



9N90

Power MOSFET

900V N-CHANNEL MOSFET

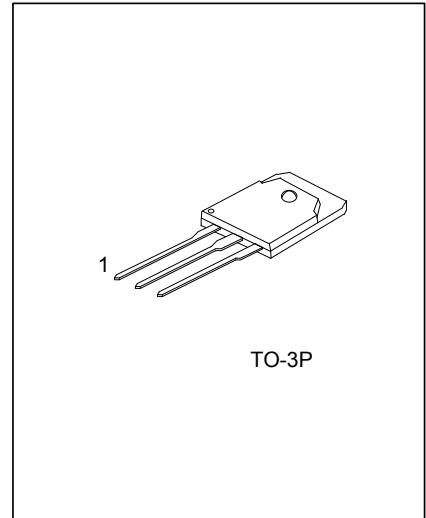
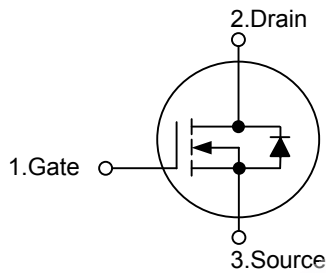
DESCRIPTION

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

9N90L-T3P-T (1) Packing Type (2) Package Type (3) Lead Plating	(1) T: Tube (2) T3P: TO-3P (3) L: Lead Free Plating, Blank: Pb/Sn
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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℃)		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		P _D	280	W
Derate above 25℃			2.22	W/℃
Junction Temperature		T _J	125	℃
Operating Temperature		T _{OPR}	-20 ~ +85	℃
Storage Temperature		T _{STG}	-40 ~ +150	℃

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}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	900			V
Drain-Source Leakage Current		I_{DSS}	$V_{DS} = 900\text{ V}, V_{GS} = 0\text{ V}$			10	μA
Gate-Body Leakage Current	Forward	I_{GSSF}	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$			100	nA
	Reverse	I_{GSSR}	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$			-100	
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C		0.99		V/°C
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	3.0		5.0	V
Static Drain-Source On-Resistance		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 4.5\text{ A}$		1.12	1.4	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$		2100	2730	pF
Output Capacitance		C_{OSS}			175	230	pF
Reverse Transfer Capacitance		C_{RSS}			14	18	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D(ON)}$	$V_{DD} = 4500\text{V}, I_D = 11.0\text{ A}$, $R_G = 25\Omega$ (Note 4, 5)		50	110	ns
Turn-On Rise Time		t_R			120	250	ns
Turn-Off Delay Time		$t_{D(OFF)}$			100	210	ns
Turn-Off Fall Time		t_F			75	160	ns
Total Gate Charge		Q_G	$V_{DS} = 720\text{V}, I_D = 11.0\text{A}$, $V_{GS} = 10\text{ V}$ (Note 4, 5)		45	58	nC
Gate-Source Charge		Q_{GS}			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}	$V_{GS} = 0\text{ V}, I_S = 9.0\text{ A},$ $dI_F / dt = 100\text{ A}/\mu\text{s}$ (Note 4)		550		ns
Reverse Recovery Charge	Q_{RR}			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

