

7.0 Amps, 600/650 Volts N-CHANNEL POWER MOSFET

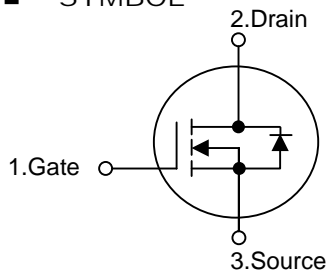
DESCRIPTION

7N60 7N65 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 switching power supplies and adaptors.

FEATURES

- * $R_{DS(ON)} = 1.0\Omega @ V_{GS} = 10V$
- * $R_{DS(ON)} = 1.2\Omega @ V_{GS} = 10V$
- * Ultra Low Gate Charge (Typical 29 nC)
- * Low Reverse Transfer Capacitance ($C_{RSS} = \text{typical } 16\text{pF}$)
- * Fast Switching Capability
- * Avalanche Energy Tested
- * Improved dv/dt Capability, High Ruggedness

SYMBOL

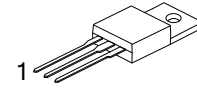


ORDERING INFORMATION

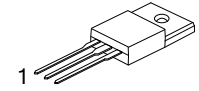
Ordering Number	Package	Pin Assignment		
		1	2	3
7N60	TO-220	G	D	S
	ITO-220/TO-220F	G	D	S
	TO-262/I ² PAK	G	D	S
7N65	TO-263/D ² PAK	G	D	S
	TO-251/IPAK	G	D	S
	TO-252/DPAK	G	D	S

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

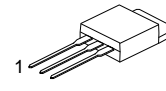
Part No.	Package	Packing
7N6* -TU	TO-251	75pcs / Tube
7N6* -TR	TO-252	2.5Kpcs / 13" Reel
7N6* -TU	TO-252	75pcs / Tube
7N6* -TU	TO-220	50pcs / Tube
7N6* -TU	ITO-220	50pcs / Tube
7N6* -TU	TO-262	50pcs / Tube
7N6* -TU	TO-263	50pcs / Tube
7N6* -TR	TO-263	800pcs / 13" Reel



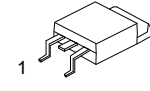
TO-220



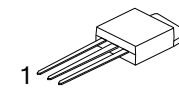
ITO-220/TO-220F



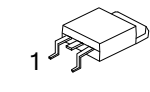
TO-262/I²PAK



TO-263/D²PAK



TO-251/IPAK



TO-252/DPAK

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage	7N60	V_{DSS}	600	V
	7N65		650	V
Gate-Source Voltage		V_{GSS}	± 30	V
Avalanche Current (Note 2)		I_{AR}	7.0	A
Drain Current	Continuous	I_D	7.0	A
	Pulsed (Note 2)	I_{DM}	29.6	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	530	mJ
	Repetitive (Note 2)	E_{AR}	14.2	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	P_D ($T_C = 25^\circ\text{C}$)	142	W
	TO-220F		48	W
	TO-262/I ² PAK		142	W
	TO-263/D ² PAK		142	W
Junction Temperature		T_J	+150	$^\circ\text{C}$
Ambient Operating Temperature		T_{OPR}	-55 ~ +150	$^\circ\text{C}$
Storage Temperature		T_{STG}	-55 ~ +150	$^\circ\text{C}$

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. $L=64\text{mH}$, $I_{AS}=7.0\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD}\leq 7.0\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/ITO-220/TO-220F TO-262/TO-263	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-251/ TO-252		160	
Junction to Case	TO-220/TO-262/TO-263	θ_{JC}	1.25	$^\circ\text{C}/\text{W}$
	ITO-220/TO-220F		3.5	
	TO-251/ TO-252		2.5	

