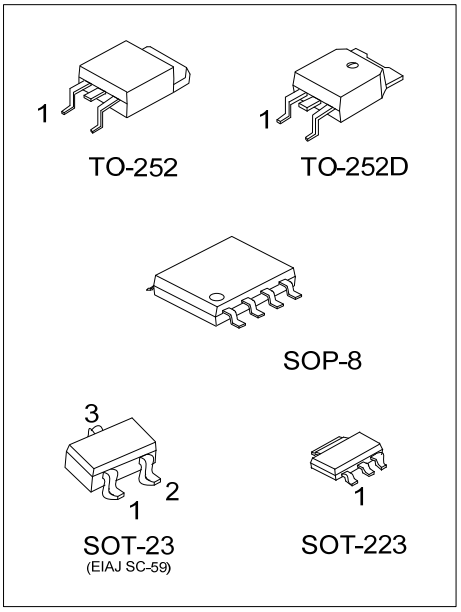
UTD413

Power MOSFET

P-CHANNEL ENHANCEMENT MODE



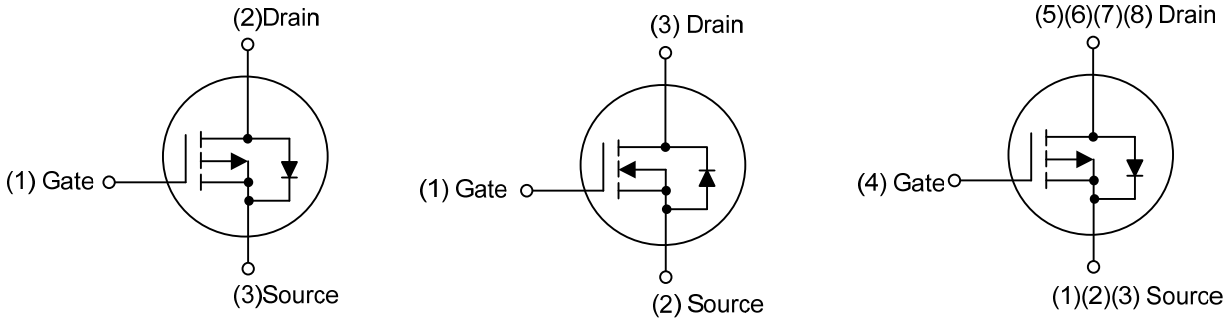
■ DESCRIPTION

The **UTD413** can provide excellent $R_{DS(ON)}$ and low gate charge by using UTC's advanced trench technology. The **UTD413** is well suited for high current load applications with the excellent thermal resistance of the TO-252 package.

■ FEATURES

* $R_{DS(ON)} \leq 45\ m\Omega$ @ V_{GS}=-10V, I_D= -12A
* $R_{DS(ON)} \leq 69\ m\Omega$ @ V_{GS}=-4.5V, I_D= -8.0A
* Low capacitance
* Low gate charge
* Fast switching capability
* Avalanche energy specified

