

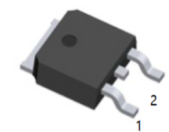
**Features**

- $V_{DS} (V) = 55V$
- $I_D = 44A (V_{GS}=10V)$
- $R_{DS(ON)} < 27m\Omega (V_{GS} = 10V)$

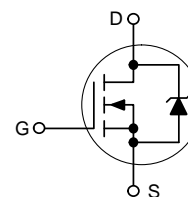
**Description**

The D-PAK is designed for surface mounting using vapor phase, infrared, or wave soldering techniques. The straight lead version is for through-hole mounting applications. Power dissipation levels up to 1.5 watts are possible in typical surface mount applications.

- Ultra Low On-Resistance
- Fast Switching
- Fully Avalanche Rated
- Lead-Free



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



N-Channel

**Absolute Maximum Ratings**

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	44 <sup>⑤</sup>	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	31 <sup>⑤</sup>	
$I_{DM}$	Pulsed Drain Current <sup>①⑦</sup>	160	
$P_D @ T_C = 25^\circ C$	Power Dissipation	107	W
	Linear Derating Factor	0.71	W/°C
$V_{GS}$	Gate-to-Source Voltage	± 20	V
$E_{AS}$	Single Pulse Avalanche Energy <sup>②⑦</sup>	210	mJ
$I_{AR}$	Avalanche Current <sup>①⑦</sup>	25	A
$E_{AR}$	Repetitive Avalanche Energy <sup>①⑦</sup>	11	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ <sup>③</sup>	5.0	V/ns
$T_J$	Operating Junction and Storage Temperature Range	-55 to + 175	°C
$T_{STG}$			
	Soldering Temperature, for 10 seconds	300 (1.6mm from case )	

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case		1.4	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)		50	
$R_{\theta JA}$	Junction-to-Ambient		110	

## Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	55			V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient		0.055		V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance			27	m $\Omega$	$V_{GS} = 10V, I_D = 26A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0		4.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$g_{fs}$	Forward Transconductance	17			S	$V_{DS} = 25V, I_D = 25A$ ⑦
$I_{DSS}$	Drain-to-Source Leakage Current			25	$\mu A$	$V_{DS} = 55V, V_{GS} = 0V$
				250	$\mu A$	$V_{DS} = 44V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage			100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage			-100	nA	$V_{GS} = -20V$
$Q_g$	Total Gate Charge			65	nC	$I_D = 25A$
$Q_{gs}$	Gate-to-Source Charge			12	nC	$V_{DS} = 44V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge			27	nC	$V_{GS} = 10V$ , See Fig. 6 and 13 ④ ⑦
$t_{d(on)}$	Turn-On Delay Time		7.3		ns	$V_{DD} = 28V$ $I_D = 25A$ $R_G = 12\Omega$ $R_D = 1.1\Omega$ , See Fig. 10 ④ ⑦
$t_r$	Rise Time		69			
$t_{d(off)}$	Turn-Off Delay Time		47			
$t_f$	Fall Time		60			
$L_D$	Internal Drain Inductance		4.5		nH	Between lead, 6mm (0.25in.) from package and center of die contact ⑥
$L_S$	Internal Source Inductance		7.5			
$C_{iss}$	Input Capacitance		1300		pF	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0\text{MHz}$ , See Fig. 5 ⑦
$C_{oss}$	Output Capacitance		410			
$C_{rss}$	Reverse Transfer Capacitance		150			

## Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)			44	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ① ⑦			160		
$V_{SD}$	Diode Forward Voltage			1.3	V	$T_J = 25^\circ\text{C}, I_S = 22A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time		65	98	ns	$T_J = 25^\circ\text{C}, I_F = 25A$
$Q_{rr}$	Reverse Recovery Charge		160	240	nC	$di/dt = 100A/\mu s$ ④ ⑦
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$ )				

### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )
- ②  $V_{DD} = 25V$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 470\mu H$   
 $R_G = 25\Omega$ ,  $I_{AS} = 25A$ . (See Figure 12)
- ③  $I_{SD} \leq 25A$ ,  $di/dt \leq 320A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  
 $T_J \leq 175^\circ\text{C}$
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- ⑤ Calculated continuous current based on maximum allowable junction temperature; Package limitation current = 20A
- ⑥ This is applied for I-PAK,  $L_S$  of D-PAK is measured between lead and center of die contact
- ⑦ Uses IRFZ44N data and test conditions

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

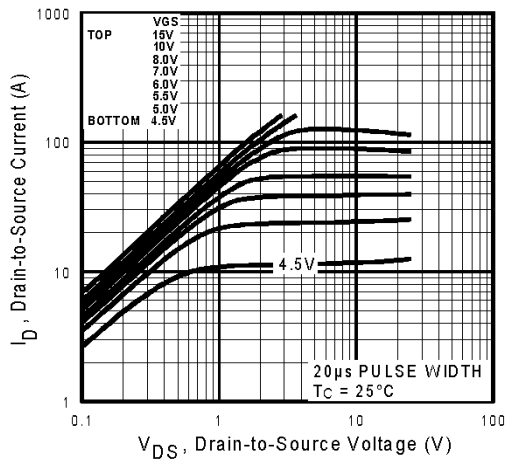


Fig 1. Typical Output Characteristics

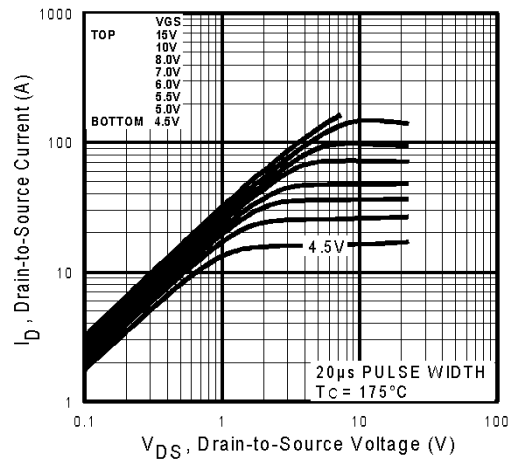


Fig 2. Typical Output Characteristics

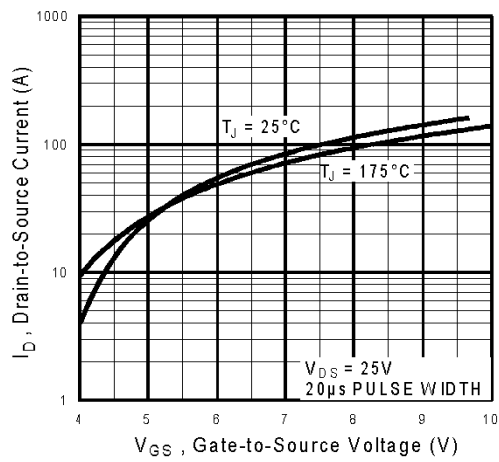


Fig 3. Typical Transfer Characteristics

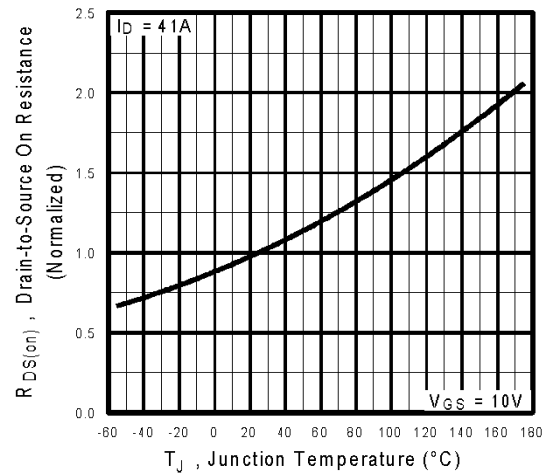
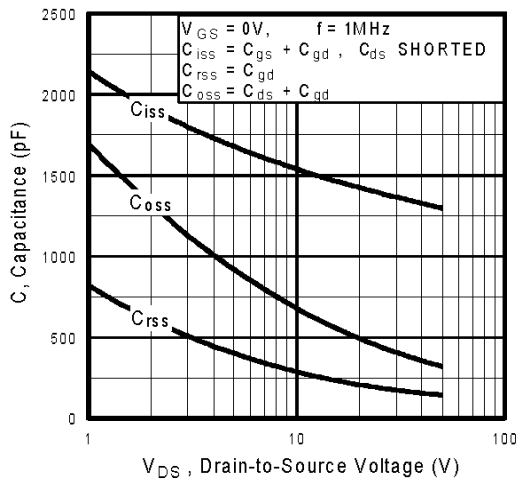
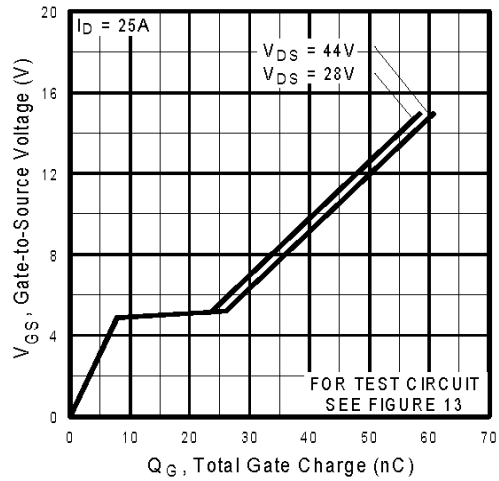


Fig 4. Normalized On-Resistance Vs. Temperature

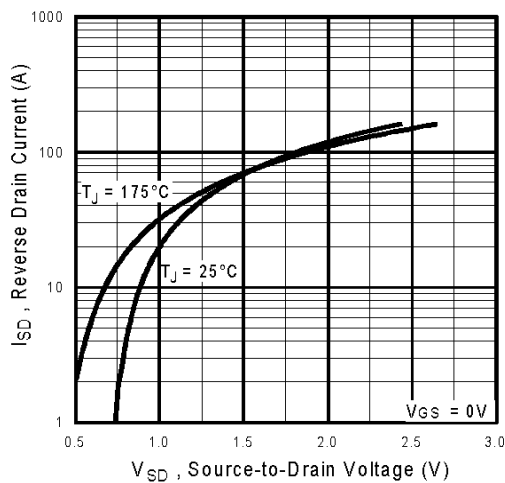
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



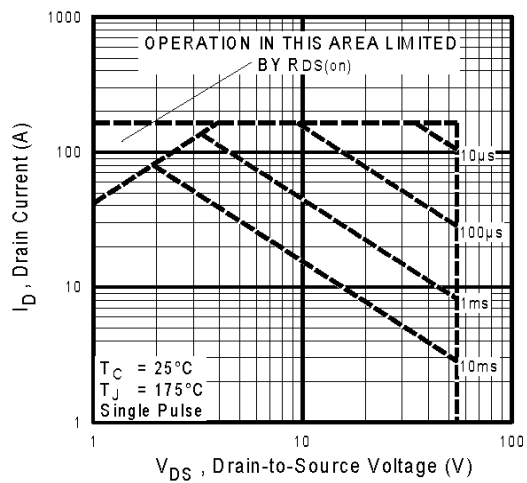
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



