



6N70-P

Power MOSFET

6A, 700V N-CHANNEL POWER MOSFET

DESCRIPTION

The UTC **6N70-P** is a N-channel mode power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance, high switching speed, low gate charge and low input capacitance.

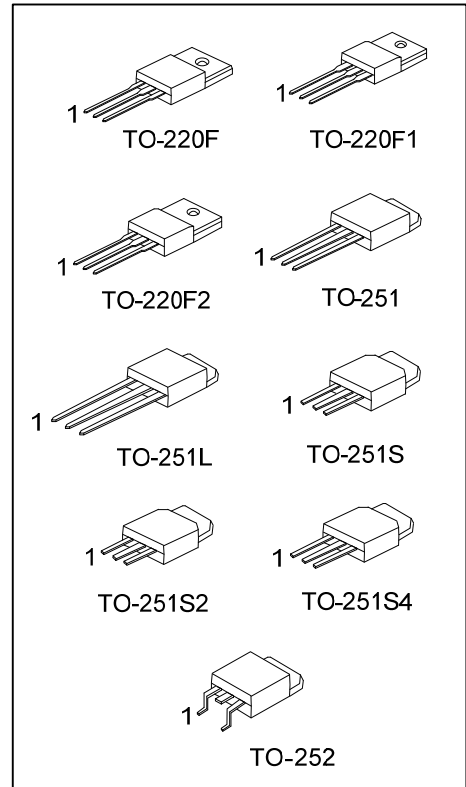
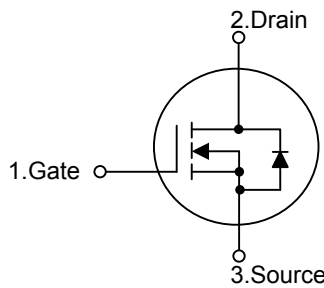
The UTC **6N70-P** is universally applied in high efficiency switch mode power supply.

FEATURES

* $R_{DS(ON)} < 1.8\Omega$ @ $V_{GS}=10V, I_D=3.0A$

* High switching speed

SYMBOL



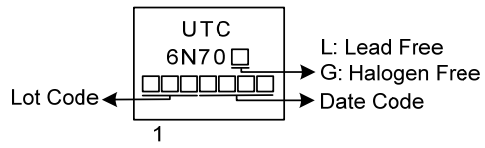
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
6N70L-TF1-T	6N70G-TF1-T	TO-220F1	G	D	S	Tube
6N70L-TF2-T	6N70G-TF2-T	TO-220F2	G	D	S	Tube
6N70L-TF3-T	6N70G-TF3-T	TO-220F	G	D	S	Tube
6N70L-TM3-T	6N70G-TM3-T	TO-251	G	D	S	Tube
6N70L-TMA-T	6N70G-TMA-T	TO-251L	G	D	S	Tube
6N70L-TMS-T	6N70G-TMS-T	TO-251S	G	D	S	Tube
6N70L-TMS2-T	6N70G-TMS2-T	TO-251S2	G	D	S	Tube
6N70L-TMS4-T	6N70G-TMS4-T	TO-251S4	G	D	S	Tube
6N70L-TN3-R	6N70G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>6N70G-TF1-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, TM3: TO-251, TMA: TO-251L, TMS: TO-251S, TMS2: TO-251S2, TMS4: TO-251S4, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



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■ ABSOLUTE MAXIMUM RATINGS (unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT	
Drain-Source Voltage		V_{DSS}	700	V	
Gate-Source Voltage (Note 2)		V_{GSS}	± 30	V	
Drain Current	Continuous	I_D	$T_C=25^\circ\text{C}$	6	A
			$T_C=100^\circ\text{C}$	3.8	A
	Pulsed	I_{DM}	24	A	
Avalanche Current (Note 2)		I_{AR}	6	A	
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	200	mJ	
	Repetitive (Note 2)	E_{AR}	13	mJ	
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.5	V/ns	
Power Dissipation	TO-220F/TO-220F1	P_D	40	W	
	TO-220F2		42		
	TO-251/TO-252		55		
	TO-251L/TO-251S TO-251S2/TO-251S4				
Junction Temperature		T_J	+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 maximum junction temperature.
 3. $L = 12\text{mH}$, $I_{AS} = 6\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 27\Omega$, Starting $T_J = 25^\circ\text{C}$
 4. $I_{SD} \leq 6\text{A}$, $di/dt \leq 140\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT	
Junction to Ambient	TO-220F/TO-220F1 TO-220F2	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$	
	TO-251/TO-252 TO-251L/TO-251S TO-251S2/TO-251S4		110	$^\circ\text{C}/\text{W}$	
	Junction to Case		θ_{JC}	3.1	$^\circ\text{C}/\text{W}$
				2.9	$^\circ\text{C}/\text{W}$
2.27 (Note)		$^\circ\text{C}/\text{W}$			

