

7.4A 600V N-CHANNEL POWER MOSFET

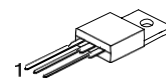
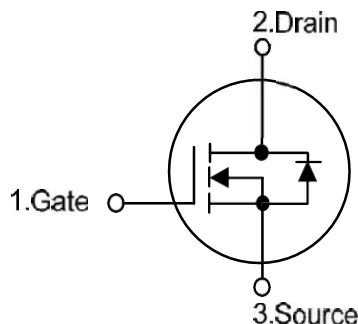
Description:

The KW7N60 is a high voltage power 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.

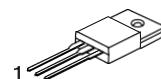
Features:

- * $V_{DS} = 600V$ $I_D = 7.4A$
- * $R_{DS(ON)} = 1.0 \text{ ohm} @ V_{GS} = 10V$ (7N60)
- * $R_{DS(ON)} = 1.2 \text{ ohm} @ V_{GS} = 10V$ (7N60-F/7N60-A/7N60-D /7N60-L)
- * Ultra Low Gate Charge (Typical 29 nC)
- * Low Reverse Transfer Capacitance ($CR_{SS} = \text{typical } 16pF$)
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt Capability, High Ruggedness

■ SYMBOL



TO-220



TO-220F

• ORDERING INFORMATION

Ordering Number	Package	Pin Assignment			Packing
		1	2	3	
KW7N60-LI	TO-220	G	D	S	Tape Box
KW7N60-BL	TO-220	G	D	S	Bulk
KW7N60F-LI	TO-220F	G	D	S	Tube

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

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

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V_{DSS}	600	V
Gate-Source Voltage	V_{GSS}	± 30	V
Avalanche Current (Note 2)	I_{AR}	7.4	A
Drain Current	Continuous	I_D	7.4
	Pulsed (Note 2)	I_{DM}	29.6
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	530
	Repetitive (Note 2)	E_{AR}	14.2
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation	TO-220	P_D	142
	TO-220F		48
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. $L = 19.5\text{mH}$, $I_{AS} = 7.4\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 7.4\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	0.88	$^\circ\text{C}/\text{W}$
	TO-220F	2.6	

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

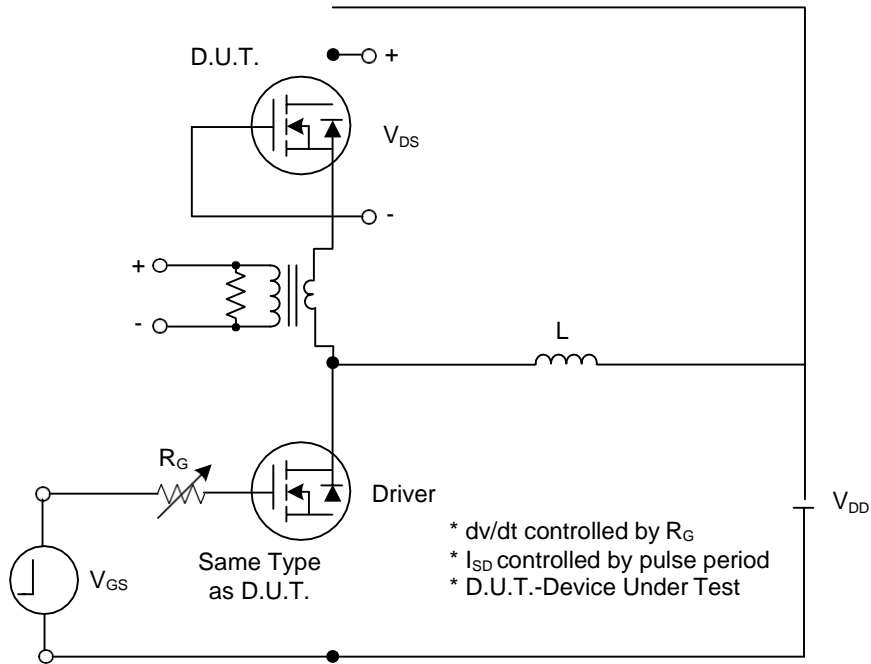
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 600V, V_{GS} = 0V$			1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	$V_{GS} = 30V, V_{DS} = 0V$		100	nA
			$V_{GS} = -30V, V_{DS} = 0V$		-100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS} / \Delta T_J$	$I_D = 250\mu A$, Referenced to 25°C		0.67		$V/^\circ\text{C}$
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0			V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10V,$ $I_D = 3.7A$	7N60	0.83	1.0	Ω
			7N60-F	0.93	1.2	Ω
			7N60-M	0.93	1.2	Ω
			7N60-Q	0.93	1.2	Ω
			7N60-R	0.93	1.2	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0\text{ MHz}$			1400	pF
Output Capacitance	C_{OSS}				180	pF
Reverse Transfer Capacitance	C_{RSS}			16	21	pF
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 300V, I_D = 7.4A,$ $R_G = 25\Omega$ (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
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q_G	$V_{DS} = 480V, I_D = 7.4A,$ $V_{GS} = 10V$ (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 AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS} = 0V, I_S = 7.4\text{ A}$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I_S				7.4	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				29.6	A
Reverse Recovery Time	t_{rr}	$V_{GS} = 0V, I_S = 7.4\text{ A},$ $di_F / dt = 100A/\mu s$ (Note 1)		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

