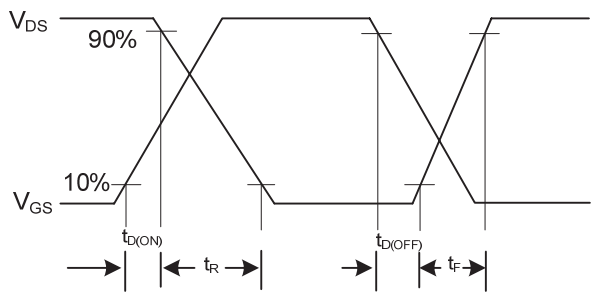
Peak Diode Recovery dv/dt Waveforms

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

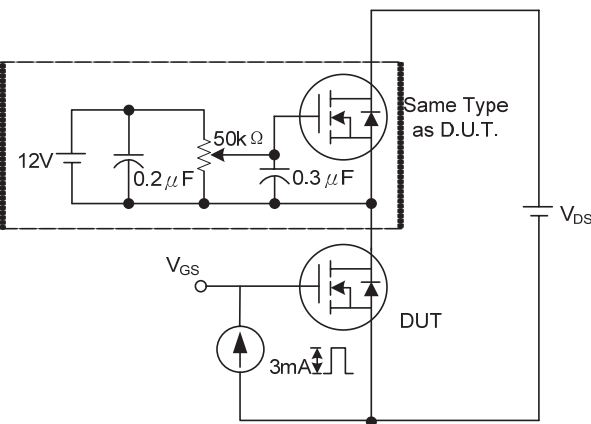
TEST CIRCUITS AND WAVEFORMS(Cont.)



