

1. Description

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

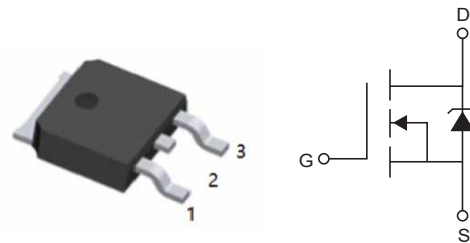
2. Features

- $V_{DS(V)}=55V$
- $I_D=27A(V_{GS}=10V)$
- $R_{DS(ON)}<45m\Omega(V_{GS}=10V)$

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	27 (5)	A
Continuous Drain Current, $V_{GS}=10V$	$T_C=100^\circ C$		19	A
Pulsed Drain Current (1)(7)		I_{DM}	100	A
Power Dissipation	$T_C=25^\circ C$	P_D	68	W
Linear Derating Factor			0.45	W/ $^\circ C$
Gate-to-Source Voltage		V_{GS}	± 20	V
Single Pulse Avalanche Energy (2)(7)		E_{AS}	65	mJ
Avalanche Current (1)(7)		I_{AR}	16	A
Repetitive Avalanche Energy (1)(7)		E_{AR}	6.8	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	$R_{\theta JC}$		2.2	°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-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	55			V
Breakdown Voltage Temp. Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	$I_D=1\text{mA}$, Reference to 25°C		0.052		$\text{V}/^\circ\text{C}$
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=16\text{A}$ ④		45		m Ω
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2		4	V
Forward Transconductance	g_{FS}	$V_{DS}=25\text{V}$, $I_D=16\text{A}$ ⑦	6.5			S
Drain-to-Source Leakage Current	I_{DSS}	$V_{DS}=55\text{V}$, $V_{GS}=0\text{V}$			25	μA
		$V_{DS}=44\text{V}$, $V_{GS}=0\text{V}$, $T_J=150^\circ\text{C}$			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	$I_D=16\text{A}$			34	nC
Gate-to-Source Charge	Q_{gs}	$V_{DS}=44\text{V}$, $V_{GS}=10\text{V}$			6.8	nC
Gate-to-Drain ("Miller") Charge	Q_{gd}	See Fig.6 and 13 ④⑦			14	nC
Turn-On Delay Time	$t_{D(on)}$	$V_{DD}=28\text{V}$		7		ns
Rise Time	t_r	$I_D=16\text{A}$		49		ns
Turn-Off Delay Time	$t_{D(off)}$	$R_G=18\Omega$, $R_D=1.8\Omega$		31		ns
Fall Time	t_f	See Fig.10 ④⑦		40		ns
Internal Drain inductance	L_D	Between lead, 6mm (0.25in.)from package and center of die contact ⑥		4.5		nH
Internal Source inductance	L_S			7.5		nH
Input Capacitance	C_{iss}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$ $f=1\text{MHz}$, See Fig. 5 ⑦		700		pF
Output Capacitance	C_{oss}			240		pF
Reverse Transfer Capacitance	C_{rss}			100		pF



