

600V 0.06Ω Super Junction Power MOSFET

Description

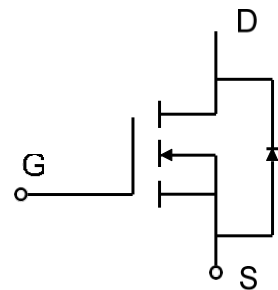
WMOS™ C4 is Wayon's 4th generation super junction MOSFET family that is utilizing charge balance technology for extremely low on-resistance and low gate charge performance. WMOS™ C4 is suitable for applications which require superior power density and outstanding efficiency.

Features

- $V_{DS}=650V @ T_{j,max}$
- Typ. $R_{DS(on)}=0.06\Omega$
- 100% UIS tested
- Pb-free plating, Halogen free

Applications

LED Lighting, Charger, Adapter, PC, LCD TV, Server



Absolute Maximum Ratings

Parameter	Symbol	WMK/WMM/WMN/WMJ	WML	Unit
Drain-source voltage	V_{DSS}	600		V
Continuous drain current ¹⁾ ($T_C = 25^\circ C$)	I_D	50		A
($T_C = 100^\circ C$)		26		A
Pulsed drain current ²⁾	I_{DM}	90		A
Gate-source voltage	V_{GS}	± 30		V
Avalanche energy, single pulse ³⁾	E_{AS}	940		mJ
Avalanche energy, repetitive ²⁾	E_{AR}	1.3		mJ
Avalanche current, repetitive ²⁾	I_{AR}	5		A
Power dissipation ($T_C = 25^\circ C$)	P_D	350	34	W
- Derate above 25°C		2.8	0.27	W/°C
Operating and storage temperature range	T_j, T_{stg}	-55 to +150		°C
Continuous diode forward current ¹⁾	I_S	50		A
Diode pulse current ²⁾	$I_{S,pulse}$	90		A

Thermal Characteristics

Parameter	Symbol	WMK/WMM/WMN/WMJ	WML	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	0.36	3.6	°C/W
Thermal resistance, junction-to-ambient	$R_{\theta A}$	62	80	°C/W



WMK53N60C4

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} =0 V, I _D =1 mA	600	-	-	V
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =0.25mA	2	3	4	V
Drain cut-off current	I _{DSS}	V _{DS} =600 V, V _{GS} =0V, T _j = 25°C T _j = 125°C	- -	- 50	1 -	μA
Gate leakage current, forward	I _{GSSF}	V _{GS} =20V, V _{DS} =0V	-	-	100	nA
Gate leakage current, reverse	I _{GSSR}	V _{GS} =-20V, V _{DS} =0V	-	-	-100	nA
Drain-source on-state resistance	R _{DS(on)}	V _{GS} =10 V, I _D =15A T _j = 25°C	- -	0.06	0.07	Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} = 100V, V _{GS} = 0V, f = 1 MHz	-	3400	-	pF
Output capacitance	C _{oss}		-	115	-	
Reverse transfer capacitance	C _{rss}		-	2.7	-	
Turn-on delay time	t _{d(on)}	V _{DD} = 300V, I _D = 15A R _G = 25Ω, V _{GS} =10V	-	53	-	ns
Rise time	t _r		-	40	-	
Turn-off delay time	t _{d(off)}		-	214	-	
Fall time	t _f		-	28	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =480V, I _D =15A, V _{GS} =0 to 10V	-	15.0	-	nC
Gate to drain charge	Q _{gd}		-	15.6	-	
Gate charge total	Q _g		-	58.0	-	
Gate plateau voltage	V _{plateau}		-	5.0	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0 V, I _F =15A	-	-	1.2	V
Reverse recovery time	t _{rr}	V _R =50V, I _F =15A, dI _F /dt=100A/μs	-	280	-	ns
Reverse recovery charge	Q _{rr}		-	4.3	-	μC
Peak reverse recovery current	I _{rrm}		-	30	-	A

Notes:

- Limited by T_{j max}. Maximum duty cycle D=0.5.
- Pulse width limited by maximum junction temperature.
- I_{AS} = 5A, V_{DD} = 50V, R_G = 25Ω, starting T_j = 25°C.