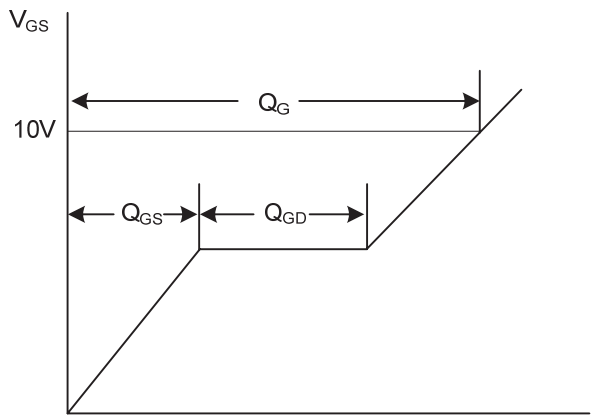
Switching Test Circuit



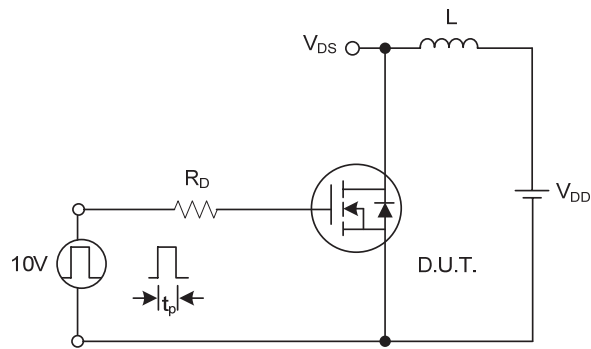
Switching Waveforms



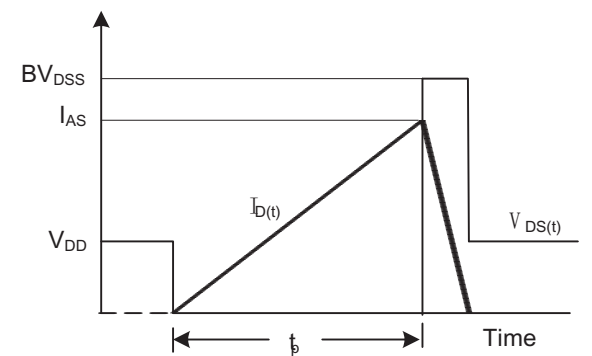
Gate Charge Test Circuit



Charge
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



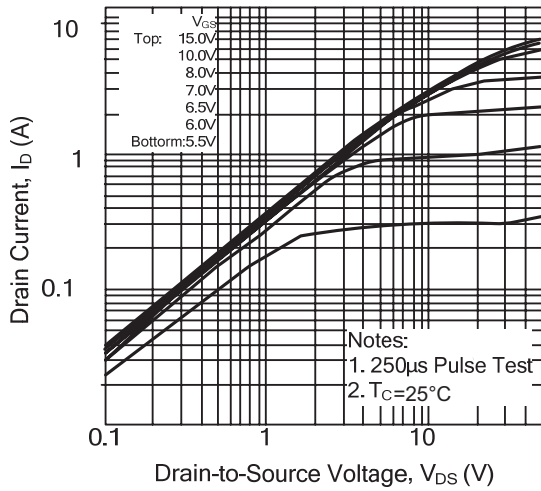
Unclamped Inductive Switching Waveforms

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

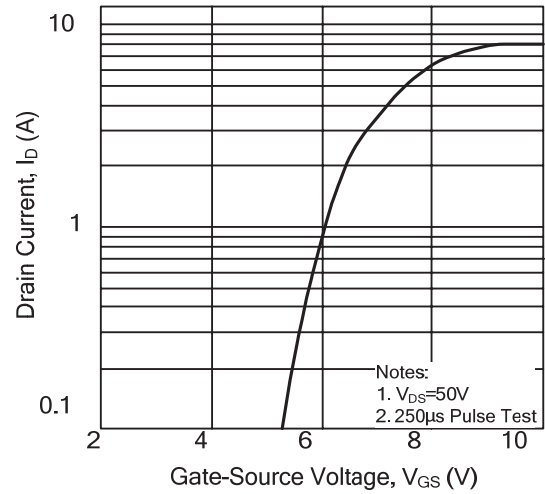
650V N-Channel Power MOSFET

TYPICAL CHARACTERISTICS

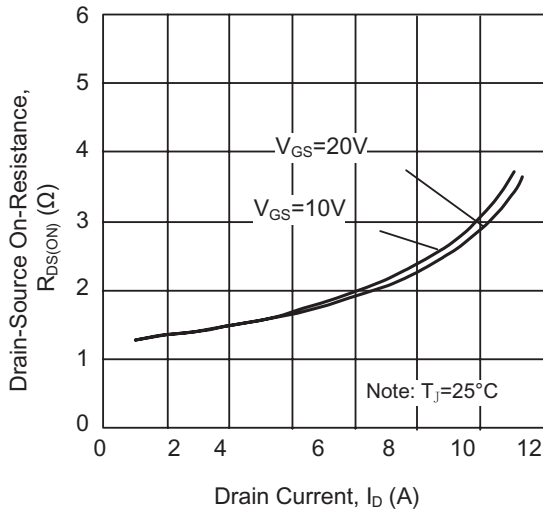
On-State Characteristics



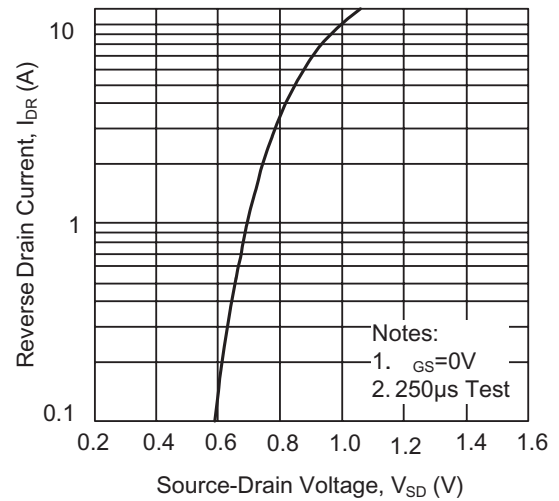
Transfer Characteristics



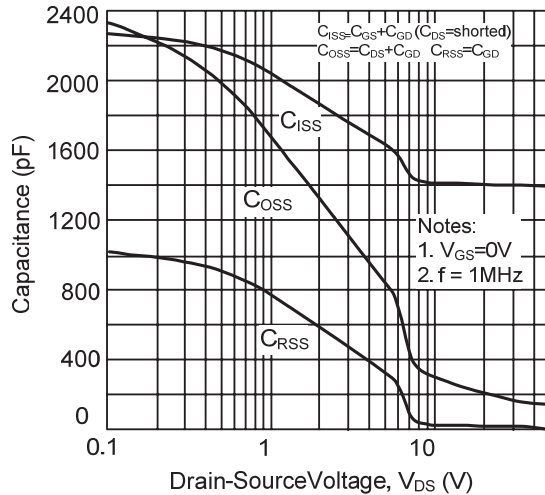
On-Resistance Variation vs. Drain Current and Gate Voltage



