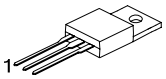
NJ7N60 POWER MOSFET

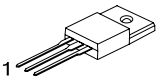
7.4A 600V N-CHANNEL POWER MOSFET

■ DESCRIPTION

The NJ7N60 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.



TO-220

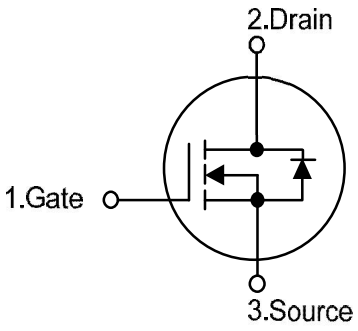


TO-220F

■ FEATURES

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

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number	Package	Pin Assignment			Packing
		1	2	3	
NJ7N60-LI	TO-220	G	D	S	Tape Box
NJ7N60-BL	TO-220	G	D	S	Bulk
NJ7N60F-LI	TO-220F	G	D	S	Tube

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

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■ ABSOLUTE MAXIMUM RATINGS (T_C = 25°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	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	142	W
	TO-220F		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 maximum junction temperature
3. L = 19.5mH, I_{AS} = 7.4A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
4. I_{SD}≤7.4A, di/dt≤200A/μs, V_{DD}≤BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		θ_{JA}	62.5	°C/W
Junction to Case	TO-220	θ_{JC}	0.88	°C/W
	TO-220F		2.6	

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

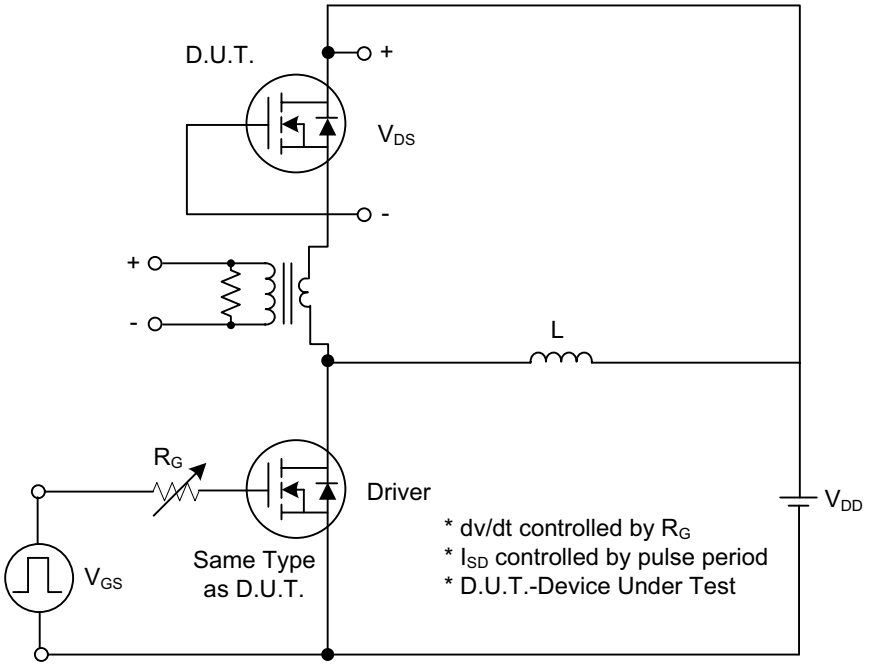
PARAMETER		SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS								
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0V, I_D = 250μA		600			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 600V, V_{GS} = 0V				1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS} = 30V, V_{DS} = 0V				100	nA
	Reverse		V_{GS} = -30V, V_{DS} = 0V				-100	nA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	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 = 3.7A	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 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 =25Ω (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 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 A, dI_F / dt = 100A/μs (Note 1)			320		ns
Reverse Recovery Charge		Q_{RR}				2.4		μC

Notes: 1. Pulse Test: Pulse width≤300μs, Duty cycle≤2%
2. Essentially independent of operating temperature