■ SYMBOL

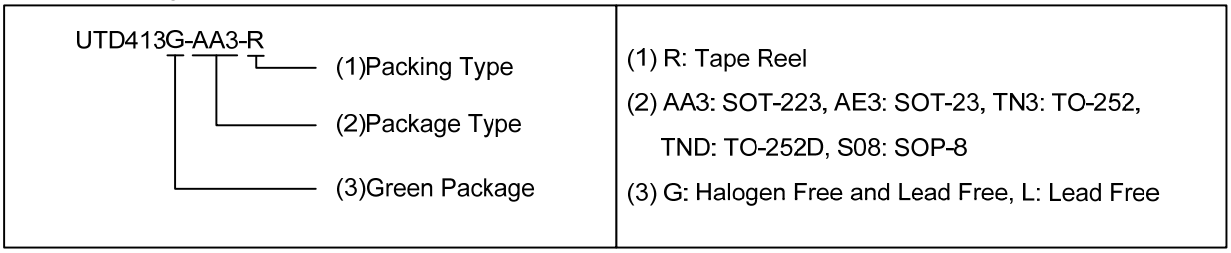


SOT-223 / TO-251 / TO-252D　　SOT-23　　PDFN5×6

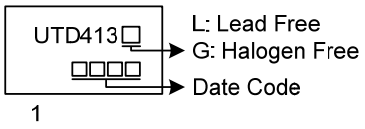
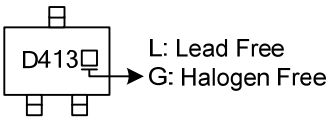
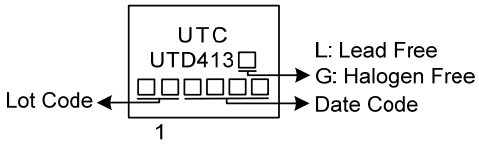
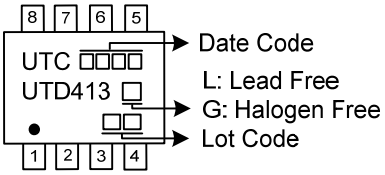
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UTD413L-AA3-R	UTD413G-AA3-R	SOT-223	G	D	S	-	-	-	-	-	Tape Reel
UTD413L-AE3-R	UTD413G-AE3-R	SOT-23	G	S	D	-	-	-	-	-	Tape Reel
UTD413L-TN3-R	UTD413G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
UTD413L-TND-R	UTD413G-TND-R	TO-252D	G	D	S	-	-	-	-	-	Tape Reel
UTD413L-S08-R	UTD413G-S08-R	SOP-8	S	S	S	G	D	D	D	D	Tape Reel

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



■ MARKING

SOT-223	SOT-23
	
TO-252 / TO-252D	**SOP-8**
	

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	-40	V
Gate-Source Voltage		V_{GSS}	±20	V
Continuous Drain Current		I_D	-12	A
Pulsed Drain Current		I_{DM}	-30	A
Avalanche Energy		E_{AS}	37	mJ
Power Dissipation	SOT-223	P_D	2.4	W
	SOT-23		1.25	W
	TO-252/TO-252D		40	W
	SOP-8		1.7	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. Repetitive Rating: Pulse width limited by maximum junction temperature
3. L = 0.1mH, I_{AS} = -27A, V_{DD} = -25V, R_G = 25Ω, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	83	°C/W
	SOT-23		177	°C/W
	TO-252/TO-252D		50	°C/W
	SOP-8		90	°C/W
Junction to Case	SOT-223	θ_{JC}	52	°C/W
	SOT-23		100	°C/W
	TO-252/TO-252D		3.125	°C/W
	SOP-8		73	°C/W

Note: When surface mounted to an FR4 board using minimum recommended pad size. (Cu. Area 0.412 sq in), Steady State.

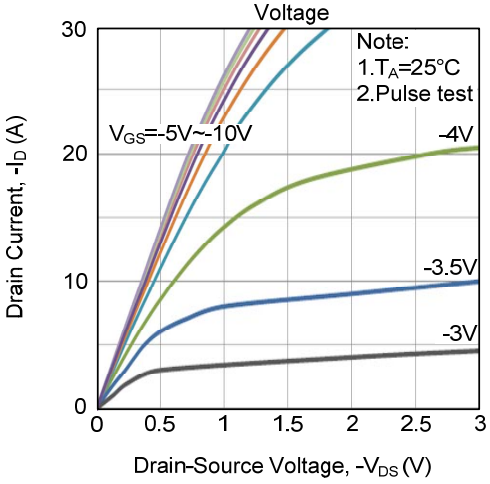
■ ELECTRICAL CHARACTERISTICS (T_J = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=-10mA	-40			V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=-32V, V_{GS}=0V			-1	μA
Gate-Source Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=±20V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=-250μA	-1.0	-1.9	-3.0	V
On State Drain Current	$I_{D(ON)}$	V_{DS}=-5V, V_{GS}=-10V	-30			A
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-12A		36	45	mΩ
		V_{GS}=-4.5V, I_D=-8.0A		51	69	mΩ
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	V_{DS}=-20V, V_{GS}=0V, f=1MHz		1200		pF
Output Capacitance	C_{OSS}			145		pF
Reverse Transfer Capacitance	C_{RSS}			118		pF
SWITCHING PARAMETERS						
Total Gate Charge	Q_G	V_{DS}=-32V, V_{GS}=-10V, I_D =-12A		25		nC
Gate Source Charge	Q_{GS}			3.8		nC
Gate Drain Charge	Q_{GD}			6		nC
Turn-ON Delay Time	$t_{D(ON)}$	V_{GS}=-10V, V_{DS}=-20V, I_D=-12A, R_G=3.3Ω		7		ns
Turn-ON Rise Time	t_R			18		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			43		ns
Turn-OFF Fall-Time	t_F			24		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				-12	A
Diode Forward Voltage	V_{SD}	I_S=-12A, V_{GS}=0V		-1	-1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_S=-12A, V_{GS}=0V, dI/dt=100A/μs		56		ns
Body Diode Reverse Recovery Charge	Q_{rr}			48		nC

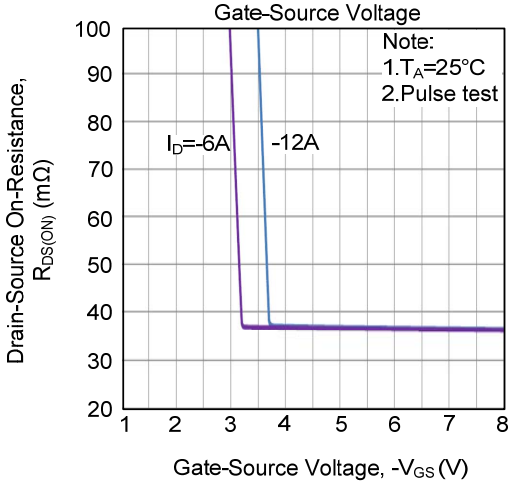
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating temperature.

