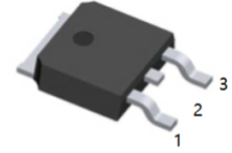
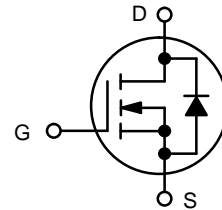


**Features**

- Low Gate Charge
- Fast Switching
- High Current Capability
- $V_{DS}(V) = 60V$
- $I_D = 46A$  ( $V_{GS} = 10V$ )
- $R_{DS(ON)} < 16m\Omega$  ( $V_{GS} = 10V$ )
- $R_{DS(ON)} < 19m\Omega$  ( $V_{GS} = 4.5V$ )



1.G 2.D 3.S  
TO-252(DPAK) top view



**MAXIMUM RATINGS** ( $T_J = 25^\circ C$  unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		$V_{DSS}$	60	V
Gate-to-Source Voltage – Continuous		$V_{GS}$	$\pm 20$	V
Gate-to-Source Voltage – Non-Repetitive ( $t_p < 10 \mu s$ )		$V_{GS}$	$\pm 30$	V
Continuous Drain Current ( $R_{\theta JC}$ )	Steady State	$T_C = 25^\circ C$	46	A
		$T_C = 100^\circ C$	33	
Power Dissipation ( $R_{\theta JC}$ )		$T_C = 25^\circ C$	$P_D$	71 W
Pulsed Drain Current	$t_p = 10 \mu s$	$I_{DM}$	203	A
Operating Junction and Storage Temperature		$T_J, T_{stg}$	-55 to 175	$^\circ C$
Source Current (Body Diode)		$I_S$	46	A
Single Pulse Drain-to-Source Avalanche Energy	(L = 0.1 mH)	$E_{AS}$	36	mJ
		$I_{AS}$	27	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260	$^\circ C$

**THERMAL RESISTANCE MAXIMUM RATINGS**

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	2.1	$^\circ C/W$
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	49	

1. Surface-mounted on FR4 board using a 650 mm<sup>2</sup>, 2 oz. Cu pad.

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit	
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V	
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			55		mV/°C	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 60\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	$\mu\text{A}$	
			$T_J = 150^\circ\text{C}$		100		
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.0		2.0	V	
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			5.6		mV/°C	
Drain-to-Source on Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		13	16	m $\Omega$	
Drain-to-Source on Resistance	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		16	19	m $\Omega$	
Forward Transconductance	gFS	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$		15		S	
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 25\text{ V}$		1400		pF	
Output Capacitance	$C_{oss}$			137			
Reverse Transfer Capacitance	$C_{rss}$			95			
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 48\text{ V}, I_D = 40\text{ A}$		29		nC	
Threshold Gate Charge	$Q_{G(TH)}$			1.1			
Gate-to-Source Charge	$Q_{GS}$			4			
Gate-to-Drain Charge	$Q_{GD}$			8			
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 48\text{ V}, I_D = 40\text{ A}$		15		nC	
Gate Resistance	$R_G$			1.3		$\Omega$	
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10\text{ V}, V_{DD} = 48\text{ V}, I_D = 40\text{ A}, R_G = 2.5\ \Omega$		8.4		ns	
Rise Time	$t_r$			12.4			
Turn-Off Delay Time	$t_{d(off)}$			26			
Fall Time	$t_f$			4.4			
Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 40\text{ A}$	$T_J = 25^\circ\text{C}$		0.95	1.2	V
			$T_J = 125^\circ\text{C}$		0.85		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 40\text{ A}$		20		ns	
Charge Time	$t_a$			13			
Discharge Time	$t_b$			7			
Reverse Recovery Charge	$Q_{RR}$			13			nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

- Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
- Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