■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	7N60	$V_{GS} = 0V, I_D = 250\mu A$	600			V
	7N65		650			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 600V, V_{GS} = 0V$			1	μA
Gate-Source Leakage Current	Forward	$V_{GS} = 30V, V_{DS} = 0V$ $V_{GS} = -30V, V_{DS} = 0V$			100	nA
	Reverse				-100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D = 250 \mu A$, Referenced to 25°C		0.67		$^\circ\text{V}/^\circ\text{C}$
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	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 3.51A$			1.2	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{DS} = 25V, V_{GS} = 0V, f = 1\text{MHz}$			1400	pF
Output Capacitance	C_{OSS}				180	pF
Reverse Transfer Capacitance	C_{RSS}			16	21	pF
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 300V, I_D = 7.0A,$ $R_G = 25\Omega$ (Note 1, 2)			70	ns
Turn-On Rise Time	t_R				170	ns
Turn-Off Delay Time	$t_{D(OFF)}$				140	ns
Turn-Off Fall Time	t_F				130	ns
Total Gate Charge	Q_G	$V_{DS} = 480V, V_{GS} = 10V,$ $I_D = 7.0A$ (Note 1, 2)		29	38	nC
Gate-Source Charge	Q_{GS}			7		nC
Gate-Drain Charge	Q_{GD}			14.5		nC
DRAIN-SOURCE DIODE CHARACTERISTICS						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS} = 0V, I_{SD} = 7.0A$			1.4	V
Continuous Drain-Source Current	I_{SD}				7.0	A
Pulsed Drain-Source Current	I_{SM}				29.6	A
Reverse Recovery Time	t_{RR}	$V_{GS} = 0V, I_{SD} = 7.0A,$ $di/dt = 100 A/\mu s$ (Note1)		320		ns
Reverse Recovery Charge	Q_{RR}			2.4		μC

