
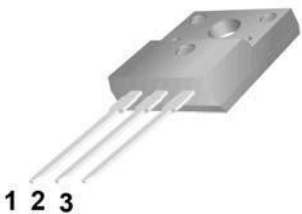
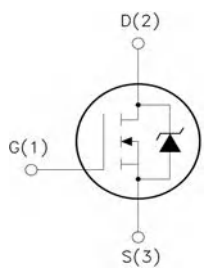


<p>28N50 500V N-Channel MOSFET</p> <p>Features:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Low Intrinsic Capacitances. <input type="checkbox"/> Excellent Switching Characteristics. <input type="checkbox"/> Extended Safe Operating Area. <input type="checkbox"/> Unrivalled Gate Charge :$Q_g=78\text{ nC}$ (Typ.). <input type="checkbox"/> $V_{DSS}=500\text{V}, I_D=30\text{A}$ <input type="checkbox"/> $R_{DS(on)} : 160\text{m}\Omega$ (Tye) @ $V_G=10\text{V}$ <input type="checkbox"/> 100% Avalanche Tested 	<div style="text-align: right;">  </div> <p style="text-align: center;">TO-220F</p>   <div style="margin-left: 20px;"> <p>1.Gate (G)</p> <p>2.Drain (D)</p> <p>3.Source (S)</p> </div>
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Absolute Maximum Ratings (* Drain current limited by junction temperature)

Symbol	Parameter	28N50	Unit
V_{DSS}	Drain-to-Source Voltage	500	V
V_{GSS}	Gate-to-Source Voltage	± 30	
I_D	Continuous Drain Current	30	A
	Continuous Drain Current @ $T_c=100^\circ\text{C}$	18	
I_{DM}	Pulsed Drain Current at $V_{GS}=10\text{V}^{[2,4]}$	112	
E_{AS}	Single Pulse Avalanche Energy	3000	mJ
dv/dt	Peak Diode Recovery $dv/dt^{[3]}$	5.0	V/ns
P_D	Power Dissipation	300	W
	Derating Factor above 25°C	2.38	W/ $^\circ\text{C}$
T_L T_{PAK}	Maximum Temperature for Soldering Leads at 0.063in (1.6mm) from Case for 10 seconds, Package Body for 10 seconds	300 260	$^\circ\text{C}$
T_J & T_{STG}	Operating and Storage Temperature Range	-55 to 150	

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	28N50	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.42	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	55	

Electrical Characteristics ($T_C = 25\text{ }^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	500	-	-	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature coefficient	$I_D = 250\mu A$, referenced to $25\text{ }^\circ\text{C}$	-	0.3	-	V/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS} = 500V, V_{GS} = 0V$	-	-	1	μA
		$V_{DS} = 400V, T_C = 125\text{ }^\circ\text{C}$	-	-	10	μA
I_{GSS}	Gate-Source Leakage, Forward	$V_{GS} = 30V, V_{DS} = 0V$	-	-	100	nA
	Gate-source Leakage, Reverse	$V_{GS} = -30V, V_{DS} = 0V$	-	-	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0	-	4.0	V
$R_{DS(ON)}$	Static Drain-Source On-state Resistance	$V_{GS} = 10V, I_D = 15A$	-	160	200	m Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{GS} = 0V, V_{DS} = 25V, f = 1MHz$	-	4500	-	pF
C_{oss}	Output Capacitance		-	3150	-	
C_{rss}	Reverse Transfer Capacitance		-	450	-	
Dynamic Characteristics						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 250V, I_D = 15.0A, R_G = 25\Omega$ (Note 4, 5)	-	25	-	ns
t_r	Rise Time		-	39	-	
$t_{d(off)}$	Turn-off Delay Time		-	100	-	
t_f	Fall Time		-	36	-	
Q_g	Total Gate Charge	$V_{DS} = 250V, V_{GS} = 10V, I_D = 30.0A$ (Note 4, 5)	-	78	-	nC
Q_{gs}	Gate-Source Charge		-	21	-	
Q_{gd}	Gate-Drain Charge(Miller Charge)		-	20	-	