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■ TEST CIRCUIT

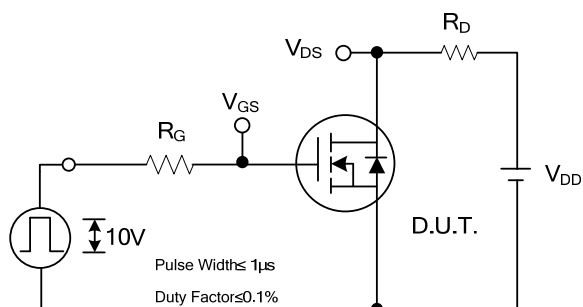


Fig. 2A Switching Test Circuit

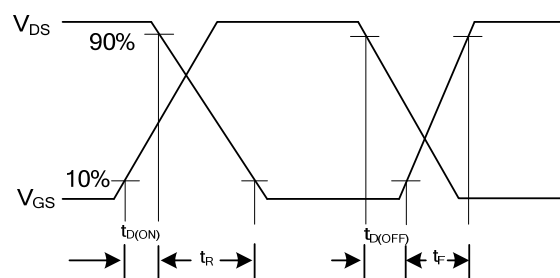


Fig. 2B Switching Waveforms

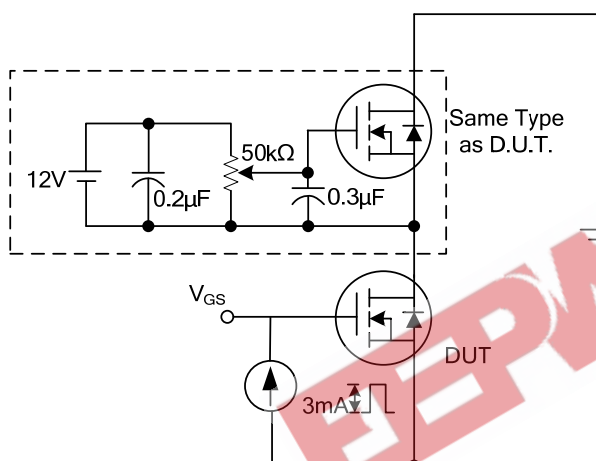


Fig. 3A Gate Charge Test Circuit

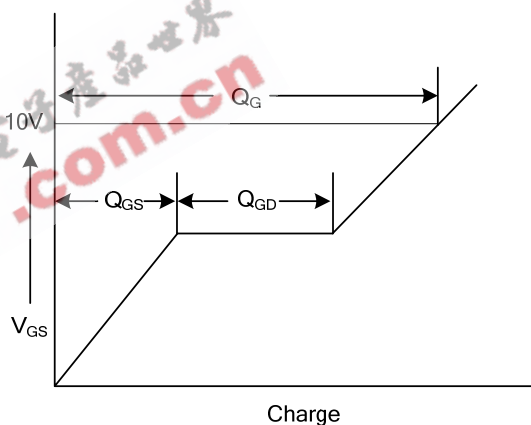


Fig. 3B Gate Charge Waveform

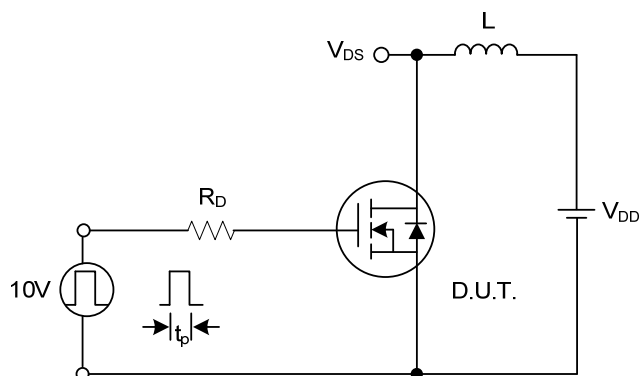


Fig. 4A Unclamped Inductive Switching Test Circuit

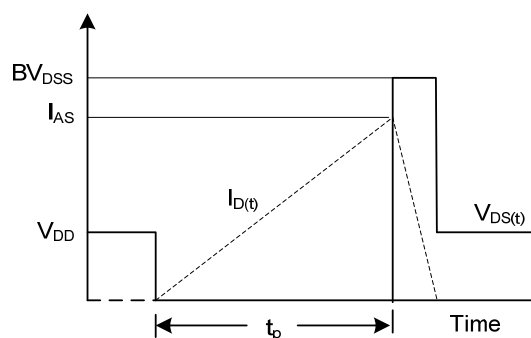


Fig. 4B Unclamped Inductive Switching Waveforms

D.U.T.

