

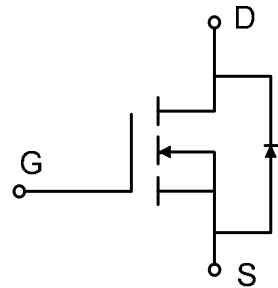
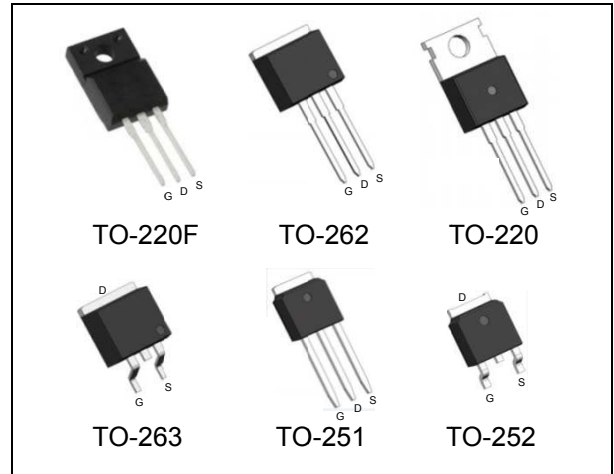
700V 0.35Ω Super Junction Power MOSFET

Description

WMOS™ EM is Wayon's 3rd generation super junction MOSFET family that is utilizing charge balance technology for extremely low on-resistance and low gate charge performance. WMOS™ EM is suitable for applications which require superior power density and outstanding efficiency.

Features

- $V_{DS} = 750V @ T_{j,max}$
- Typ. $R_{DS(on)} = 0.35\Omega$
- 100% UIS tested
- Pb-free plating, Halogen free



Applications

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

Absolute Maximum Ratings

Parameter	Symbol	WMK/WMM/WMO/WMP/WMN	WML	Unit
Drain-source voltage	V_{DS}	700		V
Continuous drain current ¹⁾ ($T_C = 25^\circ C$)	I_D	11		A
($T_C = 100^\circ C$)		6.5		A
Pulsed drain current ²⁾	I_{DM}	35		A
Gate-source voltage	V_{GS}	± 30		V
Avalanche energy, single pulse ³⁾	E_{AS}	145		mJ
Avalanche energy, repetitive ²⁾	E_{AR}	0.21		mJ
Avalanche current, repetitive ²⁾	I_{AR}	2		A
Power dissipation ($T_C = 25^\circ C$)	P_D	85	31	W
- Derate above $25^\circ C$		0.68	0.25	W/ $^\circ C$
Operating and storage temperature range	T_i, T_{stg}	-55 to +150		$^\circ C$
Continuous diode forward current	I_S	11		A
Diode pulse current	$I_{S,pulse}$	35		A
MOSFET dv/dt ruggedness	dv/dt	50		V/ns
Peak diode recovery voltage slope	dv/dt	15		V/ns

Thermal Characteristics

Parameter	Symbol	WMK/WMM/WMO/WMP/WMN	WML	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	1.47	4	$^{\circ}\text{C/W}$
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	62	80	$^{\circ}\text{C/W}$

Electrical Characteristics $T_c = 25^{\circ}\text{C}$, 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 =0.25 mA	700	-	-	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} =700 V, V _{GS} =0 V, T _J = 25°C T _J = 125°C	- -	- 50	1 -	μA
Gate leakage current, forward	I _{GSSF}	V _{GS} =20 V, V _{DS} =0 V	-	-	100	nA
Gate leakage current, reverse	I _{GSSR}	V _{GS} = -20 V, V _{DS} =0 V	-	-	-100	nA
Drain-source on-state resistance	R _{DS(on)}	V _{GS} =10 V, I _D =2 A	--	0.35	0.39	Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} = 100 V, V _{GS} = 0 V, f = 1 MHz	-	710	-	pF
Output capacitance	C _{oss}		-	25	-	
Reverse transfer capacitance	C _{rss}		-	2	-	
Turn-on delay time	t _{d(on)}	V _{DD} = 300V, I _D = 5A R _G = 25Ω, V _{GS} =10V	-	20	-	ns
Rise time	t _r		-	16	-	
Turn-off delay time	t _{d(off)}		-	61	-	
Fall time	t _f		-	17	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =480 V, I _D =5A, V _{GS} =0 to 10 V	-	3.4	-	nC
Gate to drain charge	Q _{gd}		-	10.1	-	
Gate charge total	Q _g		-	20.3	-	
Gate plateau voltage	V _{plateau}		-	4.7	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0 V, I _F =2A	-	-	1.2	V
Reverse recovery time	t _{rr}	V _R =50 V, I _F =5A, dI _F /dt=100 A/μs	-	213	-	ns
Reverse recovery charge	Q _{rr}		-	2.1	-	μC
Peak reverse recovery current	I _{rrm}		-	20	-	A

