

1.Description

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

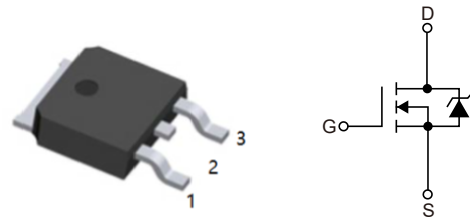
2.Features

- $V_{DS(V)}=100V$
- $I_D=9.4A$
- $R_{DS(ON)}=0.21\Omega(V_{GS}=10V)$

3.Pinning information

Pin	Symbol	Description
1	G	GATE
3	S	SOURCE
2	D	DRAIN

TO-252(DPAK)
top view



4.Absolute Maximum Ratings

Parameter		Symbol	Rating	Units
Continuous Drain Current, $V_{GS}=10V$	$T_C=25^{\circ}C$	I_D	9.4	A
Continuous Drain Current, $V_{GS}=10V$	$T_C=100^{\circ}C$		6.6	A
Pulsed Drain Current ①⑥		I_{DM}	38	A
Power Dissipation	$T_C=25^{\circ}C$	P_D	48	W
Linear Derating Factor			0.32	W/ $^{\circ}C$
Gate-to-Source Voltage		V_{GS}	± 20	V
Single Pulse Avalanche Energy ②⑥		E_{AS}	91	mJ
Avalanche Current ①⑥		I_{AR}	5.7	A
Repetitive Avalanche Energy ①⑥		E_{AR}	4.8	mJ
Peak Diode Recovery dv/dt ③		dv/dt	5	V/ns
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	$^{\circ}C$
Soldering Temperature, for 10 seconds			300 (1.6mm from case)	$^{\circ}C$



5.Thermal Resistance Rating

Parameter	Symbol	Typ	Max	Units
Junction-to-Case	$R_{\theta JC}$		3.1	°C/W
Junction-to-Ambient (PCB Mount) **	$R_{\theta JA}$		50	°C/W
Junction-to-Ambient	$R_{\theta JA}$		110	°C/W



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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	100			V
Breakdown Voltage Temp. Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	$I_D=1\text{mA}$, Reference to 25°C		0.12		$\text{V}/^\circ\text{C}$
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=5.6\text{A}$ ④			0.21	Ω
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2		4	V
Forward Transconductance	g_{FS}	$V_{DS}=25\text{V}$, $I_D=5.7\text{A}$ ⑥	2.7			S
Drain-to-Source Leakage Current	I_{DSS}	$V_{DS}=100\text{V}$, $V_{GS}=0\text{V}$			25	μA
		$V_{DS}=80\text{V}$, $V_{GS}=0\text{V}$, $T_J=150^\circ\text{C}$			250	μA
Gate-to-Source Forward Leakage	I_{GSS}	$V_{GS}=20\text{V}$			100	nA
Gate-to-Source Reverse Leakage		$V_{GS}=-20\text{V}$			-100	nA
Total Gate Charge	Q_g	$I_D=5.7\text{A}$			25	nC
Gate-to-Source Charge	Q_{gs}	$V_{DS}=80\text{V}$, $V_{GS}=10\text{V}$			4.8	nC
Gate-to-Drain ("Miller") Charge	Q_{gd}	See Fig. 6 and 13 ④⑥			11	nC
Turn-On Delay Time	$t_{D(on)}$	$V_{DD}=50\text{V}$, $I_D=5.7\text{A}$ $R_G=22\Omega$, $R_D=8.6\Omega$ See Fig. 10 ④⑥		4.5		ns
Rise Time	t_r			23		ns
Turn-Off Delay Time	$t_{D(off)}$			32		ns
Fall Time	t_f			23		ns
Internal Drain inductance	L_D	Between lead, 6mm (0.25in.) from package and center of die contact⑤		4.5		nH
Internal Source inductance	L_S			7.5		nH
Input Capacitance	C_{iss}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$ $f = 1.0\text{MHz}$, See Fig. 5 ⑥		330		pF
Output Capacitance	C_{oss}			92		pF
Reverse Transfer Capacitance	C_{rss}			54		pF