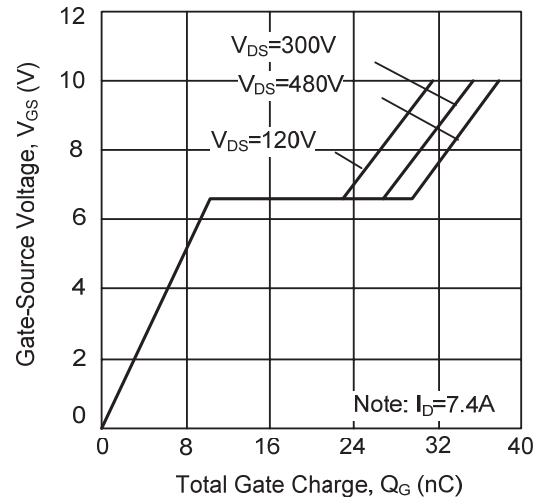
On State Current vs. Allowable Case Temperature



Capacitance Characteristics (Non-Repetitive)



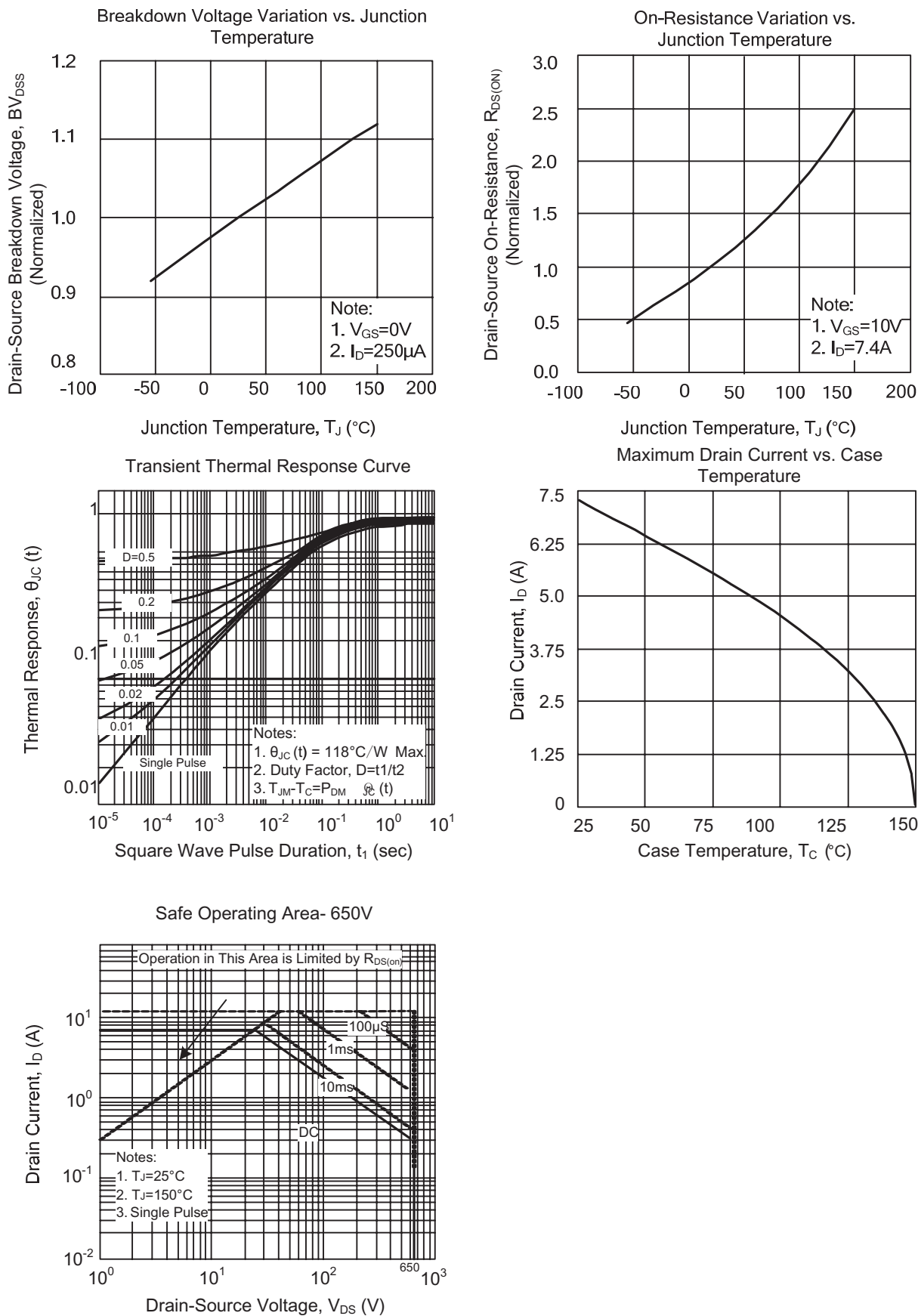
Gate Charge Characteristics