Note: The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.

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

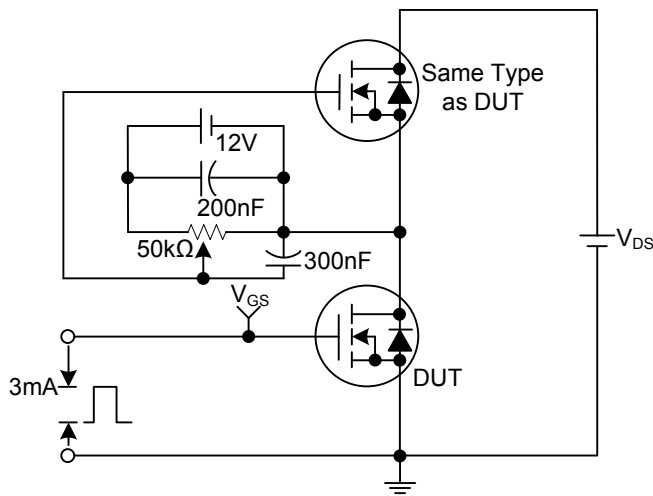
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	700			V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu\text{A}$		0.79		$V/^\circ\text{C}$
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=700\text{V}$			25	μA
		$V_{DS}=560\text{V}$, $T_C=125^\circ\text{C}$			250	μA
Gate-Source Leakage Current	Forward	$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$			+100	nA
	Reverse	$V_{GS}=-30\text{V}$, $V_{DS}=0\text{V}$			-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=3.0\text{A}$ (Note 1)		1.6	1.8	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$ (Note 1, 2)		810	1000	pF
Output Capacitance	C_{OSS}			95	135	pF
Reverse Transfer Capacitance	C_{RSS}			15	25	pF
SWITCHING PARAMETERS						
Total Gate Charge	Q_G	$V_{GS}=10\text{V}$, $V_{DS}=50\text{V}$, $I_D=1.3\text{A}$ (Note 1, 2)		25	35	nC
Gate to Source Charge	Q_{GS}			6.5		nC
Gate to Drain Charge	Q_{GD}			6.0		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DS}=30\text{V}$, $I_D=0.5\text{A}$, $R_G=2.5\Omega$		57	84	ns
Rise Time	t_R			64	90	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			180	220	ns
Fall-Time	t_F			68	100	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S	Integral reverse pn-diode in the MOSFET			6	A
Maximum Body-Diode Pulsed Current (Note 3)	I_{SM}				24	A
Drain-Source Diode Forward Voltage (Note 2)	V_{SD}	$I_S=6\text{A}$, $V_{GS}=0\text{V}$, $T_J = 25^\circ\text{C}$			1.4	V

Notes: 1. Pulse Test: Pulse width $\leq 250\mu\text{s}$, Duty cycle $\leq 2\%$.

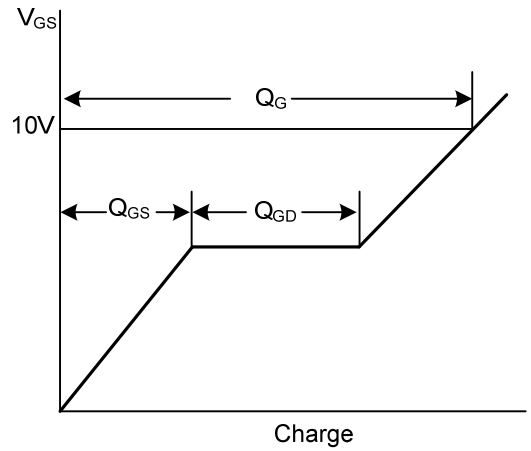
2. Essentially independent of operating temperature.