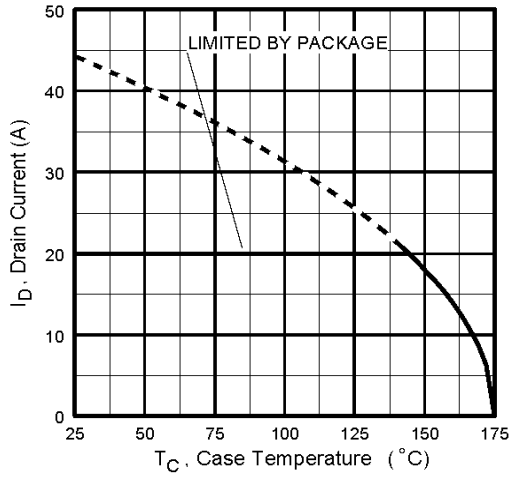
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



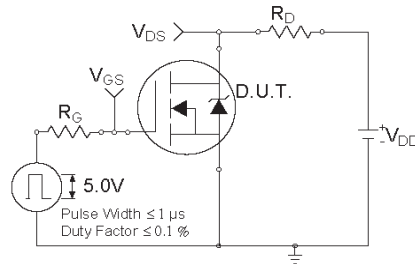
**Fig 7.** Typical Source-Drain Diode Forward Voltage



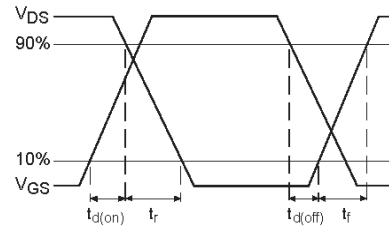
**Fig 8.** Maximum Safe Operating Area



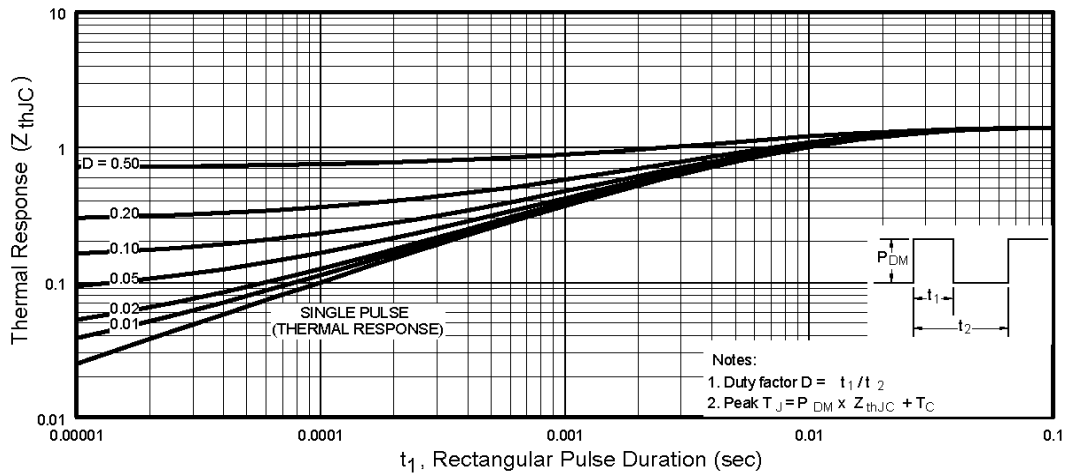
**Fig 9.** Maximum Drain Current Vs. Case Temperature



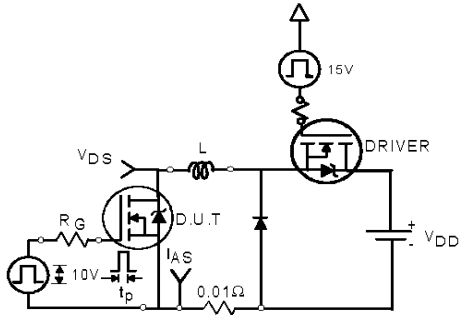
**Fig 10a.** Switching Time Test Circuit