Notes:

1. Limited by $T_{j\max}$. Maximum duty cycle $D=0.5$.
2. Repetitive rating: pulse width limited by maximum junction temperature.
3. $I_{AS}=2\text{ A}$, $V_{DD}=50\text{ V}$, $R_G=25\Omega$, starting $T_j=25^{\circ}\text{C}$.

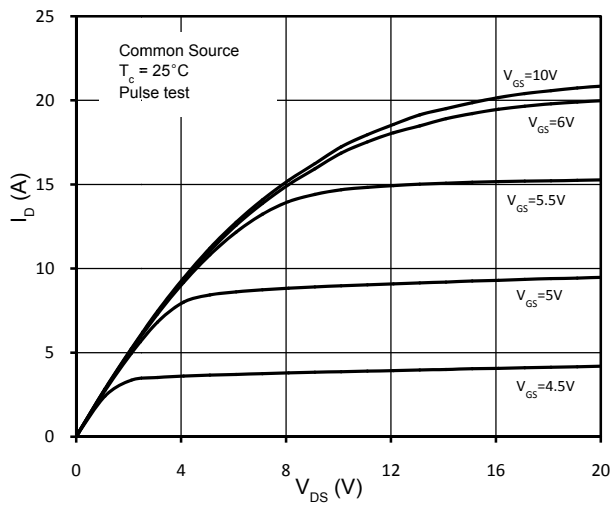


Figure 1. On-Region Characteristics

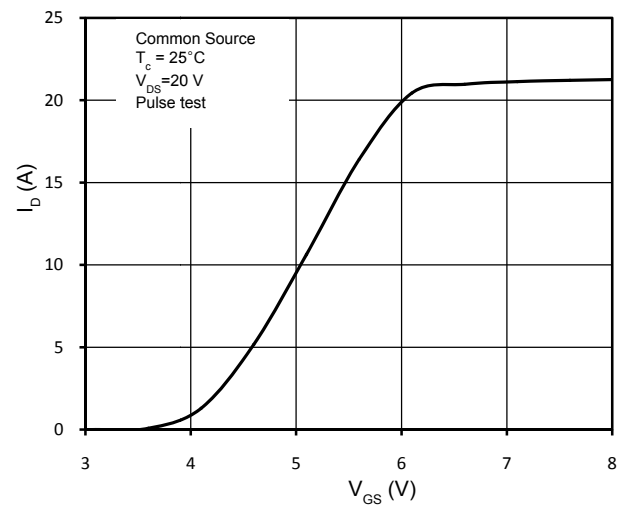