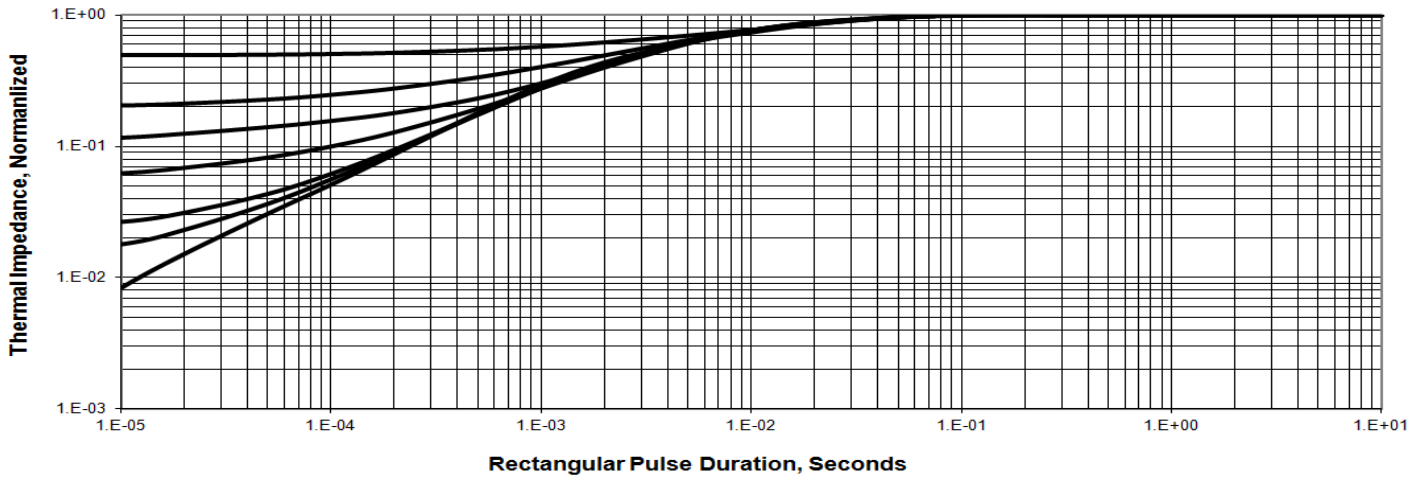
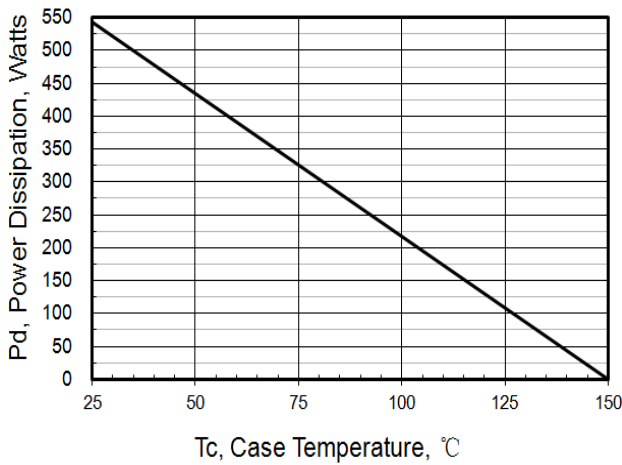
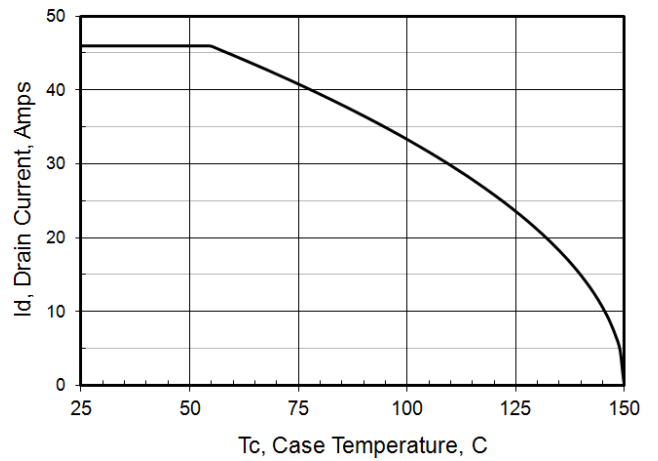
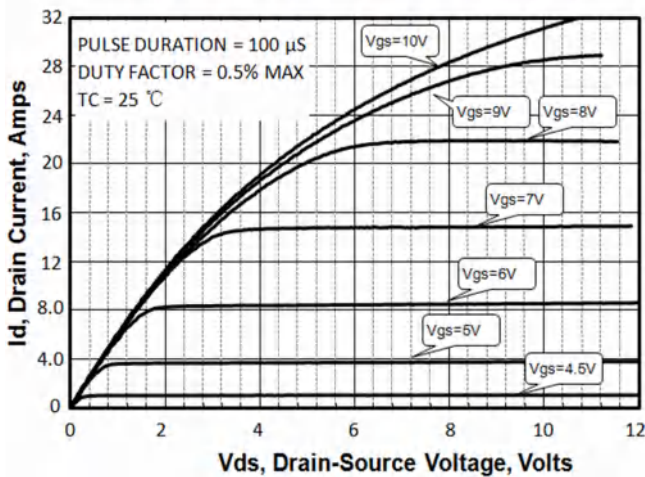
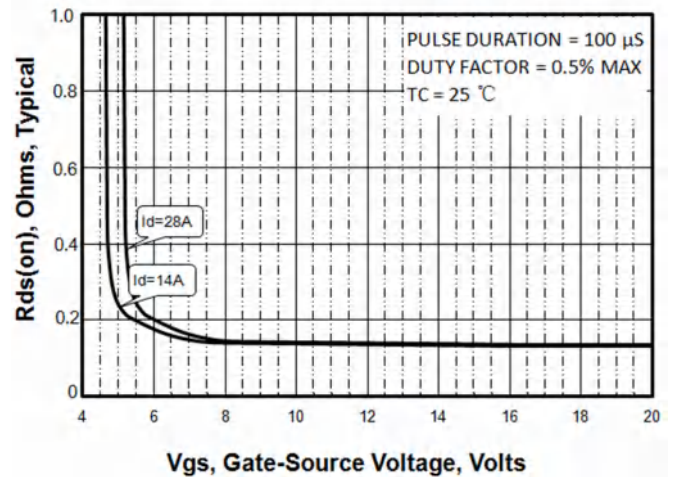
Source-Drain Diode Ratings and Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit.
I_S	Continuous Source Current	Integral Reverse p-n Junction Diode in the MOSFET	-	-	30	A
I_{SM}	Pulsed Source Current		-	-	110	
V_{SD}	Diode Forward Voltage	$I_S = 30.0A, V_{GS} = 0V$	-	-	1.4	V
t_{rr}	Reverse Recovery Time	$I_S = 30A, V_{GS} = 0V, dI_F/dt = 100A/\mu s$	-	530	-	ns
Q_{rr}	Reverse Recovery Charge		-	4.6	-	μC