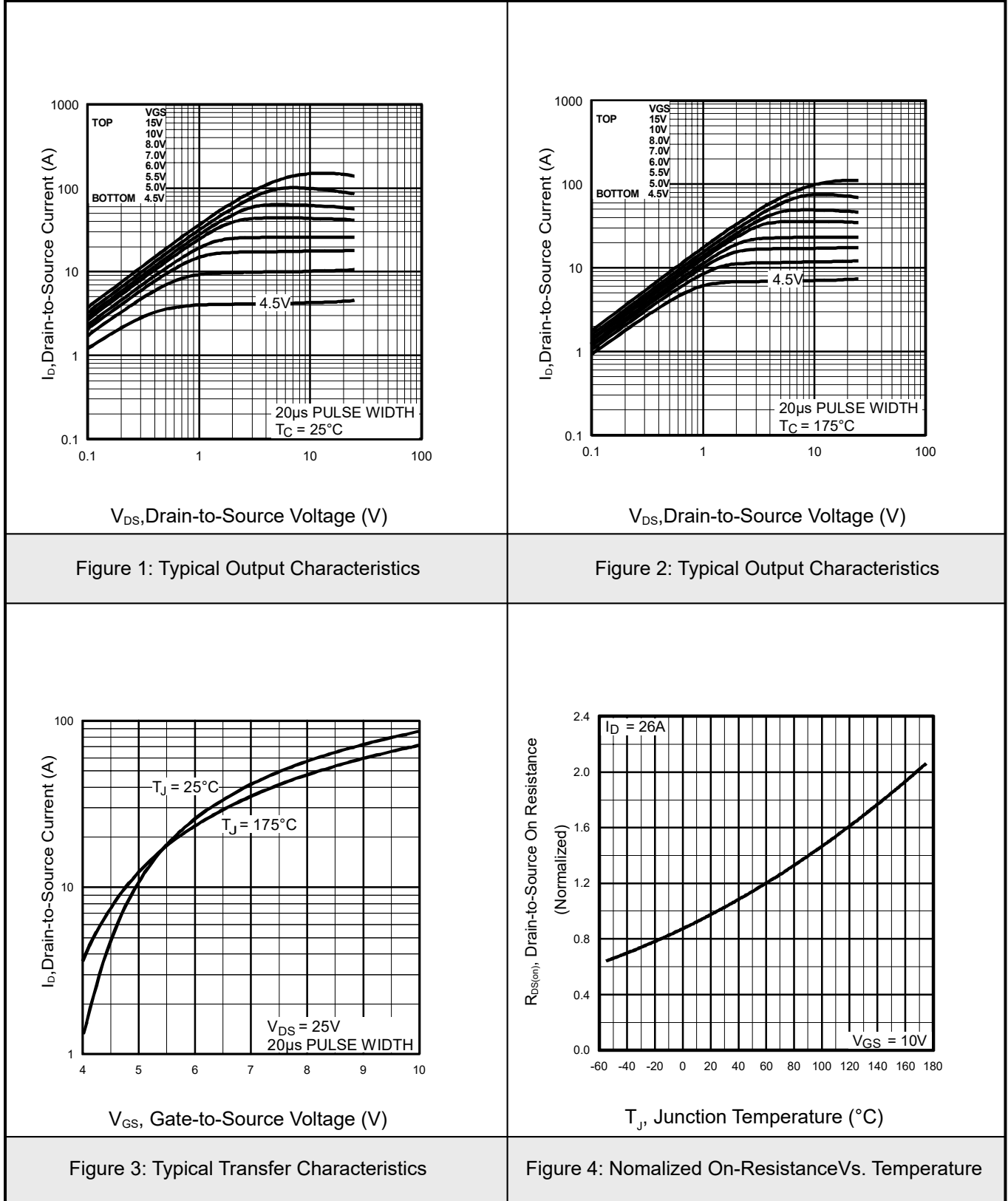
Source-Drain Ratings and Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			27 ^⑤	A
Pulsed Source Current (Body Diode) ①⑦	I_{SM}				100	
Diode Forward Voltage	V_{SD}	$T_J=25^\circ\text{C}$, $I_S=16\text{A}$, $V_{GS}=0\text{V}$ ④			1.6	V
Reverse Recovery Time	t_{rr}	$T_J=25^\circ\text{C}$, $I_F=16\text{A}$ $di/dt=100\text{A}/\mu\text{s}$ ④⑦		57	86	ns
Reverse Recovery Charge	Q_{rr}			130	200	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 $T_J=25^\circ\text{C}$, $L=410\mu\text{H}$, $R_G=25\Omega$, $I_{AS}=16\text{A}$.(See figure.12)
- ③ $I_{SD} \leq 16\text{A}$, $di/dt \leq 420\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 175^\circ\text{C}$.
- ④ Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.
- ⑤ Calculated continuous current based on maximum allowable junction temperature; Package limitation current = 20A