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

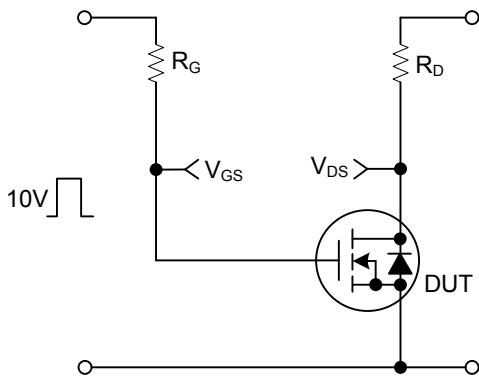
■ TEST CIRCUITS AND WAVEFORMS



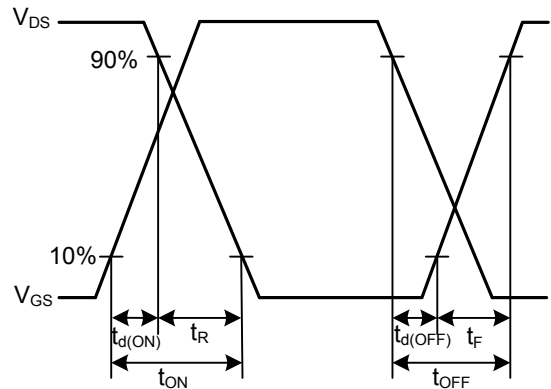
Gate Charge Test Circuit



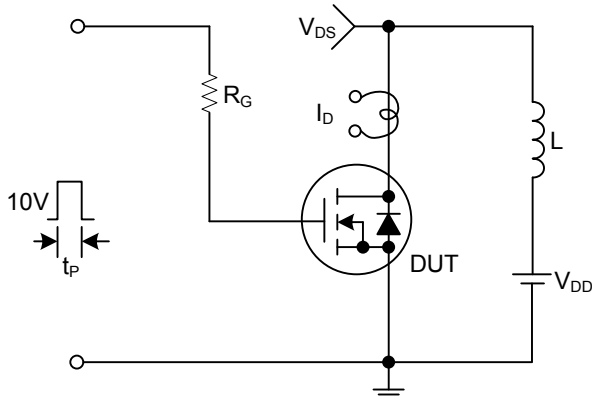
Gate Charge Waveforms



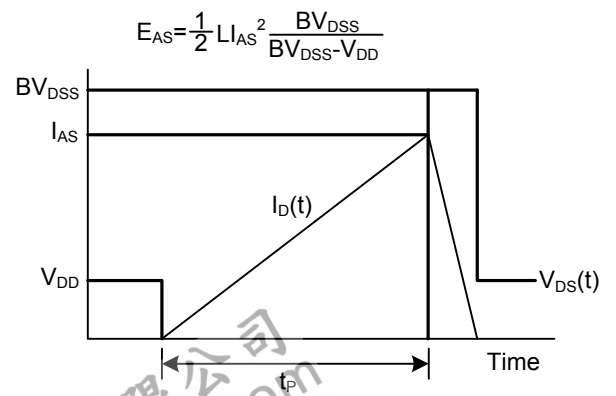
