



9N90

Power MOSFET

900V N-CHANNEL MOSFET

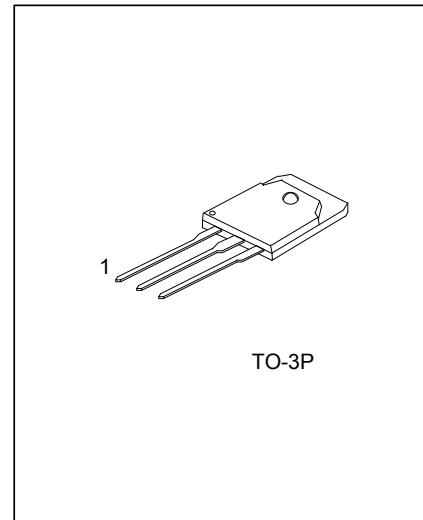
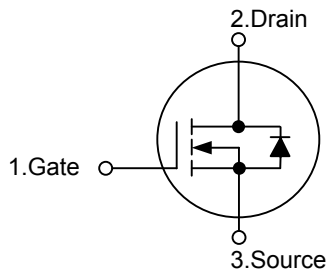
DESCRIPTION

The UTC **9N90** uses UTC's advanced proprietary, planar stripe, DMOS technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with low gate voltages. This device is suitable for use as a load switch or in PWM applications.

FEATURES

- * $R_{DS(ON)} = 1.4\Omega @ V_{GS} = 10V$
- * Ultra low gate charge (typical 45 nC)
- * Low reverse transfer capacitance ($C_{RSS} =$ typical 14 pF)
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL



*Pb-free plating product number: 9N90L

ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
9N90-T3P-T	9N90L-T3P-T	TO-3P	G	D	S	Tube

<p>9N90L-T3P-T</p> <p>(1) Packing Type (2) Package Type (3) Lead Plating</p>	<p>(1) T: Tube (2) T3P: TO-3P (3) L: Lead Free Plating, Blank: Pb/Sn</p>
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■ ABSOLUTE MAXIMUM RATING (T_C = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V _{DSS}	900	V
Gate-Source Voltage		V _{GSS}	±30	V
Continuous Drain Current (T _C = 25°C)		I _D	9.0	A
Pulsed Drain Current (Note 1)		I _{DM}	36	A
Avalanche Current (Note 1)		I _{AR}	9.0	A
Avalanche Energy	Single Pulsed(Note 2)	E _{AS}	900	mJ
	Repetitive(Note 1)	E _{AR}	28	
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.0	V/ns
Power Dissipation Derate above 25°C		P _D	280	W
			2.22	W/°C
Junction Temperature		T _J	125	°C
Operating Temperature		T _{OPR}	-20 ~ +85	°C
Storage Temperature		T _{STG}	-40 ~ +150	°C

Note: 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.

■ THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Junction-to- Ambient	θ _{JA}			40	°C/W
Junction-to-Case	θ _{JC}			0.45	°C/W

■ ELECTRICAL CHARACTERISTICS (T_J = 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	900			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} = 900 V, V _{GS} = 0 V			10	μA
Gate-Body Leakage Current	Forward	I _{GSSF}			100	nA
	Reverse	I _{GSSR}			-100	
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D = 250 μA, Referenced to 25°C		0.99		V/°C
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} = V _{GS} , I _D = 250 μA	3.0		5.0	V
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} = 10 V, I _D = 4.5 A		1.12	1.4	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz		2100	2730	pF
Output Capacitance	C _{OSS}			175	230	
Reverse Transfer Capacitance	C _{RSS}			14	18	
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{D(ON)}	V _{DD} = 4500V, I _D = 11.0 A, R _G = 25Ω (Note 4, 5)		50	110	ns
Turn-On Rise Time	t _R			120	250	
Turn-Off Delay Time	t _{D(OFF)}			100	210	
Turn-Off Fall Time	t _F			75	160	
Total Gate Charge	Q _G			45	58	
Gate-Source Charge	Q _{GS}	V _{DS} = 720V, I _D = 11.0A, V _{GS} = 10 V (Note 4, 5)		13		nC
Gate-Drain Charge	Q _{GD}			18		nC

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 9.0\text{ A}$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I_S				9.0	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				36	A
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, I_S = 9.0\text{ A},$		550		ns
Reverse Recovery Charge	Q_{RR}	$dI_F / dt = 100\text{ A}/\mu\text{s}$ (Note 4)		6.5		μC

