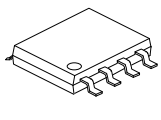
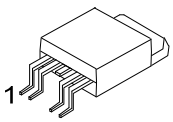
UT20NP04

Power MOSFET

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



SOP-8



TO-252-4

PDFN3×3

■ DESCRIPTION

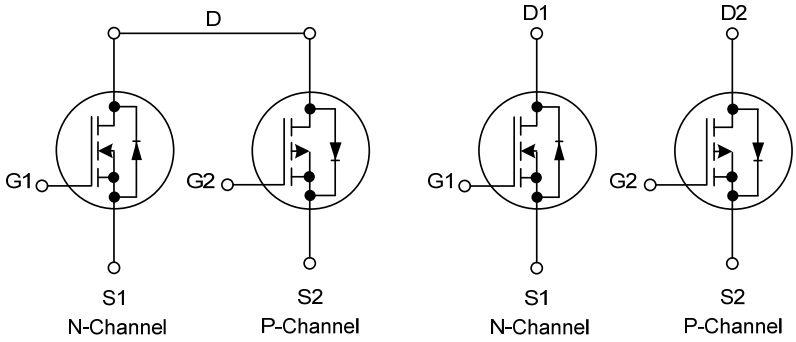
The UTC **UT20NP04** incorporates a N-channel MOSFET and a P-channel MOSFET，it uses UTC's advanced technology to provide customers a minimum on-state resistance, high switching speed, low gate charge and cost effectiveness.

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

■ FEATURES

*N-CHANNEL
$R_{DS(on)}$ ≤ 45 mΩ @ V_{GS}=10V, I_D=10A
$R_{DS(on)}$ ≤ 65 mΩ @ V_{GS}=4.5V, I_D=10A
*P-CHANNEL
$R_{DS(on)}$ ≤ 73 mΩ @ V_{GS}=-10V, I_D=-10A
$R_{DS(on)}$ ≤ 150 mΩ @ V_{GS}=-4.5V, I_D=-10A
* High switching speed

■ SYMBOL



TO-252-4　　SOP-8 / PDFN3×3

■ 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
UT20NP04L-P3030-R	UT20NP04G-P3030-R	PDFN3×3	S1	G1	S2	G2	D2	D2	D1	D1	Tape Reel

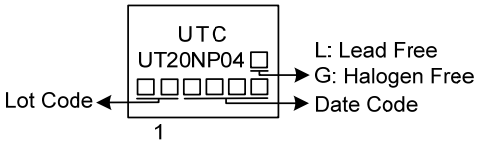
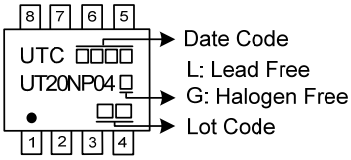
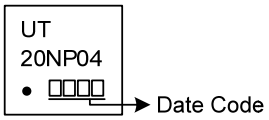
Note: Pin Assignment: G: Gate D: Drain S: Source

UT20NP04G-TN4-R

(1)Packing Type
(2)Package Type
(3)Green Package

(1) R: Tape Reel
(2) TN4: TO-252-4, S08: SOP-8, P3030: PDFN3×3
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

PACKAGE	MARKING
TO-252-4	
SOP-8	
PDFN3×3	

■ 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	55		W
		SOP-8		2.1		W
		PDFN3×3		18		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	θ_{JA}	110	°C/W
	SOP-8		125	°C/W
	PDFN3×3		75	°C/W
Junction to Case	TO-252-4	θ_{JC}	2.27 (Note)	°C/W
	SOP-8		59.5 (Note)	°C/W
	PDFN3×3		6.9(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.)

