



UT20NP04

Power MOSFET

**DUAL ENHANCEMENT MODE
(N-CHANNEL / P-CHANNEL)**

■ **DESCRIPTION**

The UTC **UT20NP04** incorporates a N-channel MOSFET and a P-channel MOSFET, it uses UTC's advanced technology to provide customers a minimum on-state resistance, high switching speed, low gate charge and cost effectiveness.

The UTC **UT20NP04** is universally applied in low voltage applications.

■ **FEATURES**

*N-CHANNEL

$R_{DS(on)} \leq 45 \text{ m}\Omega @ V_{GS}=10V, I_D=10A$

$R_{DS(on)} \leq 65 \text{ m}\Omega @ V_{GS}=4.5V, I_D=10A$

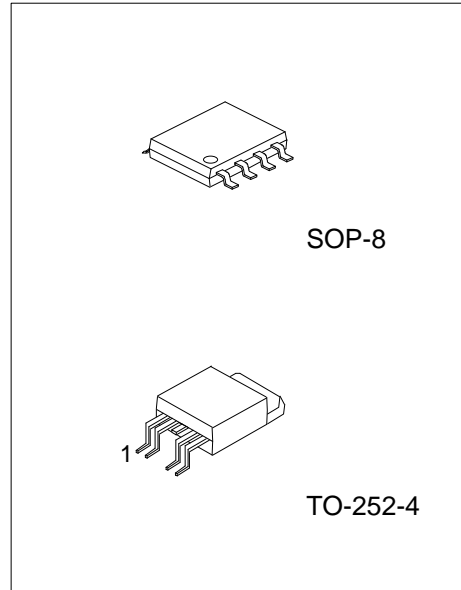
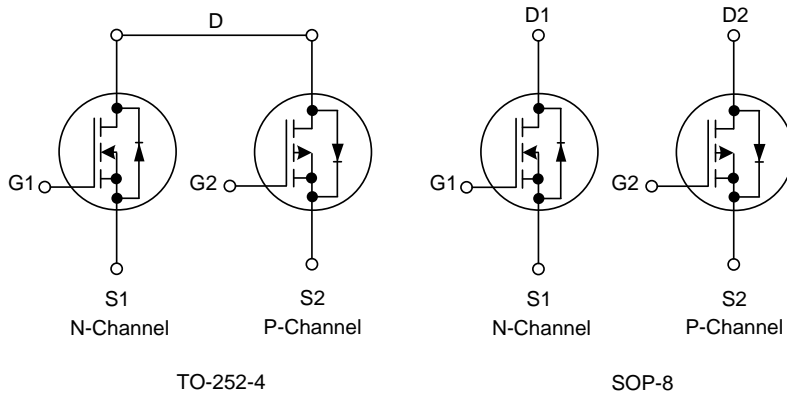
*P-CHANNEL

$R_{DS(on)} \leq 73 \text{ m}\Omega @ V_{GS}=-10V, I_D=-10A$

$R_{DS(on)} \leq 150 \text{ m}\Omega @ V_{GS}=-4.5V, I_D=-10A$

* High switching speed

■ **SYMBOL**



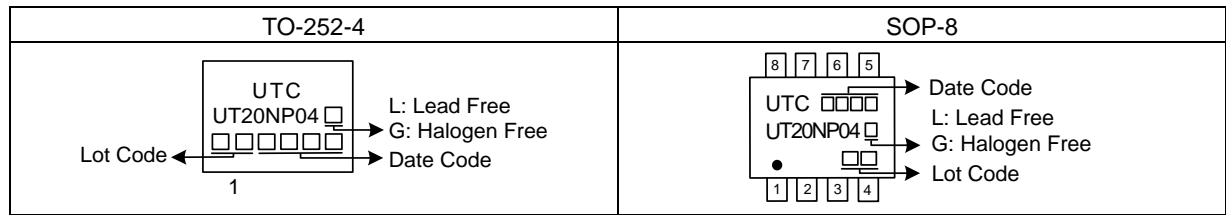
■ **ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UT20NP04L-TN4-R	UT20NP04G-TN4-R	TO-252-4	S1	G1	D	S2	G2	-	-	-	Tape Reel
UT20NP04L-S08-R	UT20NP04G-S08-R	SOP-8	S1	G1	S2	G2	D2	D2	D1	D1	Tape Reel

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

<p>UT20NP04G-TN4-R</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) TN4: TO-252-4, S08: SOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_C=25°C, unless otherwise specified)