Note 1. Repetitive Rating : Pulse width limited by maximum junction temperature

2. $L = 21\text{mH}, I_{AS} = 9.0\text{A}, V_{DD} = 50\text{V}, R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

3. $I_{SD} \leq 9.0\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

4. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$

5. Essentially independent of operating temperature

■ TEST CIRCUIT

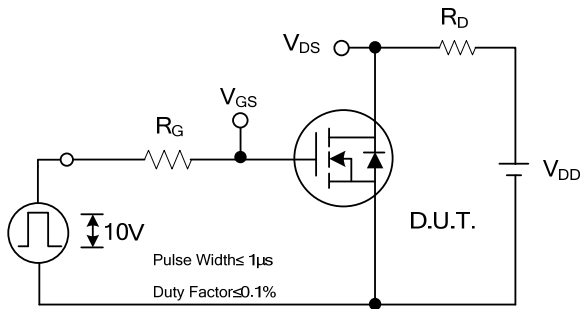


Fig. 2A Switching Test Circuit

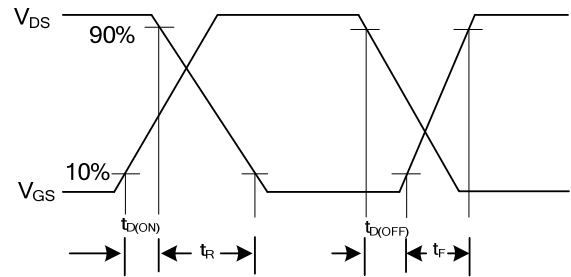


Fig. 2B Switching Waveforms

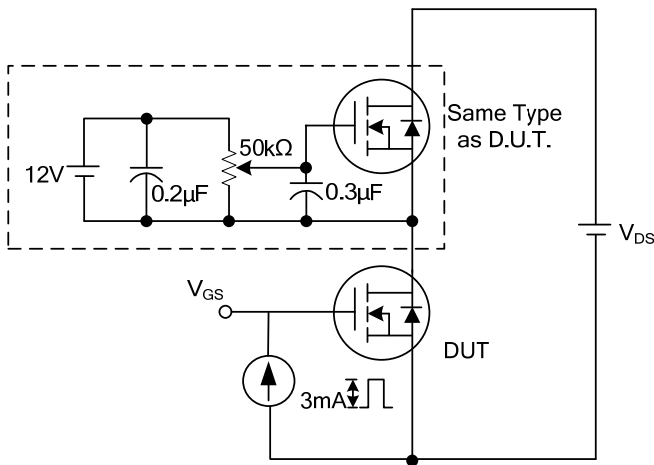


Fig. 3A Gate Charge Test Circuit

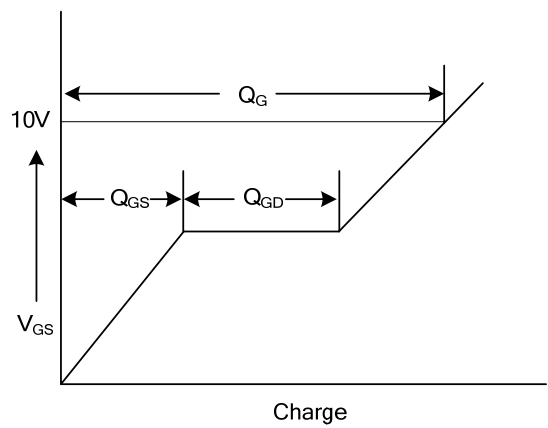


Fig. 3B Gate Charge Waveform

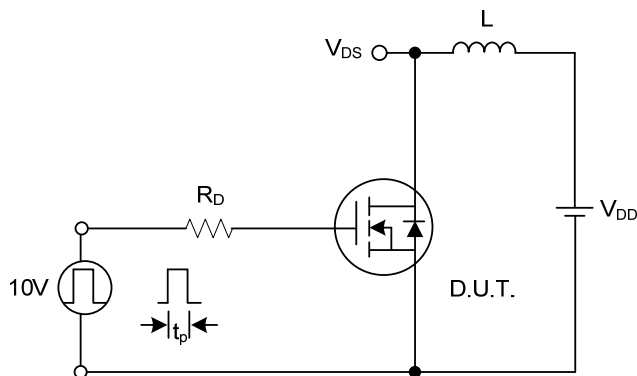


Fig. 4A Unclamped Inductive Switching Test Circuit

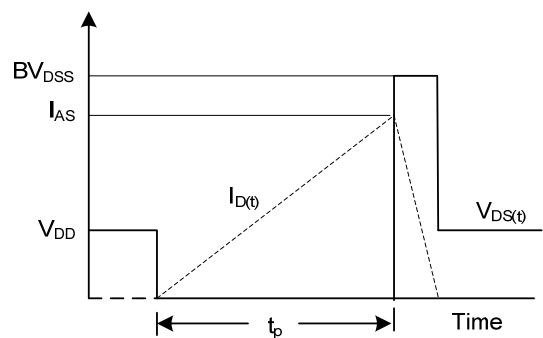


Fig. 4B Unclamped Inductive Switching Waveforms

■ TEST CIRCUIT(Cont.)