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

■ TEST CIRCUITS AND WAVEFORMS

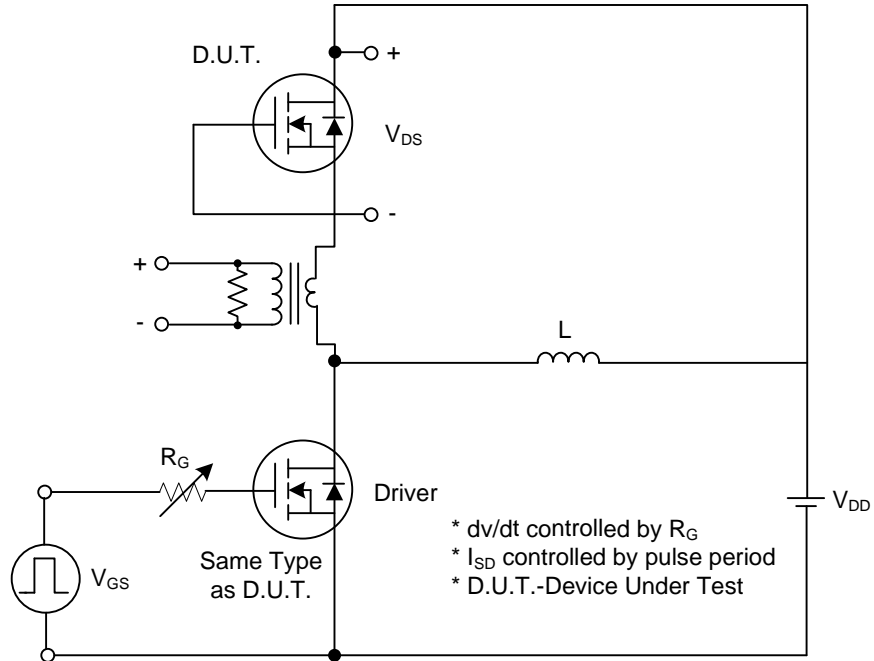


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

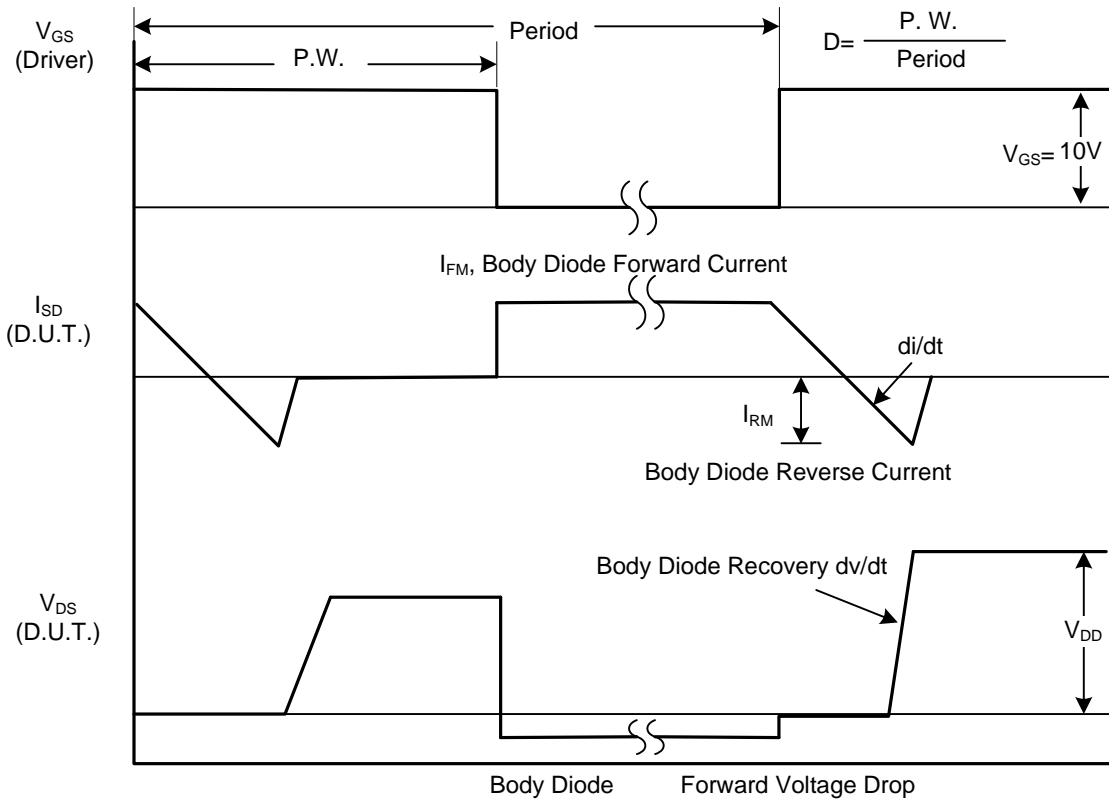


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

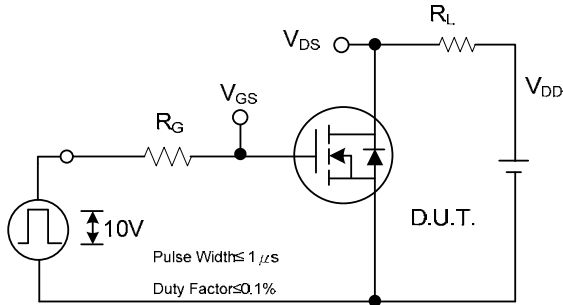


Fig. 2A Switching Test Circuit

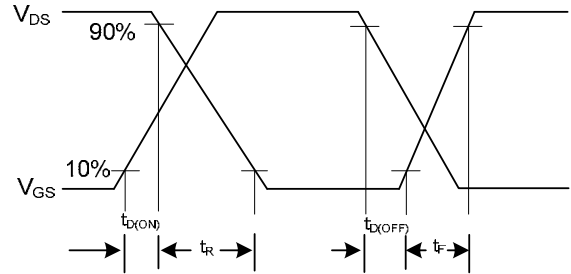


Fig. 2B Switching Waveforms

