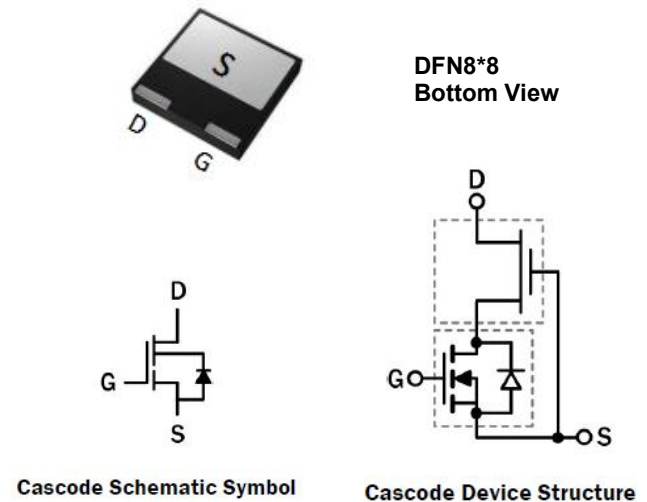


Features

- 650V, 21A, $R_{DS(on)}$ (typ.) = 70mΩ@VGS = 12V.
- Very low Q_{RR}
- Reduced Crossover Loss
- Easy to drive with commonly-used gate drivers
- Excellent $Q_G \times R_{DS(on)}$ figure of merit (FOM)
- RoHS compliant and Halogen-free

Application

- High efficiency power supplies
- Telecom and datacom
- Automotive
- Servo motors



Absolute Maximum Ratings (T_C = 25° C unless otherwise noted)

Symbol	Parameter		Limit	Unit
V _{DS}	Drain-Source Voltage		650	V
V _{(TR)DSS}	Transient Drain to Source Voltage ^a		800	V
V _{GSS}	Gate-Source Voltage		± 20	V
I _D	Drain Current-Continuous	T _C = 25°C ^b	21	A
	Drain Current-Continuous	T _C = 100°C ^b	13	A
I _{DM}	Drain Current-Pulsed	Pulse Width = 100μs	107	A
P _D	Maximum power Dissipation @T _C = 25°C		60	W
T _C	Operating Temperature Case		-55 to +150	°C
T _J	Operating Temperature Junction		-55 to +150	°C
T _S	Storage Temperature		-55 to +150	°C
T _{SOLD}	Soldering Peak Temperature ^c		260	°C

Thermal Characteristics

Symbol	Parameter	Typical	Unit
R _{θJC}	Thermal Resistance Junction-Case	2.1	°C/W
R _{θJA}	Thermal Resistance Junction-Ambient ^d	50	°C/W

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

■ Off Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{(BL)DSS}$	Reverse Breakdown Voltage	$V_{GS} = 0V$	650	-	-	V
I_{DSS}	Reverse Leakage Current	$V_{GS} = 0V, V_{DS} = 650V$ $T_J = 25^\circ\text{C}$	-	-	20	μA
		$V_{GS} = 0V, V_{DS} = 650V$ $T_J = 150^\circ\text{C}$	-	50	-	μA
I_{GSS}	Gate-to-source Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 20V$	-	-	± 150	nA

■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 500\mu\text{A}$	3.0	4.0	5.0	V
$R_{DS(on)eff}$	On Resistance	$V_{GS} = 12V, I_D = 4A$ $T_J = 25^\circ\text{C}$	-	70	90	m Ω
		$V_{GS} = 12V, I_D = 4A$ $T_J = 150^\circ\text{C}$	-	140	-	

■ Dynamic Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
C_{ISS}	Input Capacitance	$V_{GS} = 0V,$ $V_{DS} = 400V$ $f = 1\text{MHz}$	-	540	-	pF
C_{OSS}	Output Capacitance		-	77	-	
C_{RSS}	Transfer Capacitance		-	3	-	
$C_{o(er)}$	Output Capacitance, energy related	$V_{GS} = 0V,$ $V_{DS} = 0 \sim 400V$	-	115	-	pF
$C_{o(tr)}$	Output Capacitance, time related		-	210	-	
Q_{OSS}	Output Charge		-	84	-	nC