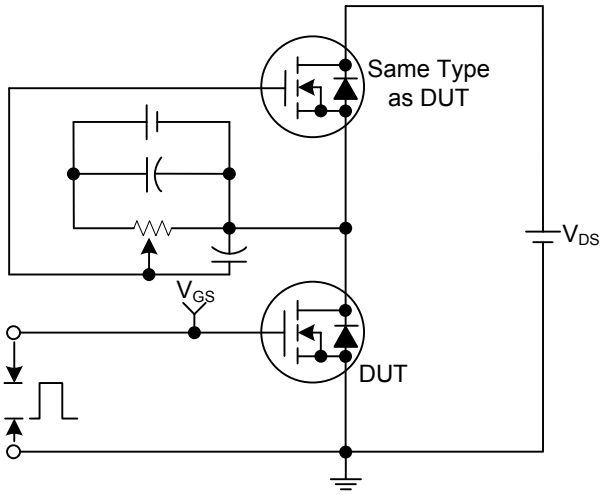
P-Channel

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=-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			73	mΩ
			V_{GS}=-4.5V, I_D=-10A			150	mΩ
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=3Ω		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

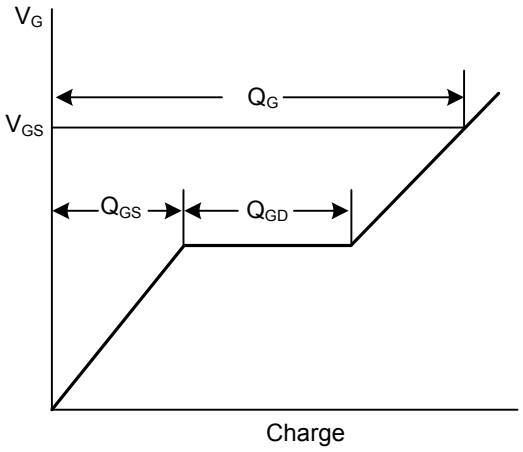
Note: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