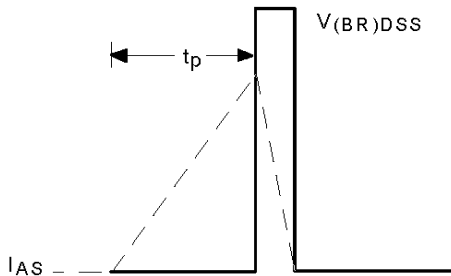
**Fig 10b.** Switching Time Waveforms



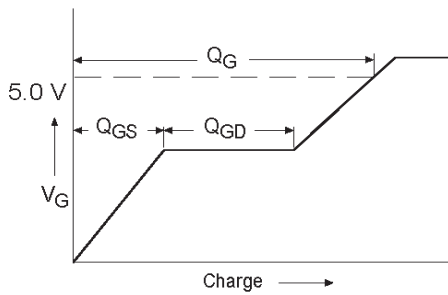
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



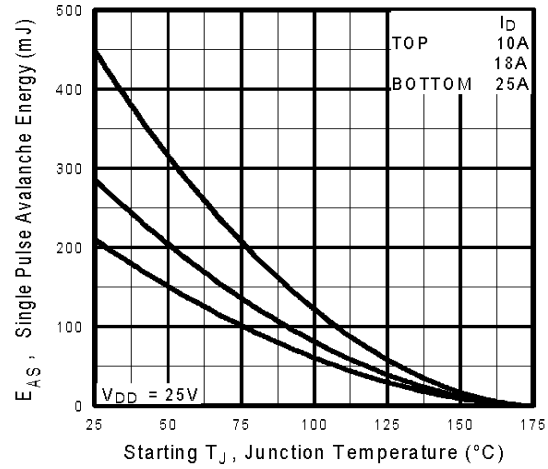
**Fig 12a.** Unclamped Inductive Test Circuit



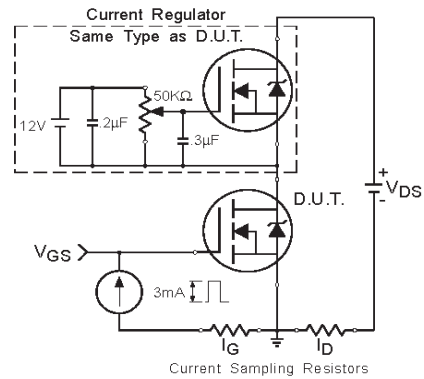
**Fig 12b.** Unclamped Inductive Waveforms



**Fig 13a.** Basic Gate Charge Waveform

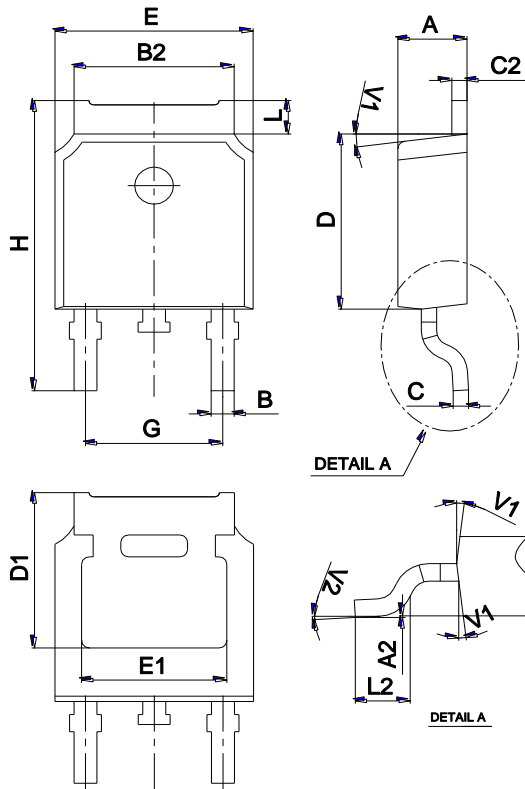


**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current



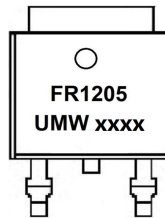
**Fig 13b.** Gate Charge Test Circuit

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 IRFR1205TR	TO-252	2500	Tape and reel