PARAMETER			SYMBOL	RATINGS		UNIT
				N-CH	P-CH	
Drain-Source Voltage			V _{DSS}	40	-40	V
Gate-Source Voltage			V _{GSS}	±20	±20	V
Drain Current	Continuous	T _C =25°C	I _D	10	-10	A
	Pulsed		I _{DM}	20	-20	A
Avalanche Energy, Single Pulse			E _{AS}	3	26	mJ
Power Dissipation		TO-252-4	P _D	46		W
		SOP-8		1.5		W
Junction Temperature			T _J	+150		°C
Range of 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. N-Channel: L=0.1mH, I_{AS}=7.7A, V_{DD}=30V, R_G=25Ω, Starting T_J=25°C
 P-Channel: L=0.1mH, I_{AS}=-22.9A, V_{DD}=-30V, R_G=25Ω, Starting T_J=25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-252-4			
	SOP-8	125	°C/W	
Junction to Case	TO-252-4	θ _{JC}	2.7 (Note)	°C/W
	SOP-8		83.3 (Note)	°C/W

Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

N-Channel

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	40			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =40V, V _{GS} =0V, T _J =25°C			1	μA
			V _{DS} =48V, V _{GS} =0V, T _J =125°C			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =+20V			+100	nA
	Reverse		V _{GS} =-20V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	1.0		3.0	V
Static Drain-Source On-State Resistance (Note)		R _{DS(ON)}	V _{GS} =10V, I _D =10A			45	mΩ
			V _{GS} =4.5V, I _D =10A			65	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		385		pF
Output Capacitance		C _{OSS}			52		pF
Reverse Transfer Capacitance		C _{RSS}			45		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note)		Q _G	V _{GS} =48V, V _{DS} =10V, I _D =10A, I _G =1mA		12		nC
Gate to Source Charge		Q _{GS}			1.8		nC
Gate to Drain Charge		Q _{GD}			2		nC
Turn-ON Delay Time (Note)		t _{D(ON)}	V _{DD} =20V, V _{GS} =10V, I _D =10A, R _G =25Ω		4		ns
Rise Time		t _R			16		ns
Turn-OFF Delay Time		t _{D(OFF)}			42		ns
Fall-Time		t _F			28		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I _S				10	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				20	A
Drain-Source Diode Forward Voltage (Note)		V _{SD}	I _S =10A, V _{GS} =0V			1.2	V

■ ELECTRICAL CHARACTERISTICS (Cont.)

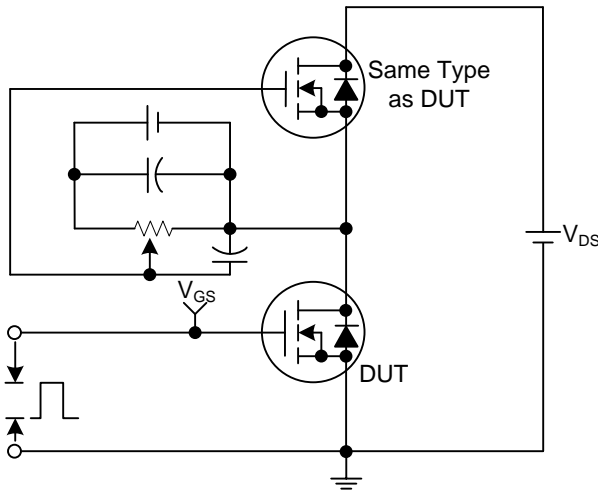
P-Channel

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=-250\mu A, V_{GS}=0V$	-40			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=-40V, V_{GS}=0V, T_J=25^\circ C$			-1	μA
		$V_{DS}=-48V, V_{GS}=0V, T_J=125^\circ C$			-10	μA
Gate-Source Leakage Current	Forward	I_{GSS}			+100	nA
	Reverse					
					-100	nA
		$V_{GS}=-20V$				
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0		-3.0	V
Static Drain-Source On-State Resistance (Note)	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-10A$			73	m Ω
		$V_{GS}=-4.5V, I_D=-10A$			150	m Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0V, V_{DS}=-25V, f=1.0MHz$		610		pF
Output Capacitance	C_{OSS}			95		pF
Reverse Transfer Capacitance	C_{RSS}			82		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note)	Q_G	$V_{GS}=-48V, V_{DS}=-10V, I_D=-10A, I_G=-1mA$		17		nC
Gate to Source Charge	Q_{GS}			2.5		nC
Gate to Drain Charge	Q_{GD}			4		nC
Turn-ON Delay Time (Note)	$t_{D(ON)}$	$V_{DD}=-20V, V_{GS}=-10V, I_D=-10A, R_G=3\Omega$		6		ns
Rise Time	t_R			16		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			17		ns
Fall-Time	t_F			19		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				-10	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				-20	A
Drain-Source Diode Forward Voltage (Note)	V_{SD}	$I_S=-1.0A, V_{GS}=0V$			-2.5	V

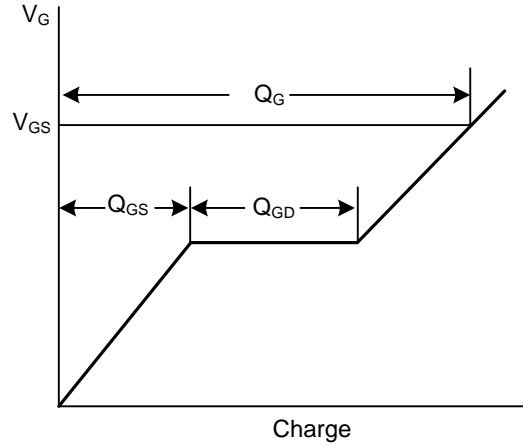
Note: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