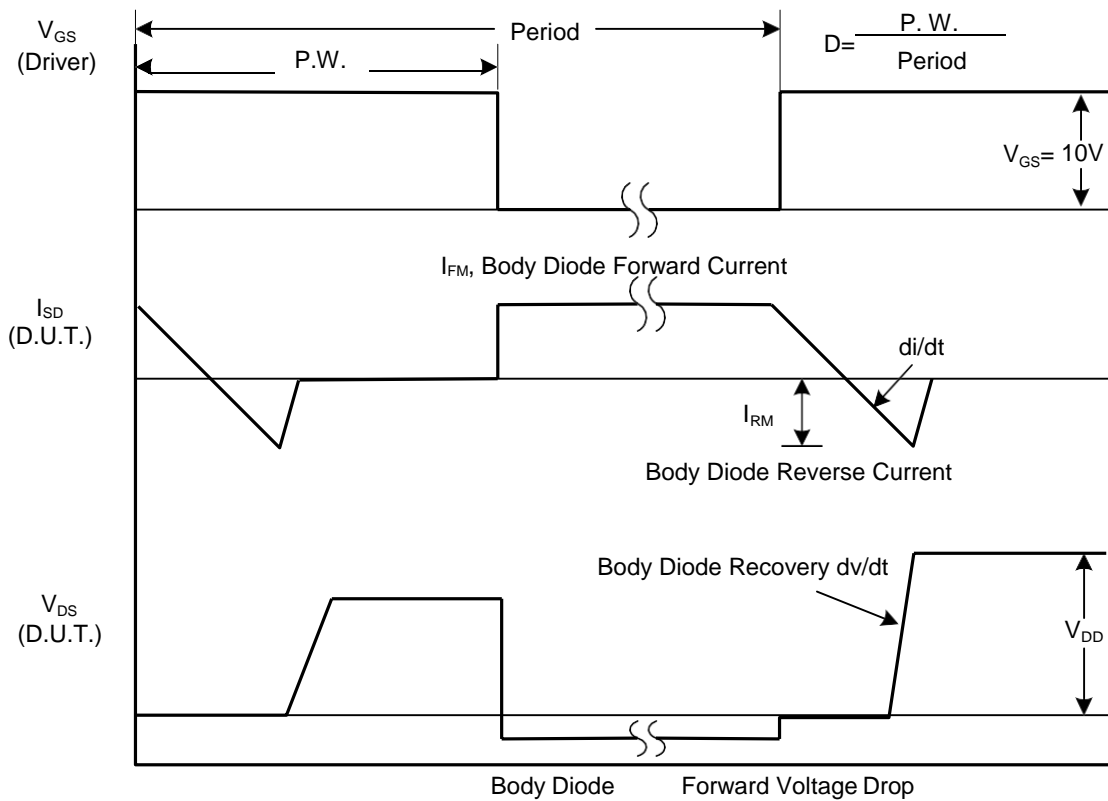
CLASSIFICATION OF $R_{DS(ON)}$

RANK	-	F	A	D	L
VALUE	1.0 Ω	1.2 Ω	1.2 Ω	1.2 Ω	1.2 Ω

TEST CIRCUITS AND WAVEFORMS

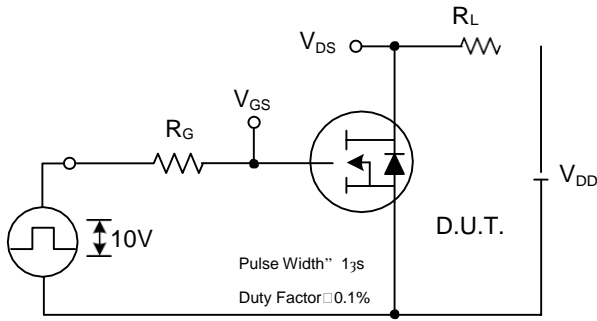