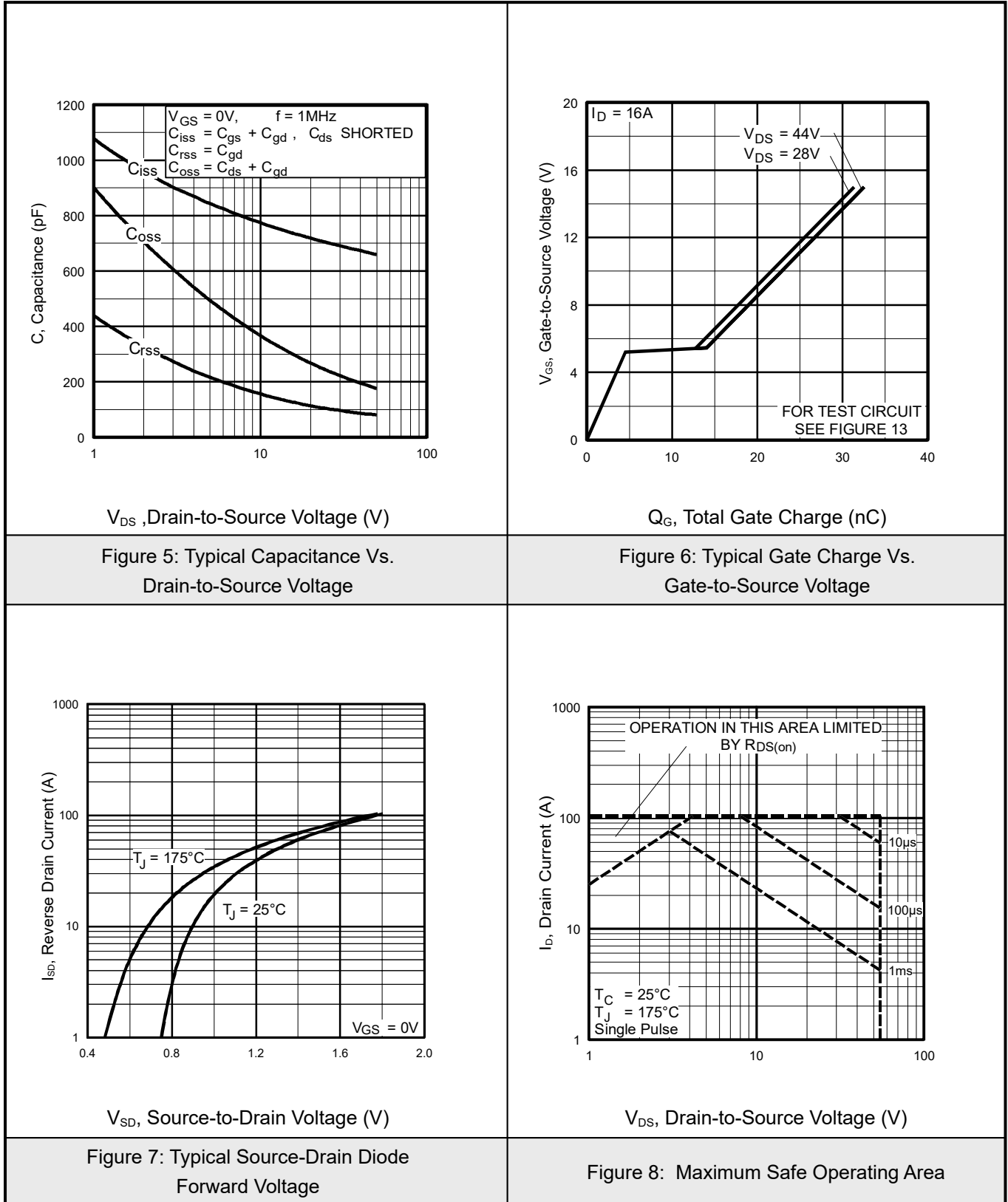


7.1 Typical Characteristics





7.2 Typical Characteristics