■ TEST CIRCUITS AND WAVEFORMS

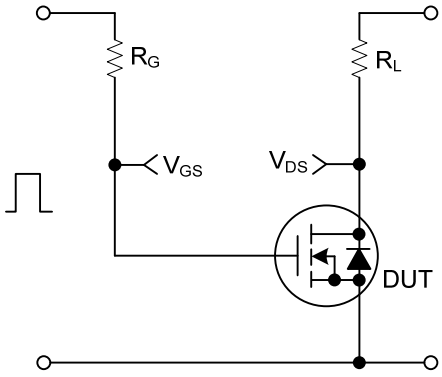
N-CHANNEL



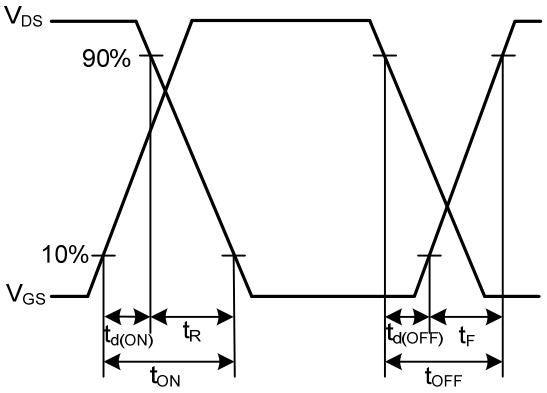
Gate Charge Test Circuit



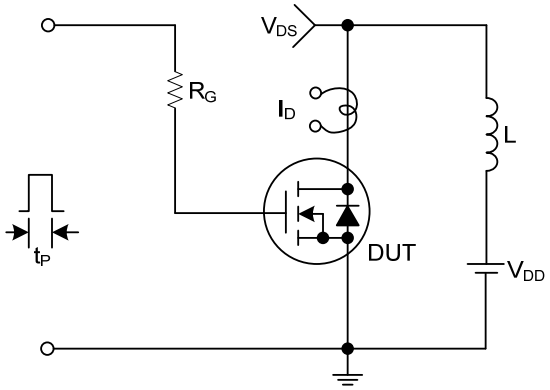
Gate Charge Waveforms



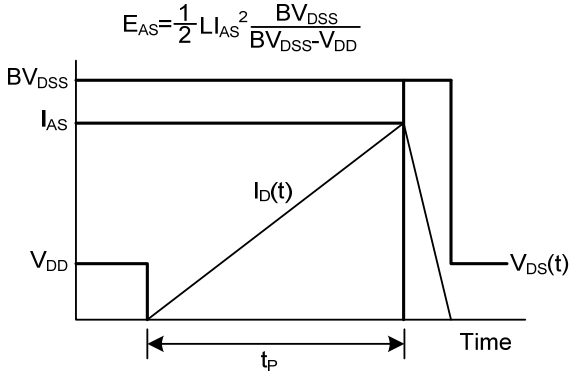
Resistive Switching Test Circuit



Resistive Switching Waveforms



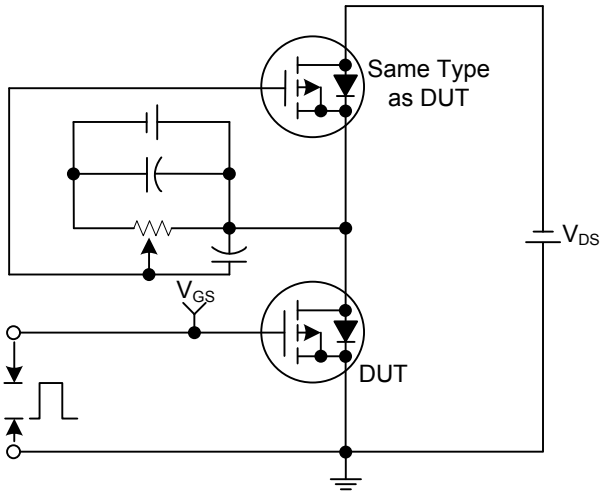
Unclamped Inductive Switching Test Circuit



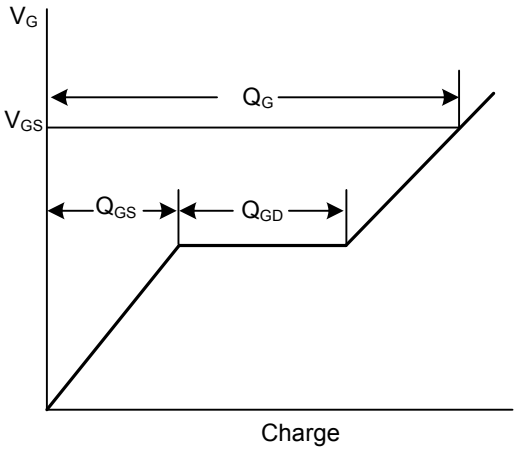
Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS