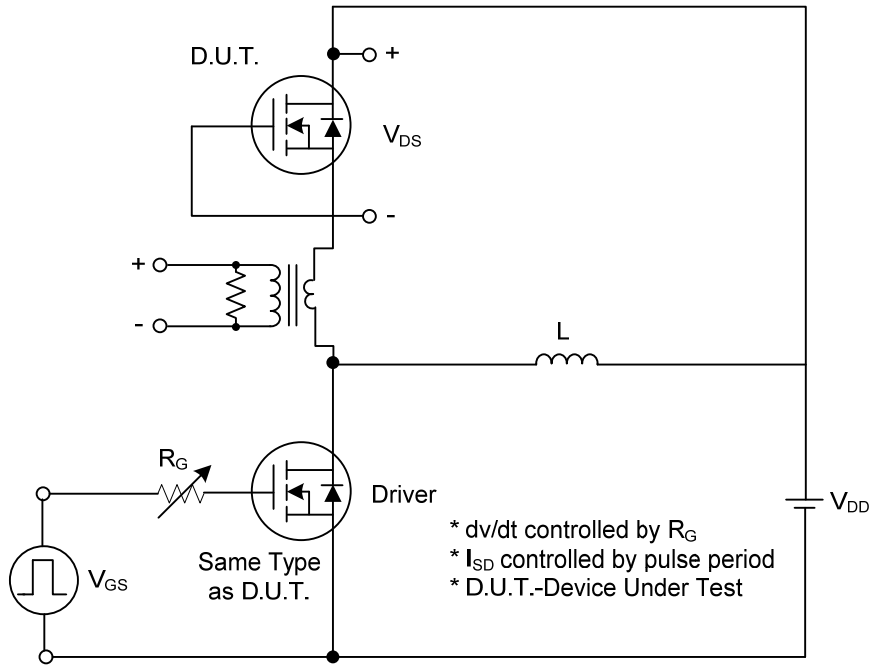
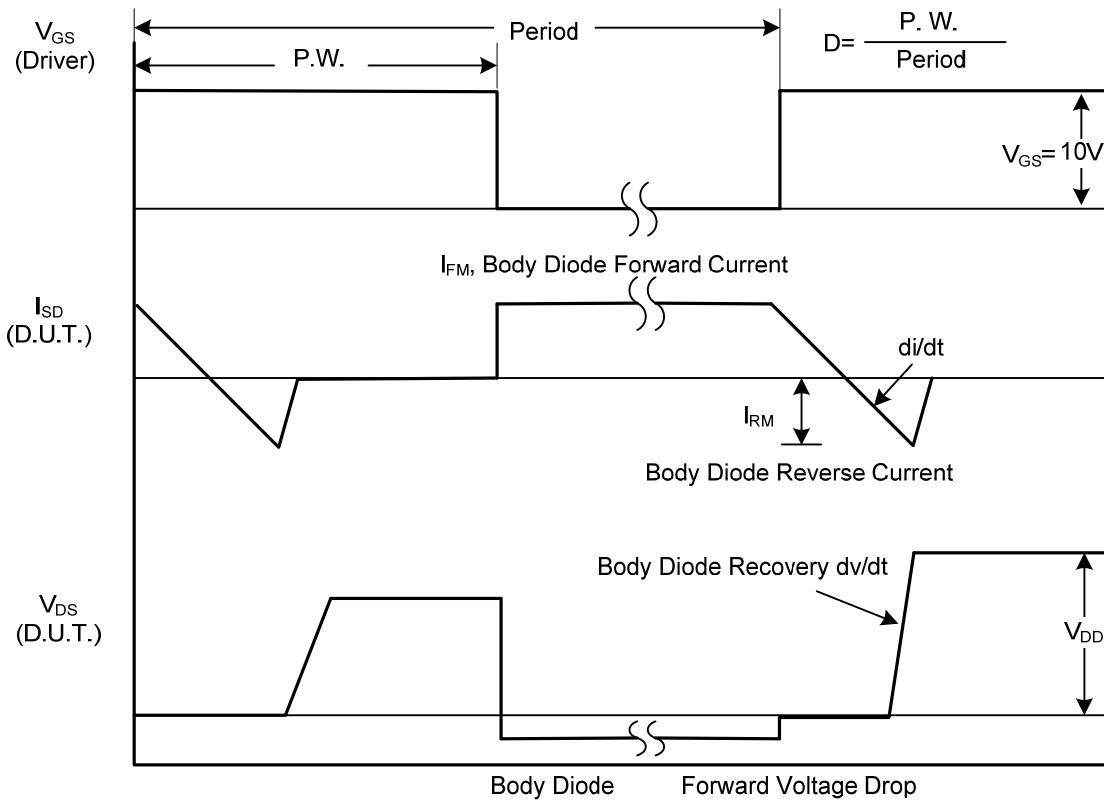
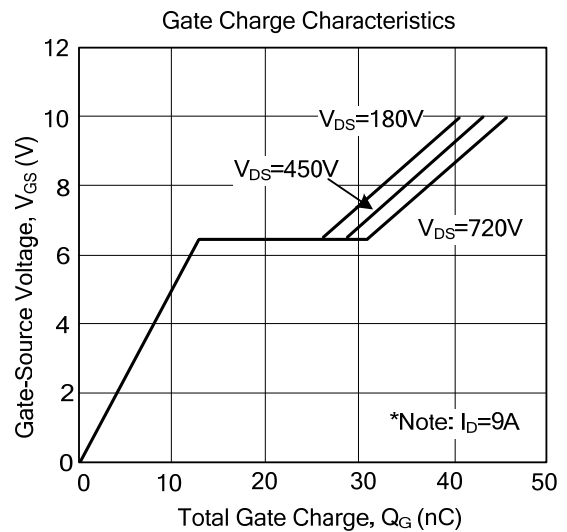