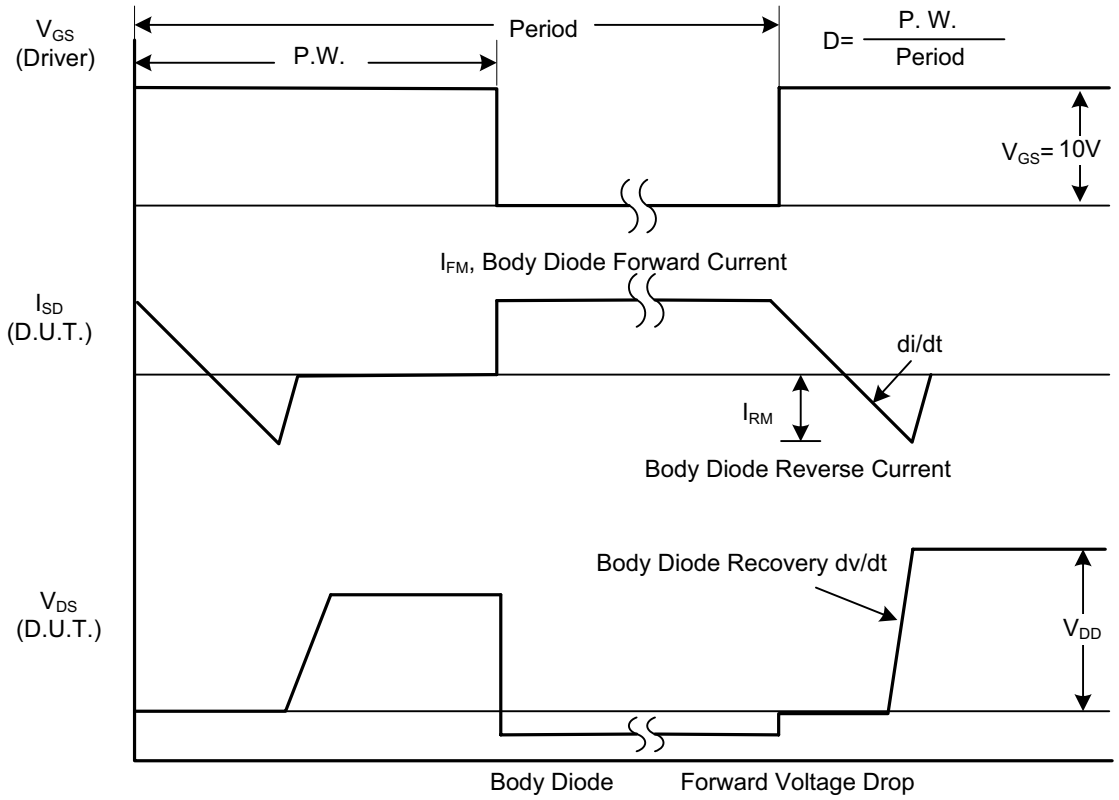
■ CLASSIFICATION OF $R_{DS(ON)}$

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

■ TEST CIRCUITS AND WAVEFORMS

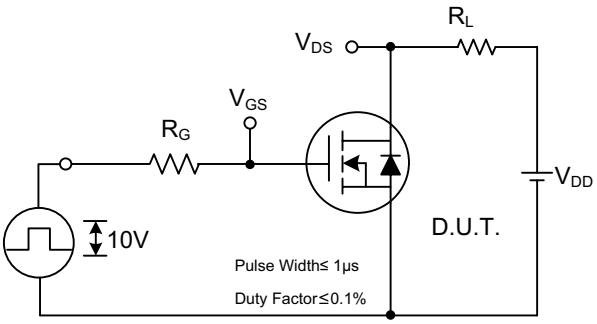


Peak Diode Recovery dv/dt Test Circuit

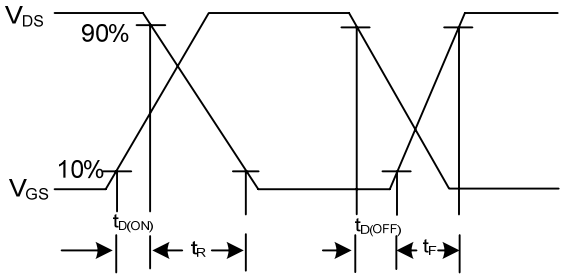


Peak Diode Recovery dv/dt Waveforms

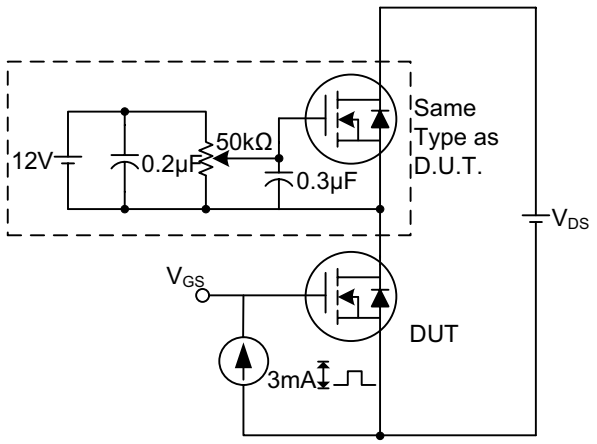
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