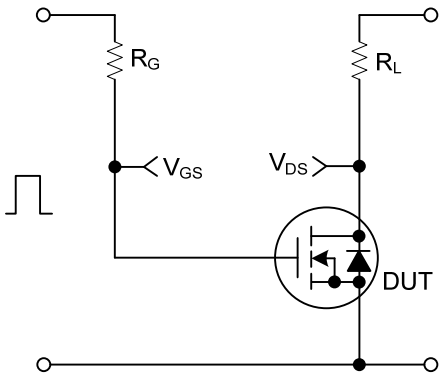
P-CHANNEL



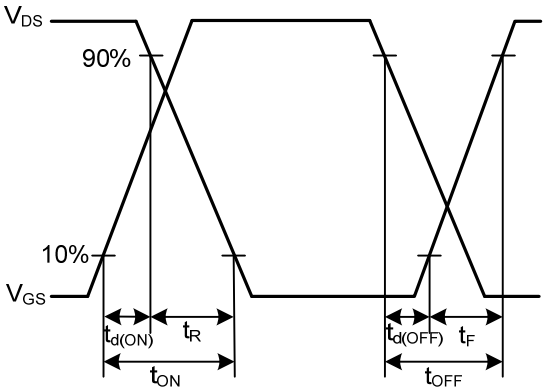
Gate Charge Test Circuit



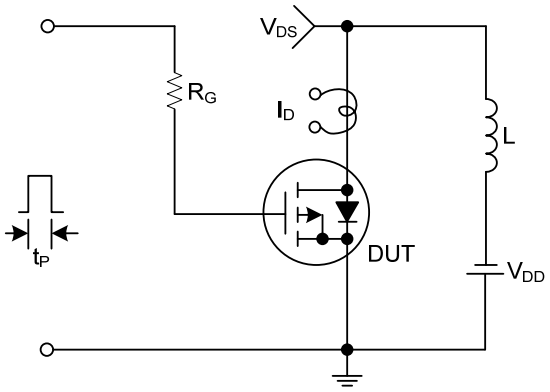
Gate Charge Waveforms



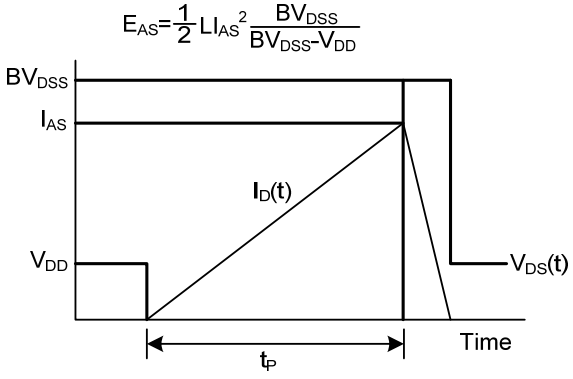
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit

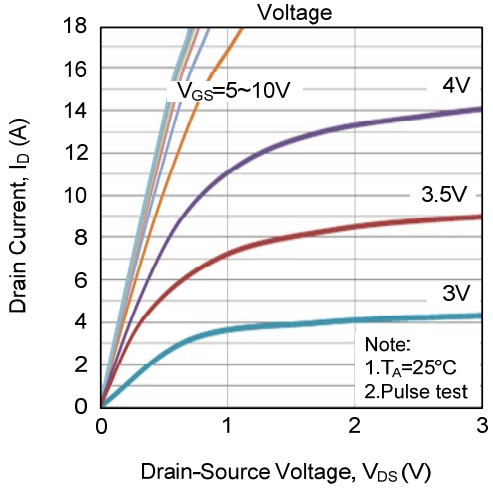


Unclamped Inductive Switching Waveforms

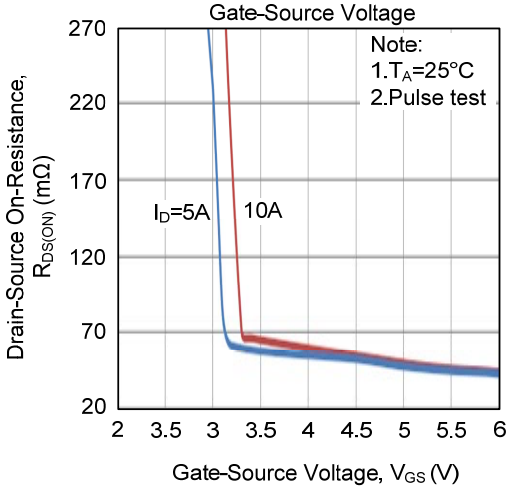
■ TYPICAL CHARACTERISTICS

N-CHANNEL

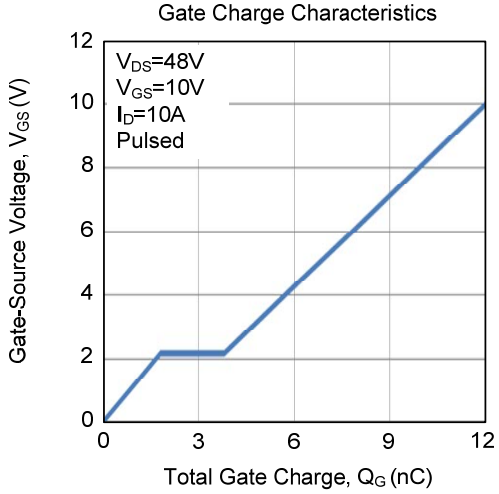
Drain Current vs. Drain-Source Voltage



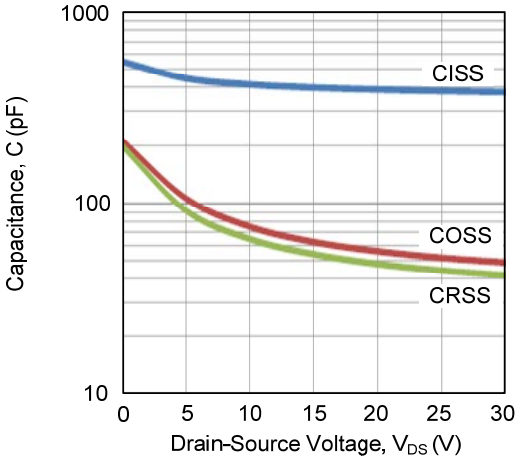
Drain-Source On-Resistance vs. Gate-Source Voltage