7.3 Typical Characteristics

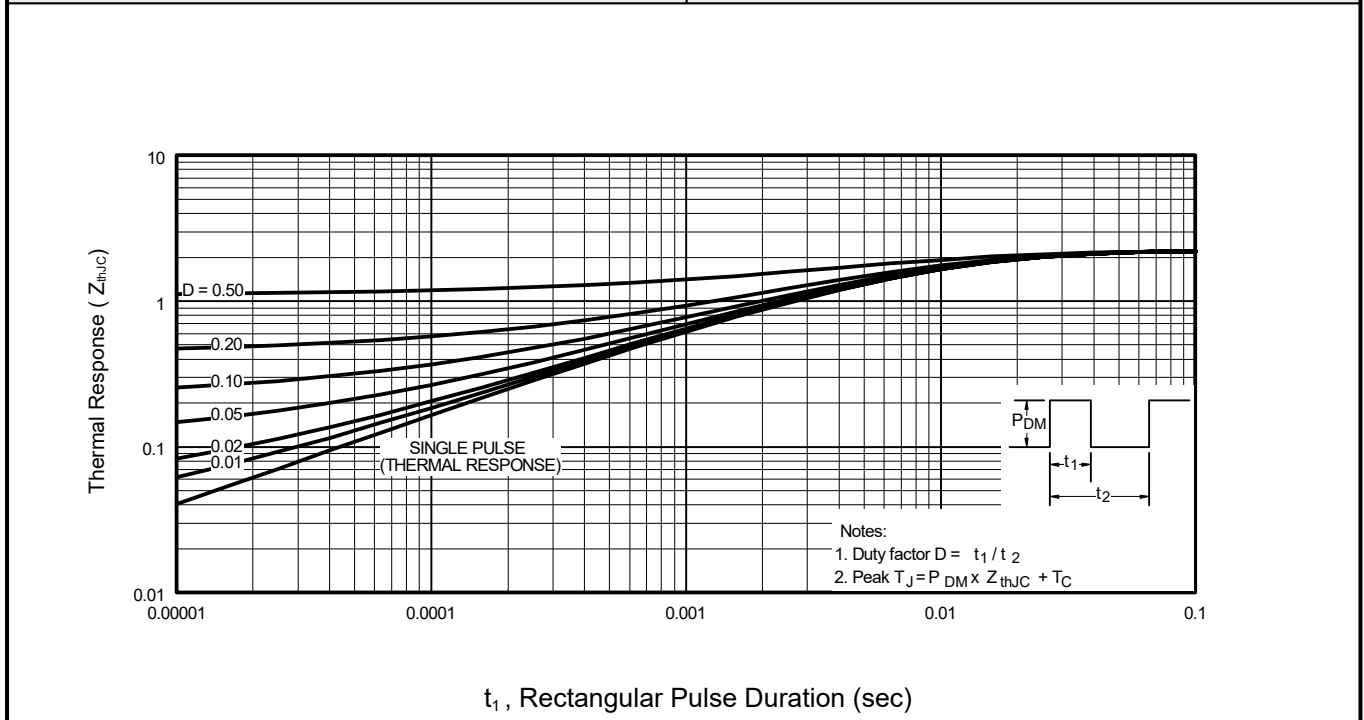
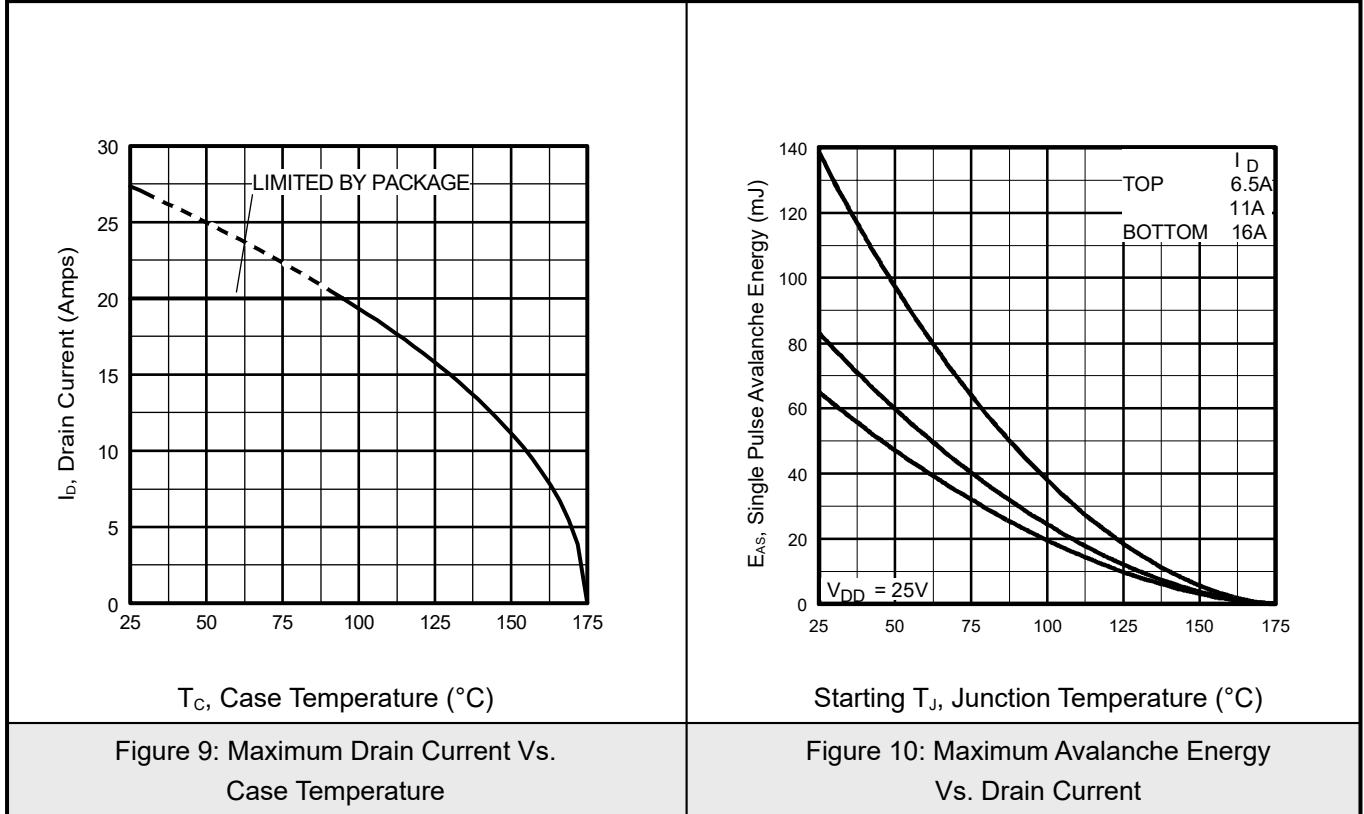