Source-Drain Ratings and Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			9.4	A
Pulsed Source Current (Body Diode) ①⑥	I_{SM}				38	
Diode Forward Voltage	V_{SD}	$T_J=25^\circ\text{C}$, $I_S=5.5\text{A}$, $V_{GS}=0\text{V}$ ④			1.3	V
Reverse Recovery Time	t_{rr}	$T_J=25^\circ\text{C}$, $I_F=5.7\text{A}$ $di/dt=100\text{A}/\mu\text{s}$ ④ ⑥		99	150	ns
Reverse Recovery Charge	Q_{rr}			390	580	nC
Forward Turn-On Time	t_{on}	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 $V_{DD}=25\text{V}$, starting $T_J=25^\circ\text{C}$, $L=4.7\text{mH}$
 $R_G=25\Omega$, $I_{AS}=5.7\text{A}$. (See Figure 12)

③ $I_{SD} \leq 5.7\text{A}$, $di/dt \leq 240\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 175^\circ\text{C}$

④ Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$

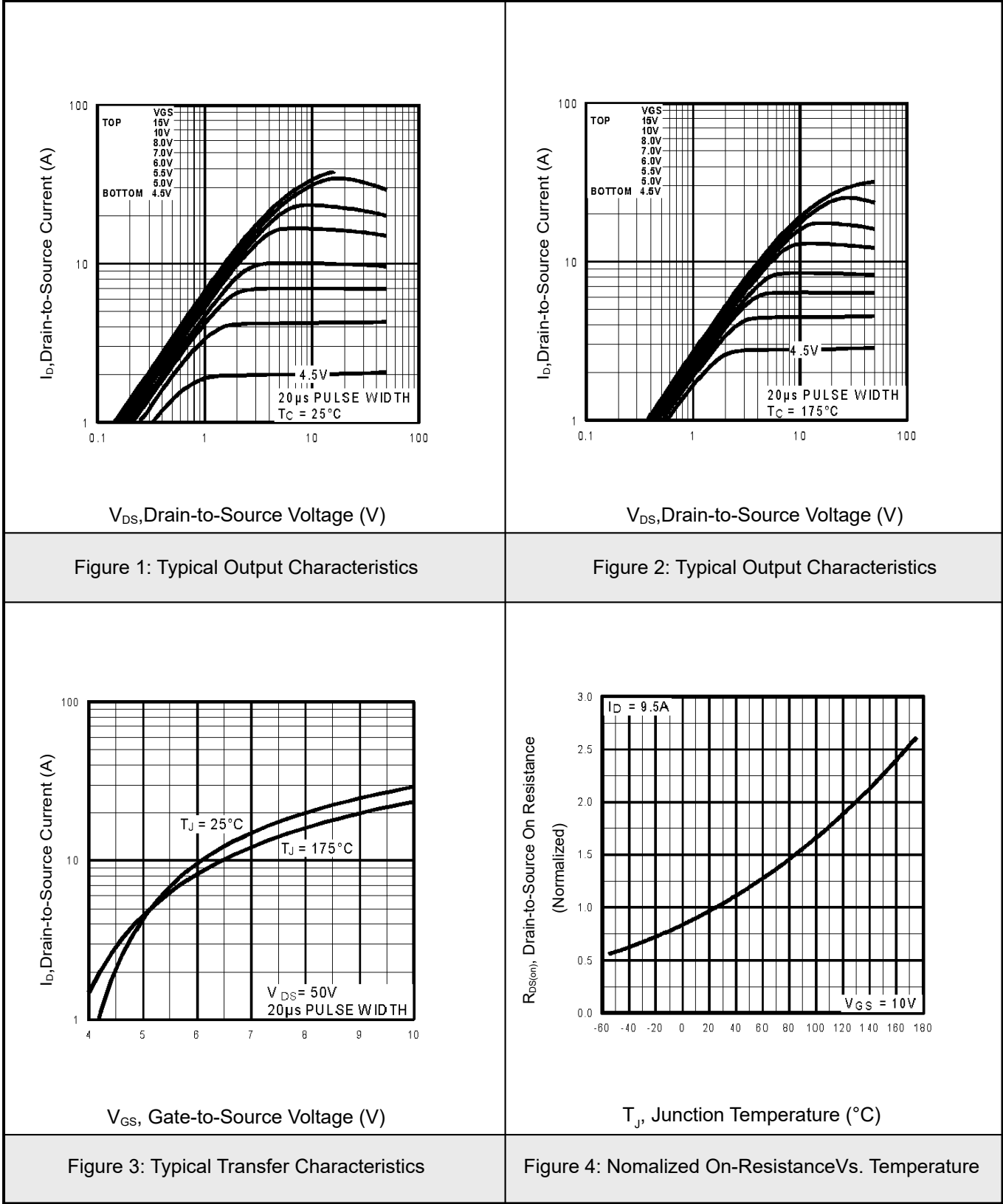
⑤ This is applied for I-PAK, L_S of D-PAK is measured between lead and center of die contact.