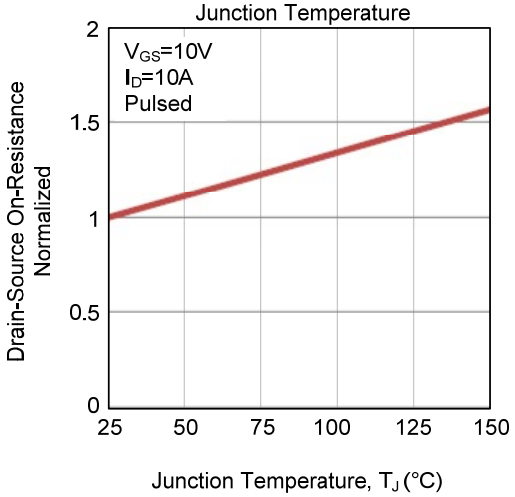
Gate Charge Characteristics



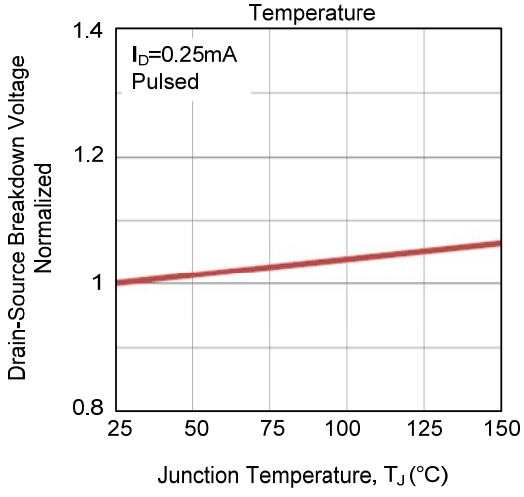
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature



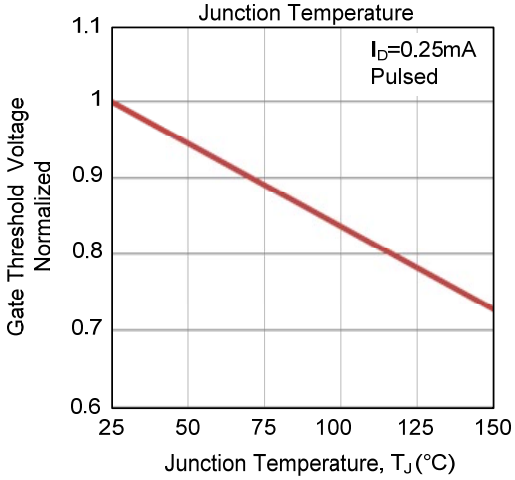
Breakdown Voltage vs. Junction Temperature



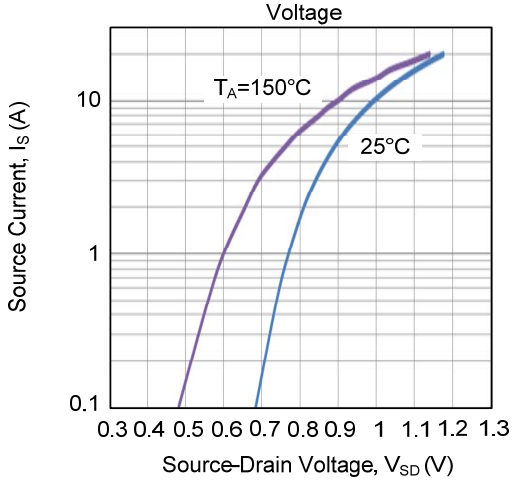
■ TYPICAL CHARACTERISTICS (Cont.)

