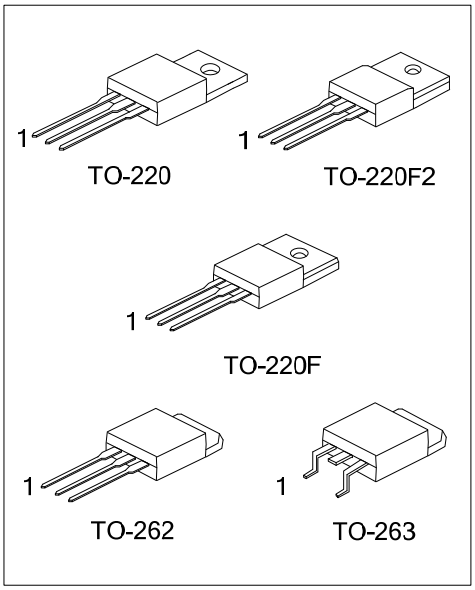
70 Amps, 60 Volts
N-CHANNEL POWER MOSFET



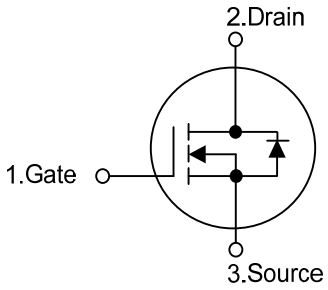
■ DESCRIPTION

The UTC **70N06** is n-channel enhancement mode power field effect transistors with stable off-state characteristics, fast switching speed, low thermal resistance, usually used at telecom and computer application.

■ FEATURES

* $R_{DS(ON)}$ < 15mΩ@V_{GS} = 10 V
* Fast switching capability
* Avalanche energy specified
* Improved dv/dt capability

■ SYMBOL



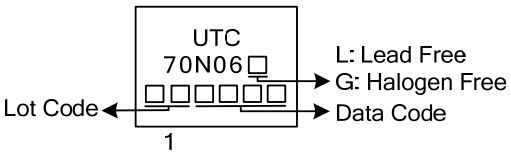
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
70N06L-TA3-T	70N06G-TA3-T	TO-220	G	D	S	Tube
70N06L-TF3-T	70N06G-TF3-T	TO-220F	G	D	S	Tube
70N06L-TF2-T	70N06G-TF2-T	TO-220F2	G	D	S	Tube
70N06L-T2Q-T	70N06G-T2Q-T	TO-262	G	D	S	Tube
70N06L-TQ2-T	70N06G-TQ2-T	TO-263	G	D	S	Tube
70N06L-TQ2-R	70N06G-TQ2-R	TO-263	G	D	S	Tape Reel

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

70N06L-TA3-T (1) Packing Type (2) Package Type (3) Green Package	(1) R: Tape Reel, T: Tube (2) TA3: TO-220, TF3: TO-220F, TF2: TO-220F2 T2Q: TO-262, TQ2: TO-263 (3) L: Lead Free, G: Halogen Free and Lead Free

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	60	V
Gate-Source Voltage		V_{GSS}	±20	V
Continuous Drain Current	T_C = 25°C	I_D	70	A
	T_C = 100°C		56	A
Drain Current Pulsed (Note 2)		I_{DM}	280	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	600	mJ
	Repetitive (Note 2)	E_{AR}	20	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	10	V/ns
Power Dissipation	TO-220/TO-262/TO-263	P_D	104	W
	TO-220F		36	W
	TO-220F2		38	W
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. Repeativity rating: pulse width limited by junction temperature
3. L=0.24mH, I_{AS}=70A, V_{DD}=25V, R_G=20Ω, Starting T_J=25°C
4. I_{SD}≤48A, di/dt≤300A/μs, V_{DD}≤BV_{DSS}, Starting T_J=25°C