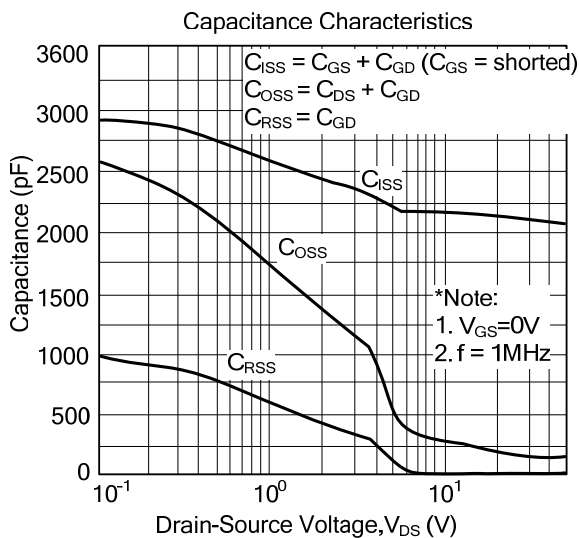
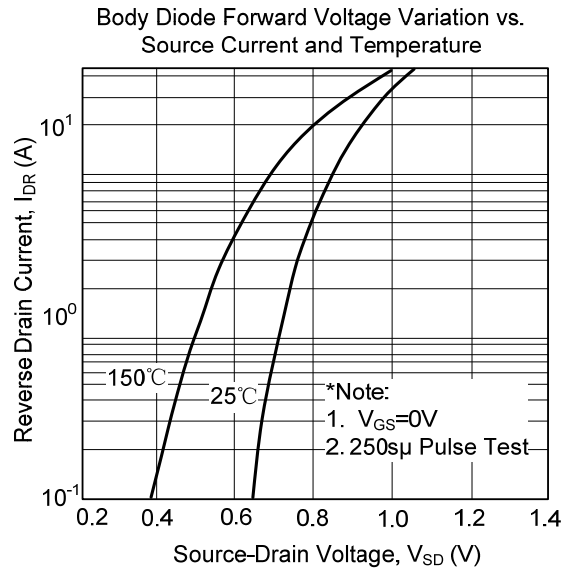