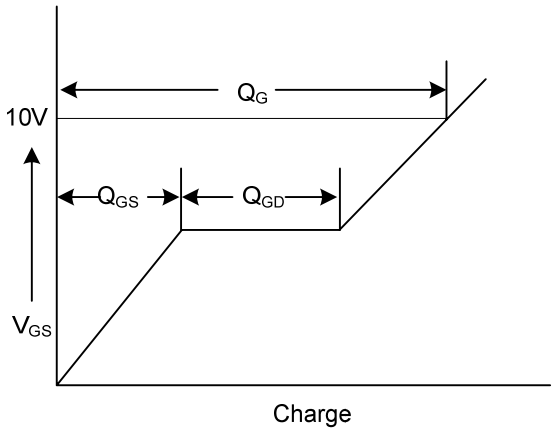
Switching Test Circuit



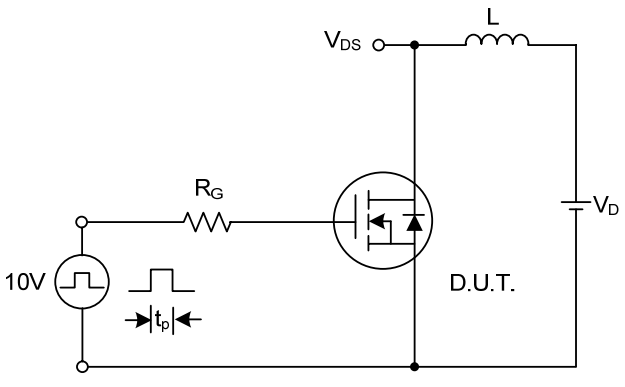
Switching Waveforms



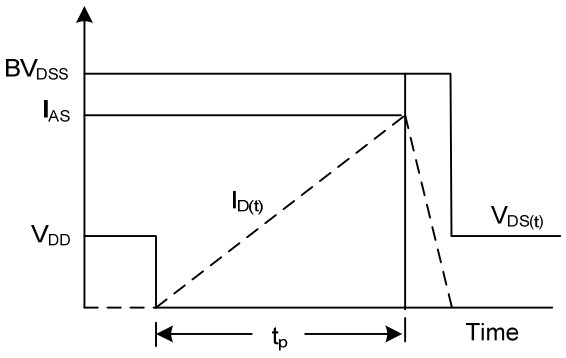
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit