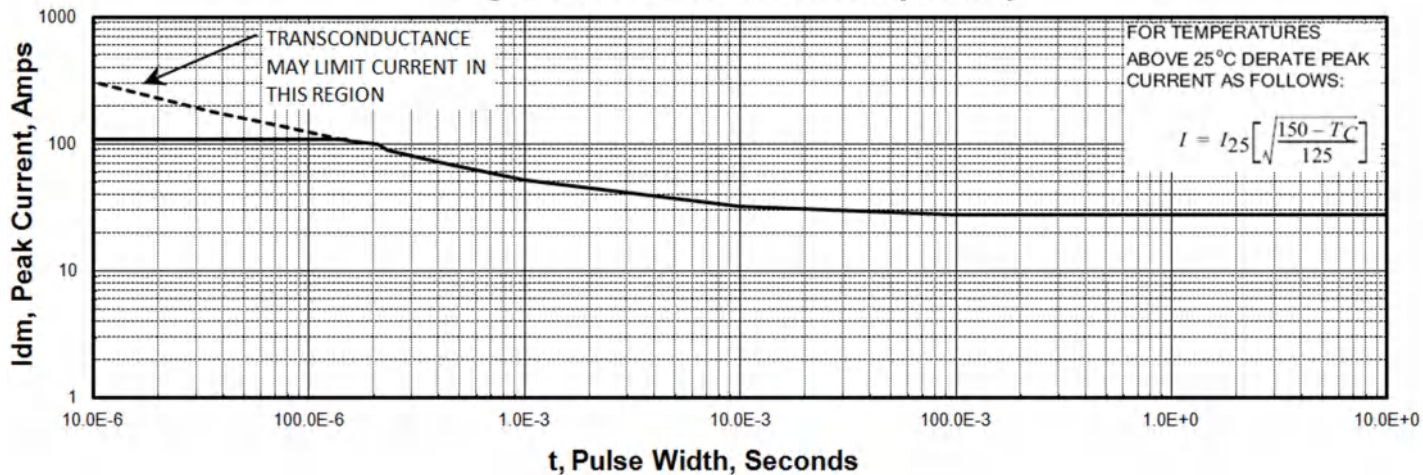
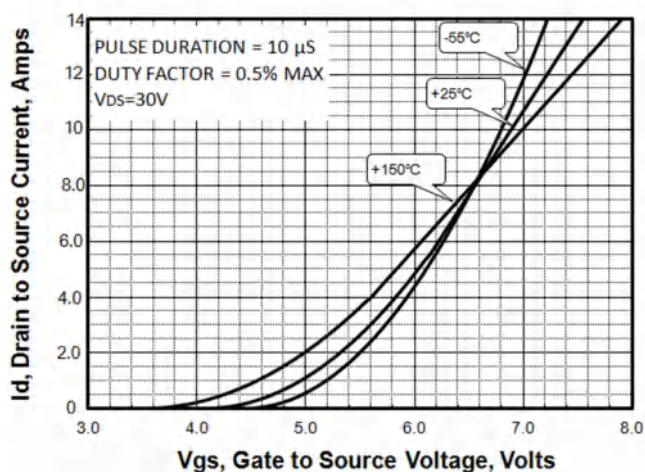
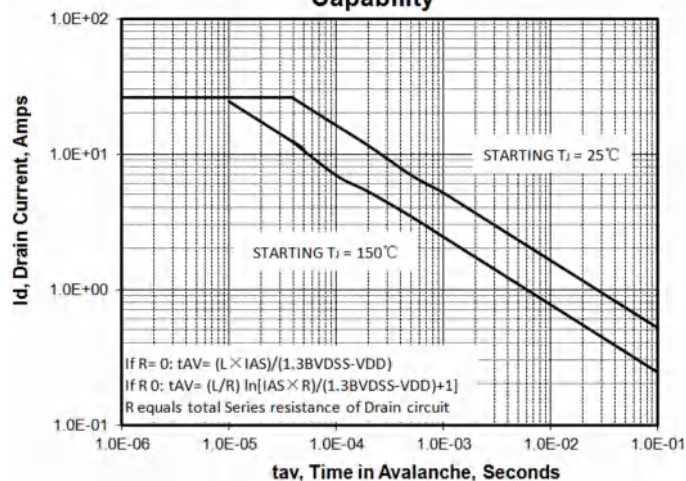
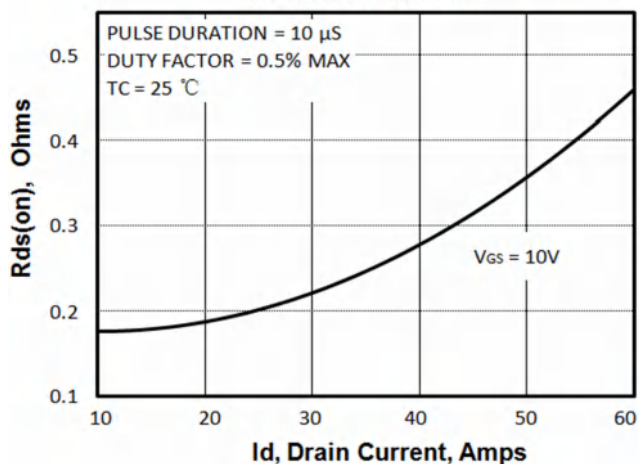
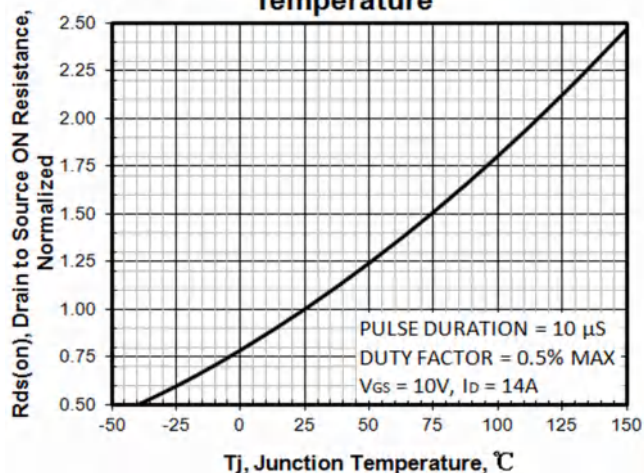
*** NOTES**