⑥ Uses IRFZ24N data and test conditions.

** When mounted on 1"square PCB(FR-4 or G-10 Material).For recommended footprint and soldering techniques refer to
application note #AN-994.

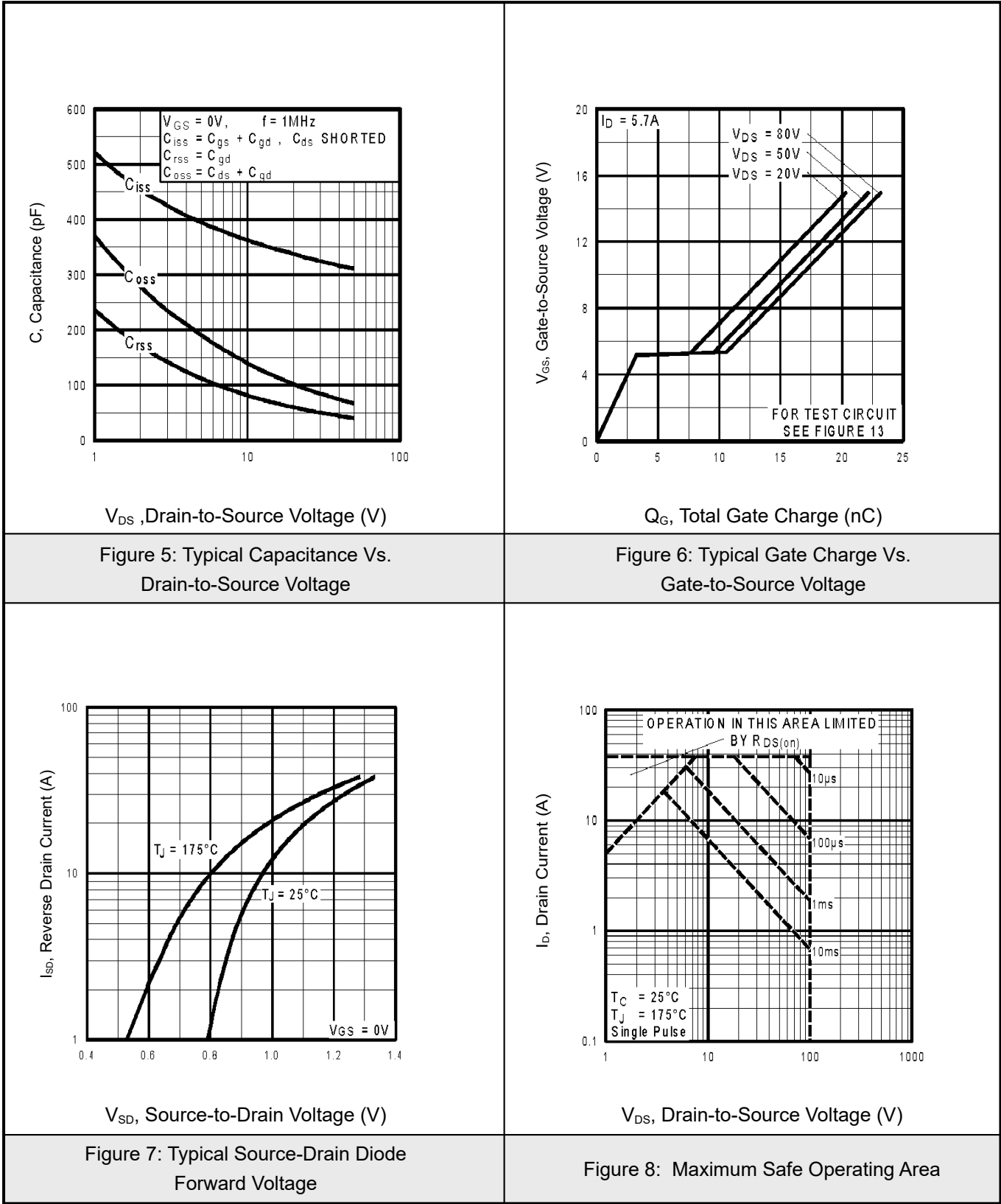


7.1 Typical Characteristics



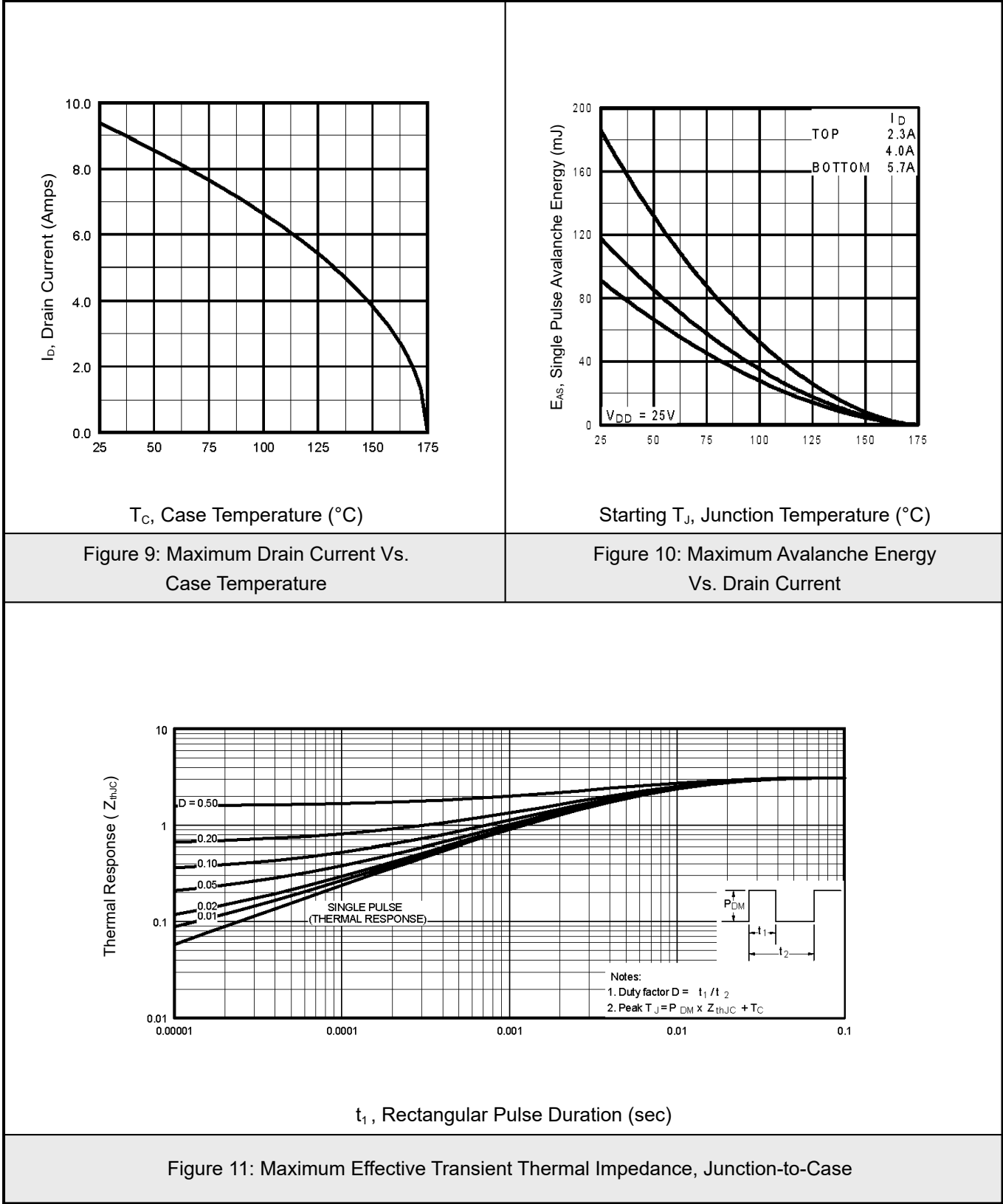


7.2Typical Characteristics





7.3Typical Characteristics





7.4 Typical Characteristics