N-CHANNEL

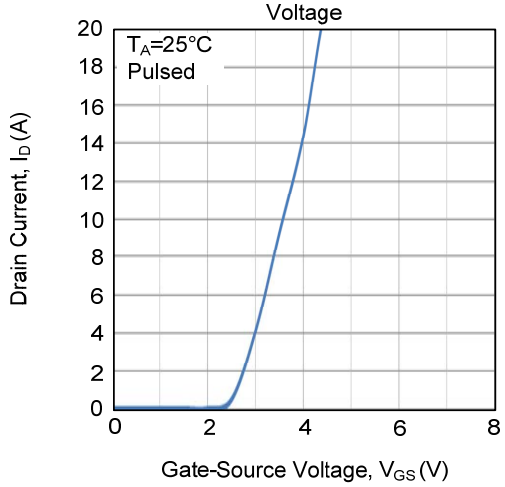
Gate Threshold Voltage vs. Junction Temperature



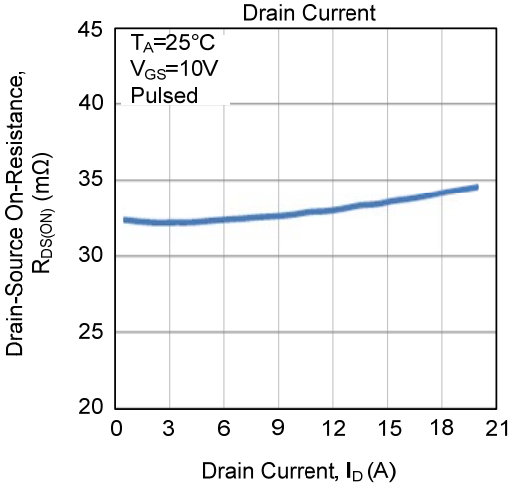
Source Current vs. Source-Drain Voltage



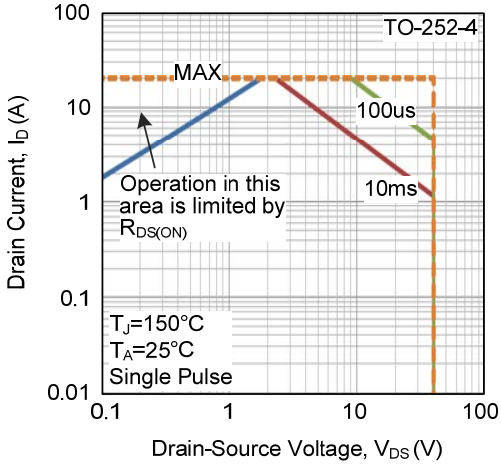
Drain Current vs. Gate-Source Voltage



Drain-Source On-Resistance vs. Drain Current



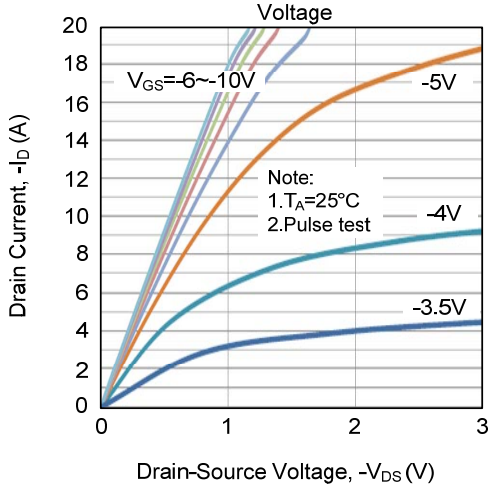
Safe Operating Area



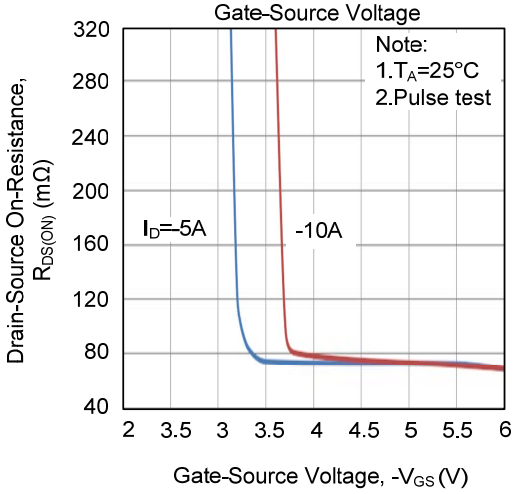
■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL