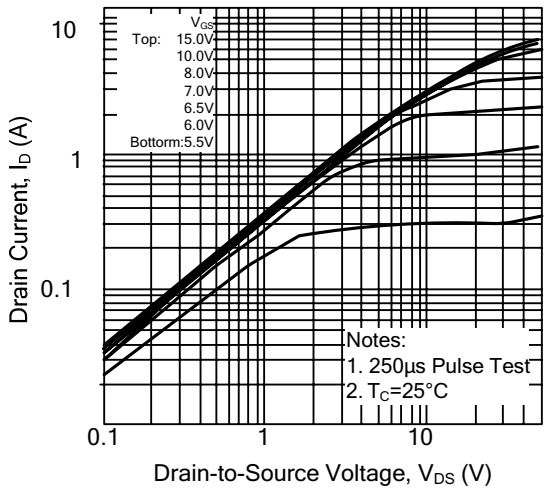


Unclamped Inductive Switching Waveforms

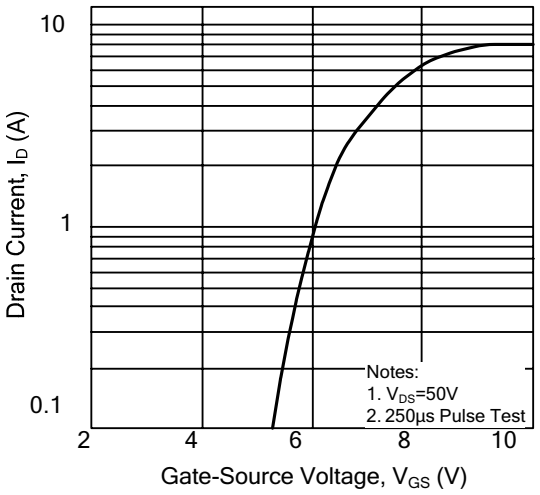
NJ7N60 POWER MOSFET

■ TYPICAL CHARACTERISTICS

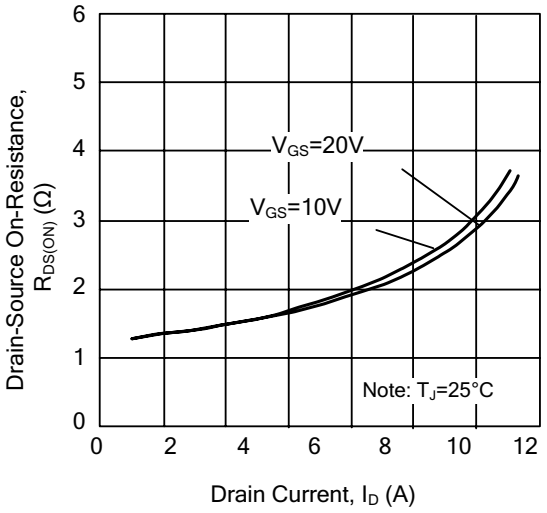
On-State Characteristics



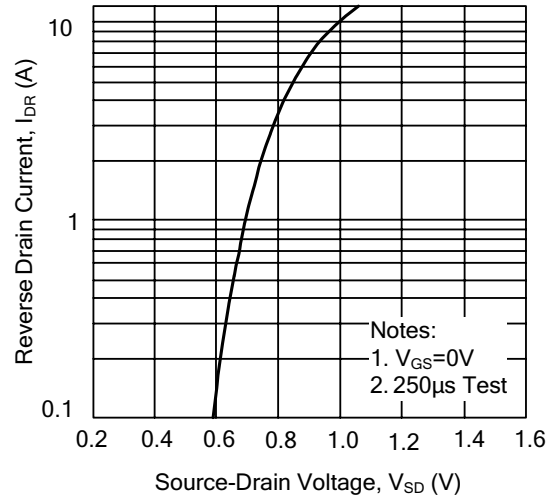
Transfer Characteristics



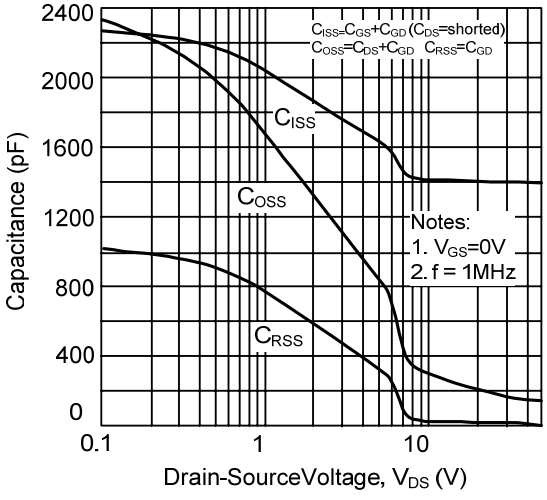
On-Resistance Variation vs.
Drain Current and Gate Voltage



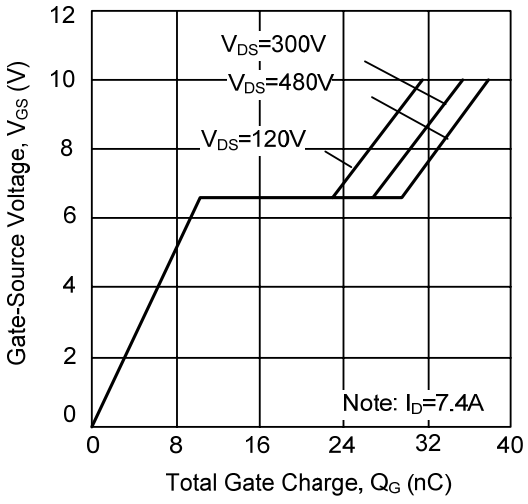
On State Current vs.
Allowable Case Temperature