■ TYPICAL CHARACTERISTICS

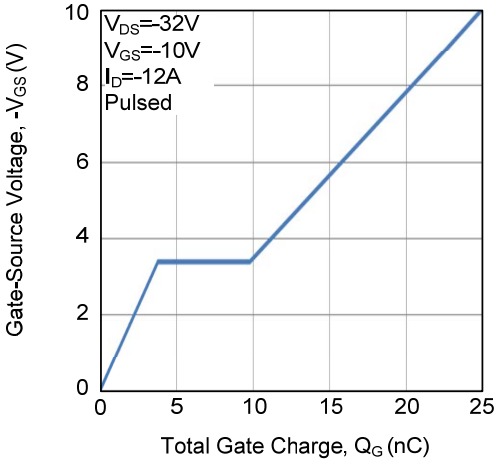
Drain Current vs. Drain-Source Voltage



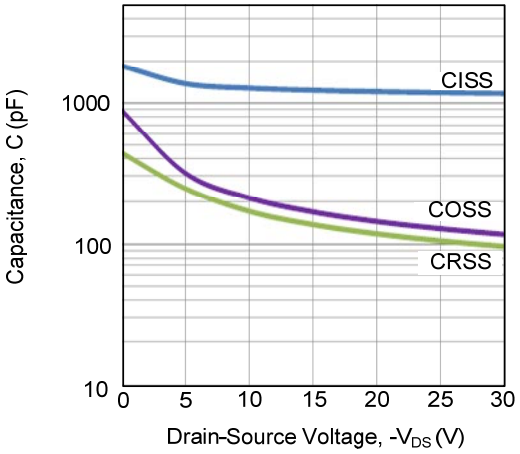
Drain-Source On-Resistance vs. Gate-Source Voltage



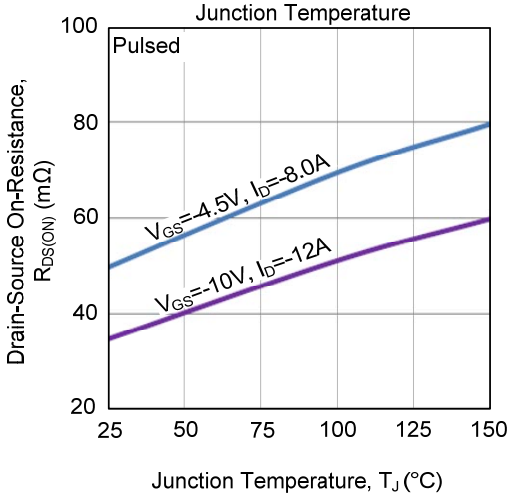
Gate Charge Characteristics



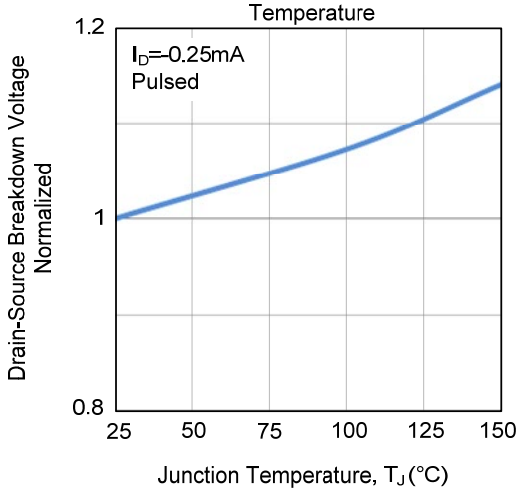
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature