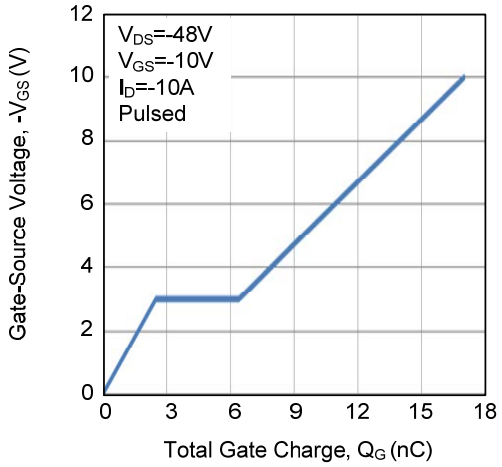
Drain Current vs. Drain-Source Voltage



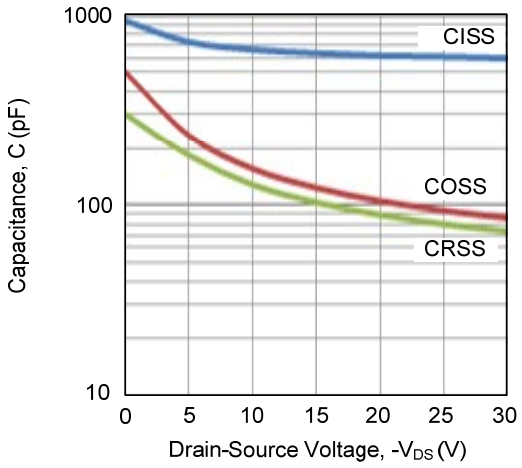
Drain-Source On-Resistance vs. Gate-Source Voltage



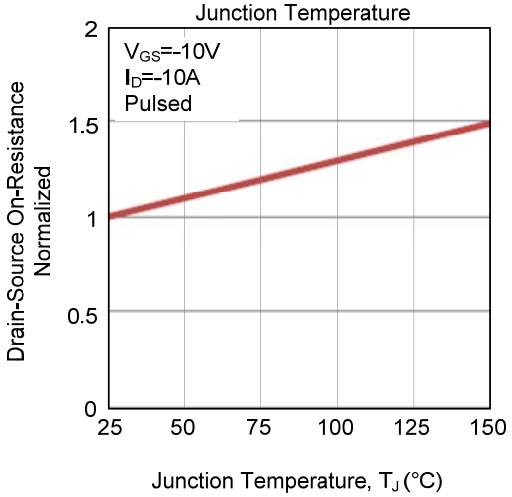
Gate Charge Characteristics



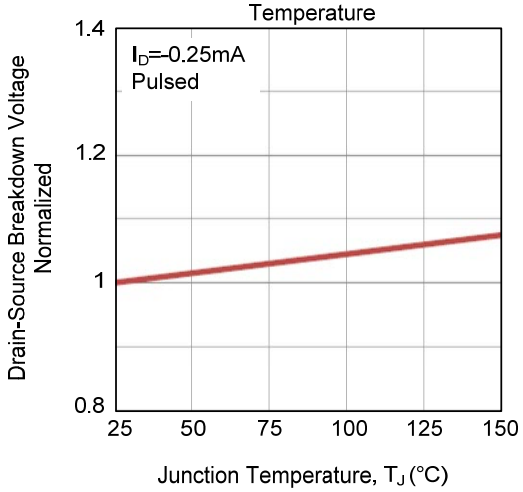
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature



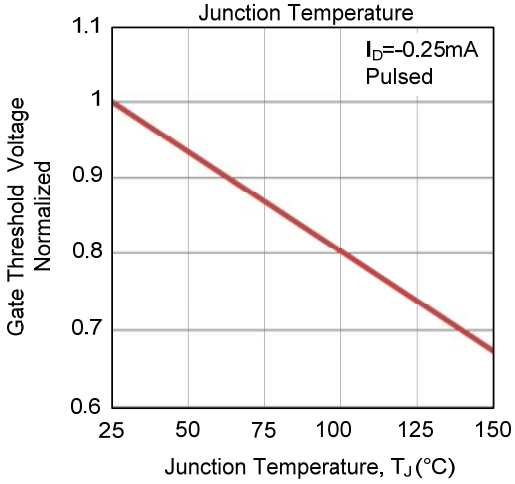
Breakdown Voltage vs. Junction Temperature