Peak Diode Recovery dv/dt Test Circuit

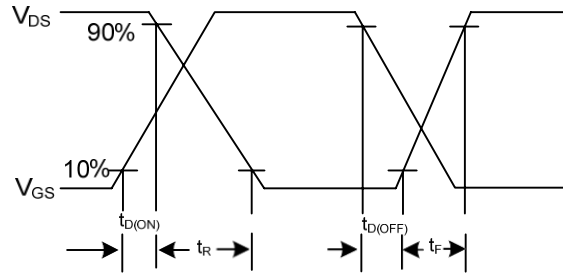


Peak Diode Recovery dv/dt Waveforms

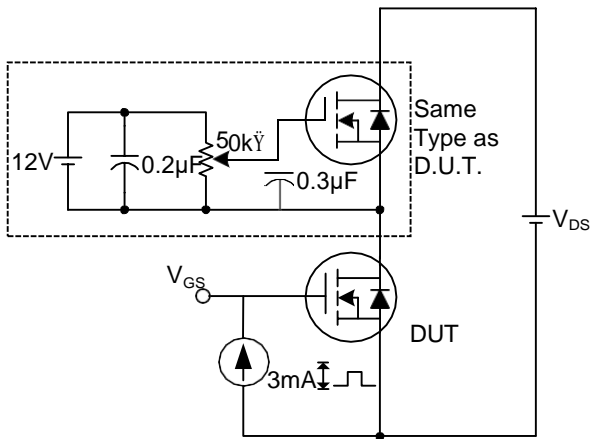
TEST CIRCUITS AND WAVEFORMS(Cont.)