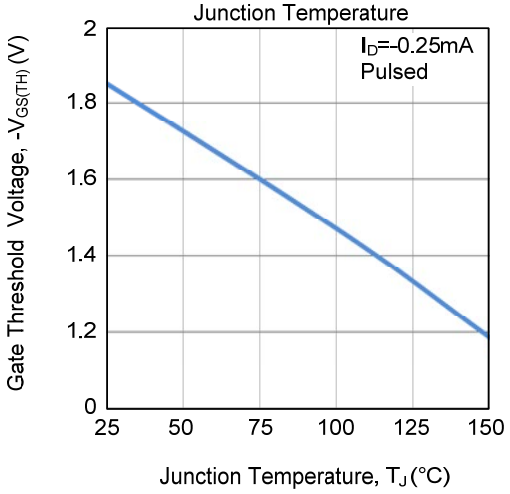


Breakdown Voltage vs. Junction Temperature

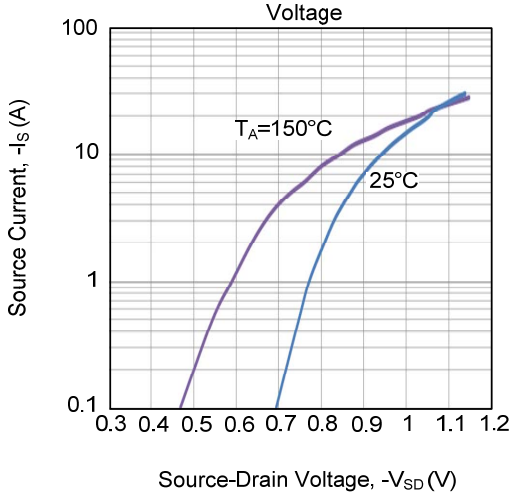


■ TYPICAL CHARACTERISTICS (Cont.)

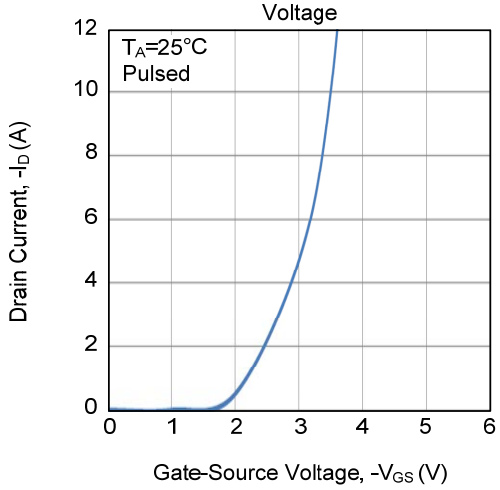
Gate Threshold Voltage vs. Junction Temperature



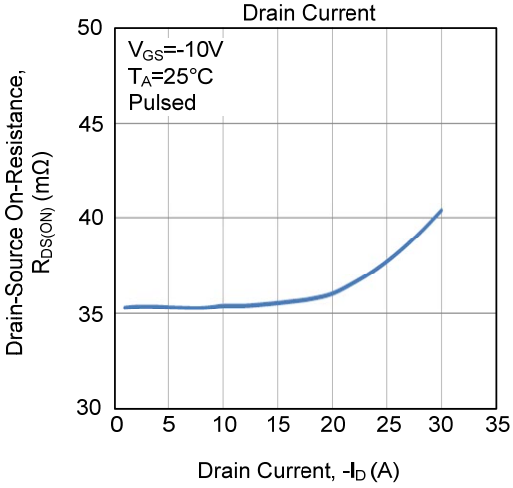
Source Current vs. Source-Drain Voltage



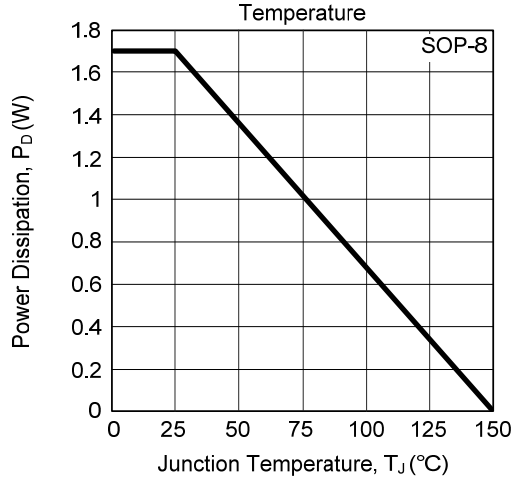
Drain Current vs. Gate-Source Voltage



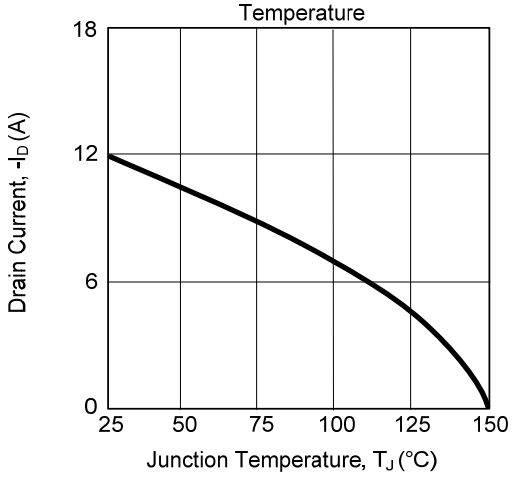
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)