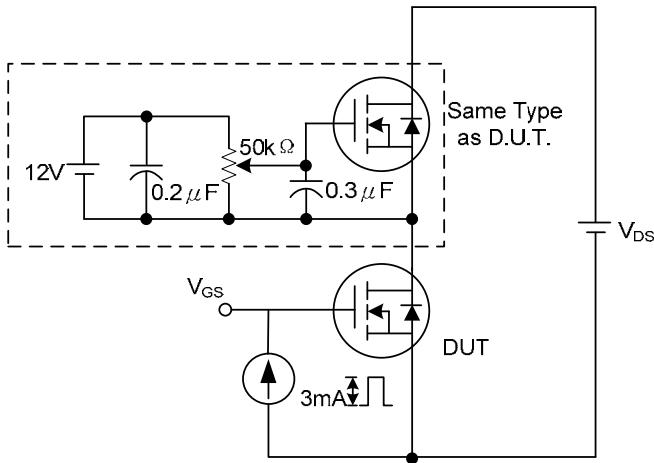


Fig. 3A Gate Charge Test Circuit

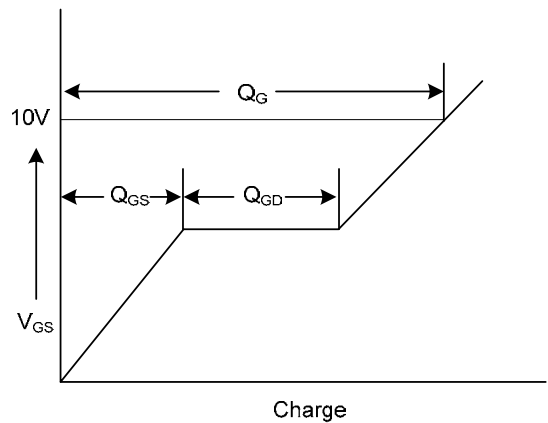


Fig. 3B Gate Charge Waveform

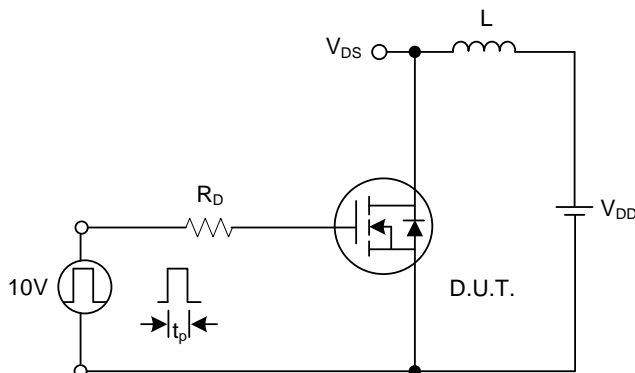


Fig. 4A Unclamped Inductive Switching Test Circuit

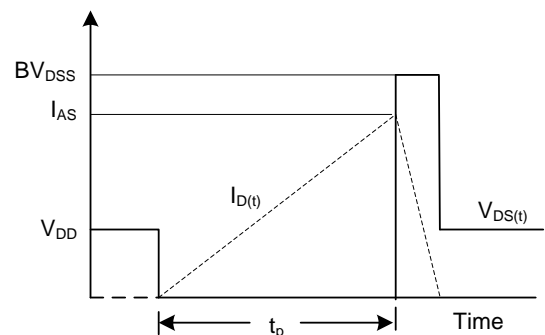
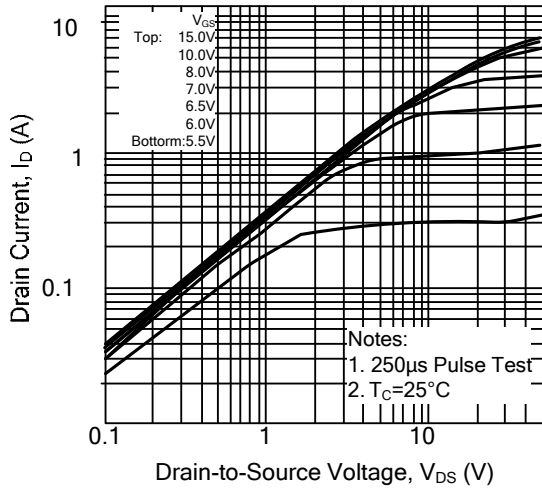


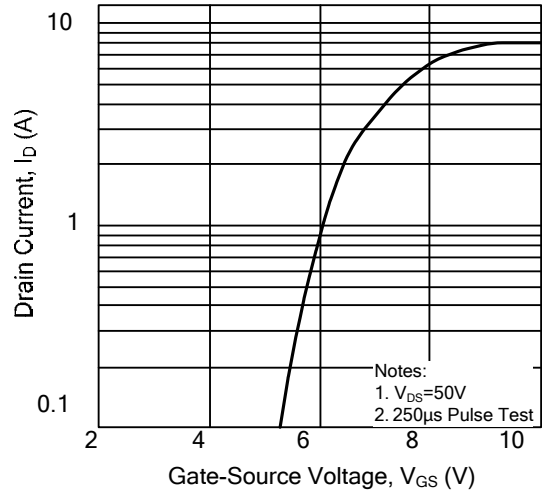
Fig. 4B Unclamped Inductive Switching Waveforms