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

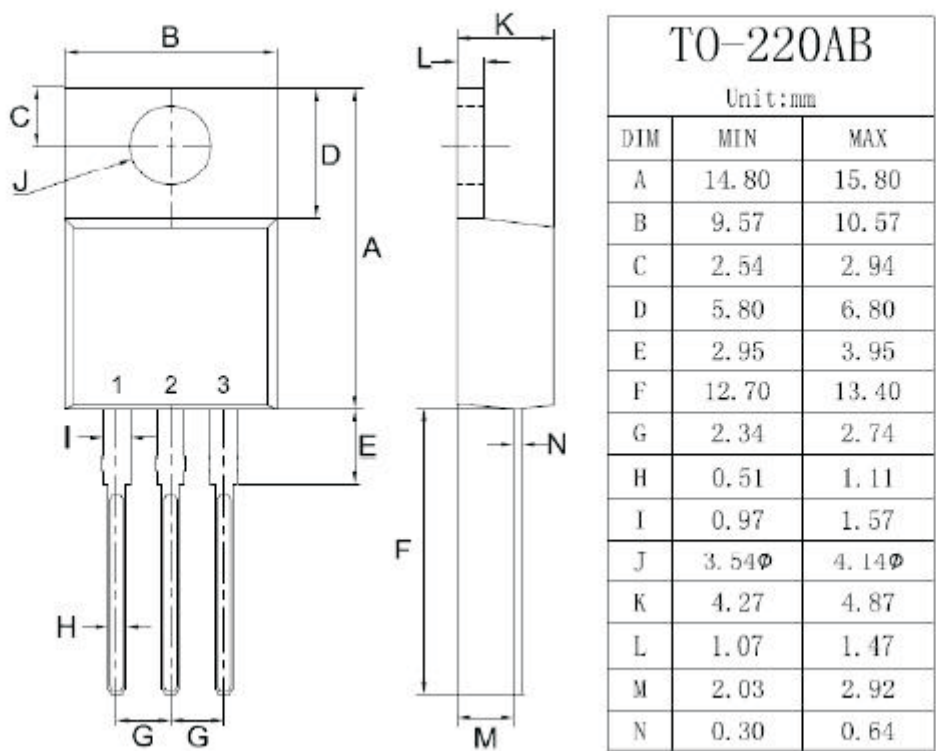
650V N-Channel Power MOSFET

TYPICAL CHARACTERISTICS

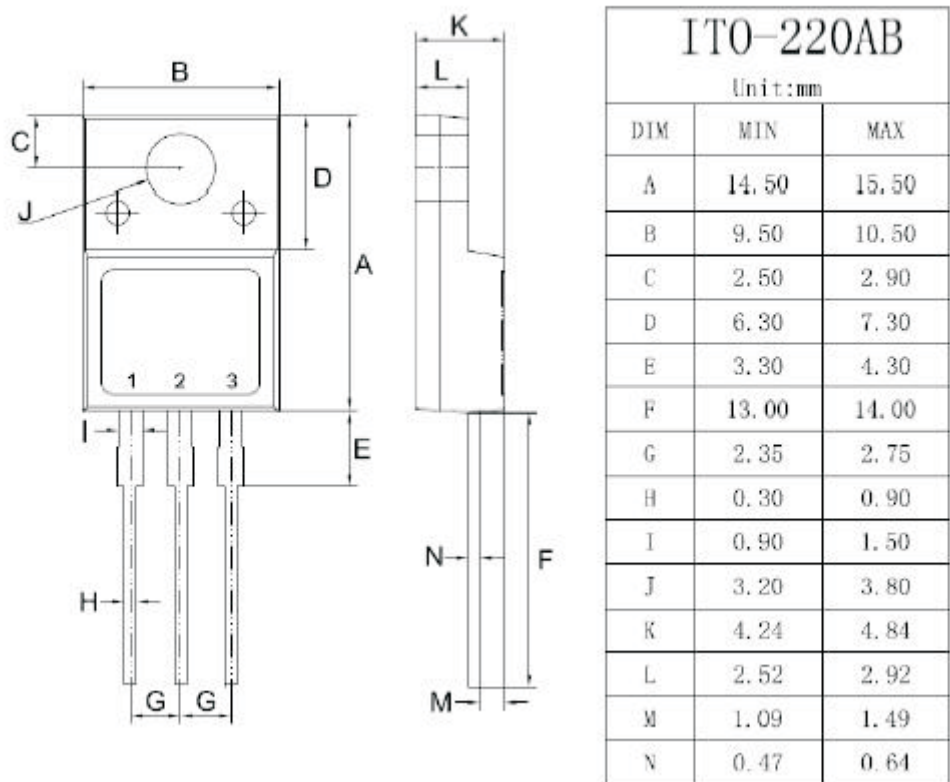


7N65 7N65F 7N65D 7N65E 7N65M 7N65N