Typical Performance Characteristics

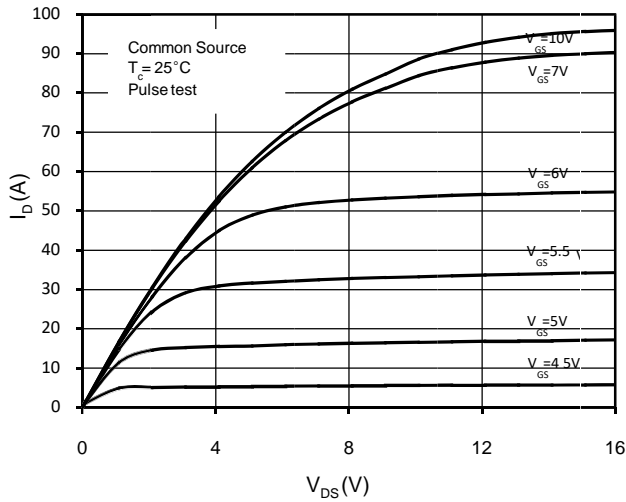


Figure 1. On-Region Characteristics

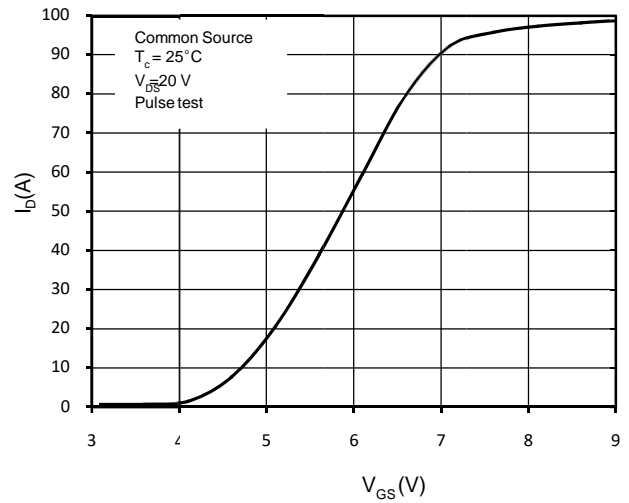


Figure 2. Transfer Characteristics

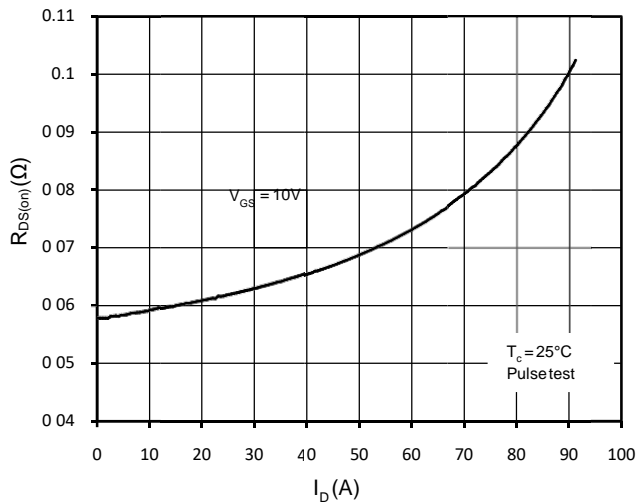


Figure 3. Static Drain-Source On Resistance