V_{DS}

L

R_G

Driver

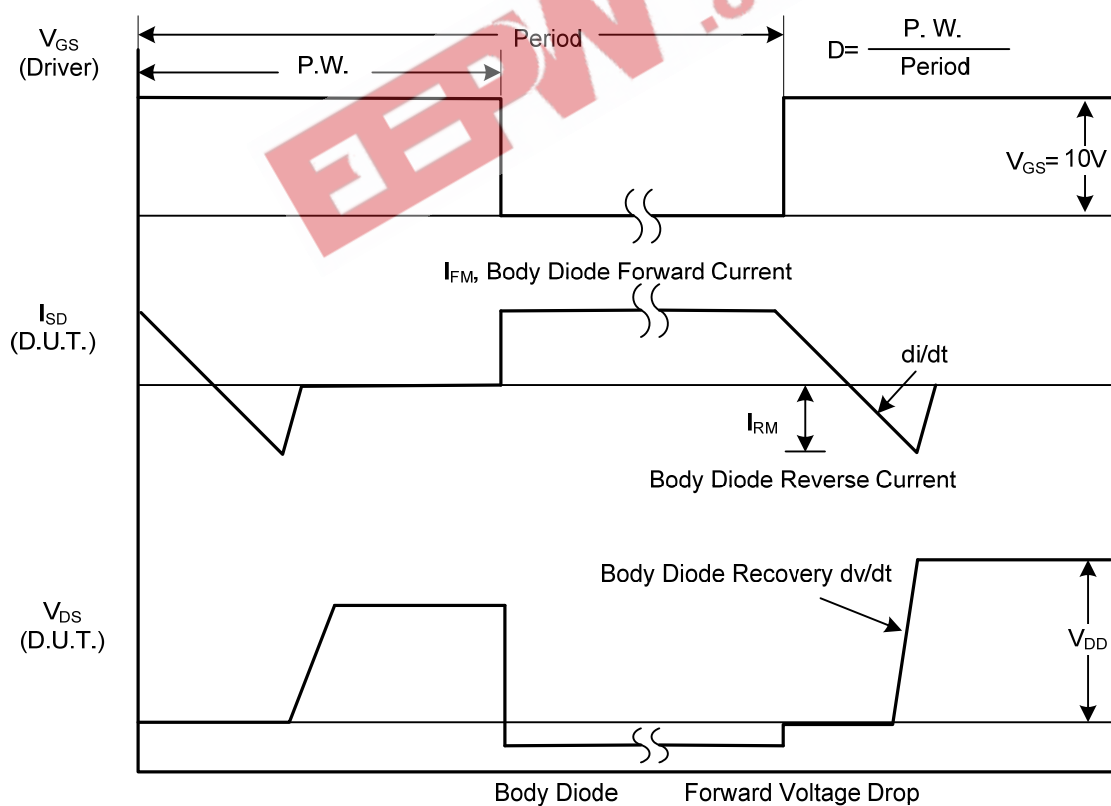
V_{GS}

Same Type as D.U.T.