Capacitance Characteristics
(Non-Repetitive)

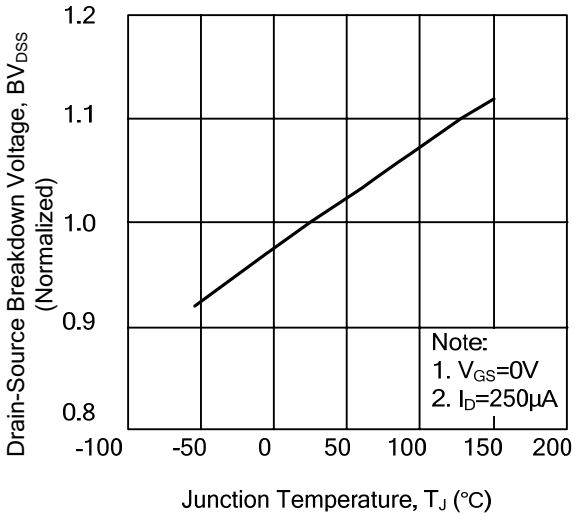


Gate Charge Characteristics

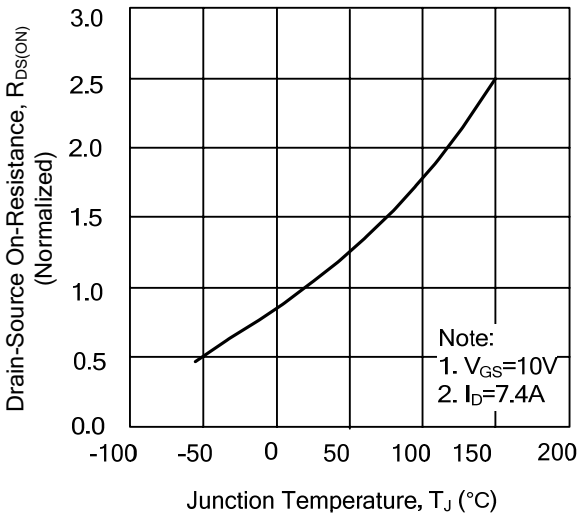


■ TYPICAL CHARACTERISTICS(Cont.)

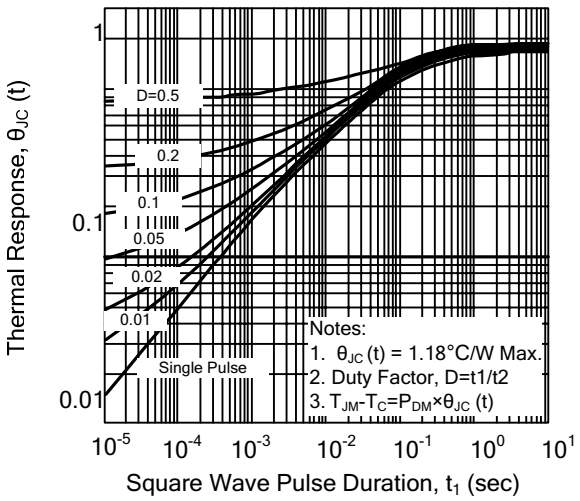
Breakdown Voltage Variation vs. Junction Temperature



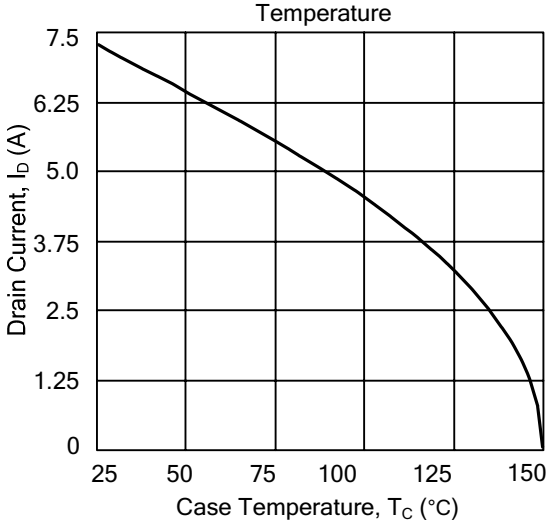
On-Resistance Variation vs. Junction Temperature



Transient Thermal Response Curve



Maximum Drain Current vs. Case Temperature



Safe Operating Area – 600V