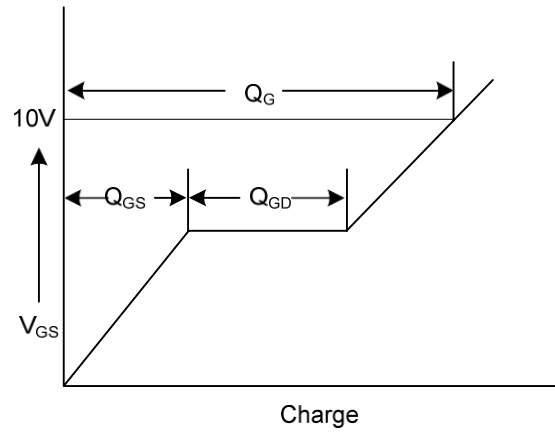
Switching Test Circuit



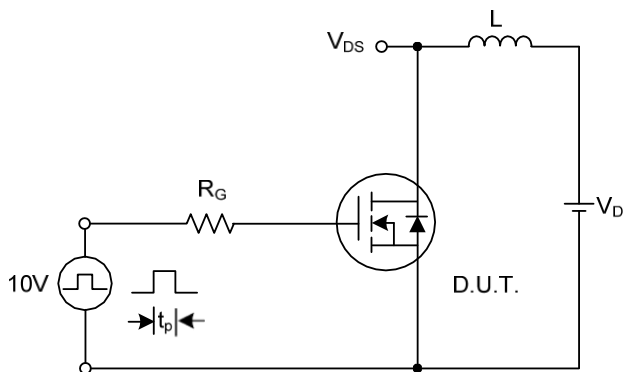
Switching Waveforms



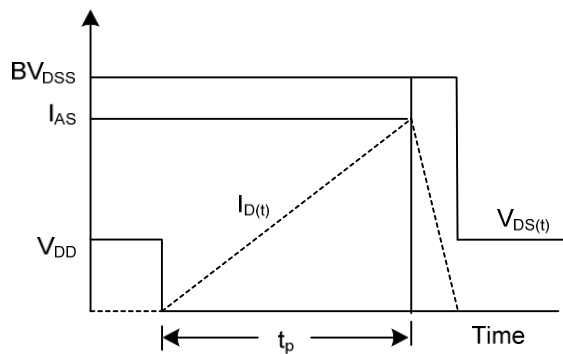
Gate Charge Test Circuit



Gate Charge Waveform



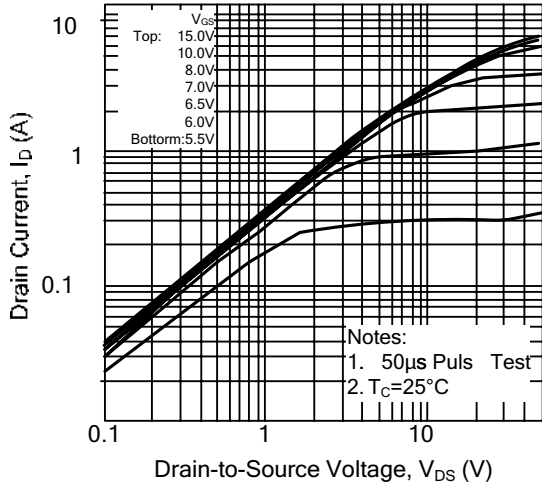
Unclamped Inductive Switching Test Circuit



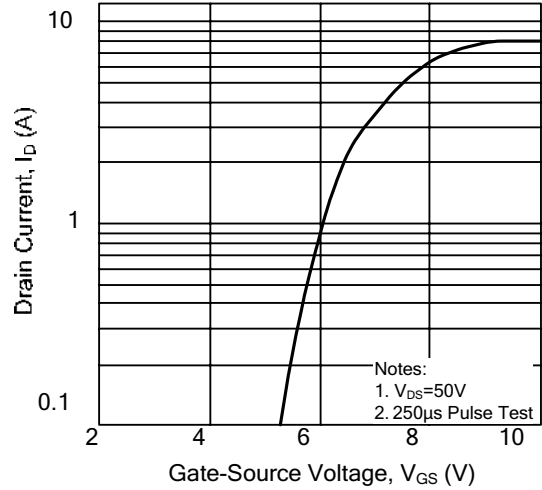
Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS