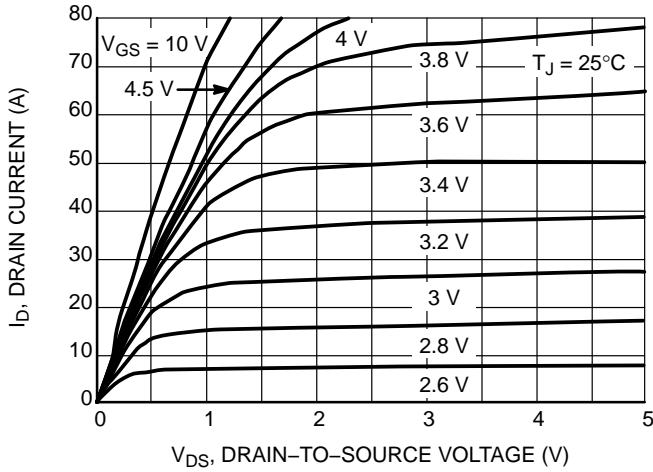


Figure 1. On-Region Characteristics

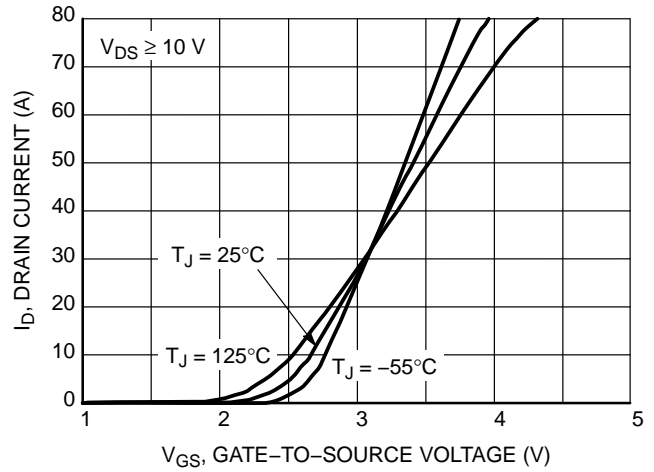


Figure 2. Transfer Characteristics

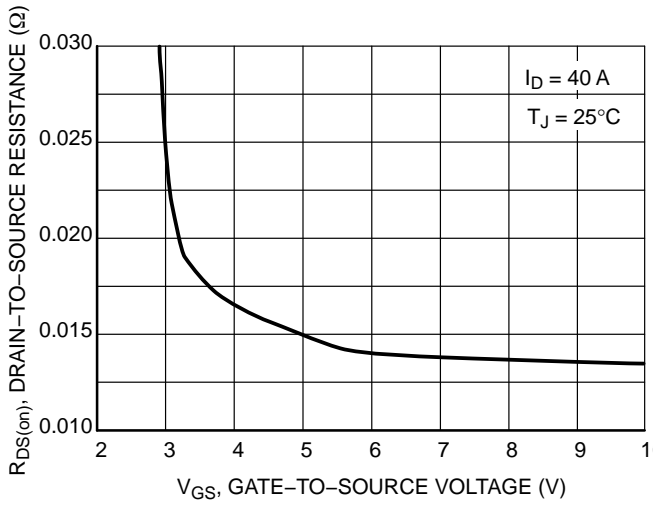


Figure 3. On-Resistance vs. Gate Voltage

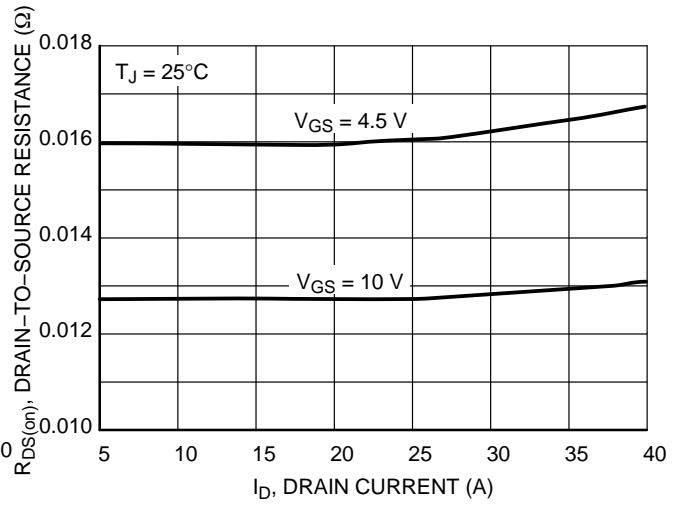


Figure 4. On-Resistance vs. Drain Current