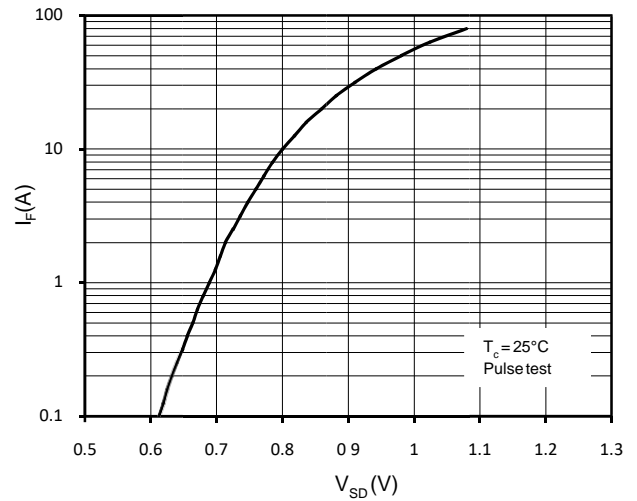


Figure 4. Body-Diode Forward Characteristics

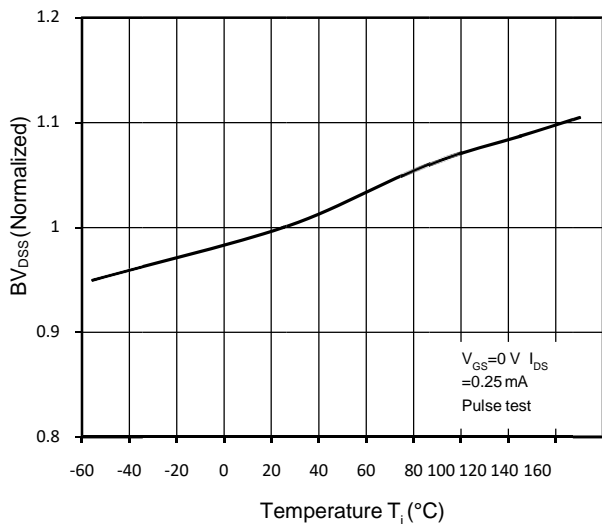


Figure 5. Normalized BV_{DS} vs. Temperature

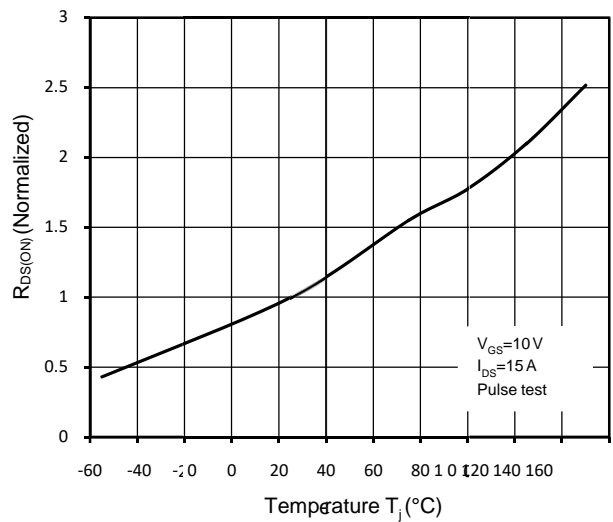


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

Typical Performance Characteristics(Con.)

