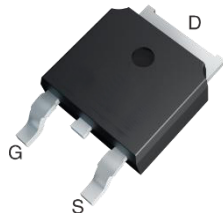
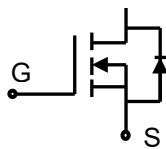


N-channel 500V, 5A Power MOSFET

Description The Power MOSFET is fabricated using the advanced planar VDMOS technology. The resulting device has low conduction resistance, superior switching performance and high avalanche energy. Features ● Low $R_{DS(on)}$ ● Low gate charge (typ. $Q_g = 9.5nC$) ● 100% UIS tested ● RoHS compliant Applications ● Power factor correction. ● Switched mode power supplies. ● LED driver.	Product Summary <table> <tr> <td>V_{DSS}</td><td>500V</td></tr> <tr> <td>I_D</td><td>5A</td></tr> <tr> <td>$R_{DS(on),typ}$</td><td>1.42Ω</td></tr> <tr> <td>$Q_{g,typ}$</td><td>9.5nC</td></tr> </table> Pin Configuration  TO-252  N-Channel MOSFET	V_{DSS}	500V	I_D	5A	$R_{DS(on),typ}$	1.42 Ω	$Q_{g,typ}$	9.5nC
V_{DSS}	500V								
I_D	5A								
$R_{DS(on),typ}$	1.42 Ω								
$Q_{g,typ}$	9.5nC								

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	500	V
Continuous drain current ¹⁾ ($T_C = 25^{\circ}C$) ($T_C = 100^{\circ}C$)	I_D	5	A
		2.5	A
Pulsed drain current ²⁾	I_{DM}	15	A
Gate-Source voltage	V_{GSS}	± 30	V
Avalanche energy, single pulse ³⁾	E_{AS}	106	mJ
Power Dissipation	P_D	76	W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^{\circ}C$
Continuous diode forward current	I_S	5	A
Diode pulse current	$I_{S,pulse}$	15	A

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.65	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient, minimal footprint ⁴⁾	$R_{\theta JA}$	62	$^{\circ}C/W$
Soldering temperature, wave soldering only allowed at leads. (1.6mm from case for 10s)	T_{sold}	260	$^{\circ}C$

Package Marking and Ordering Information

Device	Device Package	Marking	Units/Reel
HM5N50K	TO-252	HM5N50K XXXX	2500

Electrical Characteristics T_c = 25°C unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0V, I _D =0.25mA	500	-	-	V
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =0.25mA	2.0	-	4.0	V
Drain cut-off current	I _{DSS}	V _{DS} =500V, V _{GS} =0 V, T _j = 25°C	-	-	1	μA
Gate leakage current, Forward	I _{GSSF}	V _{GS} =30V, V _{DS} =0V	-	-	100	nA
Gate leakage current, Reverse	I _{GSSR}	V _{GS} =-30V, V _{DS} =0V	-	-	-100	nA
Drain-source on-state resistance	R _{DS(on)}	V _{GS} =10 V, I _D =2A T _j = 25°C T _j = 150°C	- -	1.42 -	1.78	Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} = 25V, V _{GS} = 0 V, f = 250kHz	-	391	-	pF
Output capacitance	C _{oss}		-	38.3	-	
Reverse transfer capacitance	C _{rss}		-	2.5	-	
Turn-on delay time	t _{d(on)}	V _{DD} = 250V, I _D = 4A R _G = 10Ω, V _{GS} =10V	-	9.9	-	ns
Rise time	t _r		-	29.9	-	
Turn-off delay time	t _{d(off)}		-	15.7	-	
Fall time	t _f		-	7.6	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =400V, I _D =2A V _{GS} =0 to 10V	-	1.9	-	nC
Gate to drain charge	Q _{gd}		-	4.3	-	
Gate charge total	Q _g		-	9.5	-	
Gate plateau voltage	V _{plateau}		-	4.9	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0V, I _F =7A	-	-	1.3	V
Reverse recovery time	t _{rr}	V _R =400V, I _F =5A, dI _F /dt=100 A/μs	-	248	-	ns
Reverse recovery charge	Q _{rr}		-	1263.5	-	μC
Peak reverse recovery current	I _{rrm}		-	7.3	-	A