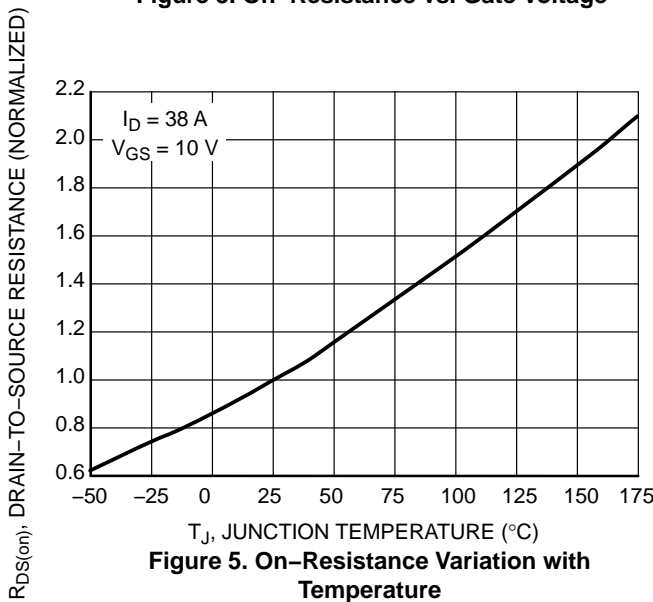


Figure 5. On-Resistance Variation with Temperature

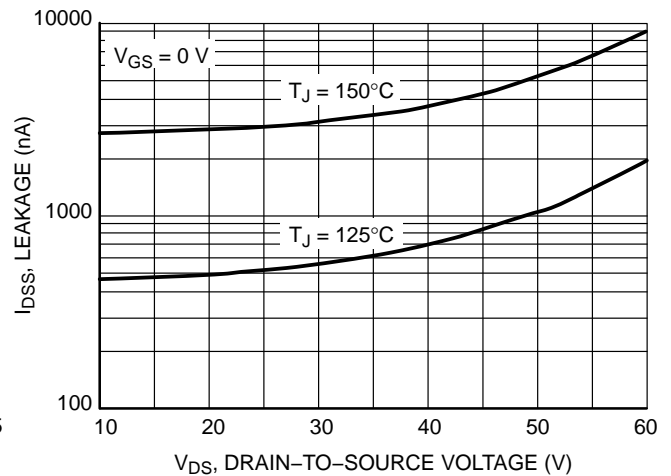


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

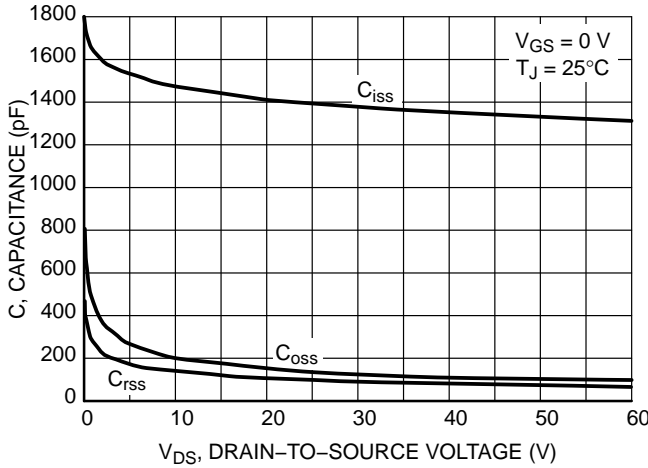


Figure 7. Capacitance Variation