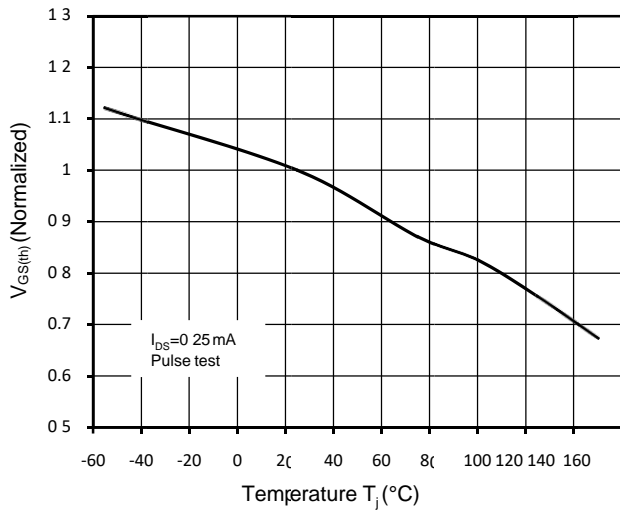


Figure 7. Threshold Voltage vs. Temperature

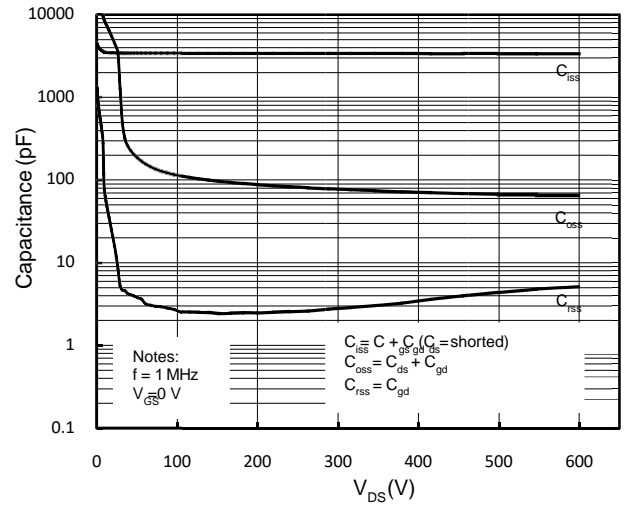


Figure 8. Capacitance Characteristics

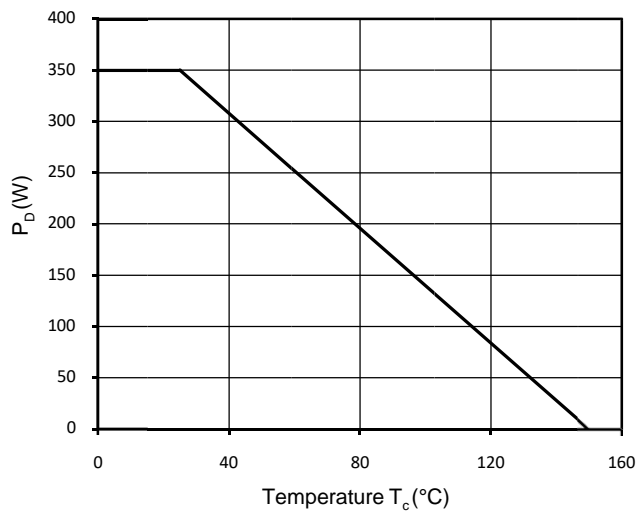


Figure 9. Power Dissipation

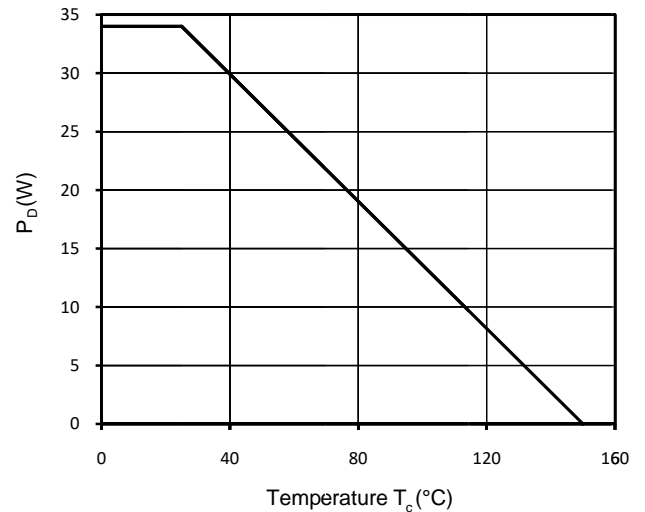


Figure 10. Power Dissipation (TO-220F)