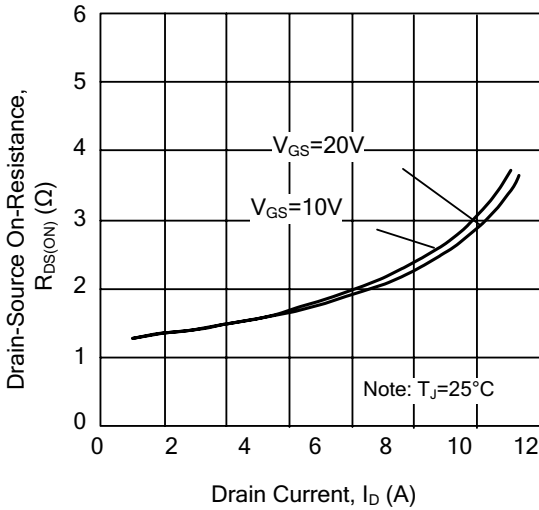
On-State Characteristics



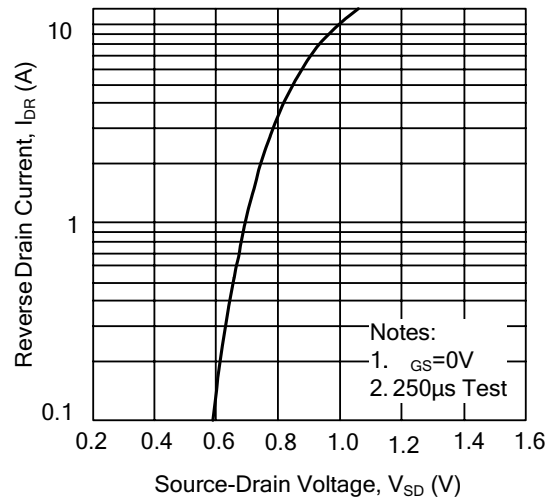
Transfer Characteristics



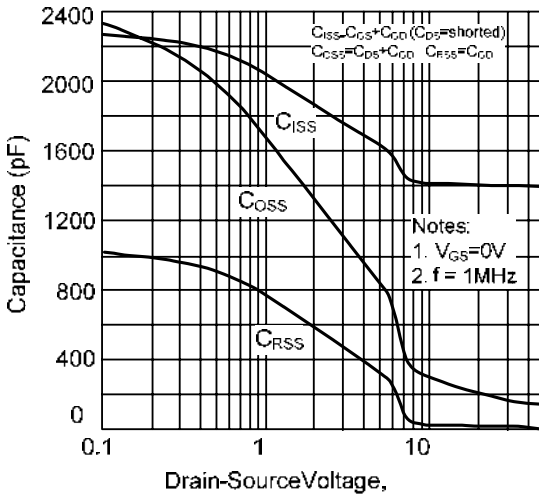
On-Resistance Variation vs. Drain Current and Gate Voltage



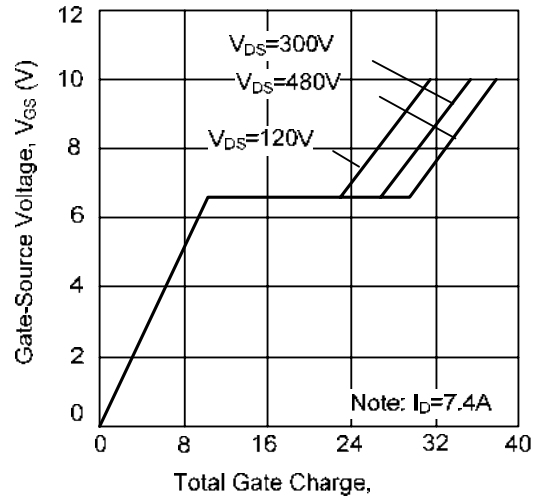
On State Current vs. Allowable Case Temperature



Capacitance Characteristics (Non-Repetitive)