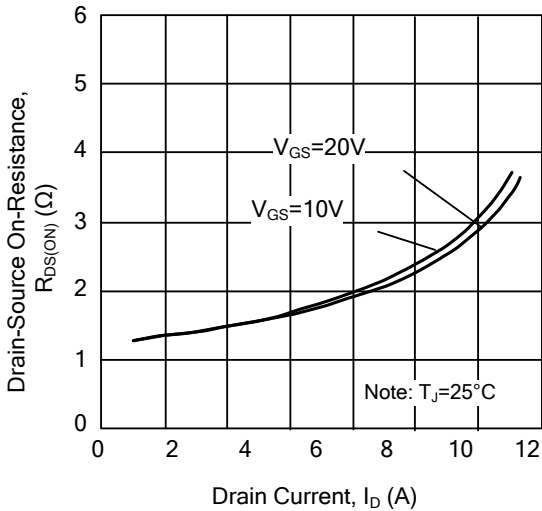
On-State Characteristics



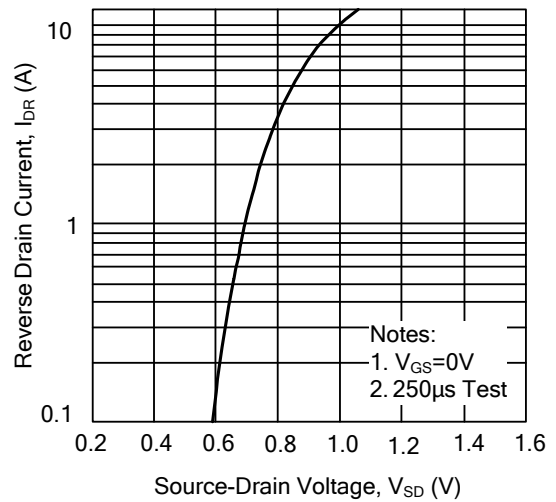
Transfer Characteristics



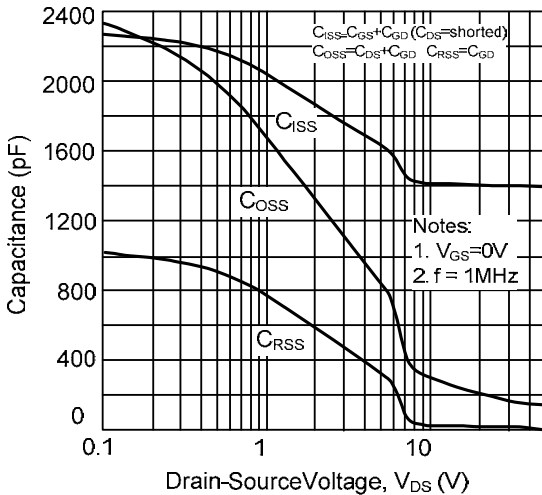
On-Resistance Variation vs. Drain Current and Gate Voltage



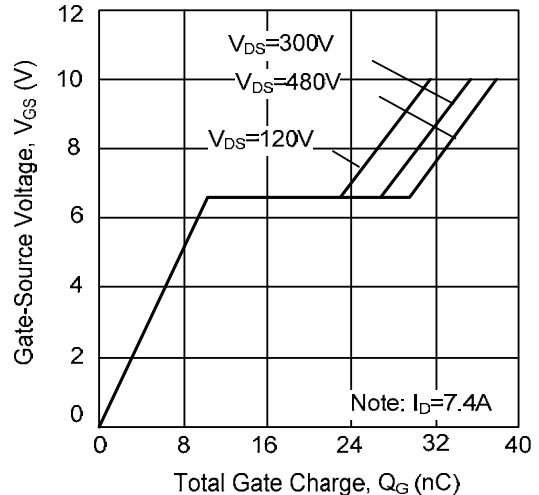
On State Current vs. Allowable Case Temperature