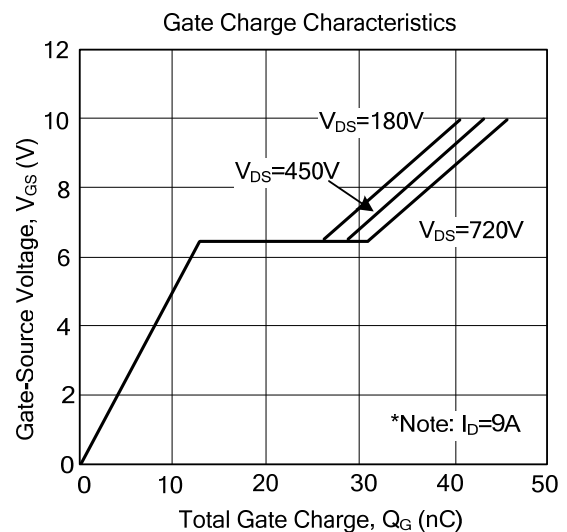
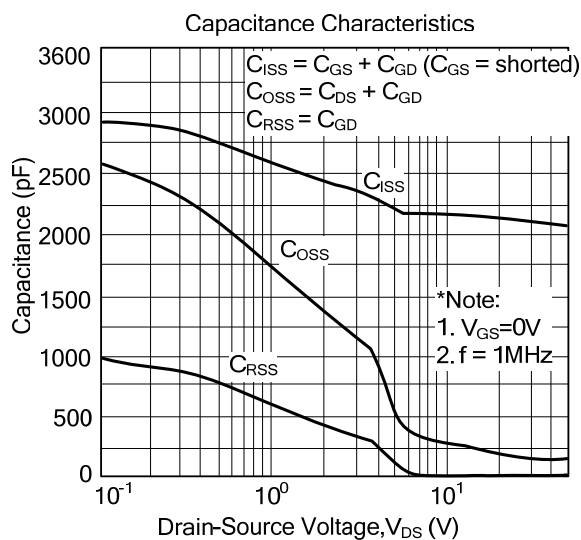
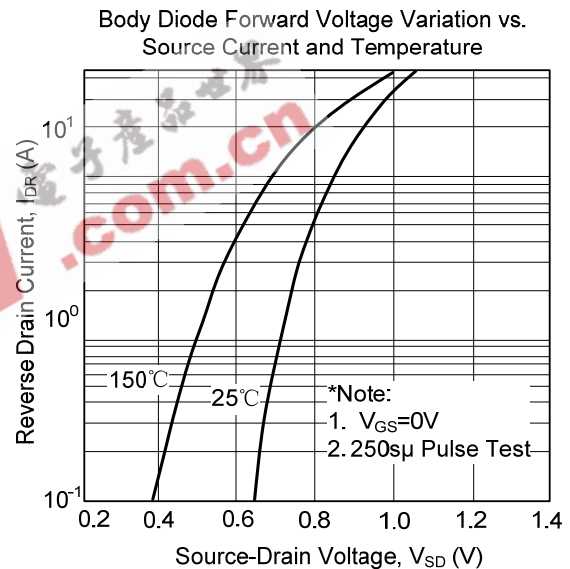
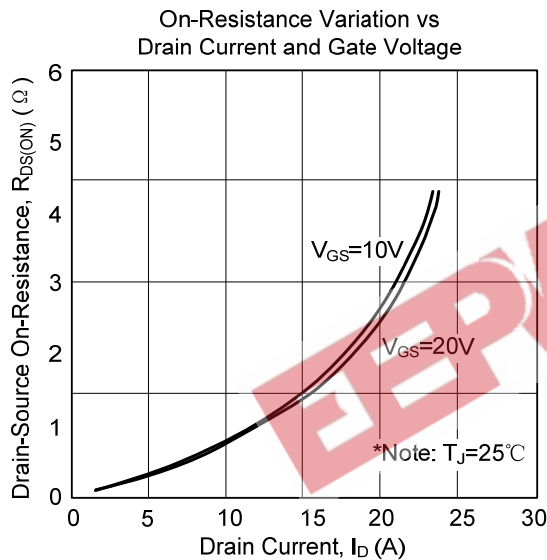
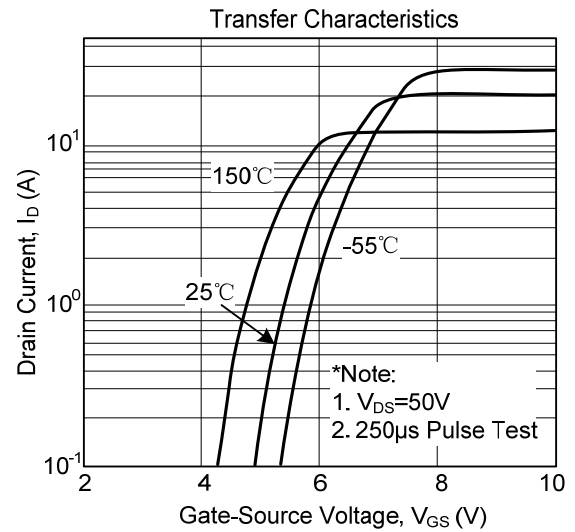
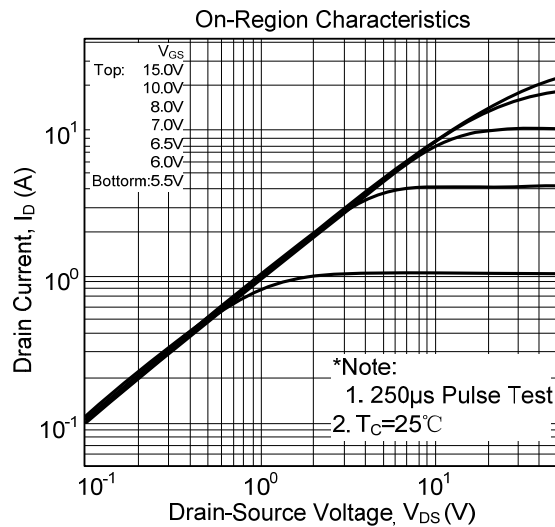
V_{DD}

- * dv/dt controlled by R_G
- * I_{SD} controlled by pulse period
- * D.U.T.-Device Under Test