■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 0 \sim 12V,$ $V_{DS} = 400V,$ $I_D = 10A,$ $R_g = 47\Omega$	-	30	-	ns
t_r	Turn-On Rise Time		-	16	-	
$t_{d(off)}$	Turn-Off Delay Time		-	80	-	
t_f	Turn-Off Fall Time		-	10	-	
Q_G	Total Gate Charge	$V_{GS} = 0 \sim 12V,$ $V_{DS} = 400V,$ $I_D = 13A$	-	12.5	-	nC
Q_{GS}	Gate-Source Charge		-	2.6	-	
Q_{GD}	Gate-Drain Charge		-	4.4	-	

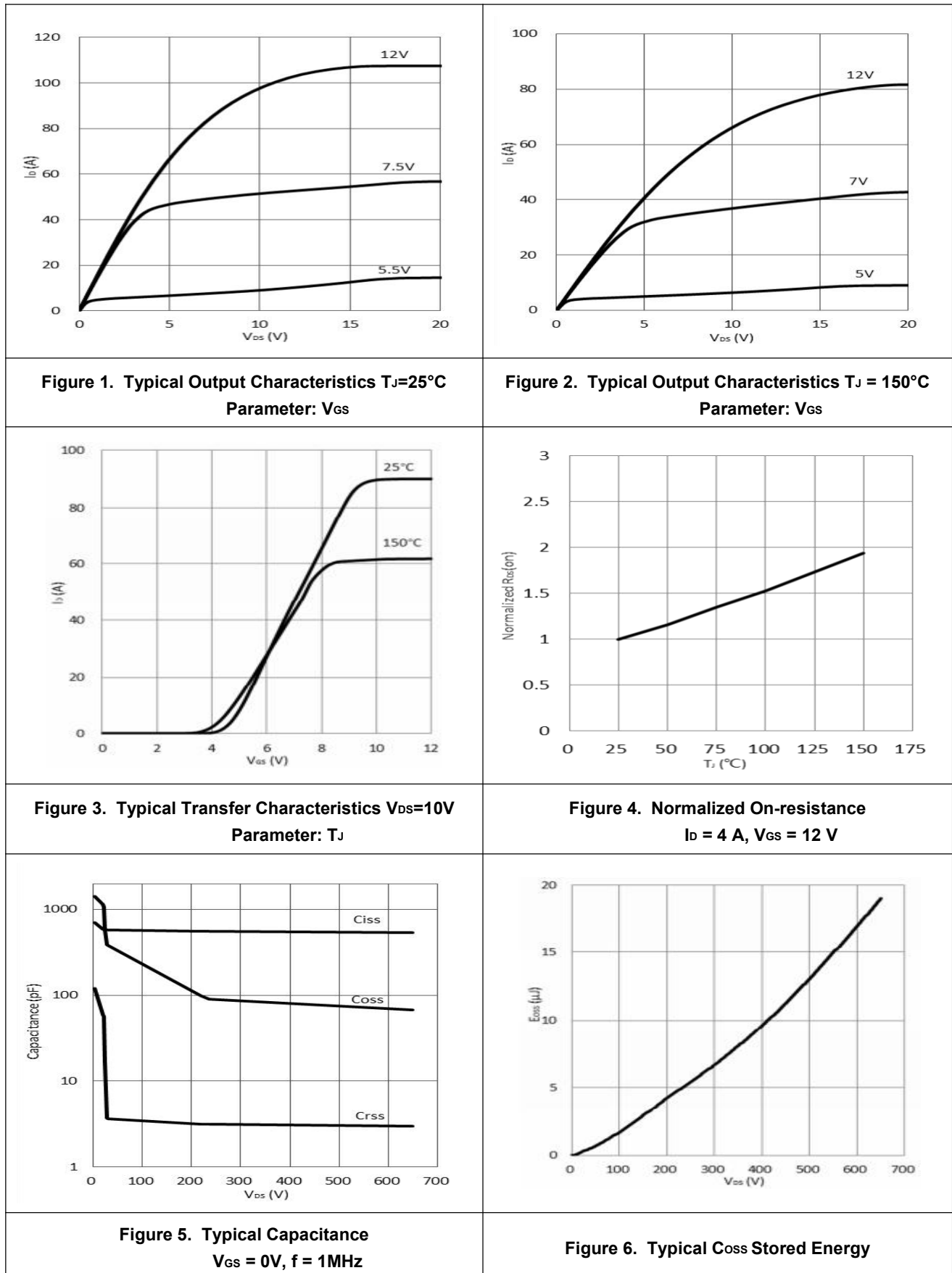
■ Drain-Source Diode Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{SD}	Reverse Voltage	$V_{GS} = 0V, I_S = 7 A$	-	1.2	-	V
		$V_{GS} = 0V, I_S = 13 A$	-	1.5	-	V
t_{RR}	Reverse Recovery Time	$I_S = 13 A, V_{DS} = 400V,$ $di/dt = 1000 A/\mu s$	-	33	-	ns
Q_{RR}	Reverse Recovery Charge		-	84	-	nC