TEST CIRCUITS AND WAVEFORMS

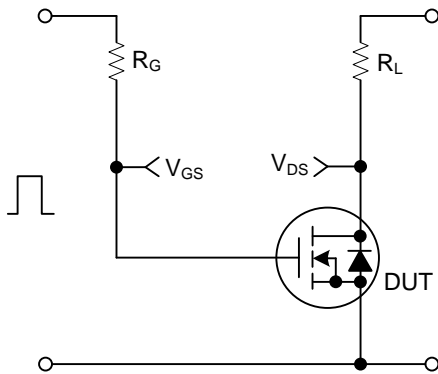
N-CHANNEL



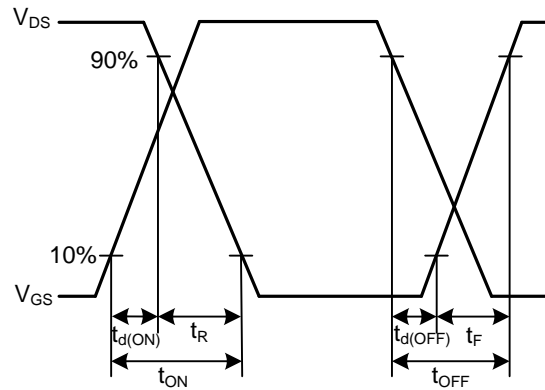
Gate Charge Test Circuit



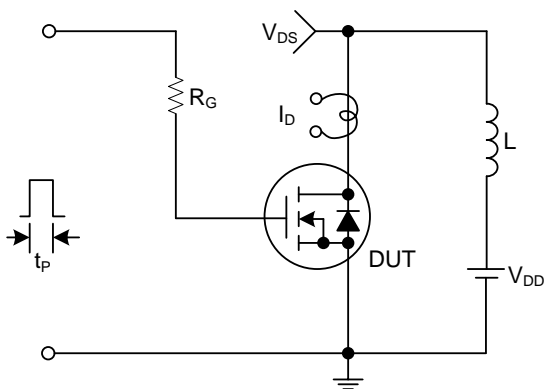
Gate Charge Waveforms



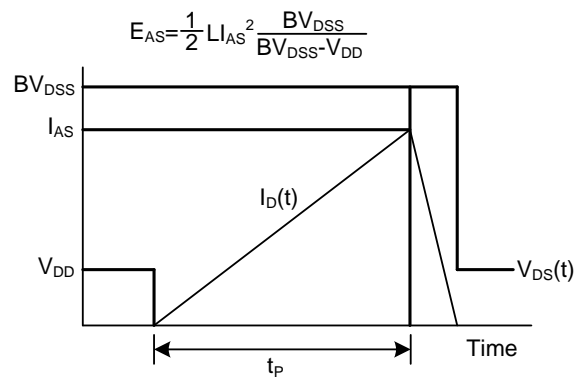
Resistive Switching Test Circuit



Resistive Switching Waveforms



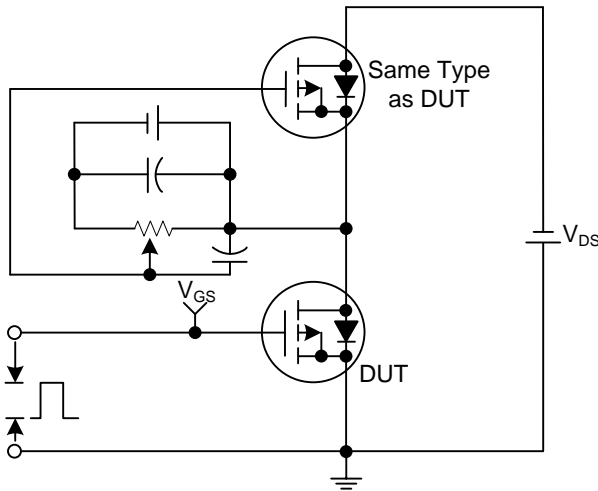
Unclamped Inductive Switching Test Circuit