Figure 11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



7.4 Typical Characteristics

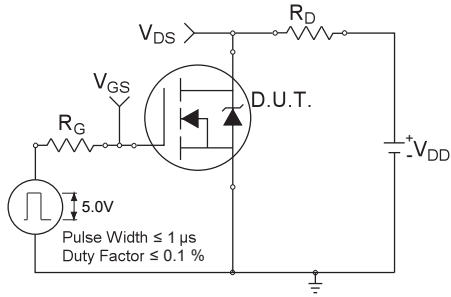


Figure 12a: Switching Time Test Circuit

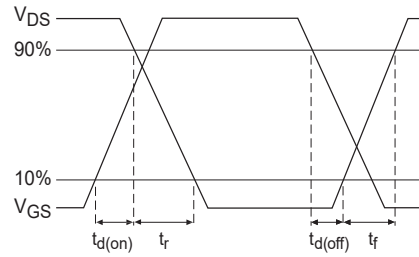


Figure 12b: Switching Time Waveforms

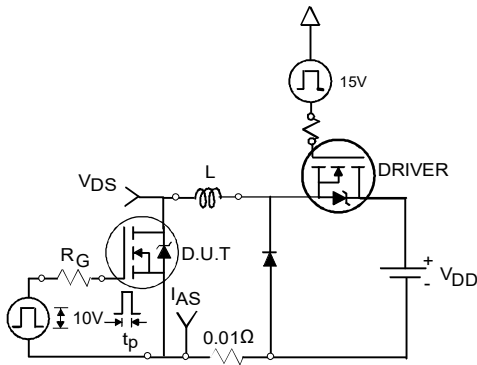


Figure 13a: Unclamped Inductive Test Circuit

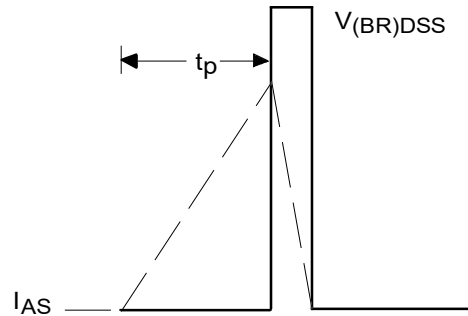


Figure 13b: Unclamped Inductive Waveforms

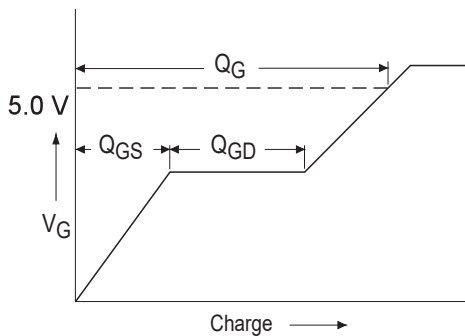


Figure 14a: Basic Gate Charge Waveform

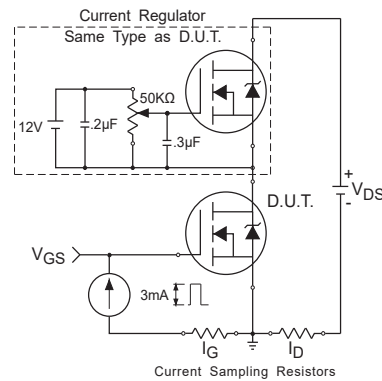