Notes:

- a. In off-state, spike duty cycle $D < 0.01$, spike duration $< 1\mu s$.
- b. For increased stability at high current operation.
- c. Reflow MSL3.
- d. Device on one layer epoxy PCB for drain connection (vertical and without air stream cooling, with $6cm^2$ copper area and $70\mu m$ thickness).

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



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

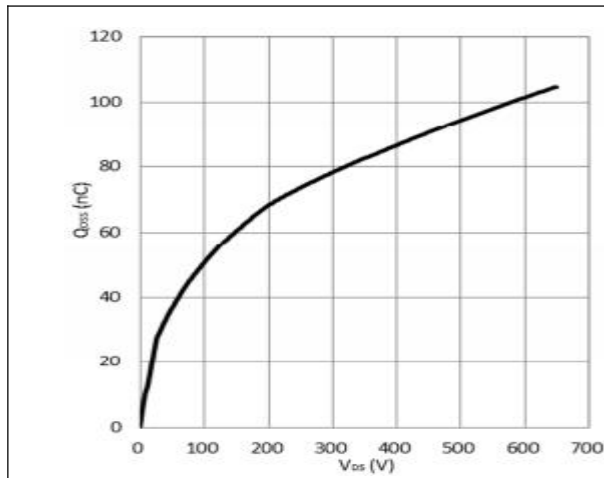


Figure 7. Typical Q_{oss}

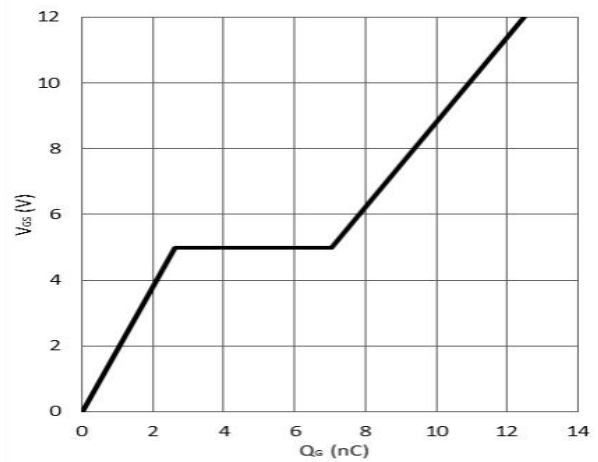


Figure 8. Typical Gate Charge

$I_{DS} = 13\text{A}$, $V_{DS} = 400\text{V}$

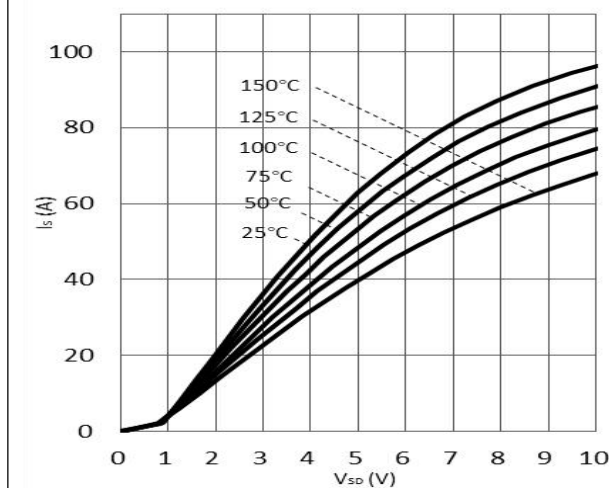


Figure 9. Forward Characteristics of Rev. Diode $I_s = f(V_{sd})$, Parameter T_J

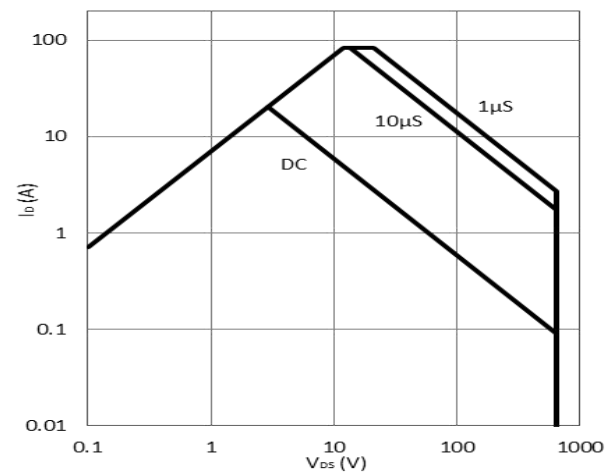


Figure 10. Safe Operating Area $T_c = 25^\circ\text{C}$
(calculated based on thermal limit)

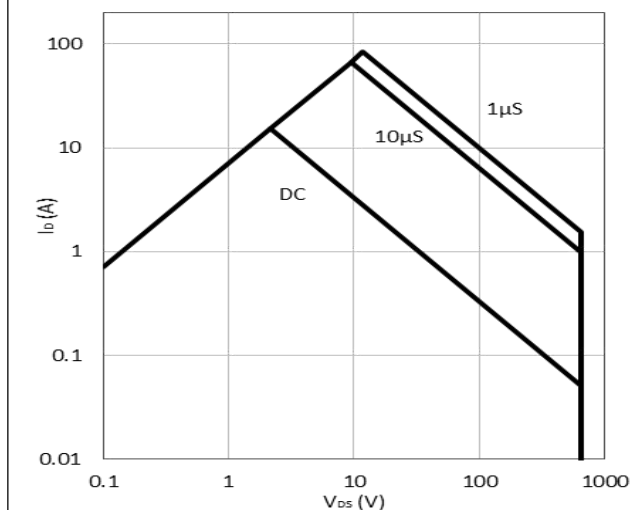


Figure 11. Safe Operating Area $T_c = 80^\circ\text{C}$
(calculated based on thermal limit)