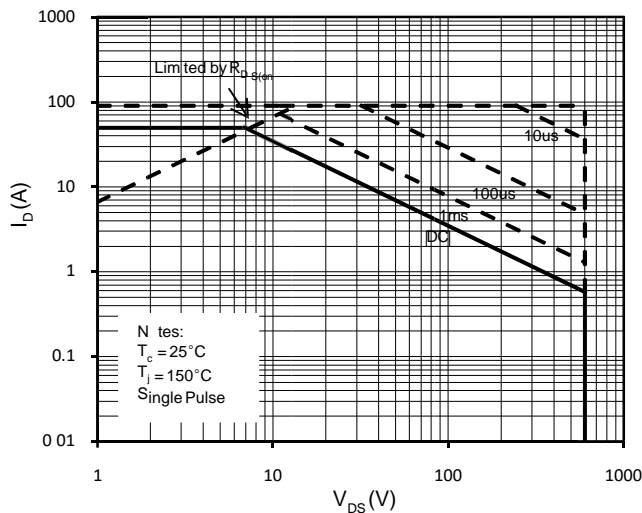


Figure 11. Maximum Safe Operating Area

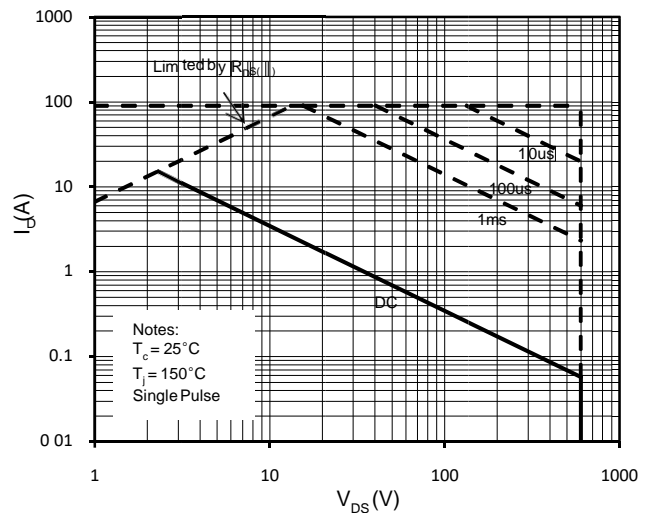


Figure 12. Maximum Safe Operating Area (TO-220F)

Typical Performance Characteristics(Con.)

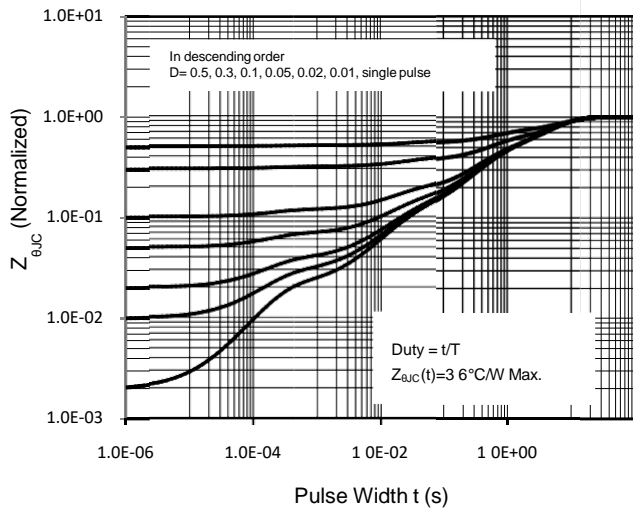


Figure 13. Transient Thermal Response Curve (TO-220F)