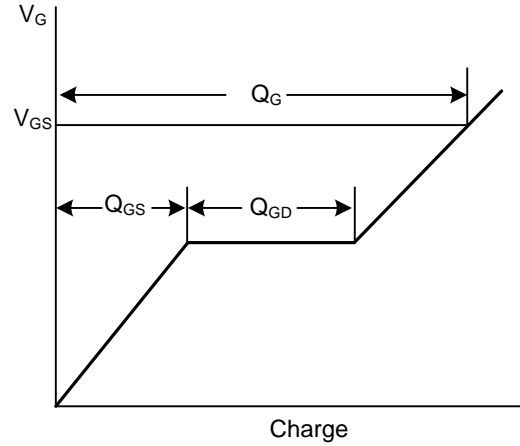
Unclamped Inductive Switching Waveforms

TEST CIRCUITS AND WAVEFORMS

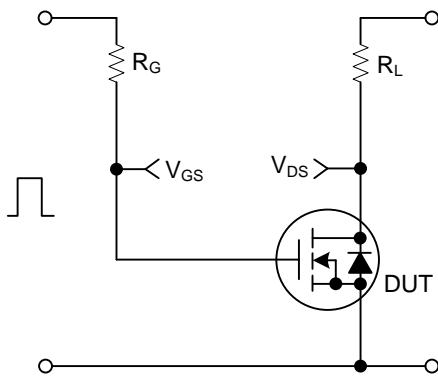
P-CHANNEL



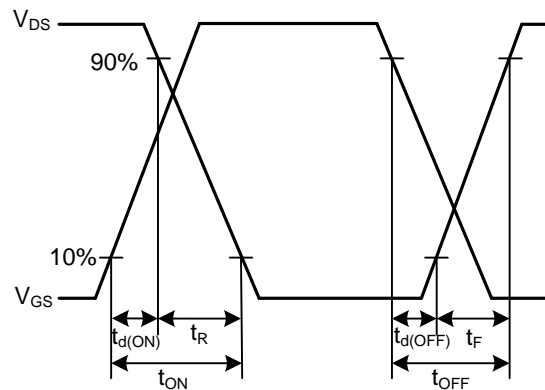
Gate Charge Test Circuit



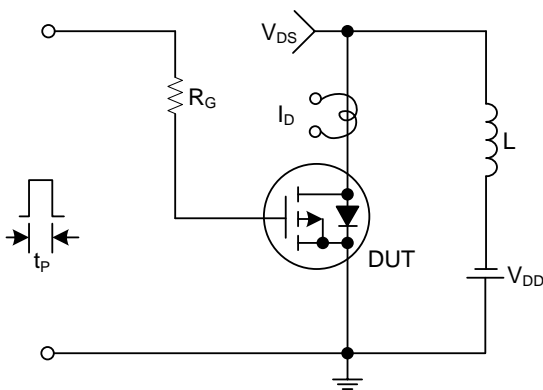
Gate Charge Waveforms



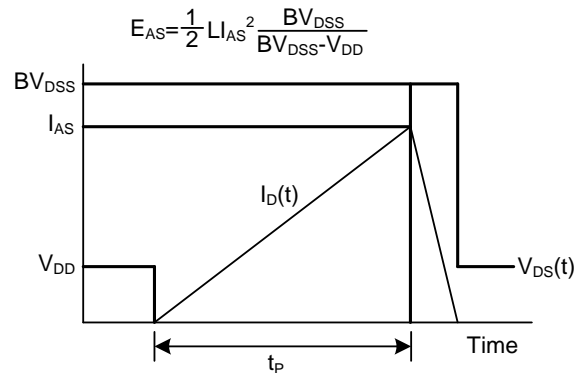