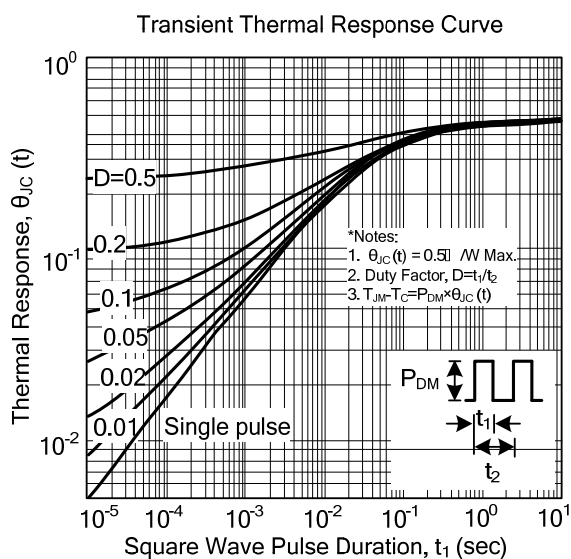
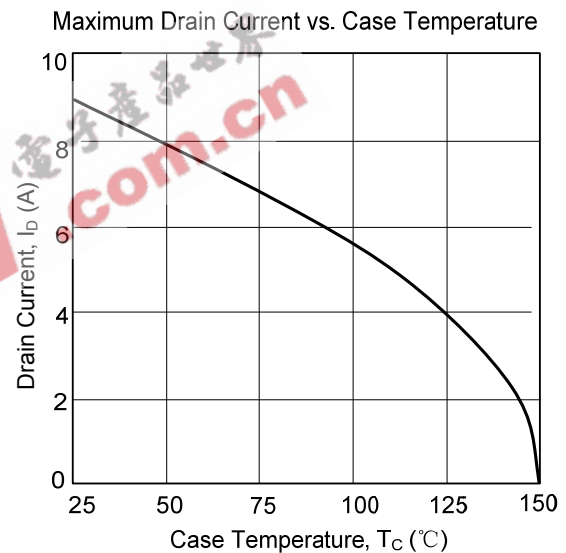
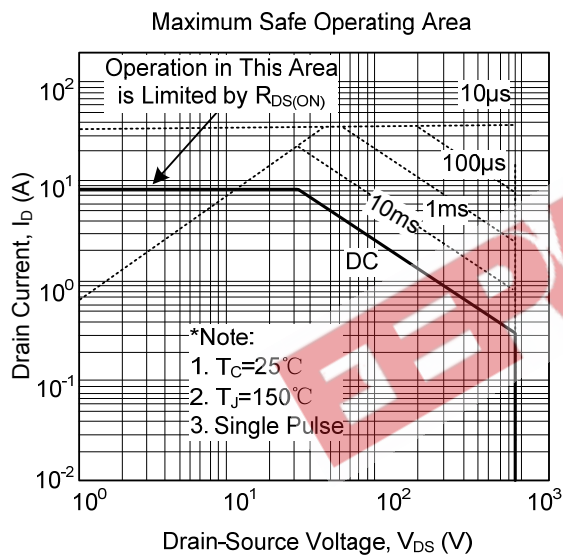
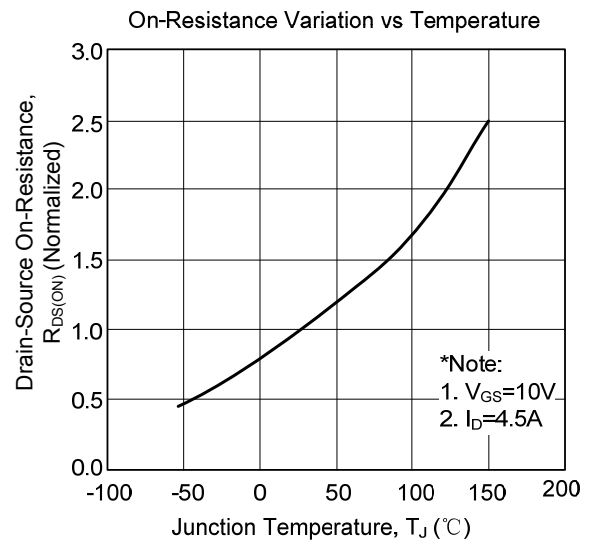
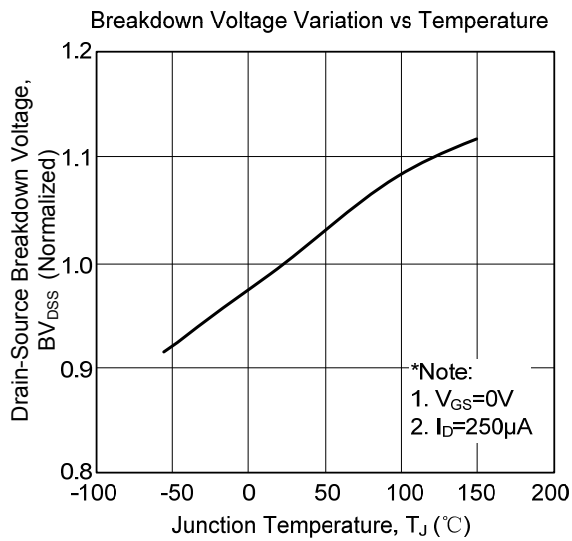
Fig. 1A Peak Diode Recovery dv/dt Test Circuit



TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS(Cont.)



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