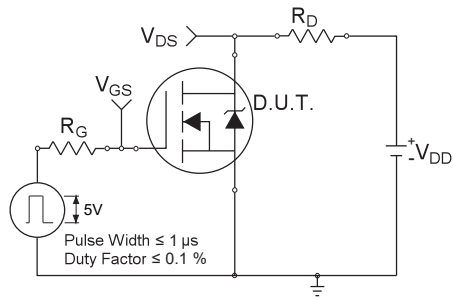


Figure 12a: Switching Time Test Circuit

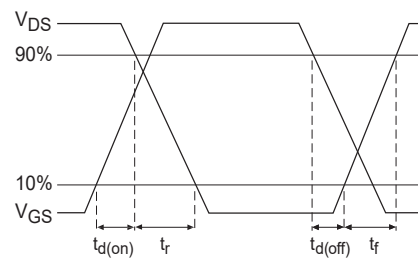


Figure 12b: Switching Time Waveforms

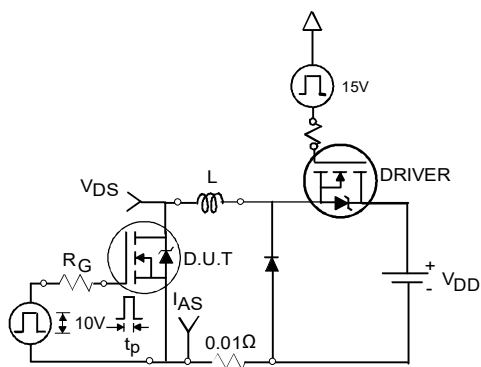


Figure 13a: Unclamped Inductive Test Circuit

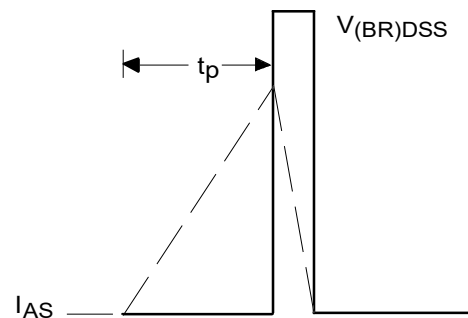


Figure 13b: Unclamped Inductive Waveforms

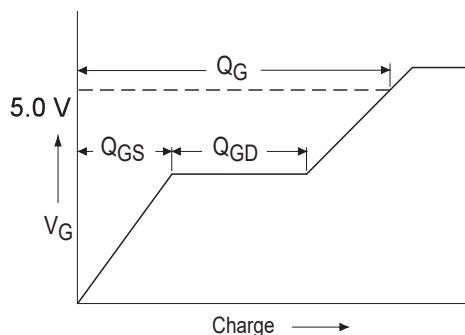