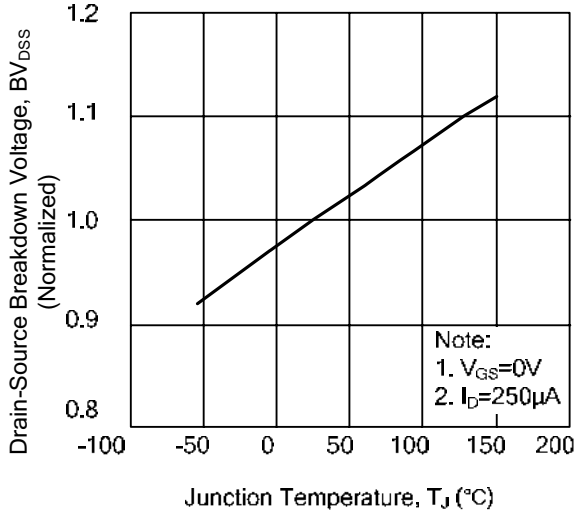


Gate Charge Characteristics

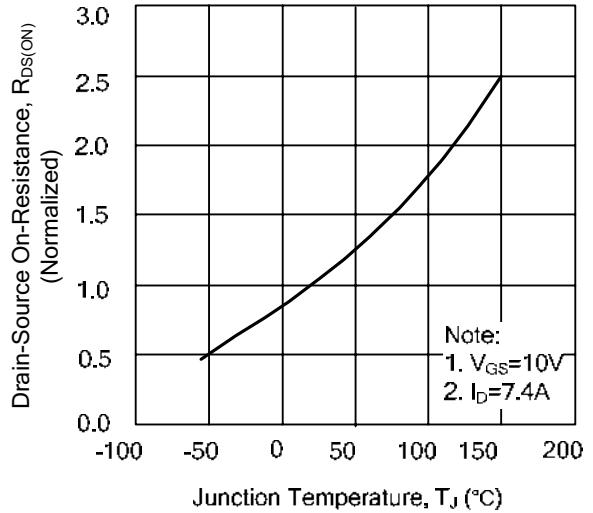


TYPICAL CHARACTERISTICS(Cont.)

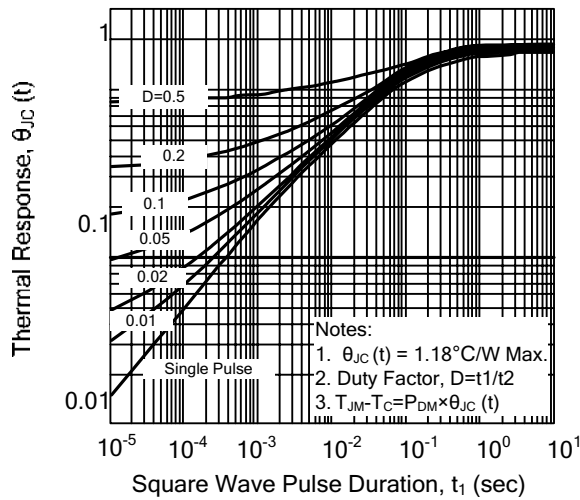
Breakdown Voltage Variation vs. Junction Temperature



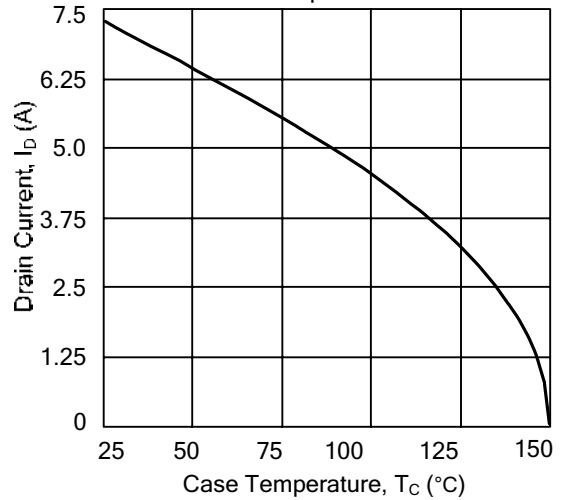
On-Resistance Variation vs. Junction Temperature



Transient Thermal Response Curve



Maximum Drain Current vs. Case Temperature



Safe Operating Area - 600V