650V N-Channel Power MOSFET

TO-220 Mechanical Drawing

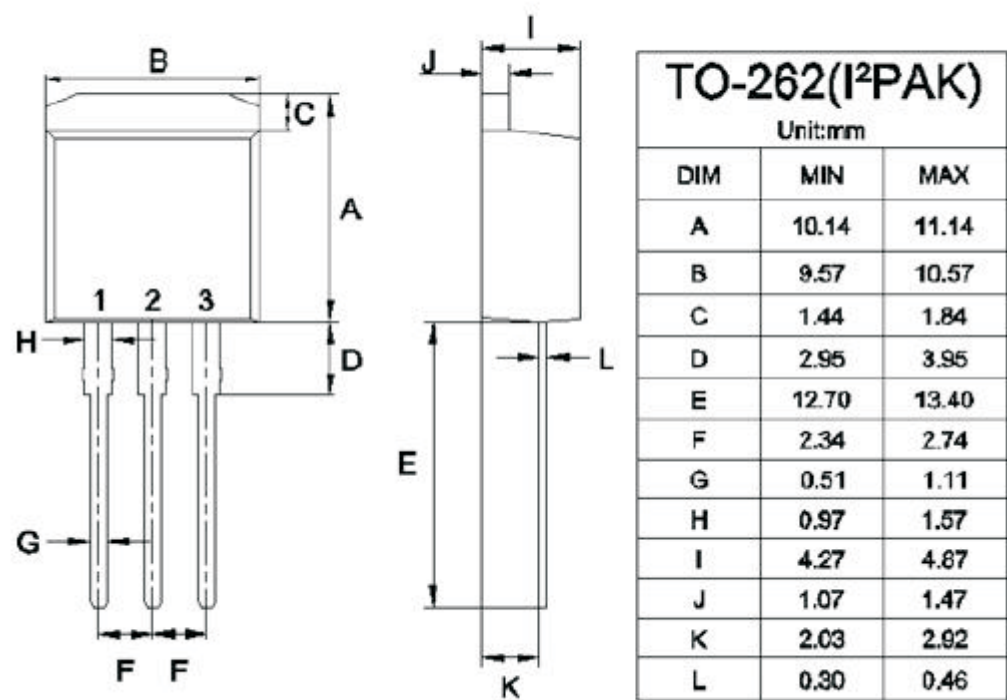


ITO-220 Mechanical Drawing

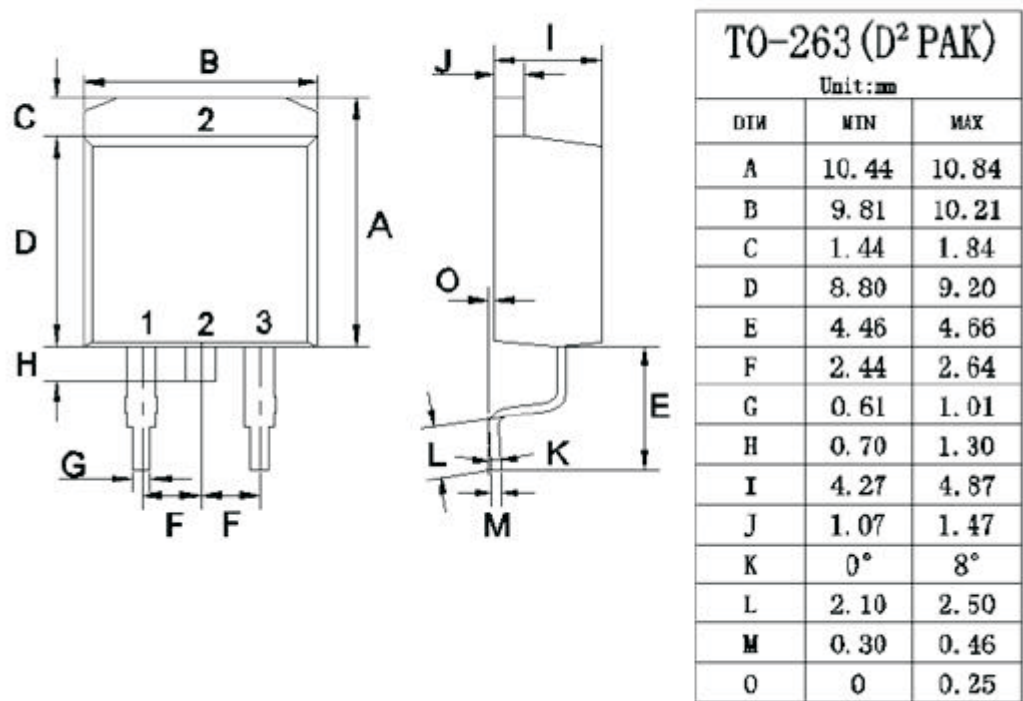


7N65 7N65F 7N65D 7N65E 7N65M 7N65N
650V N-Channel Power MOSFET