Figure 14a: Basic Gate Charge Waveform

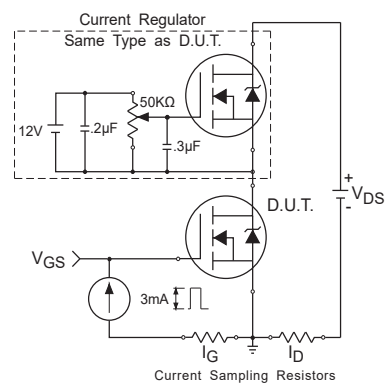
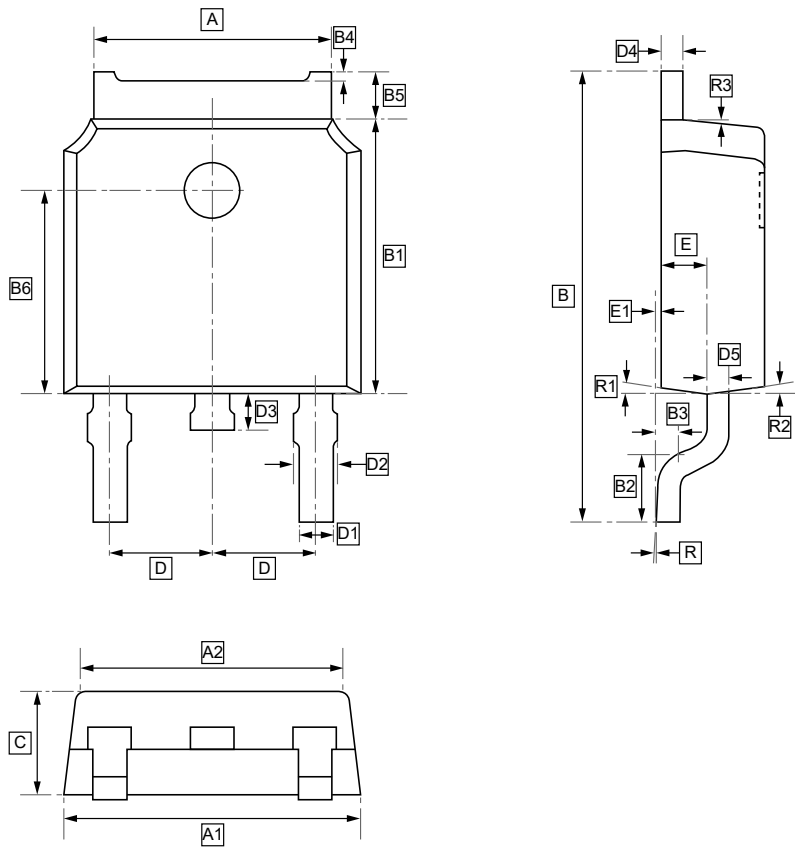


Figure 14b: Gate Charge Test Circuit



8.TO-252 Package Outline Dimensions



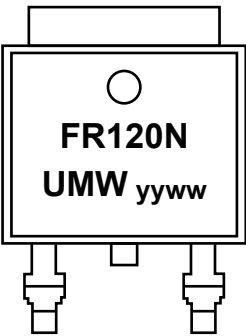
DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	B	B1	B2	B3	B4	B5	B6	C	D
Min	5.1	6.4	5.6	9.5	5.9	1.35	0.4	0.1	0.85	4.35	2.15	2.286
Max	5.5	6.8	6.0	10.3	6.3	1.65	0.6	(typ.)	1.05	4.65	2.45	(typ.)

Symbol	D1	D2	D3	D4	D5	E	E1	R	R1	R2	R3
Min	0.66	0.81	0.65	0.42	0.42	0.86	0.05	0°	7°	7°	7°
Max	0.86	1.01	0.95	0.58	0.58	1.16	0.05	6°	(typ.)	(typ.)	(typ.)



9.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRFR120NTR	TO-252	2500	Tape and reel



10.Disclaimer

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