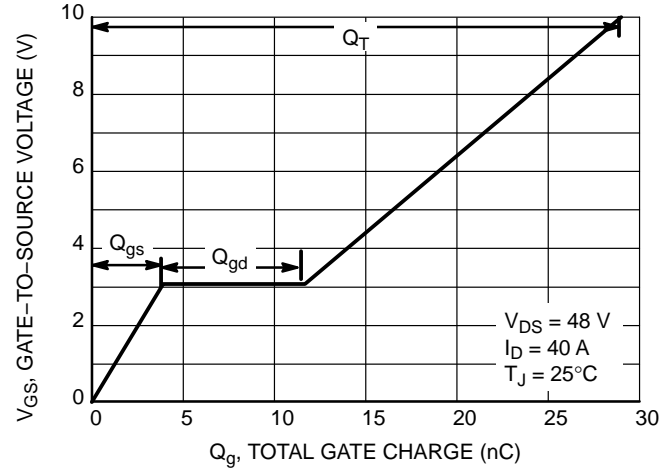


Figure 8. Gate-to-Source vs. Total Charge

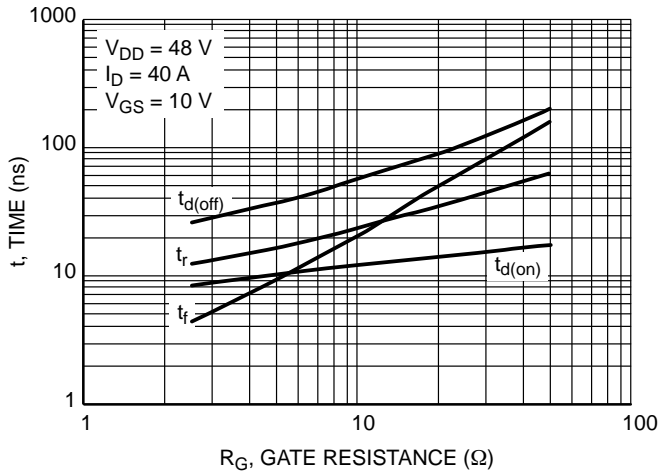


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

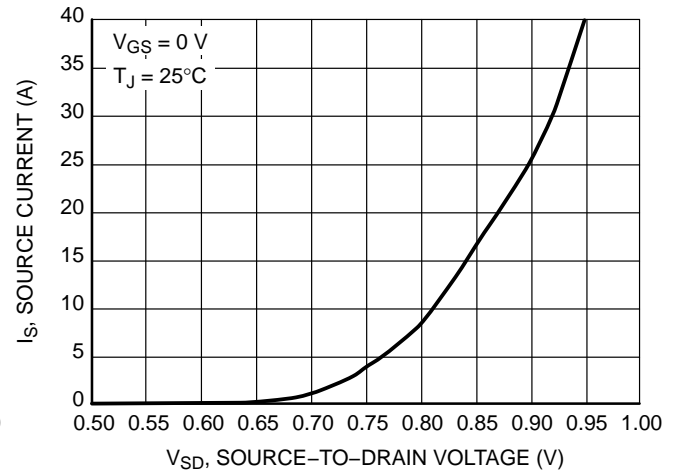


Figure 10. Diode Forward Voltage vs. Current

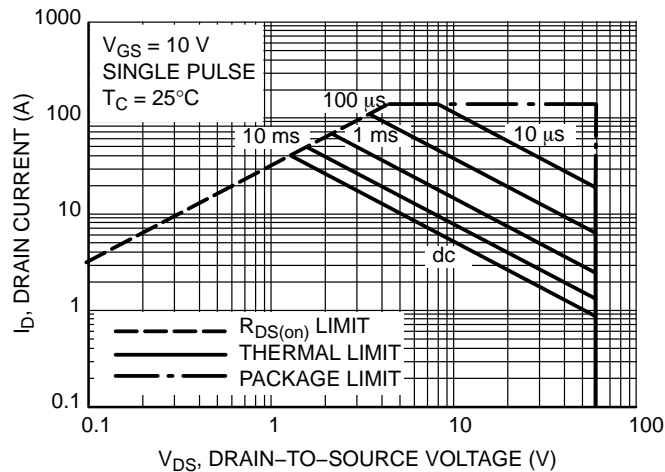