Resistive Switching Test Circuit



Resistive Switching Waveforms



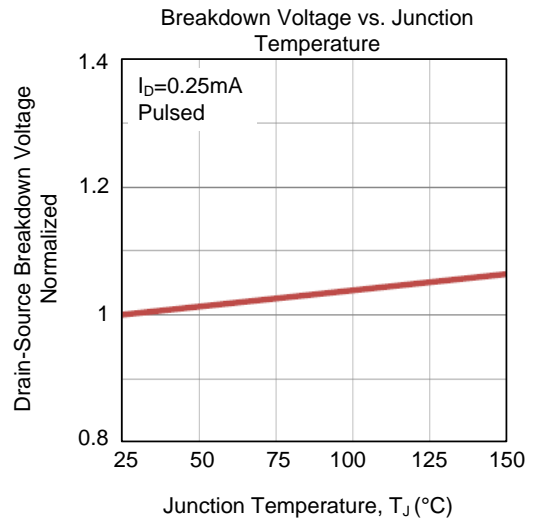
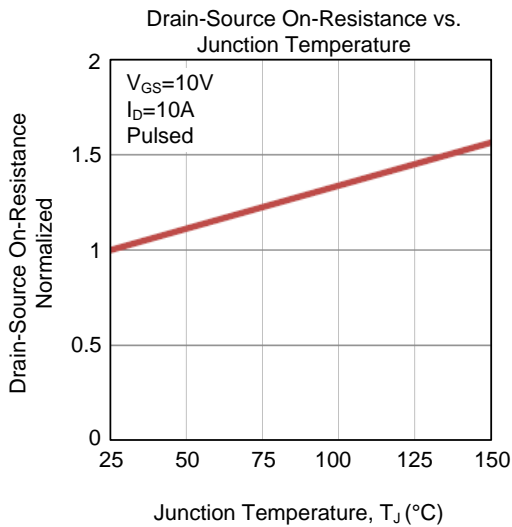
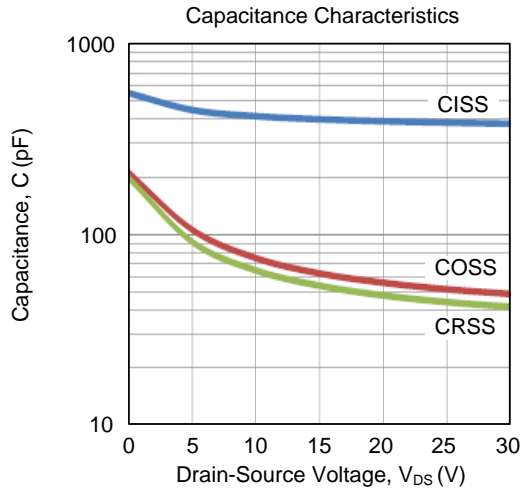
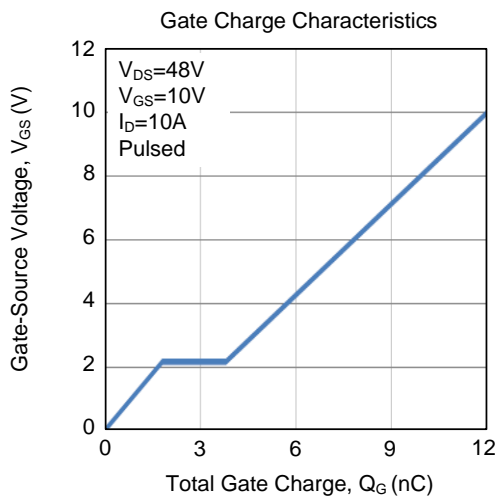
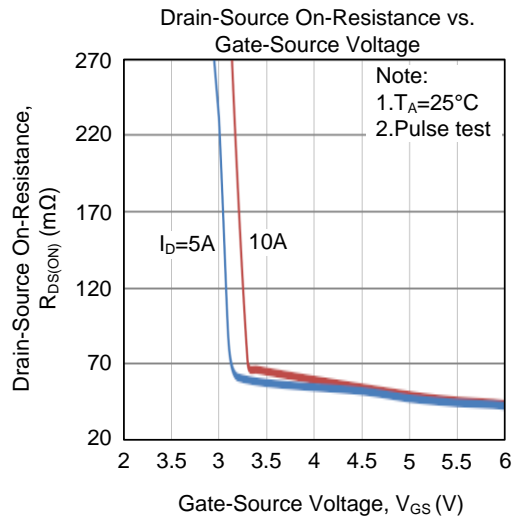
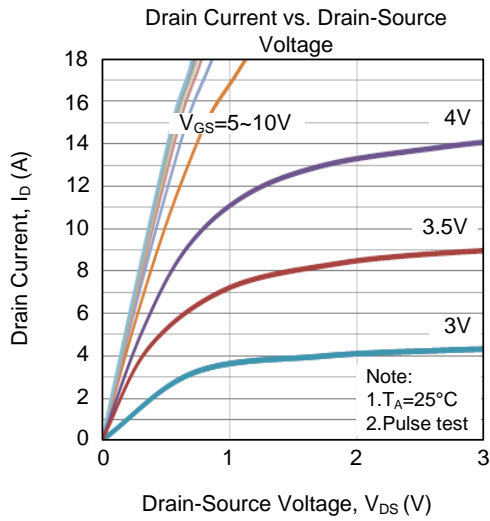
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