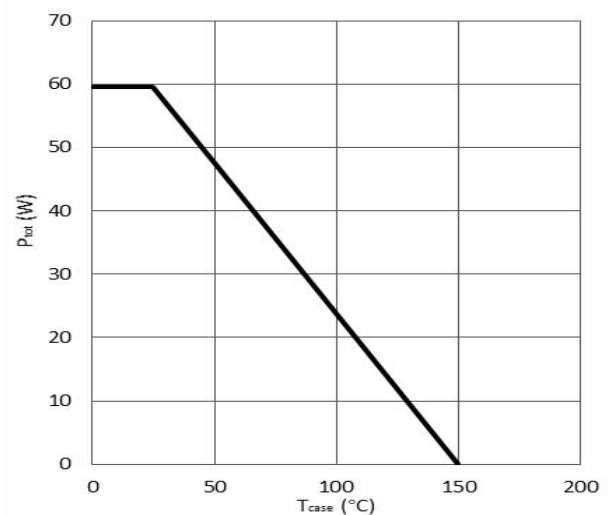


Figure 12. Power Dissipation

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

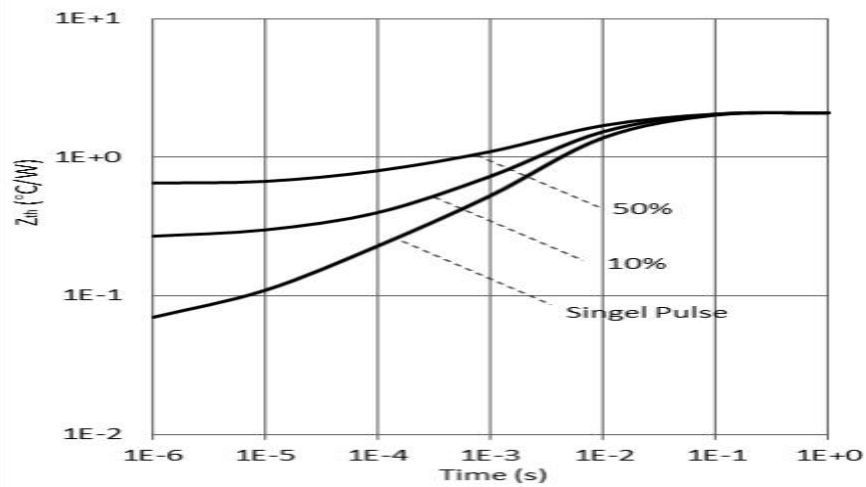


Figure 13. Transient Thermal Resistance

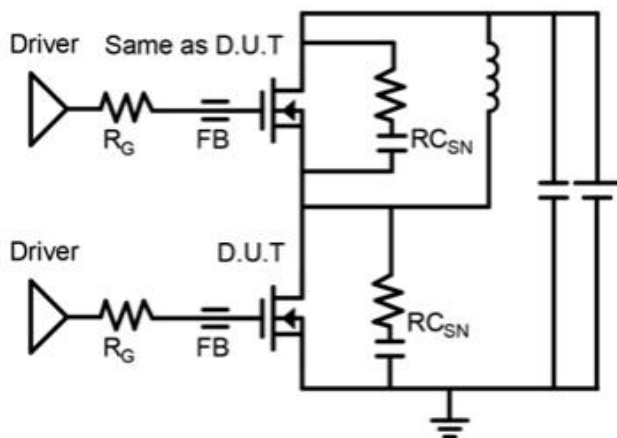


Figure 14. Switching Time Test Circuit

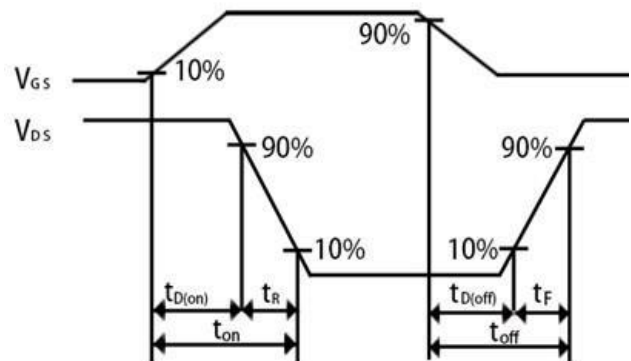