Notes:

1. Drain current limited by maximum junction temperature and duty cycle.
2. Repetitive Rating: Pulse width limited by maximum junction temperature, maximum duty cycle is 0.7.
3. $I_{AS}=4.6A, L=10mH, V_{DD}=60V$, Starting $T_j=25^\circ C$.
4. The value of R_{thJA} is measured by placing the device in a still air box which is one cubic foot.

Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

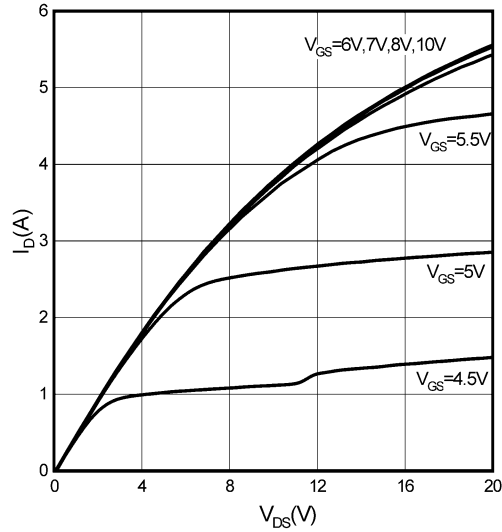


Figure 2. Transfer Characteristics

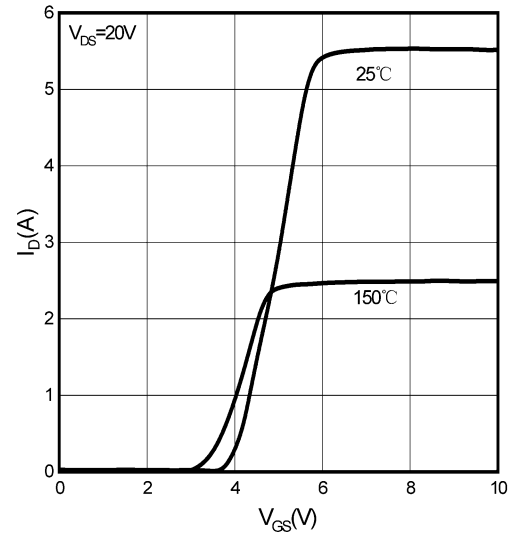


Figure 3. On-Resistance vs. Drain Current

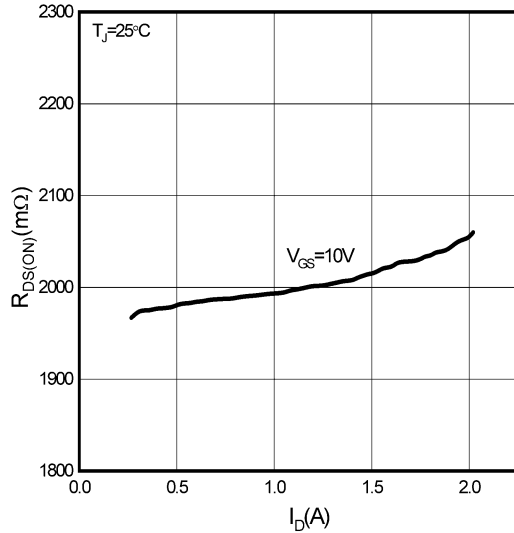