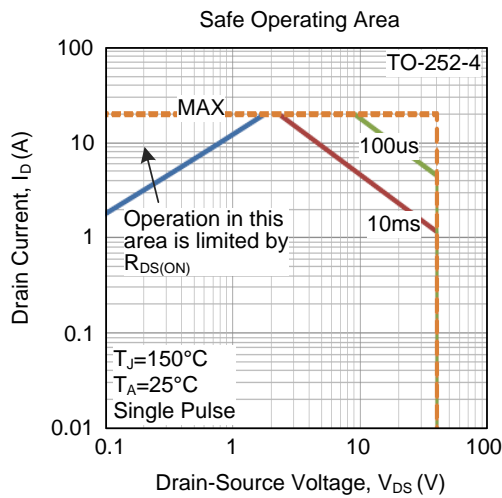
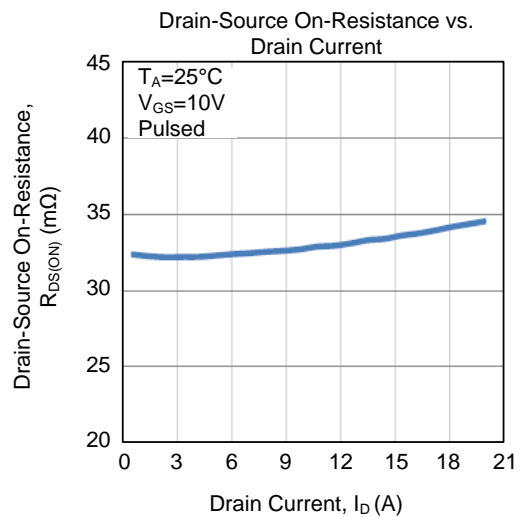
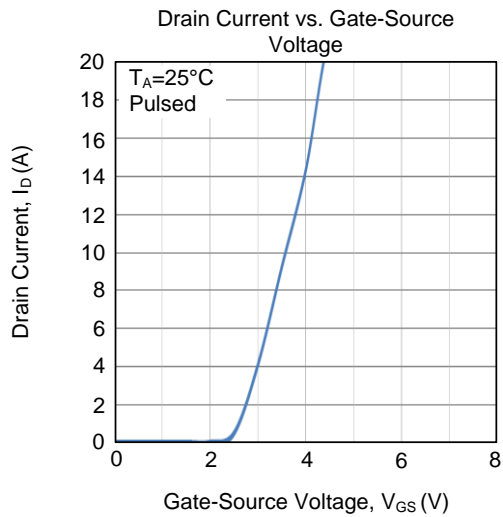
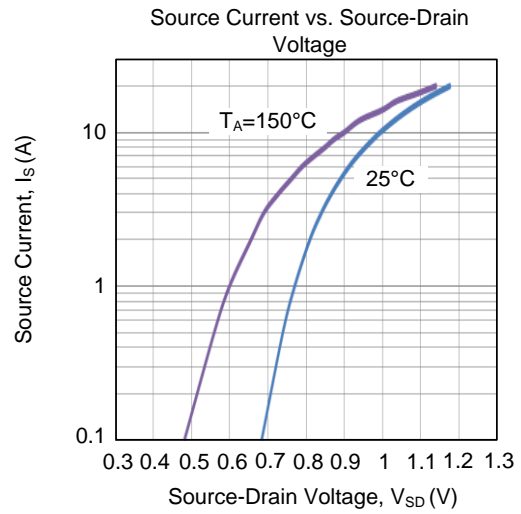
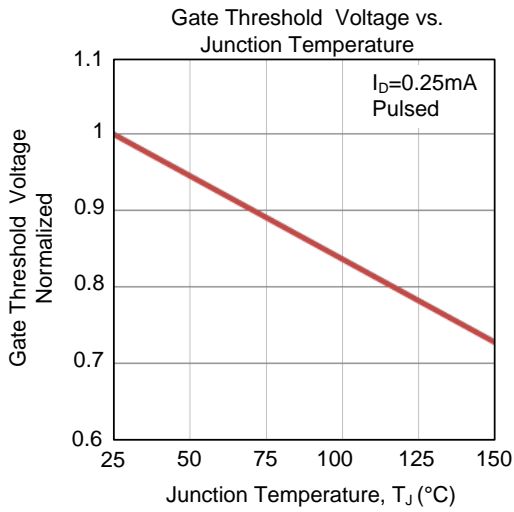
TYPICAL CHARACTERISTICS