Resistive Switching Test Circuit



Resistive Switching Waveforms



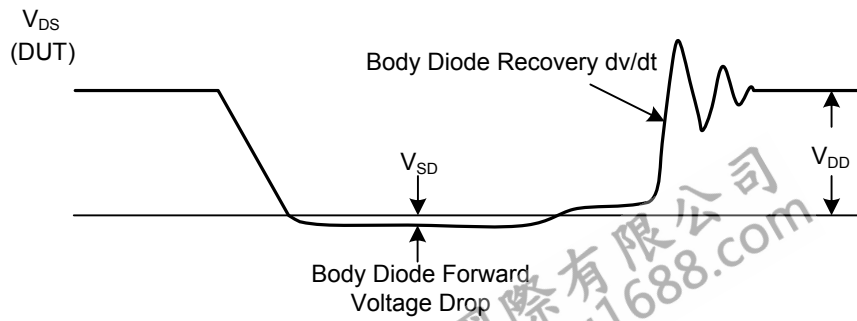
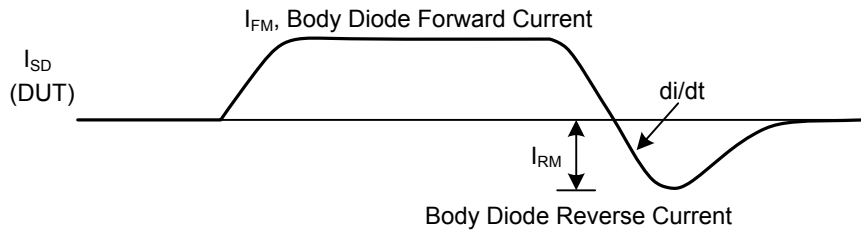
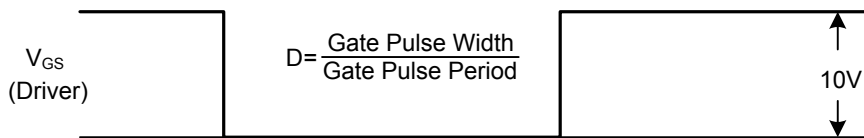
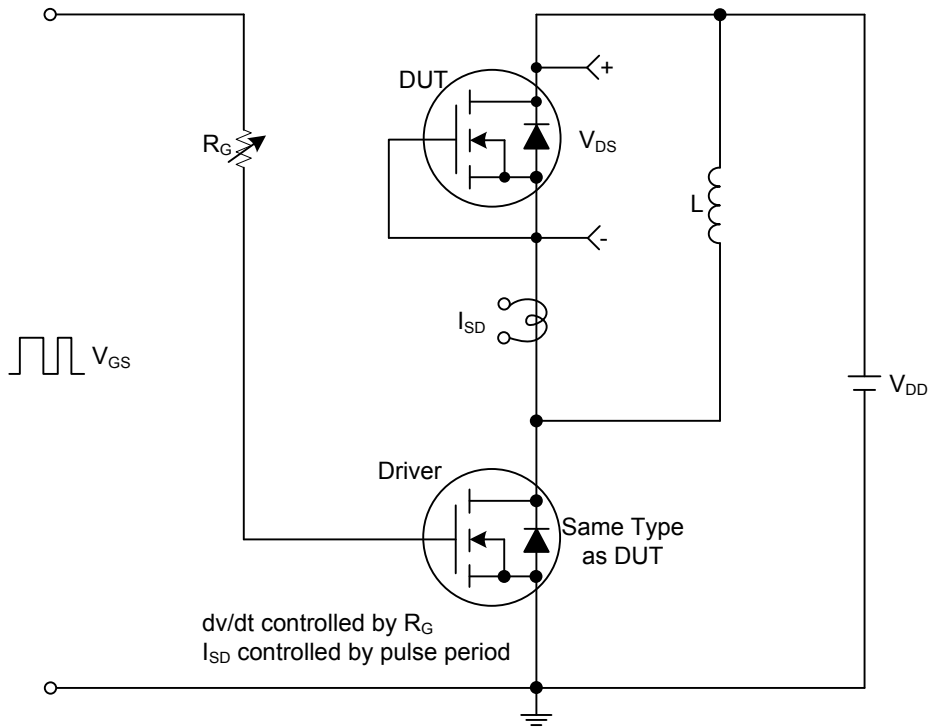
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