Figure 4. On-Resistance vs. Temperature

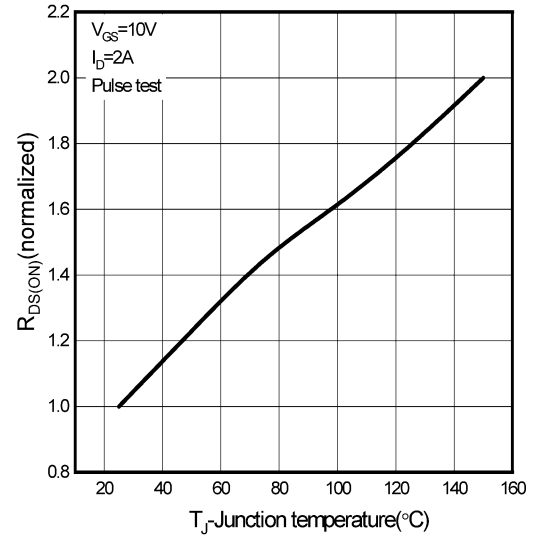


Figure 5. Breakdown Voltage vs. Temperature

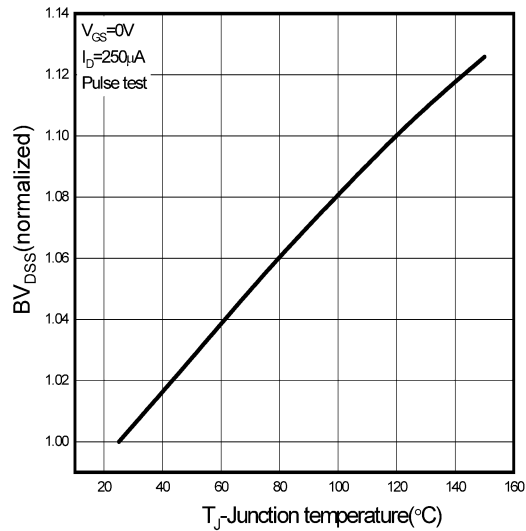


Figure 6. Threshold Voltage vs. Temperature

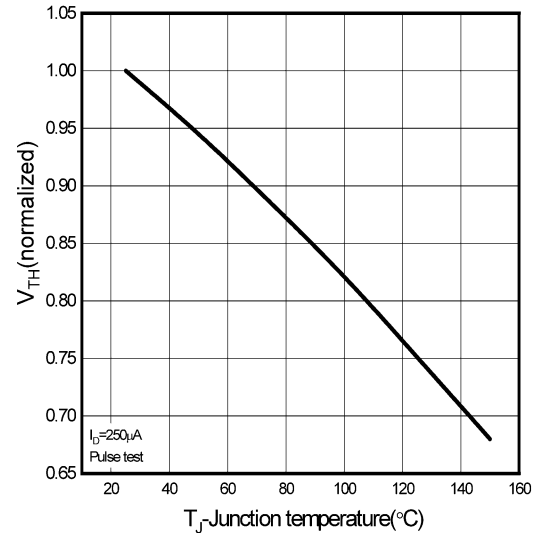


Figure 7.Rds(on) vs. Gate Voltage