- [1] $T_J = +25\text{ }^\circ\text{C}$ to $+150\text{ }^\circ\text{C}$.
 [2] Silicon limited current only.
 [3] Package limited current.
 [4] Repetitive rating; pulse width limited by maximum junction temperature.
 [5] Pulse width $\leq 380\mu s$; duty cycle $\leq 2\%$.

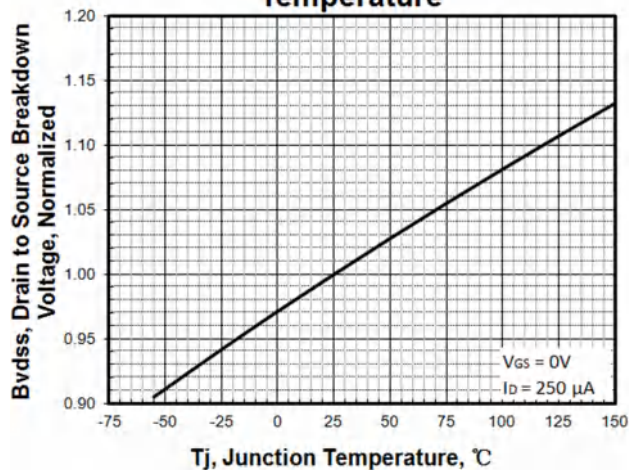
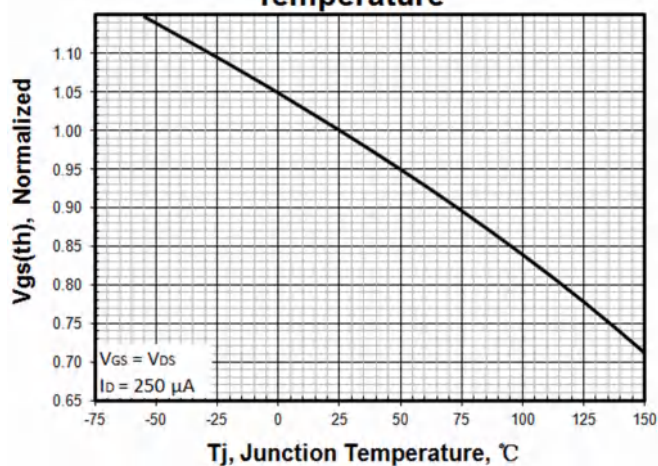
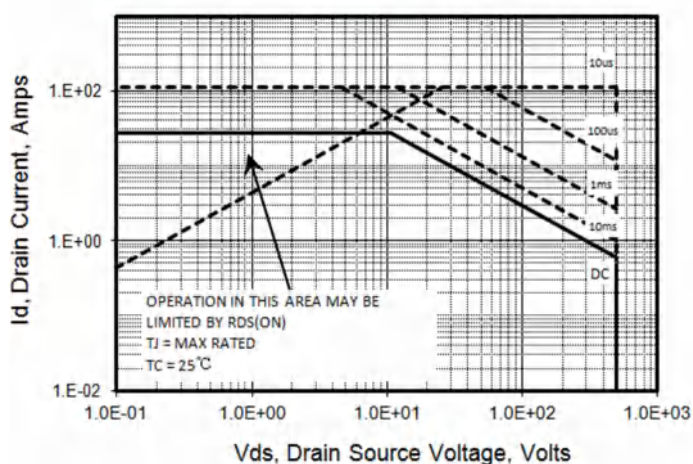
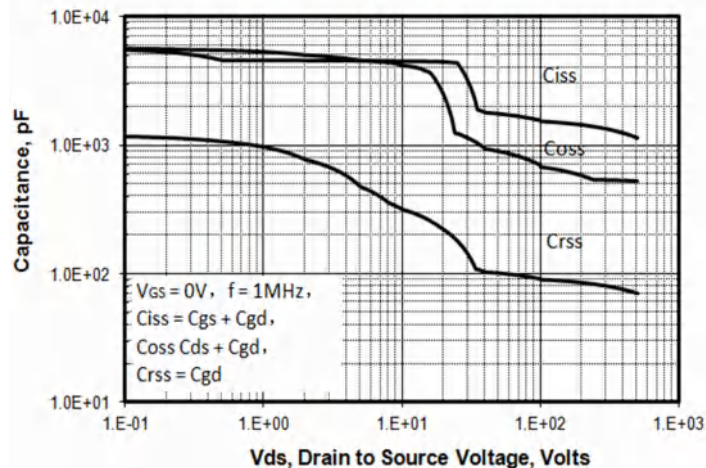
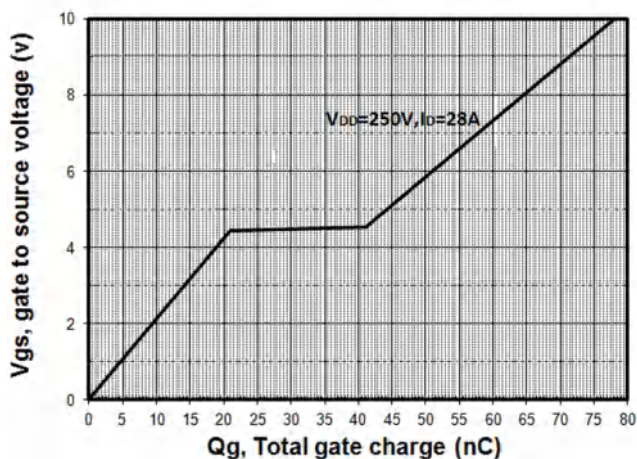
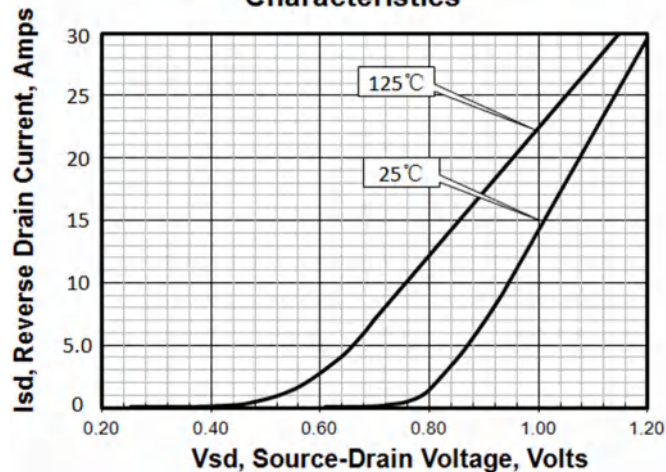
Typical Characteristics ($T_C = 25\text{ }^\circ\text{C}$ unless otherwise noted)