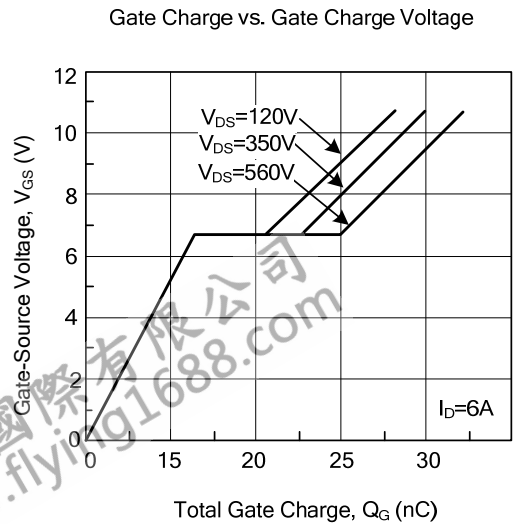
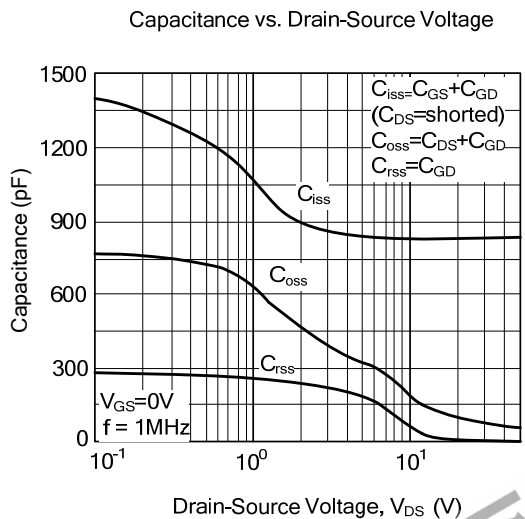
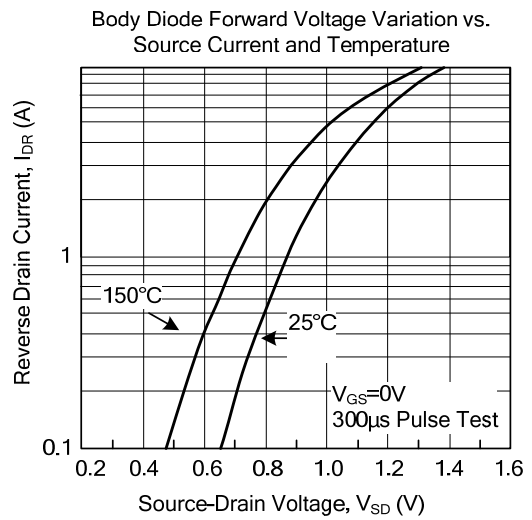
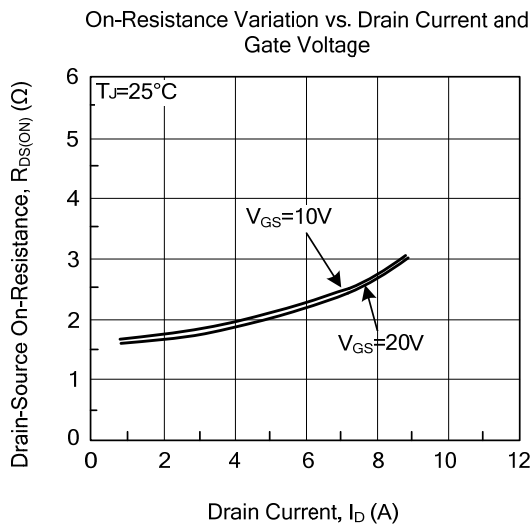
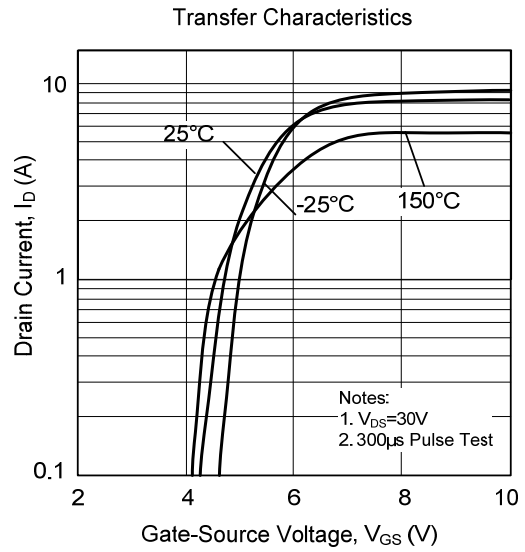
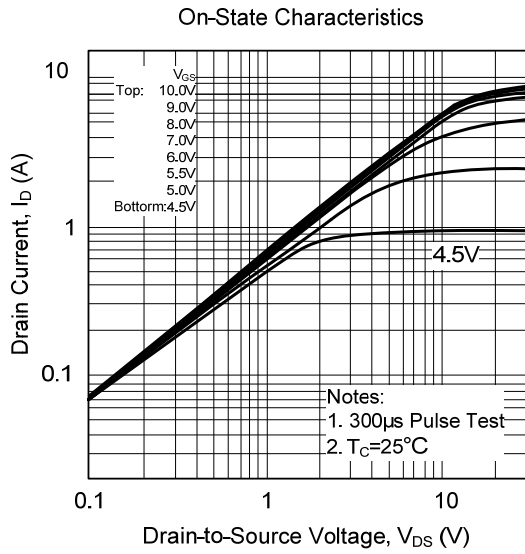
$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