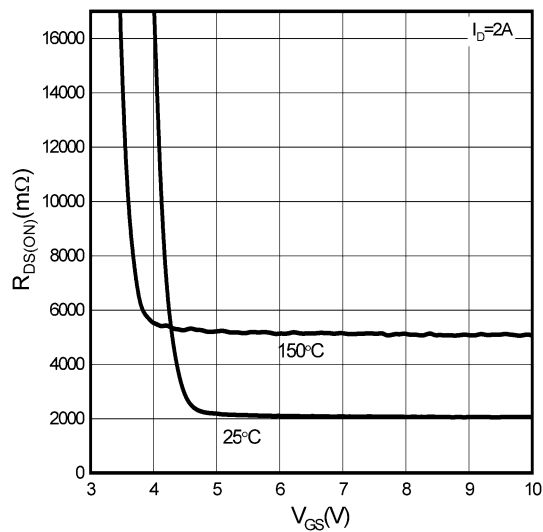


Figure 8.Body-Diode Characteristics

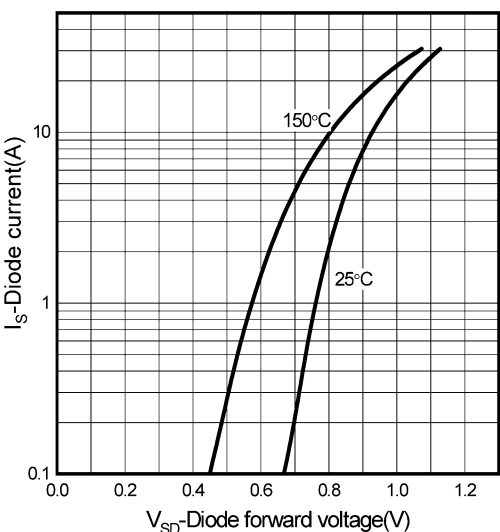


Figure 9.Capacitance Characteristics

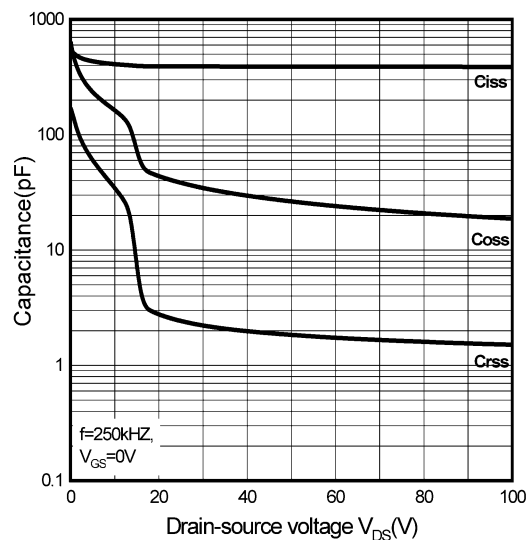


Figure 10.Gate Charge Characteristics

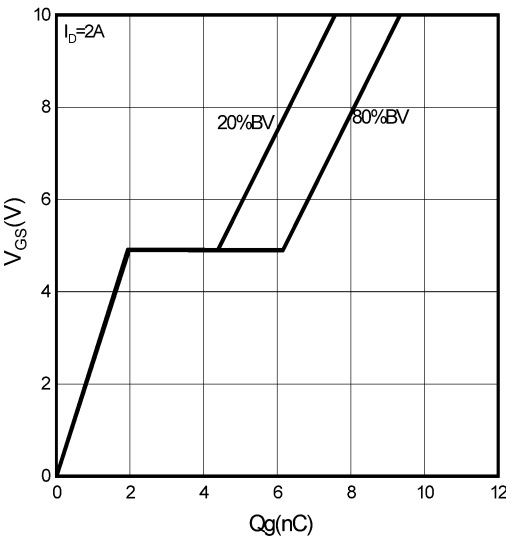


Figure 11.Drain Current Derating