Figure 1. Maximum Transient Thermal Impedance

Figure 2. Max. Power Dissipation vs Case Temperature

Figure 3. Maximum Continuous Drain Current vs Tc

Figure 4. Output Characteristics

Figure 5. Rds(on) vs Gate Voltage


Typical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Figure 6. Peak Current Capability

Figure 7. Transfer Characteristics

Figure 8. Unclamped Inductive Switching Capability

Figure 9. Drain to Source ON Resistance vs Drain Current

Figure 10. Rds(on) vs Junction Temperature


Typical Characteristics ($T_C = 25\text{ }^\circ\text{C}$ unless otherwise noted)

Figure 11. Breakdown Voltage vs Temperature

Figure 12. Threshold Voltage vs Temperature

Figure 13. Maximum Safe Operating Area

Figure 14. Capacitance vs Vds

Figure 15. Typical Gate Charge

Figure 16. Body Diode Transfer Characteristics


Test circuit

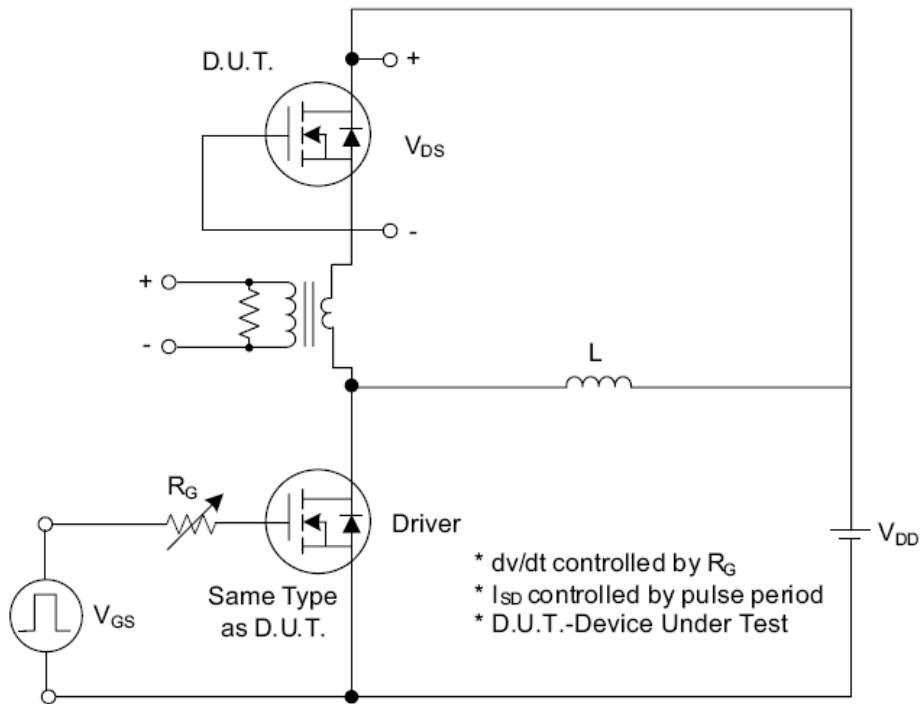


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

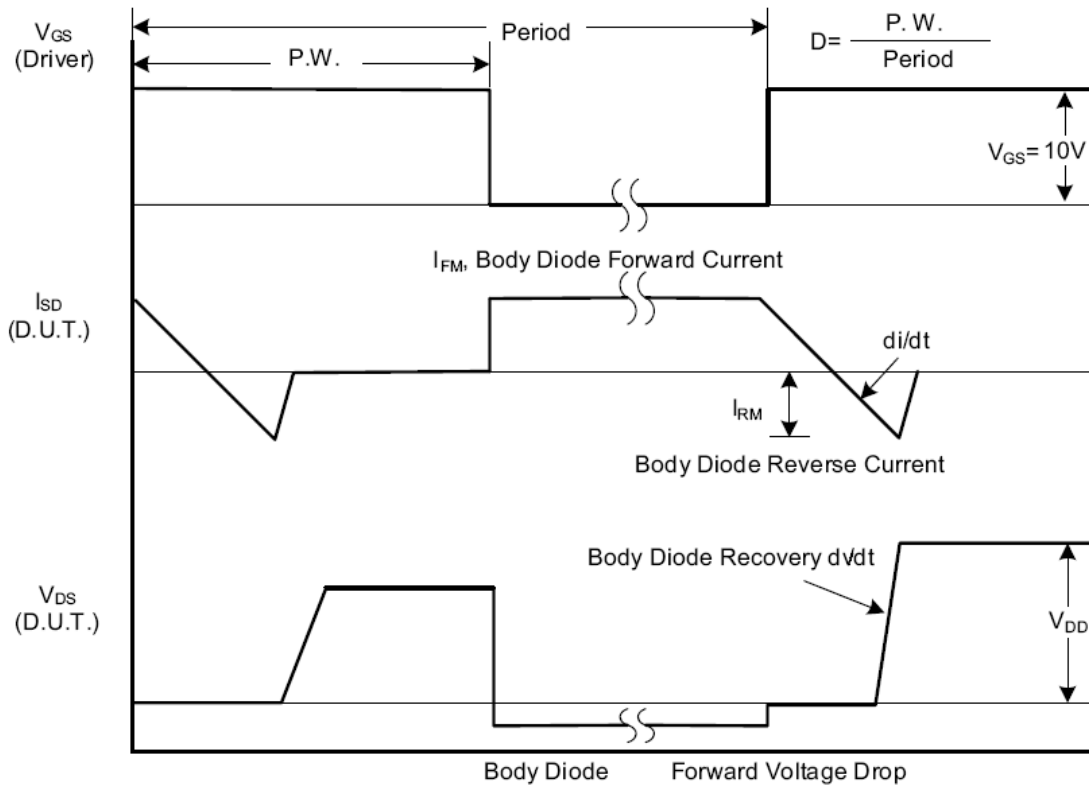


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

Test circuit

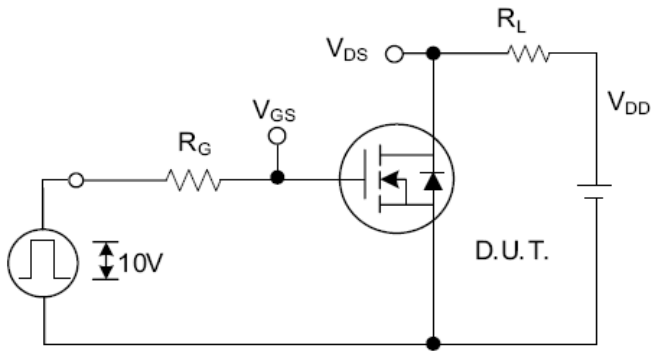


Fig. 2.1 Switching Test Circuit

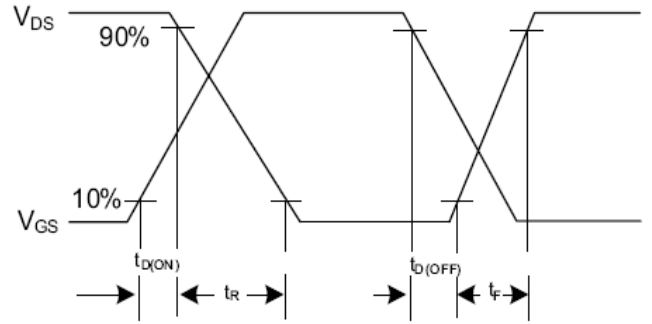


Fig. 2.2 Switching Waveforms

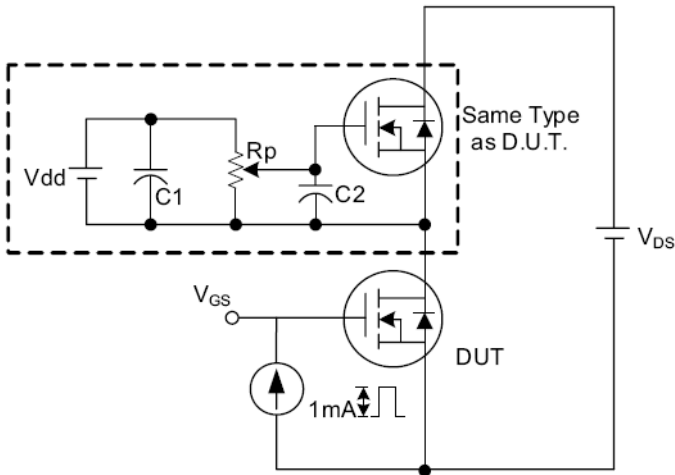


Fig. 3.1 Gate Charge Test Circuit