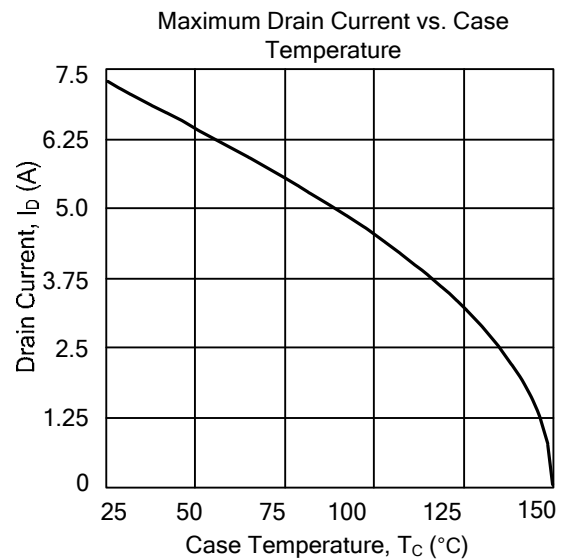
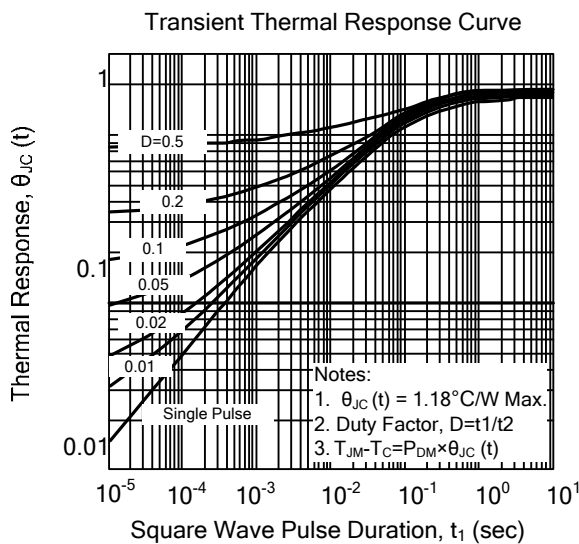
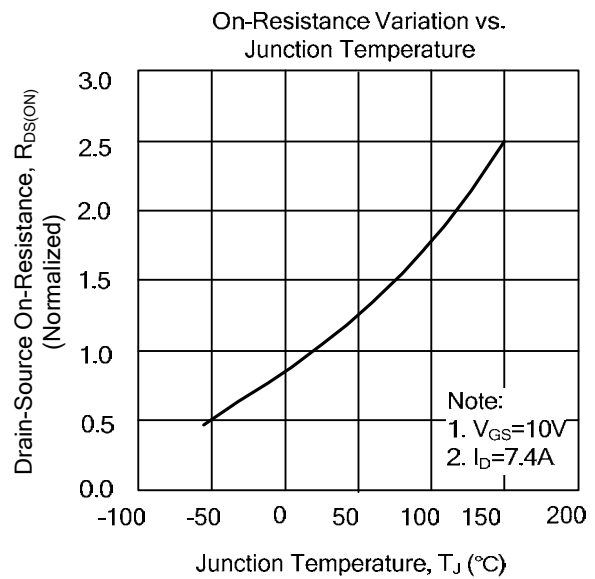
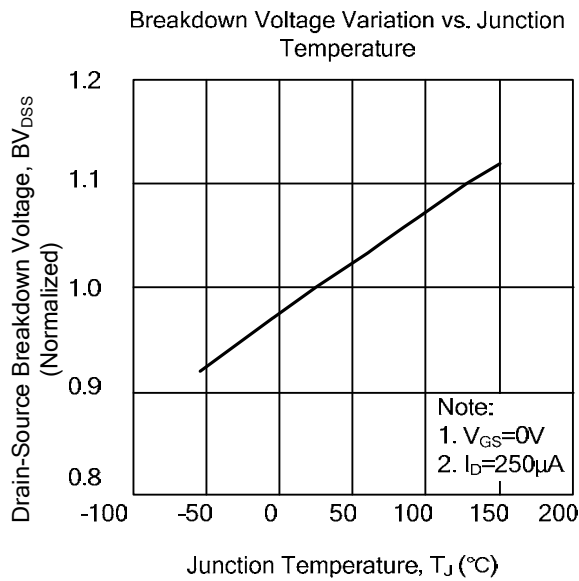
Capacitance Characteristics (Non-Repetitive)



Gate Charge Characteristics



■ TYPICAL CHARACTERISTICS(Cont.)



Safe Operating Area - 600V