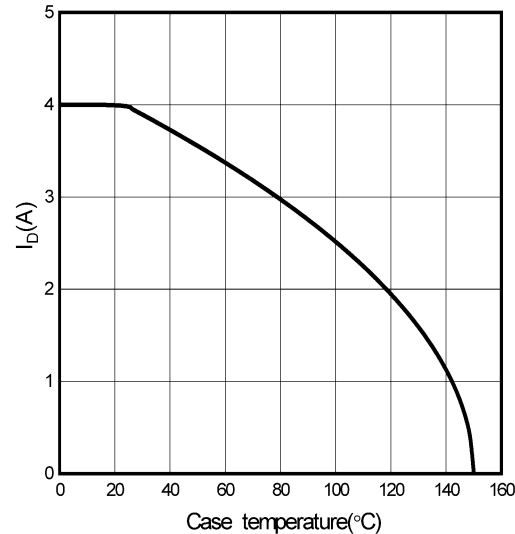


Figure 12.Power Dissipation vs. Temperature

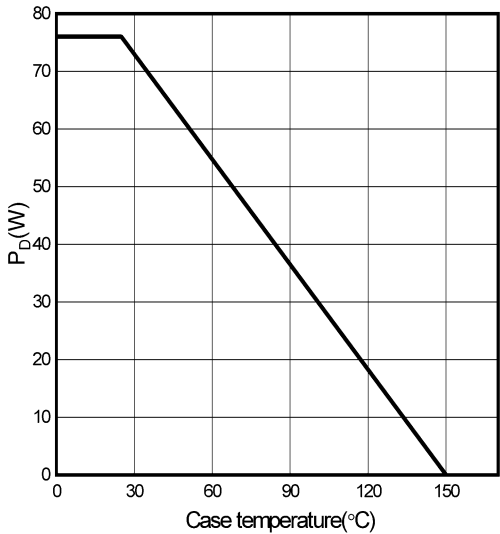


Figure 13. Safe Operating Area

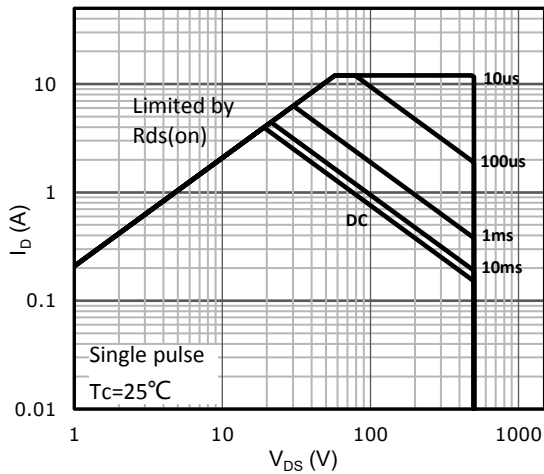
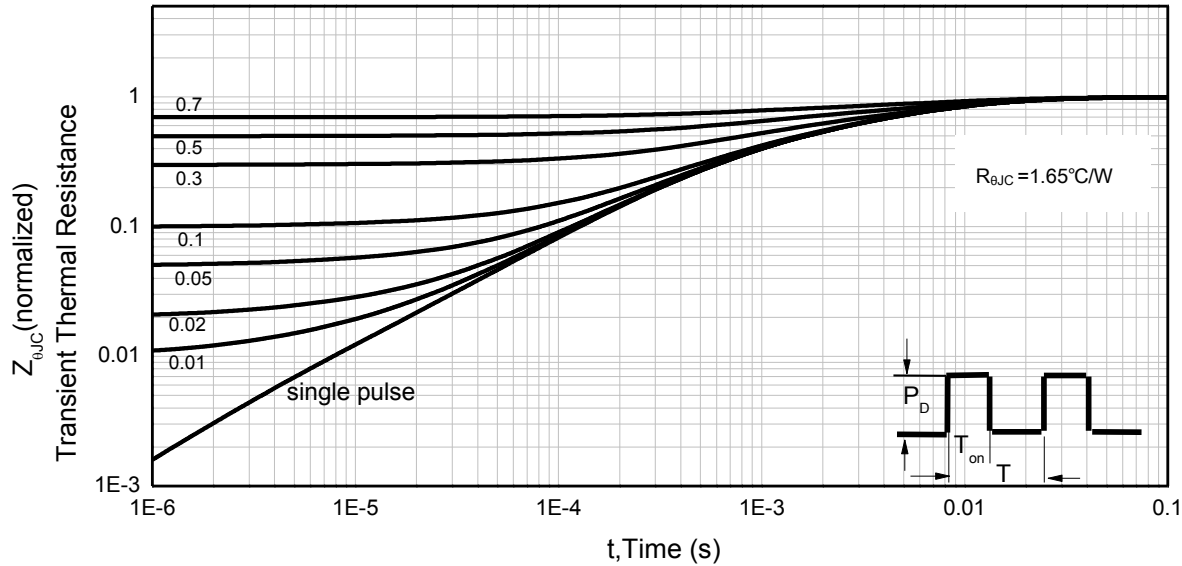
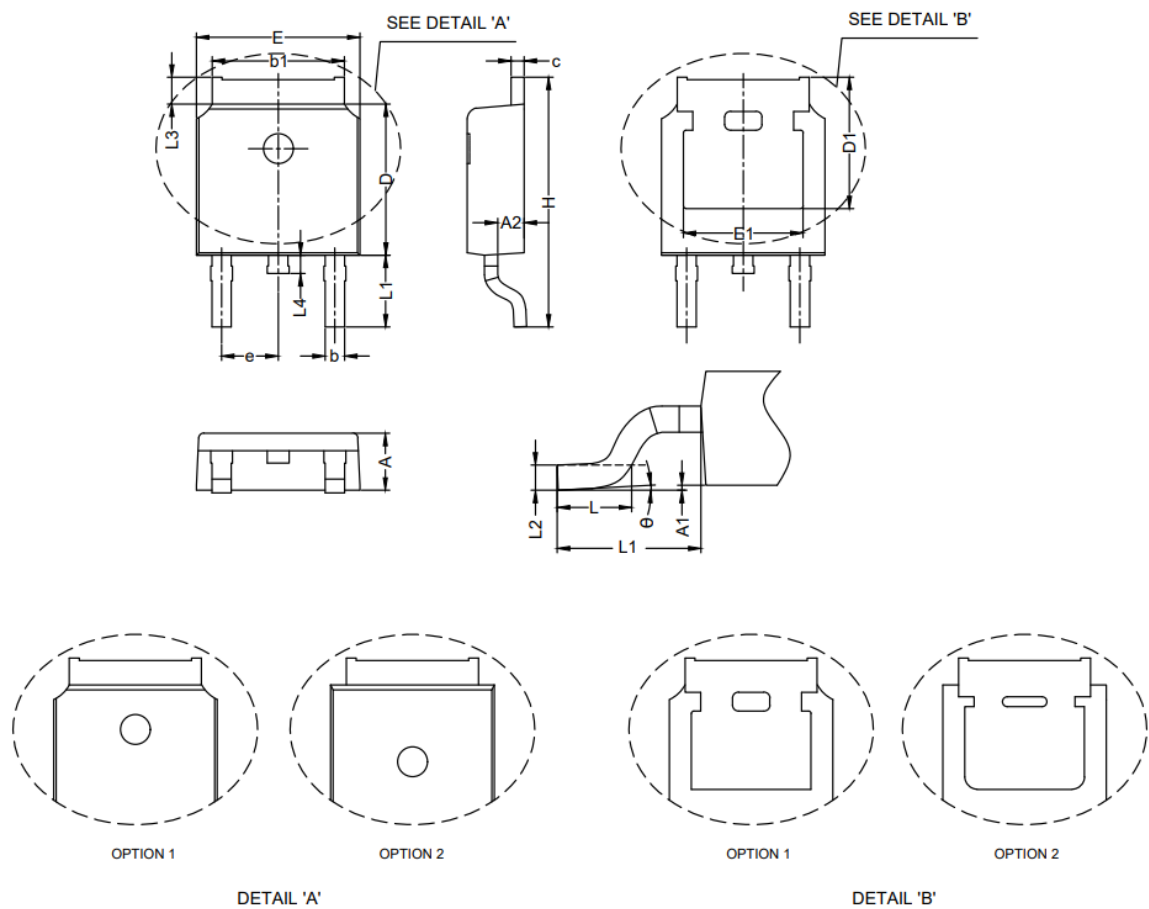