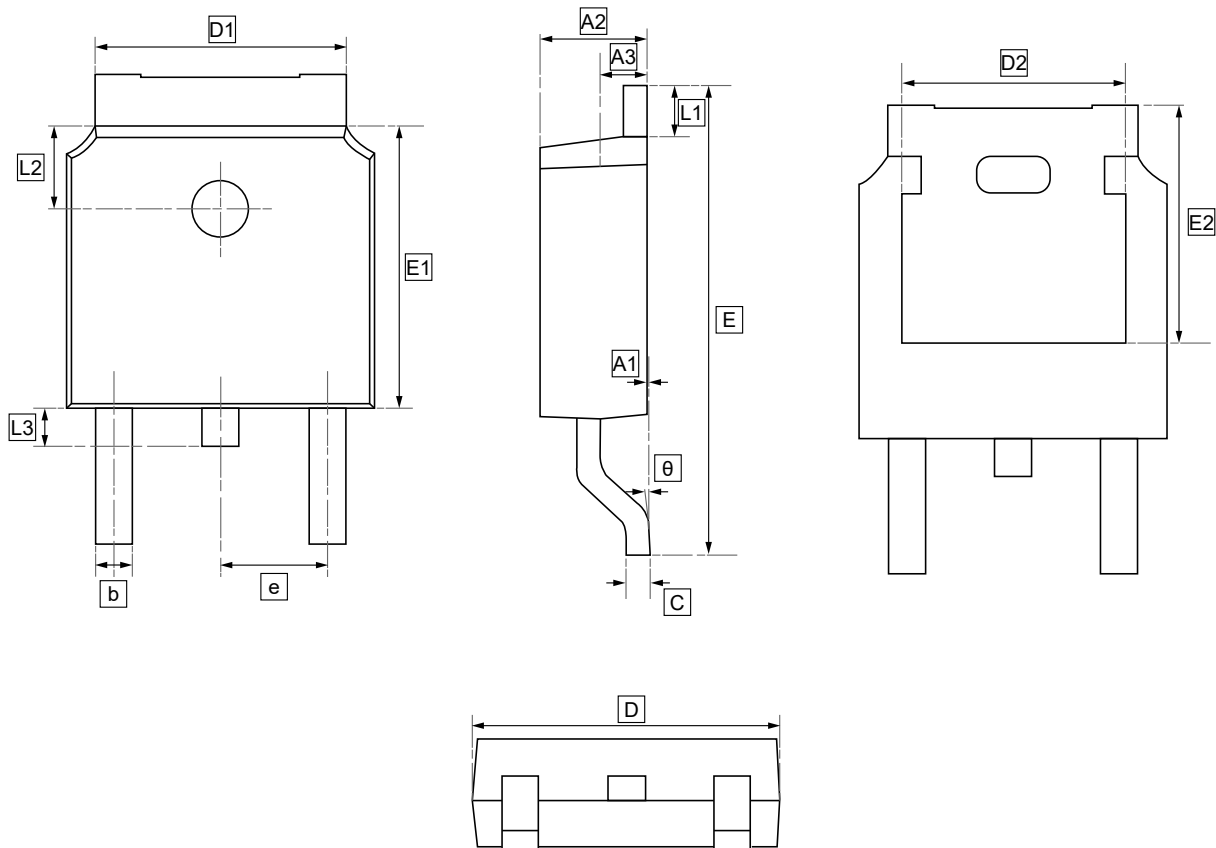


Figure 14b: Gate Charge Test Circuit



8.TO-252 Package Outline Dimensions

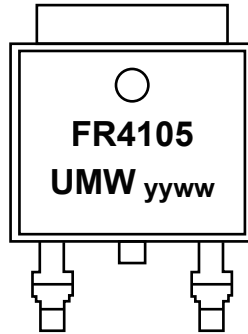


DIMENSIONS (mm are the original dimensions)

Symbol	A1	A2	A3	b	c	D	D1	D2	E	E1	E2	e	L1	L2	L3	θ
Min	0.00	2.18	0.90	0.65	0.46	6.35	4.95	4.32	9.40	5.97	5.21	2.286	0.89	1.70	0.60	0.00
Max	0.13	2.39	1.10	0.85	0.61	6.73	5.46	4.90	10.41	6.22	5.38	BSC	1.27	1.90	1.00	8.00



9. Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRFR4105TR	TO-252	2500	Tape and reel



10.Disclaimer

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