■ THERMAL DATA

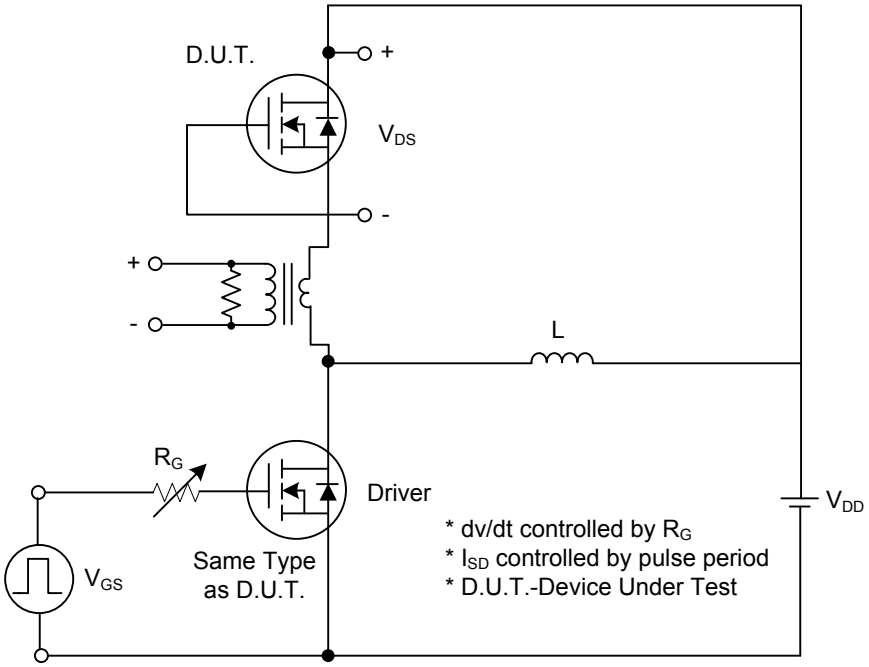
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		θ_{JA}	62	°C/W
Junction to Case	TO-220/TO-262 TO-263	θ_{JC}	1.2	°C/W
	TO-220F		3.47	°C/W
	TO-220F2		3.28	°C/W