N-CHANNEL



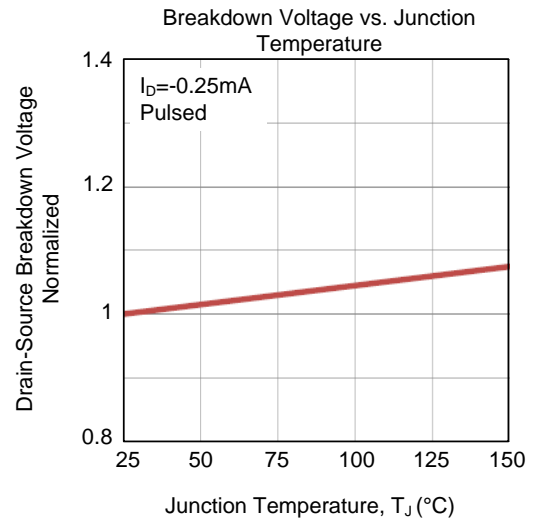
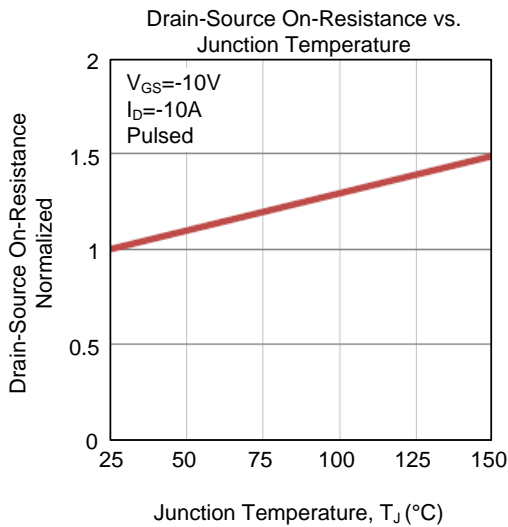
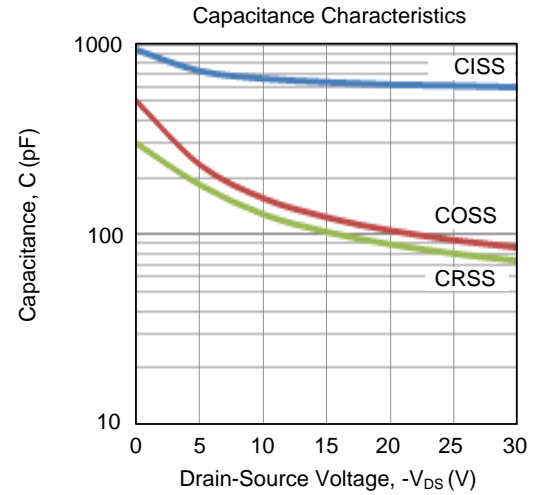
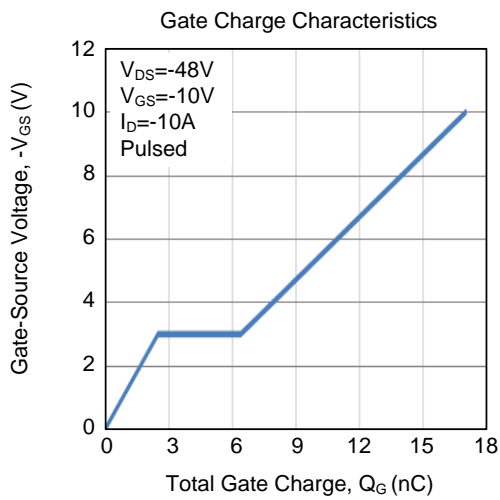
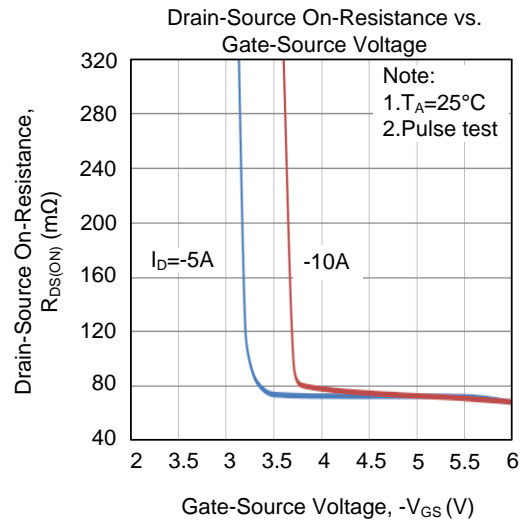
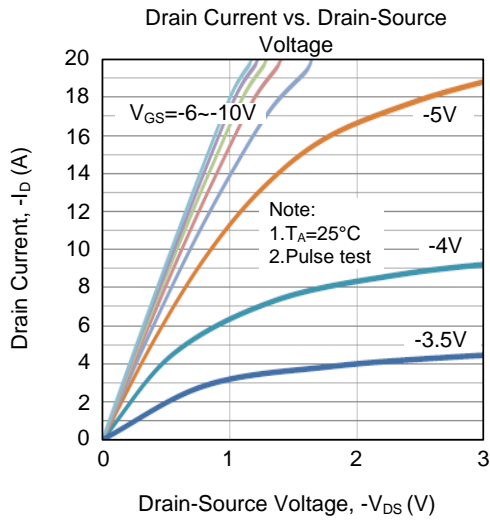
■ TYPICAL CHARACTERISTICS (Cont.)