Figure 11. Maximum Rated Forward Biased Safe Operating Area

TYPICAL CHARACTERISTICS

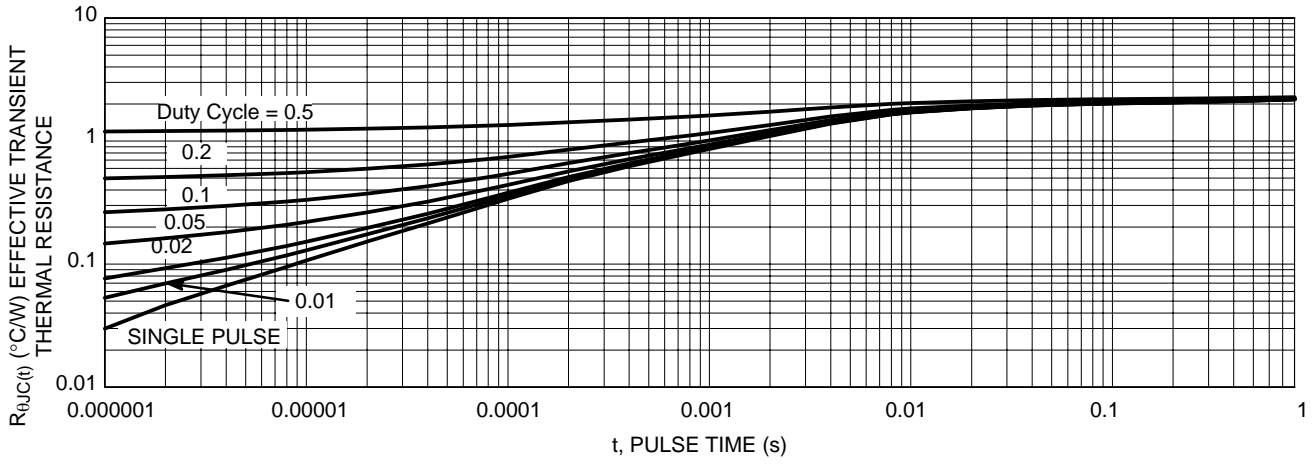
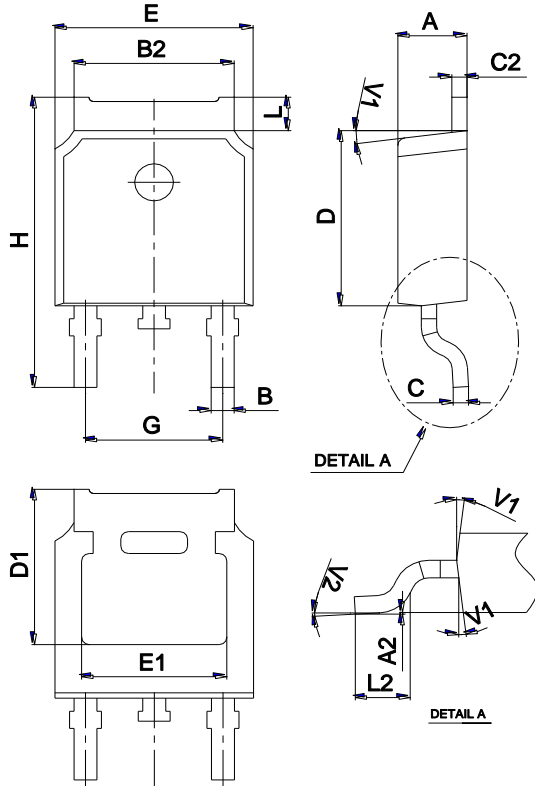


Figure 12. Thermal Response

Package Mechanical Data TO-252



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW NTD5865NLT4G	TO-252	2500	Tape and reel