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

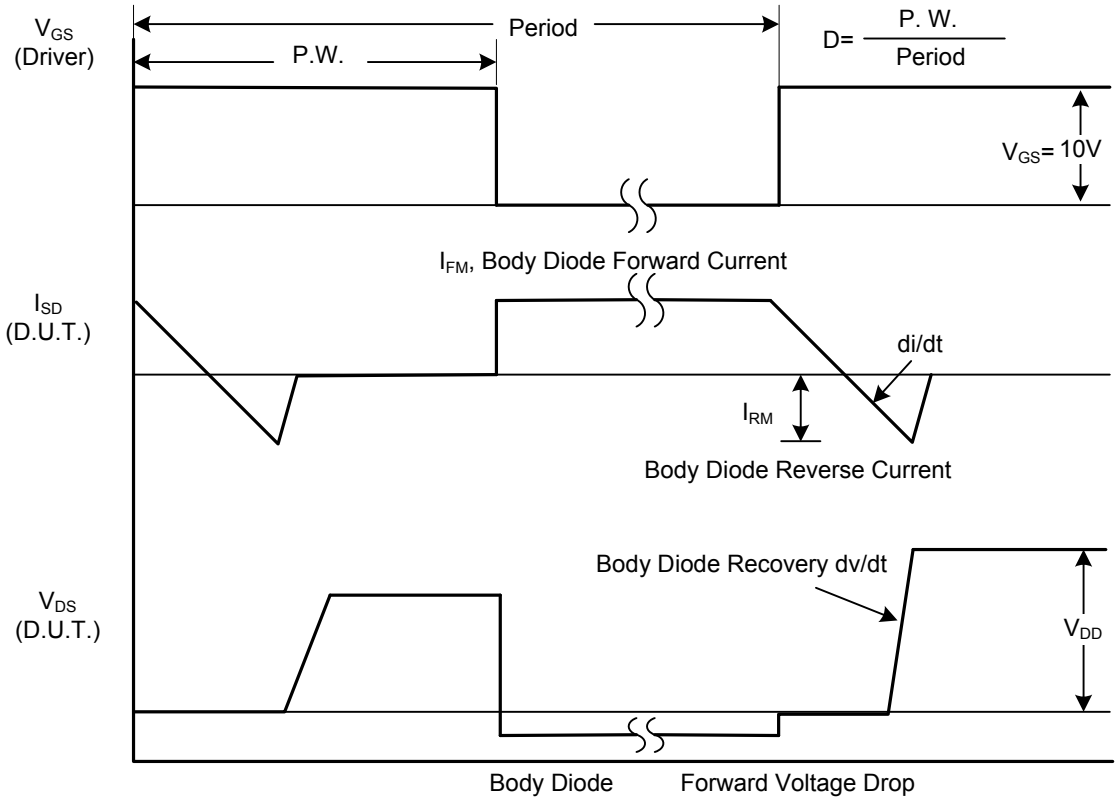
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0 V, I_D = 250 μA	60			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 60 V, V_{GS} = 0 V			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS} = 20V, V_{DS} = 0 V			100	nA
	Reverse		V_{GS} = -20V, V_{DS} = 0 V			-100	nA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	I_D = 1mA, Referenced to 25°C		0.08		V/°C
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250 μA	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS} = 10 V, I_D = 35 A			15	mΩ
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1MHz		1800	2000	pF
Output Capacitance		C_{OSS}			800	900	pF
Reverse Transfer Capacitance		C_{RSS}			130	150	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D(ON)}$	V_{DD} = 30V, V_{GS}=10V, I_D =1 A (Note 1, 2)		90	120	ns
Turn-On Rise Time		t_R			350	400	ns
Turn-Off Delay Time		$t_{D(OFF)}$			260	300	ns
Turn-Off Fall Time		t_F			260	300	ns
Total Gate Charge		Q_G	V_{DS} = 60V, V_{GS} = 10 V, I_D = 48A (Note 1, 2)		210	250	nC
Gate-Source Charge		Q_{GS}			50		nC
Gate-Drain Charge (Miller Charge)		Q_{GD}			120		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS} = 0 V, I_S = 70A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current		I_S				70	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				280	
Reverse Recovery Time		t_{RR}	V_{GS} = 0 V, I_S = 70A, dI_F / dt = 100 A/μs		90		ns
Reverse Recovery Charge		Q_{RR}			300		μC