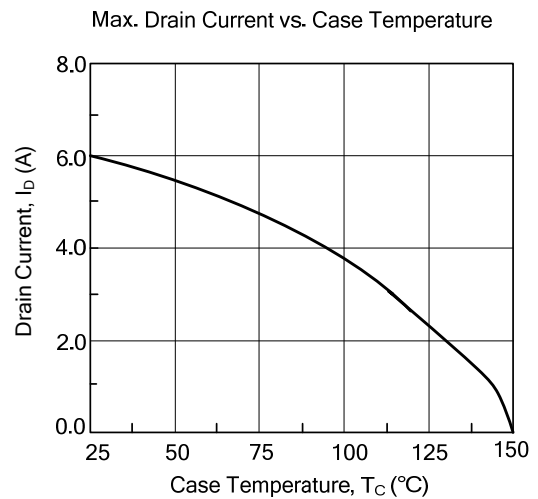
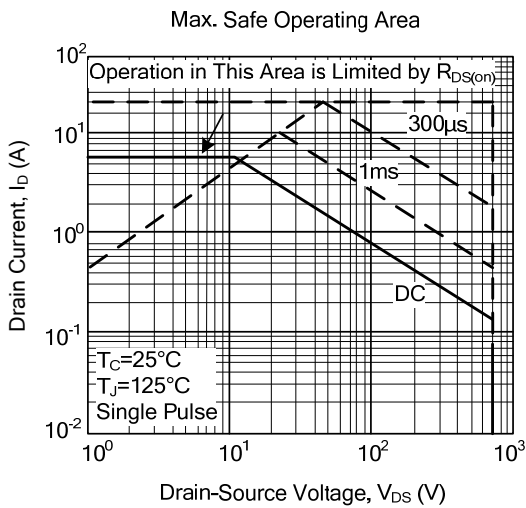
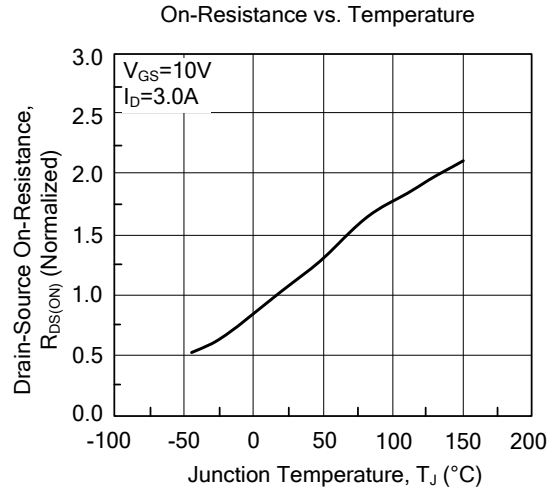
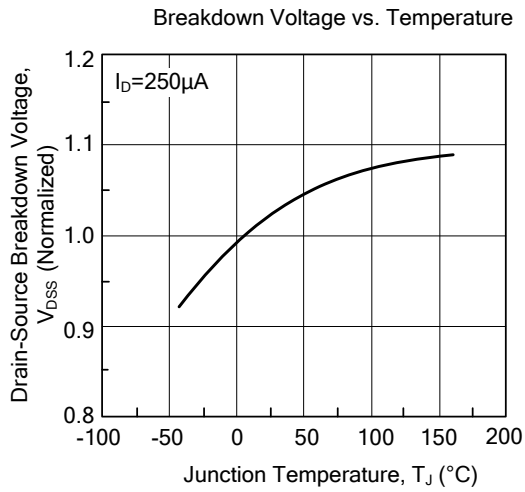


Peak Diode Recovery dv/dt Test Circuit and Waveforms

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



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