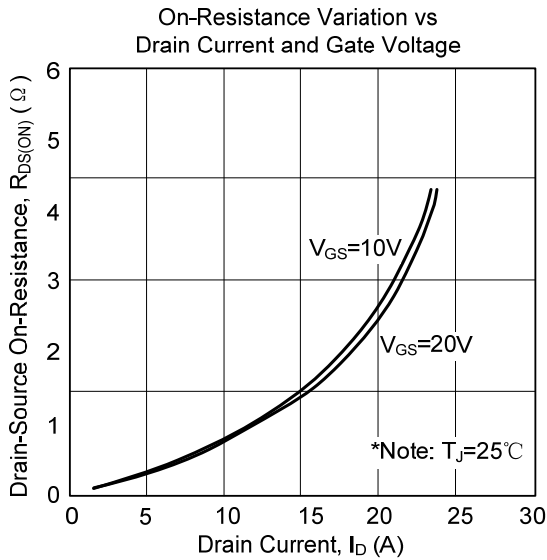
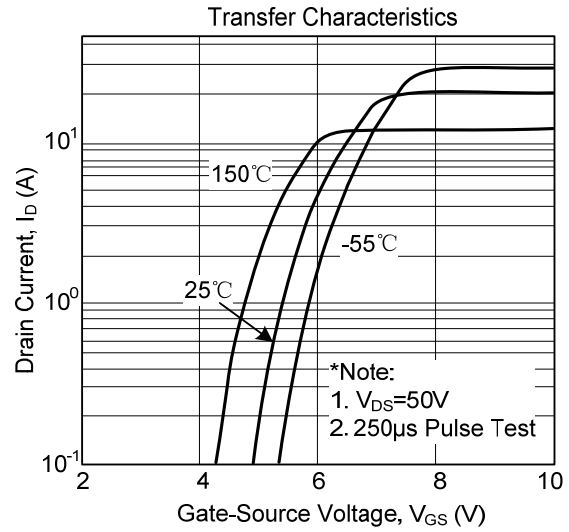
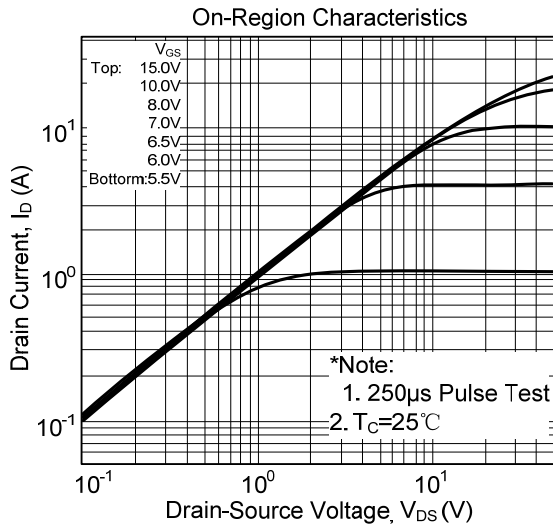