Figure 15. Switching Time Waveform

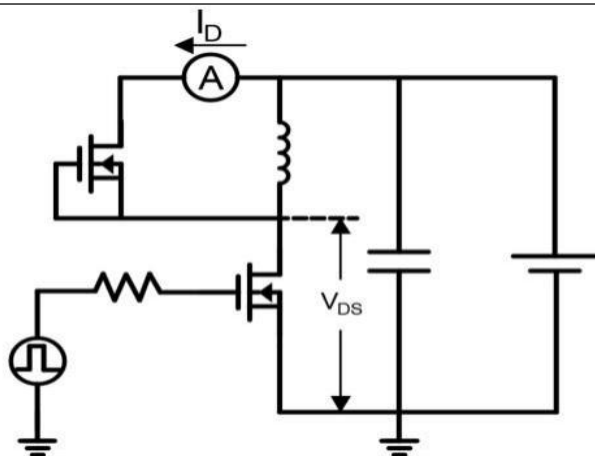


Figure 16. Diode Characteristics Test Circuit

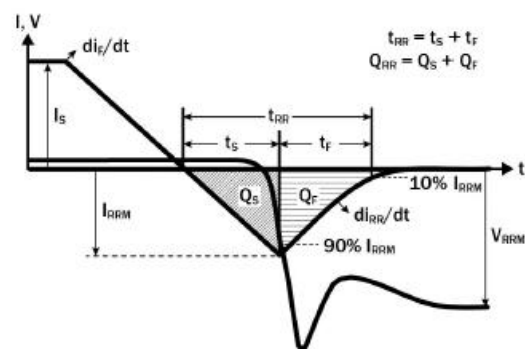
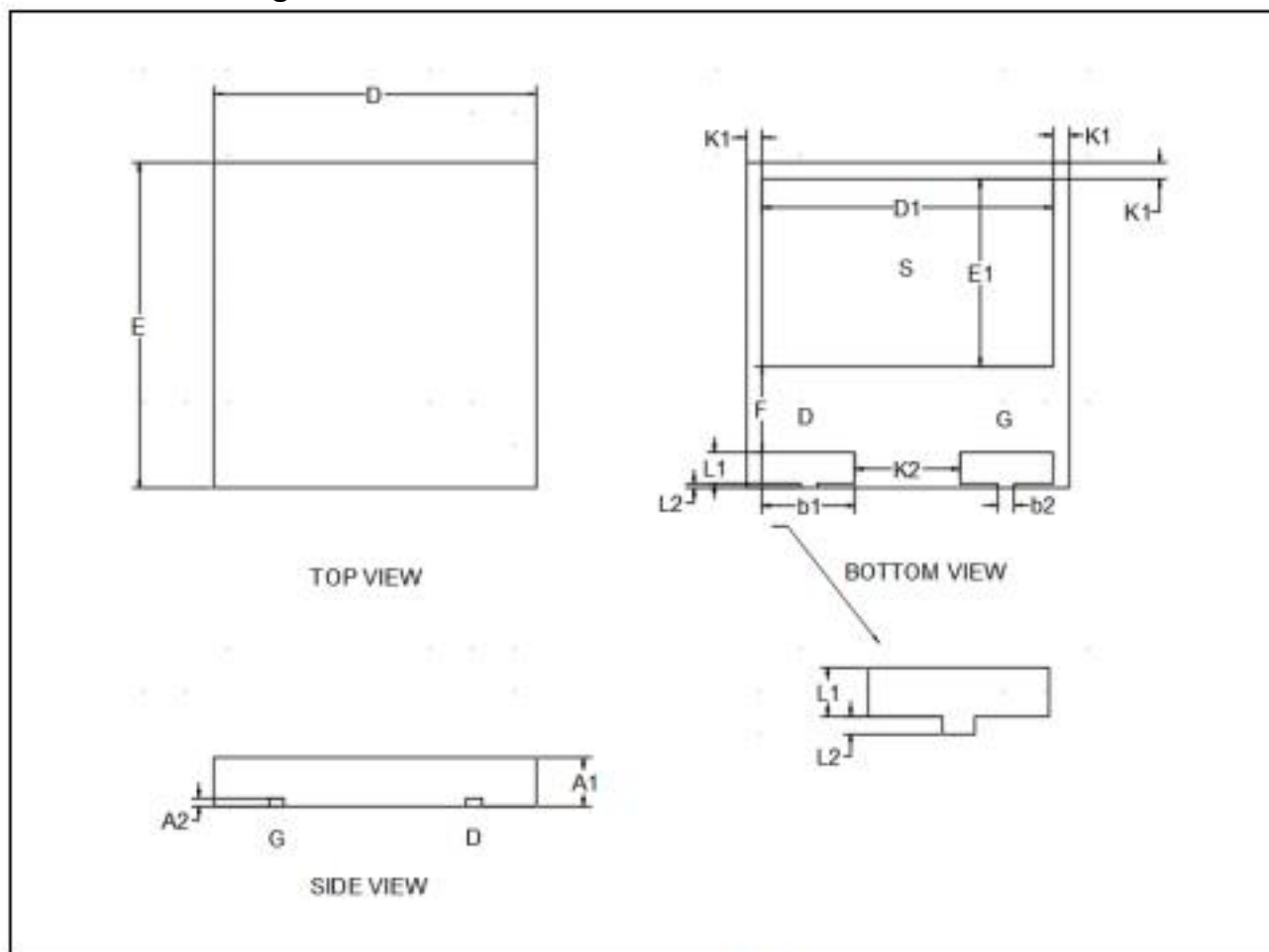


Figure 17. Diode Recovery Waveform

DFN8*8 Package Information



SYMBOL	Millimeter		
	Min	Nom	Max
A1	0.80	0.90	1.15
A2	0.19	0.203	0.22
b1	2.20	2.30	2.40
b2	0.80REF		
D	7.90	8.00	8.10
E	7.90	8.00	8.10
D1	6.90	7.20	7.50
E1	4.40	4.60	4.80
L1	0.70	0.80	0.90
L2	0.12REF		
K1	0.30	0.40	0.50
K2	2.50	2.60	2.70
F	2.05	2.15	2.35



MGZ09N65H

650V GaN Power Transistor (FET)

■ Revision History

Version	Date	Subjects (major changes since last revision)
0.1	2023-05-07	Preliminary Version
1.0	2024-10-10	Datasheet Complete