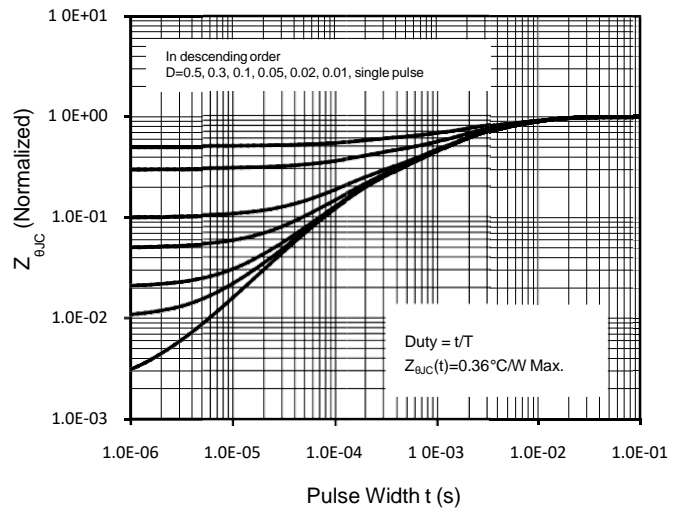


Figure 14. Transient Thermal Response Curve

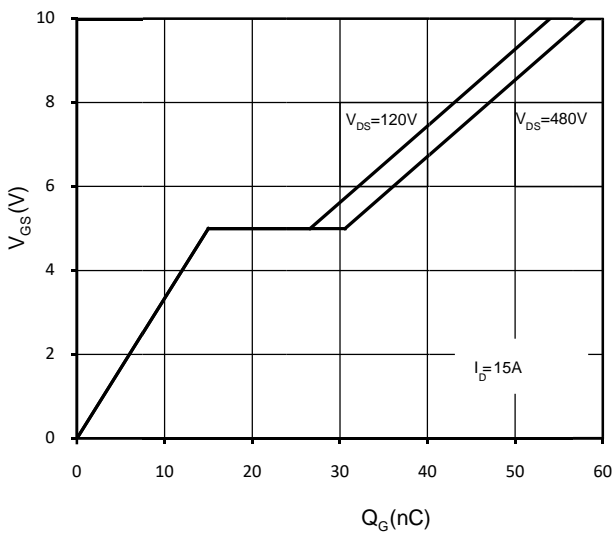
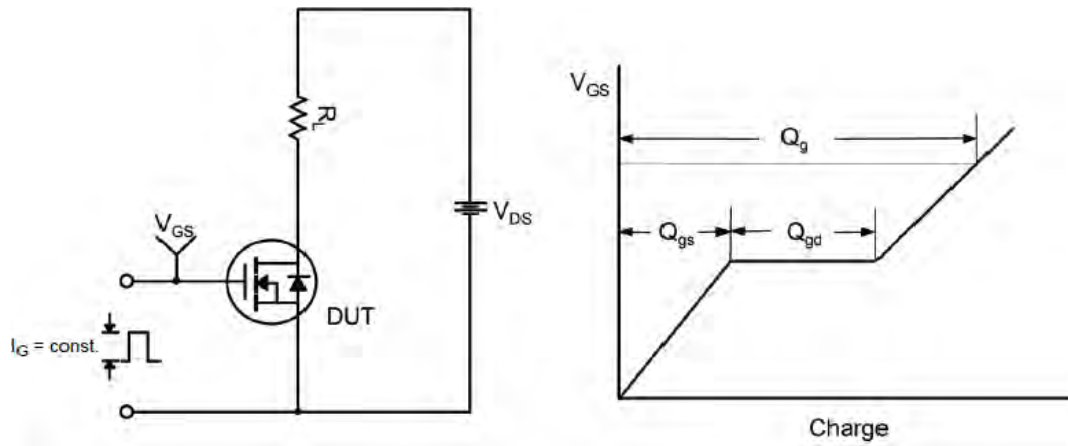
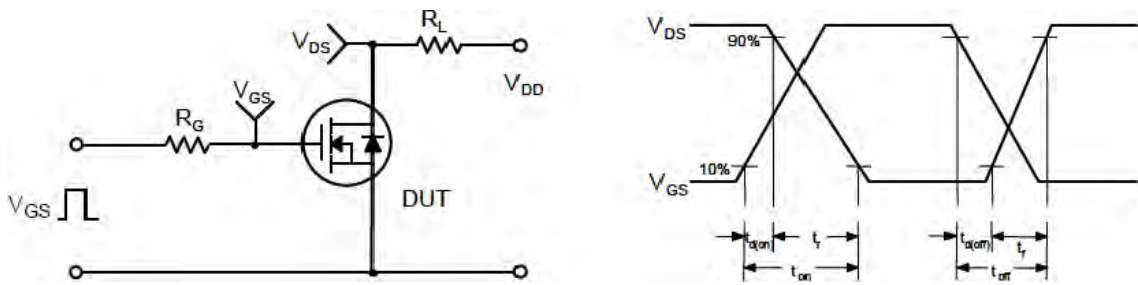