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

■ TEST CIRCUITS AND WAVEFORMS



1A Peak Diode Recovery dv/dt Test Circuit



1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

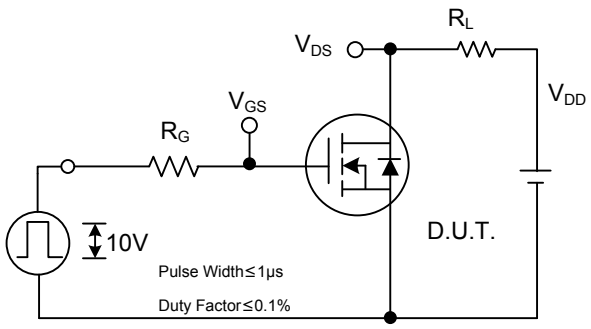


Fig. 2A Switching Test Circuit

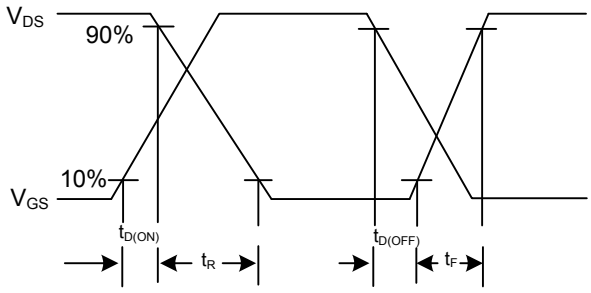


Fig. 2B Switching Waveforms

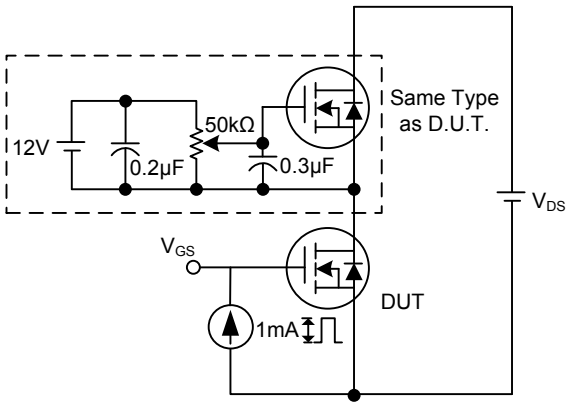


Fig. 3A Gate Charge Test Circuit

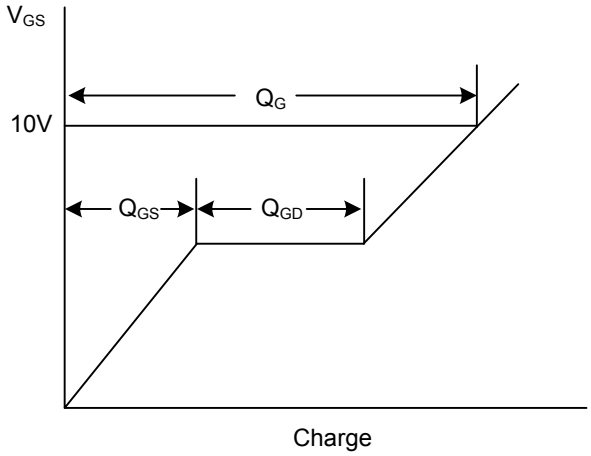


Fig. 3B Gate Charge Waveform

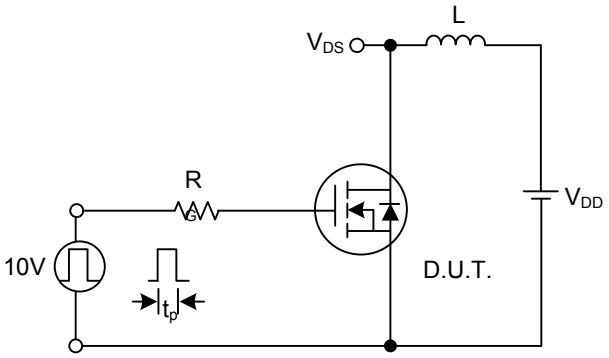


Fig. 4A Unclamped Inductive Switching Test Circuit

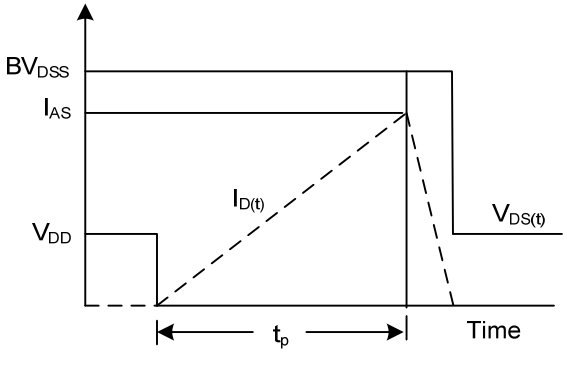
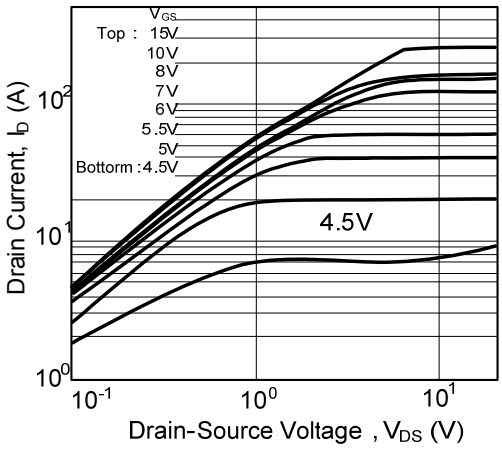