Figure 14. Normalized Maximum Transient Thermal Impedance (R_{thJC})



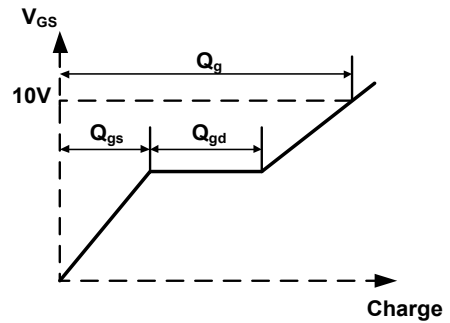
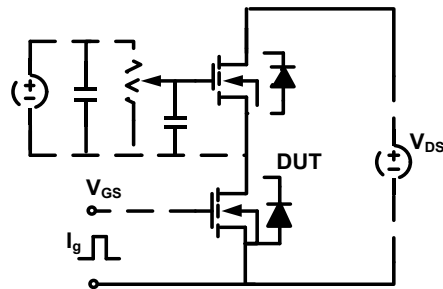
Mechanical Dimensions for TO-252



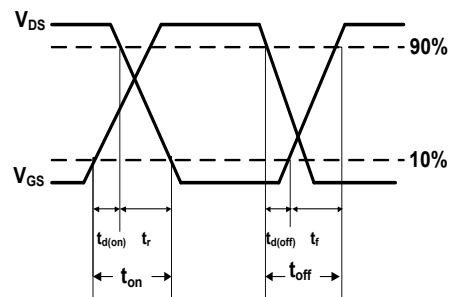
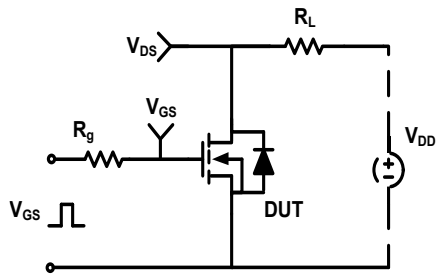
SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.10	2.50	0.083	0.098
A1	0.00	0.20	0.000	0.008
A2	0.85	1.17	0.033	0.046
b	0.60	0.90	0.024	0.035
b1	4.95	5.48	0.195	0.216
c	0.41	0.61	0.016	0.024
D	5.95	6.35	0.234	0.250
D1	5.21	-	0.205	-
E	6.35	6.80	0.250	0.268
E1	4.32	-	0.170	-
e	2.286 BSC		0.090 BSC	
H	9.40	10.50	0.370	0.413
L	0.95	1.78	0.037	0.070
L1	2.90 REF		0.114 REF	
L2	0.51 BSC		0.020 BSC	
L3	0.88	1.28	0.035	0.050
L4	-	1.02	-	0.040
theta	0°	10°	0°	10°

Test Circuit & Waveforms

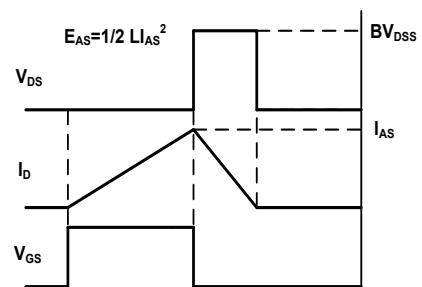
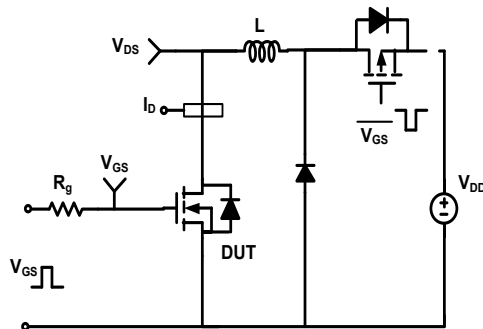
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching (UIS) Test Circuit & Waveform



Diode Recovery Test Circuit & Waveform