TO-262 Mechanical Drawing

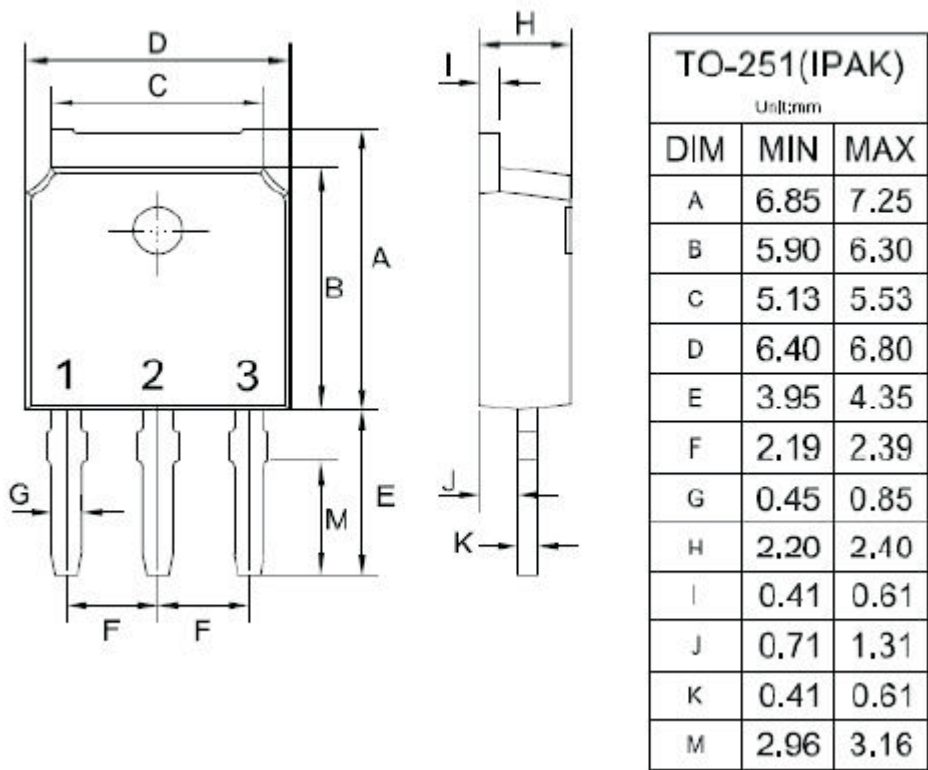


TO-263 Mechanical Drawing



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

TO-251 Mechanical Drawing



TO-252 Mechanical Drawing