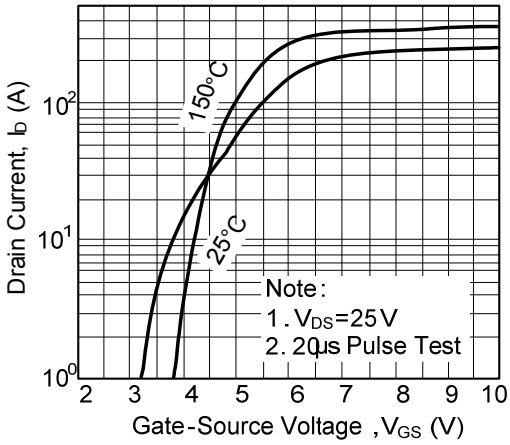
Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

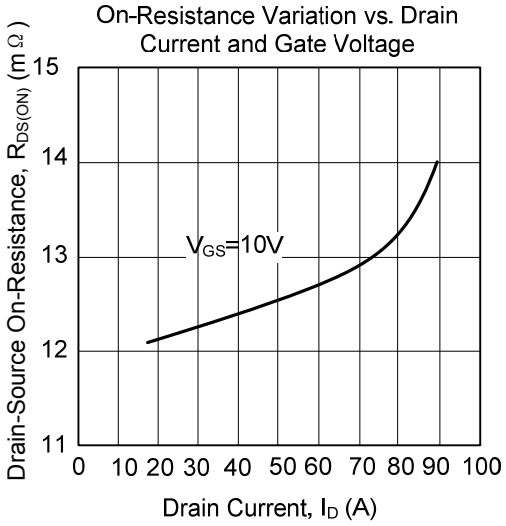
On-State Characteristics



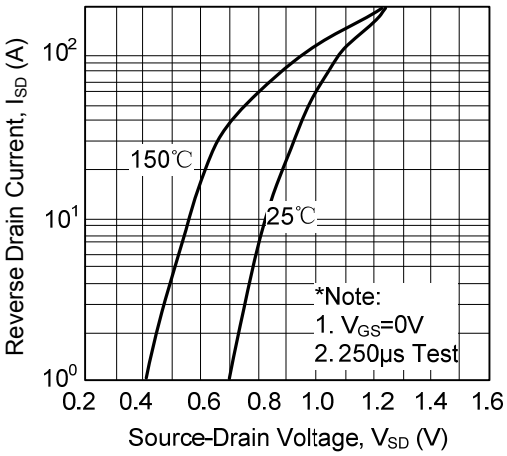
Transfer Characteristics



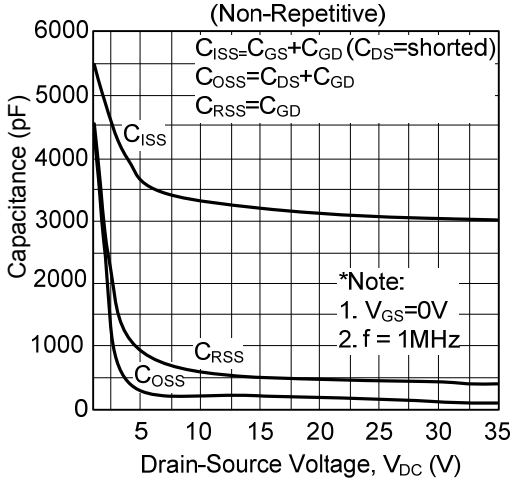
On-Resistance Variation vs. Drain Current and Gate Voltage



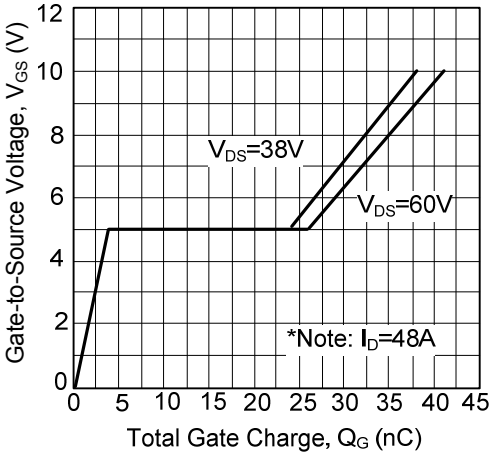
Reverse Drain Current vs. Allowable Case Temperature