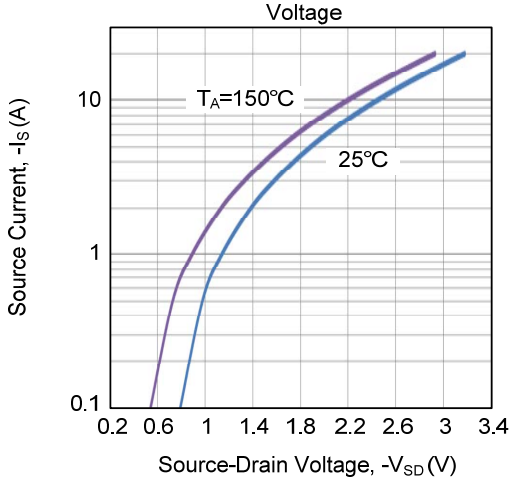
■ TYPICAL CHARACTERISTICS (Cont.)

P-CHANNEL

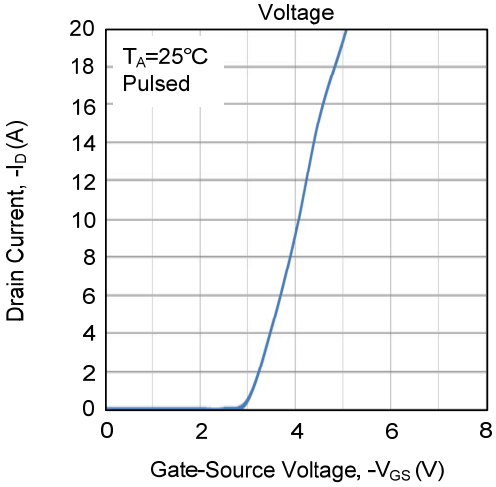
Gate Threshold Voltage vs. Junction Temperature



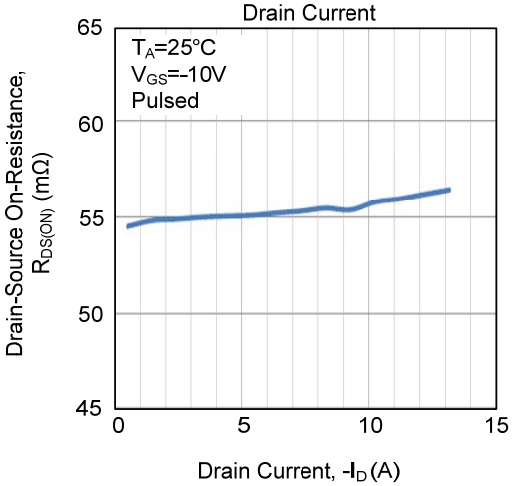
Source Current vs. Source-Drain Voltage



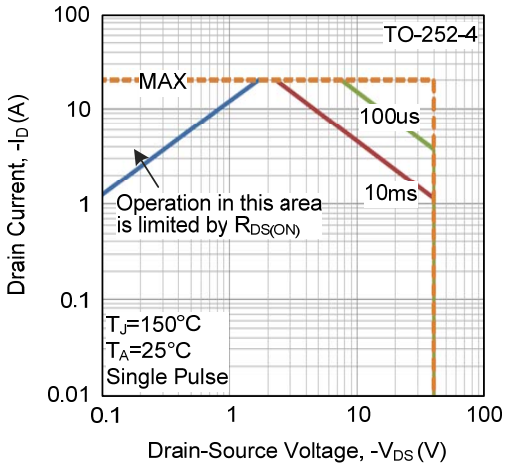
Drain Current vs. Gate-Source Voltage



Drain-Source On-Resistance vs. Drain Current



Safe Operating Area



■ TYPICAL CHARACTERISTICS (Cont.)