N-CHANNEL



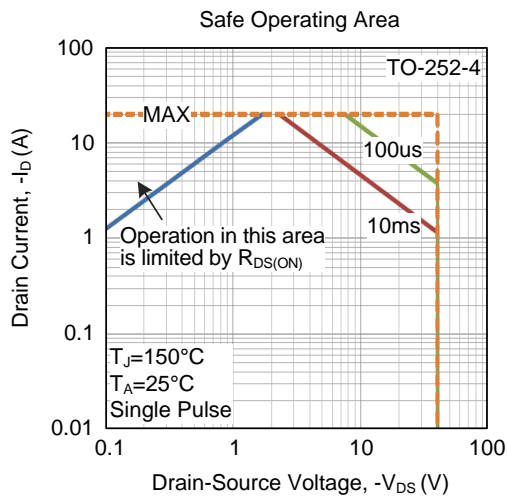
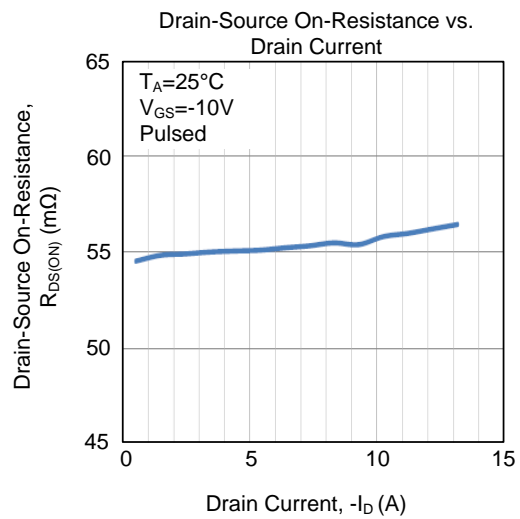
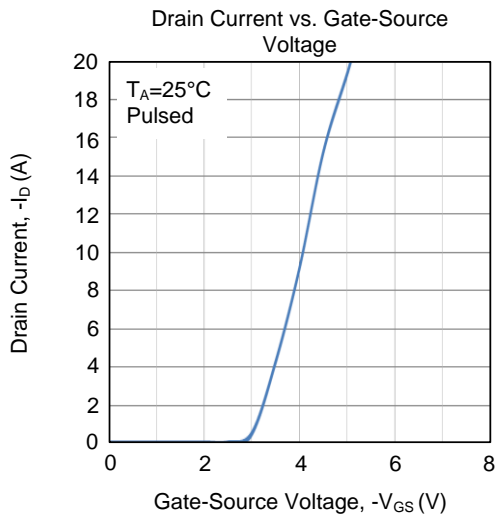
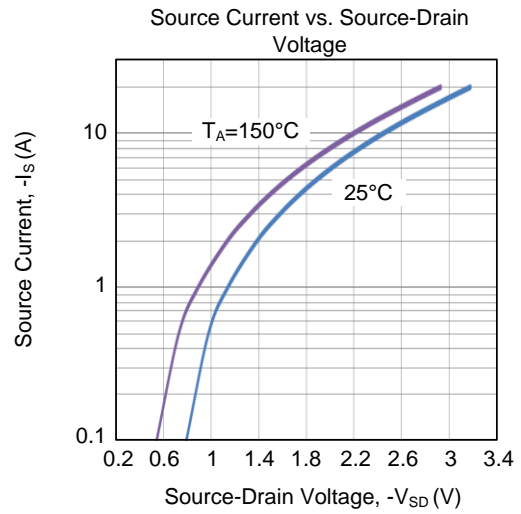
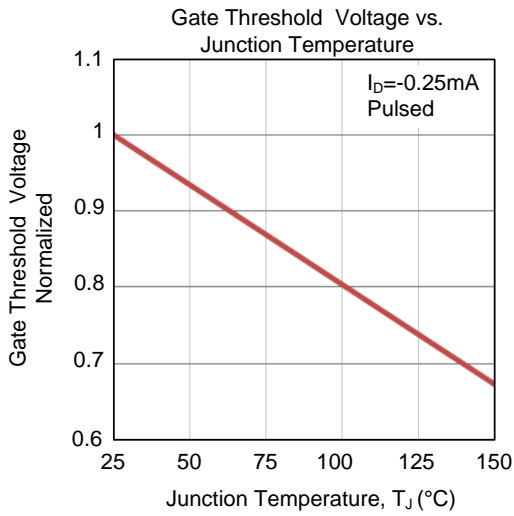
■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL

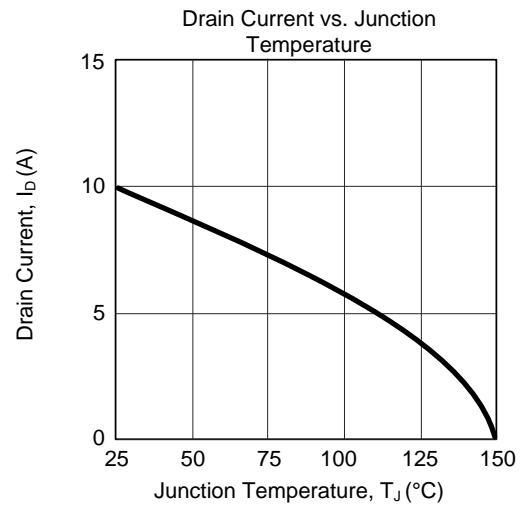
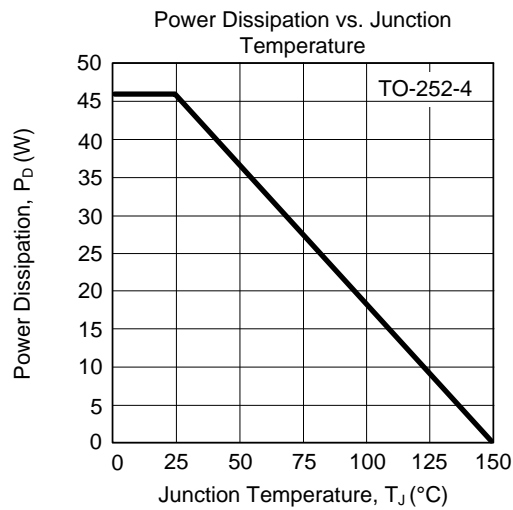


■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL



■ TYPICAL CHARACTERISTICS (Cont.)



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