Capacitance Characteristics (Non-Repetitive)

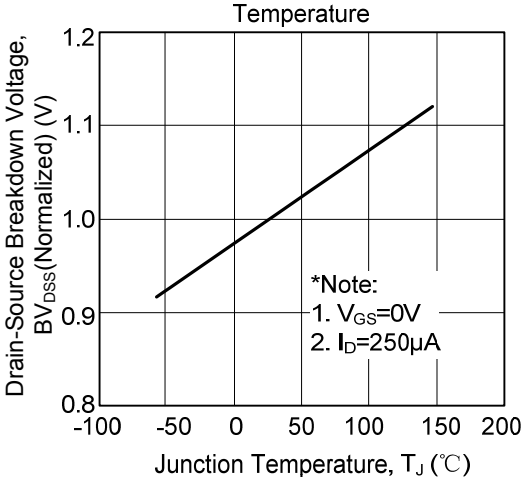


Gate Charge Characteristics

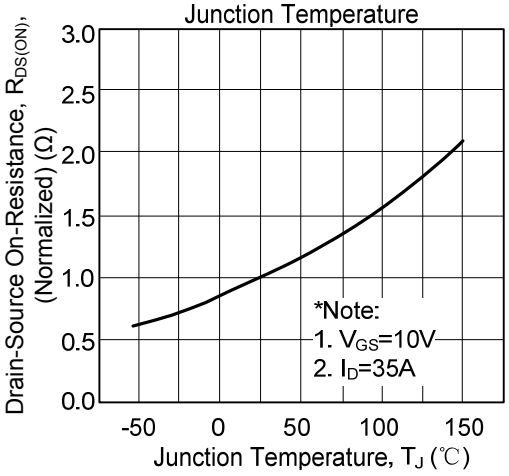


■ TYPICAL CHARACTERISTICS

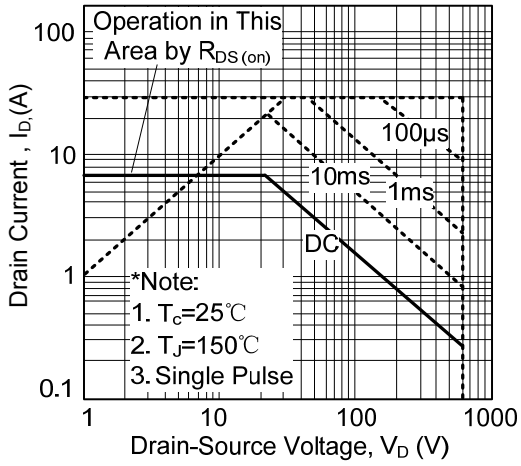
Breakdown Voltage Variation vs. Junction Temperature



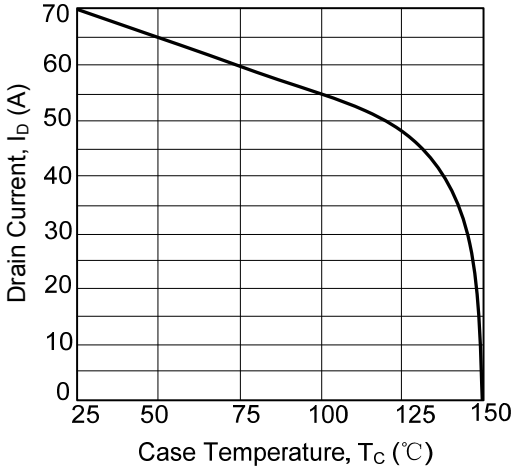
On-Resistance Variation vs. Junction Temperature



Maximum Safe Operating



Maximum Drain Current vs. Case Temperature



Transient Thermal Response Curve