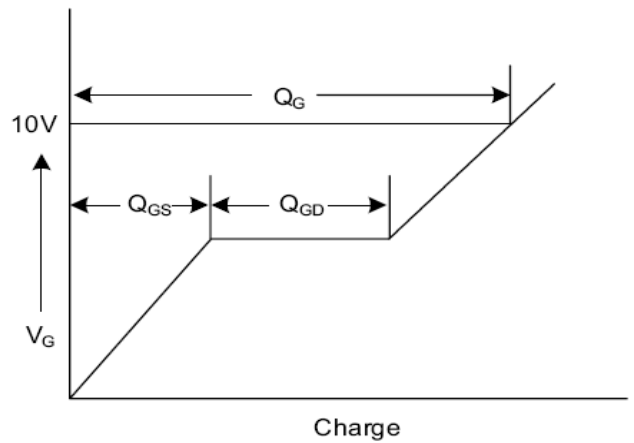


Fig. 3.2 Gate Charge Waveform

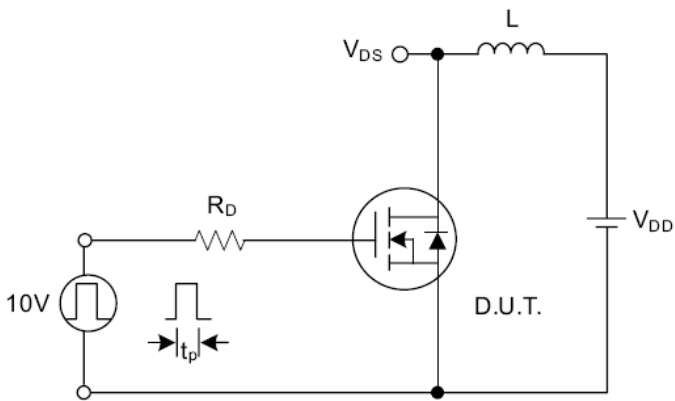


Fig. 4.1 Unclamped Inductive Switching Test Circuit

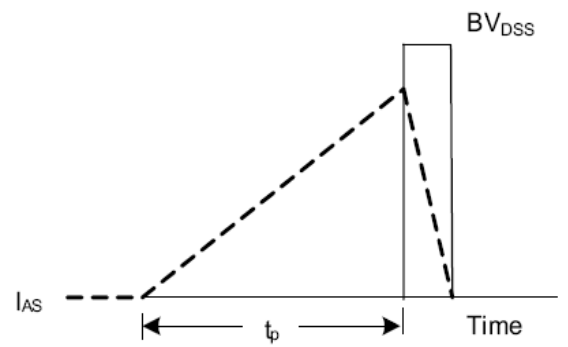
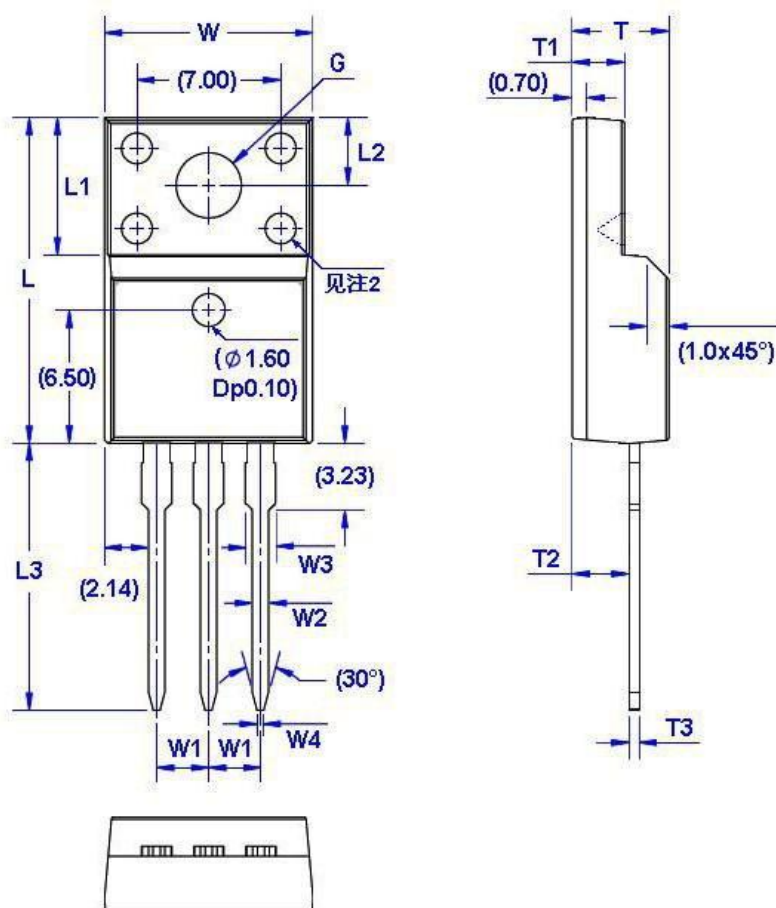


Fig. 4.2 Unclamped Inductive Switching Waveforms

Package Dimension

TO-220F

Unit: mm



Symbol	Size		Symbol	Size		Symbol	Size		Symbol	Size	
	Min	Max		Min	Max		Min	Max		Min	Max
W	9.96	10.36	W4	0.25	0.45	L3	12.78	13.18	T3	0.45	0.60
W1	2.54 (TYP)		L	15.67	16.07	T	4.50	4.90	G(Φ)	3.08	3.28
W2	0.70	0.90	L1	6.48	6.88	T1	2.34	2.74			
W3	1.24	1.47	L2	3.20	3.40	T2	2.56	2.96			