Figure 15. Gate Charge Characteristics

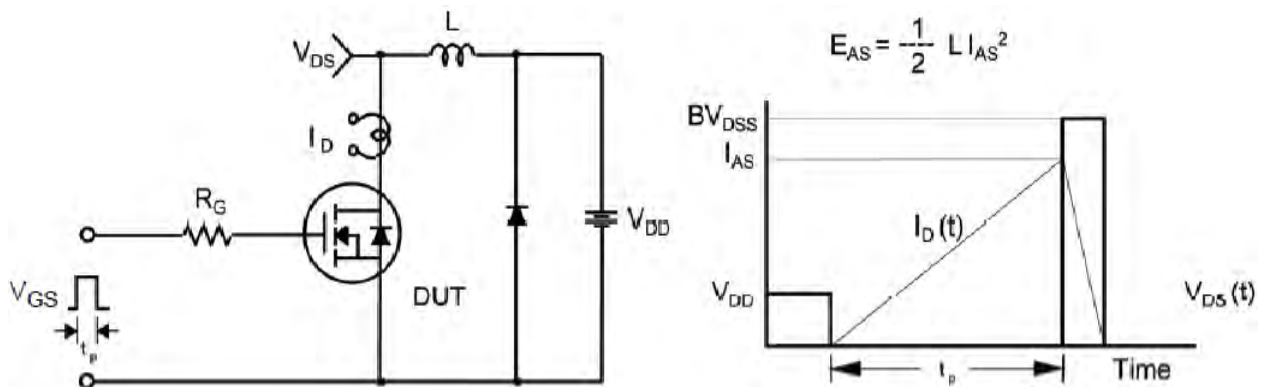
Gate Charge Test Circuit & Waveform



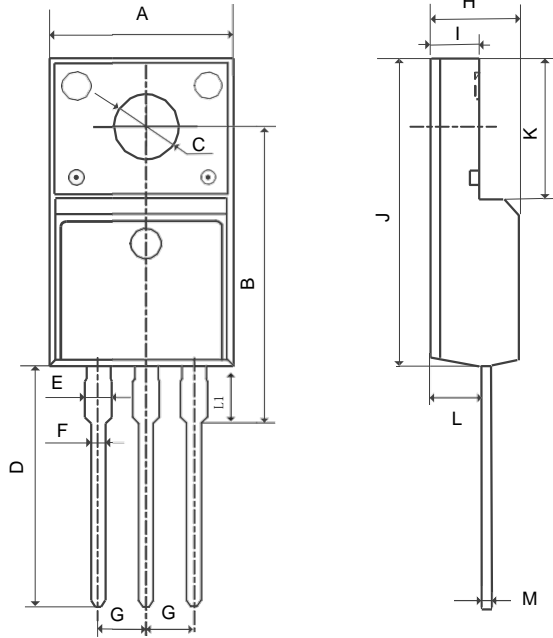
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions for TO-220F



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	9.96	10.36
B	15.10	16.10
C	3.03	3.38
D	12.64	13.28
E	1.18	1.58
F	0.70	0.95
G	2.54REF	
H	4.50	4.90
I	2.34	2.74
J	15.57	16.17
K	6.70REF	
L	2.56	2.96
M	0.40	0.65
L1	2.85	3.45