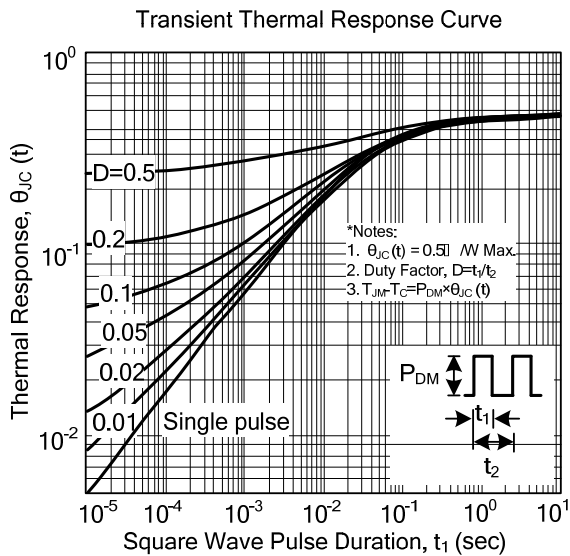
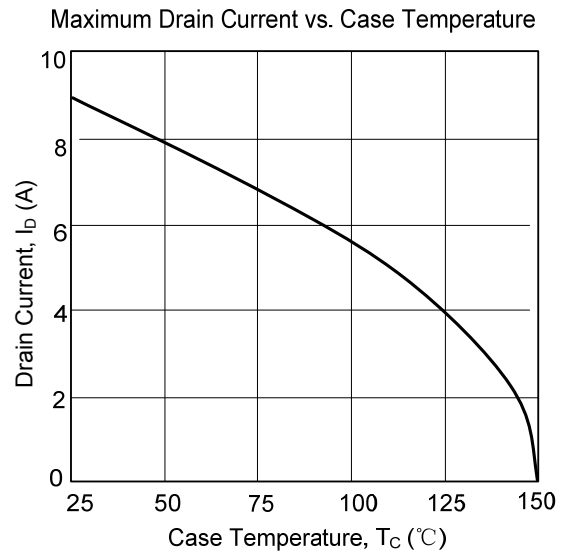
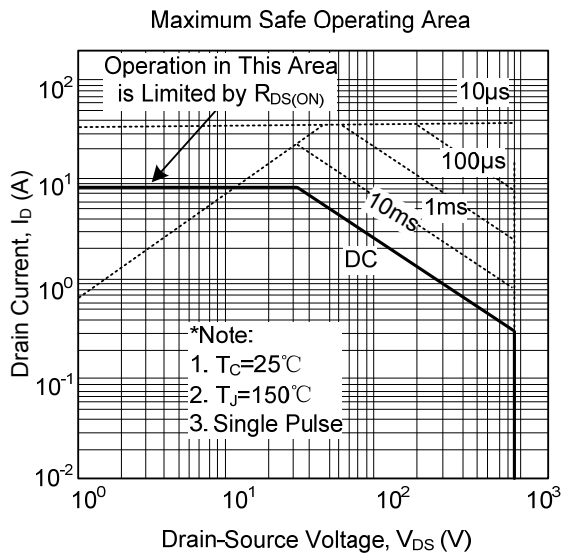
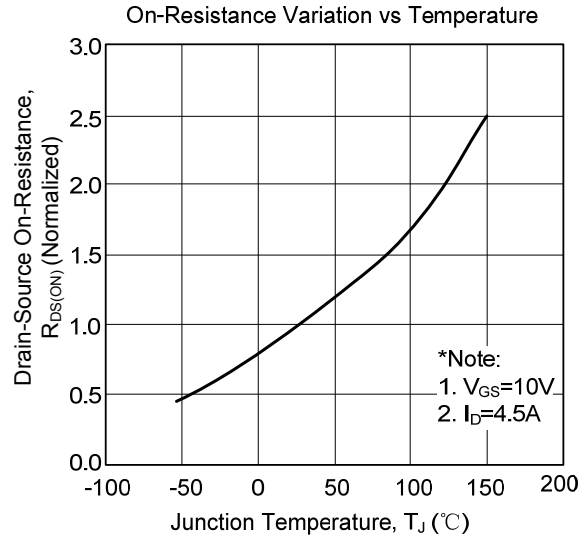
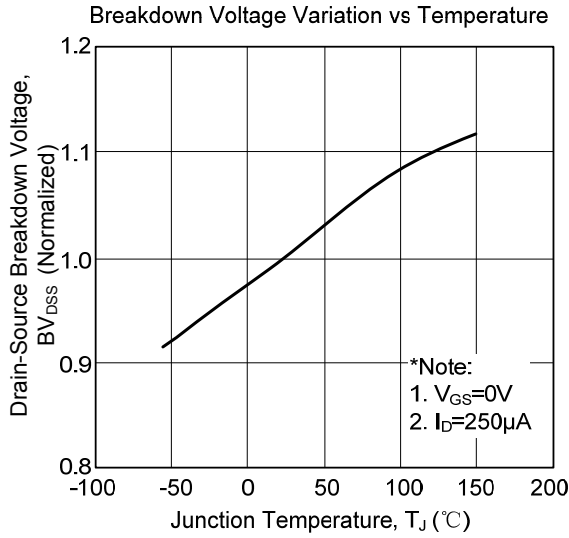
Fig. 1A Peak Diode Recovery dv/dt Test Circuit



■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



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