Figure 2. Transfer Characteristics

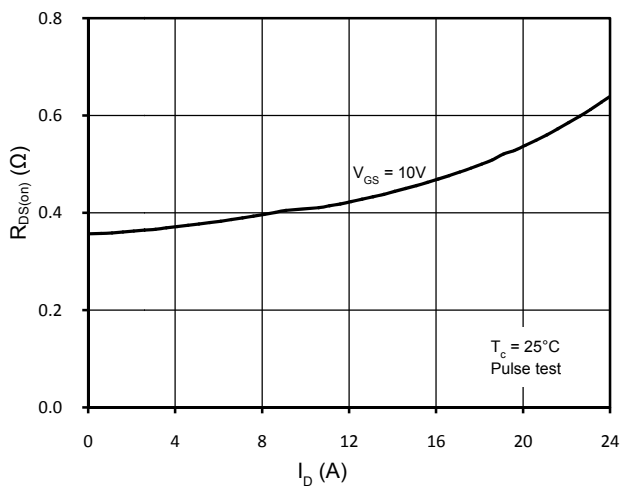


Figure 3. Static Drain-Source On Resistance

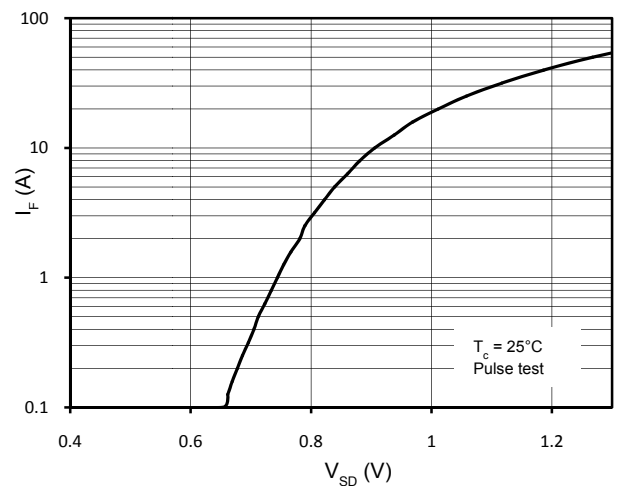
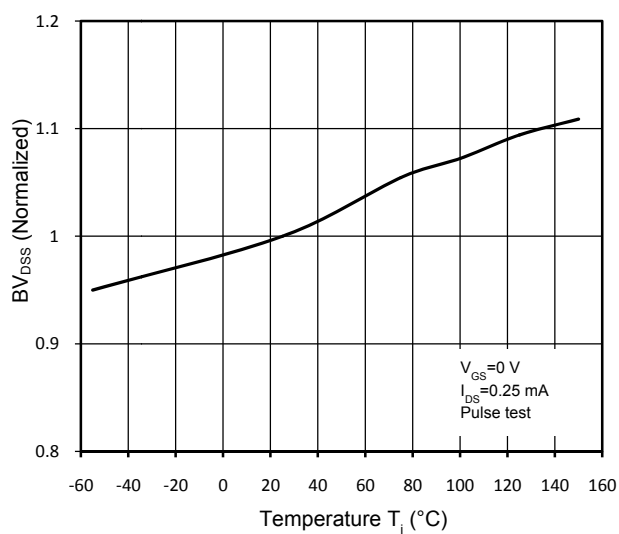
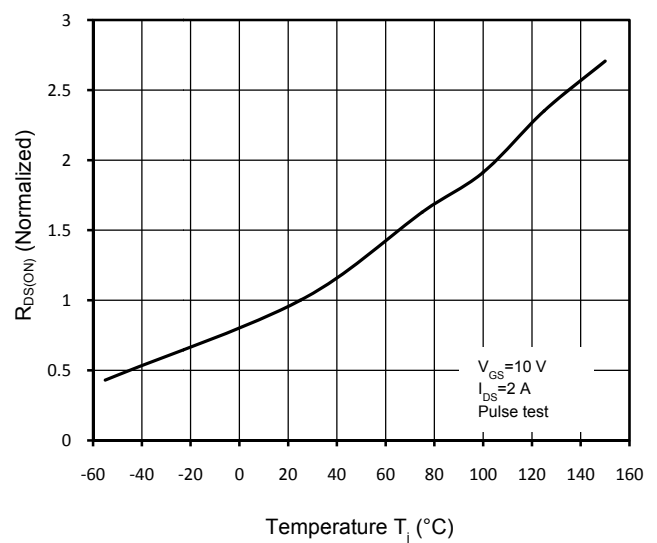


Figure 4. Body-Diode Forward Characteristics

Figure 5. Normalized BV_{DS} vs. TemperatureFigure 6. Normalized $R_{DS(on)}$ vs. Temperature

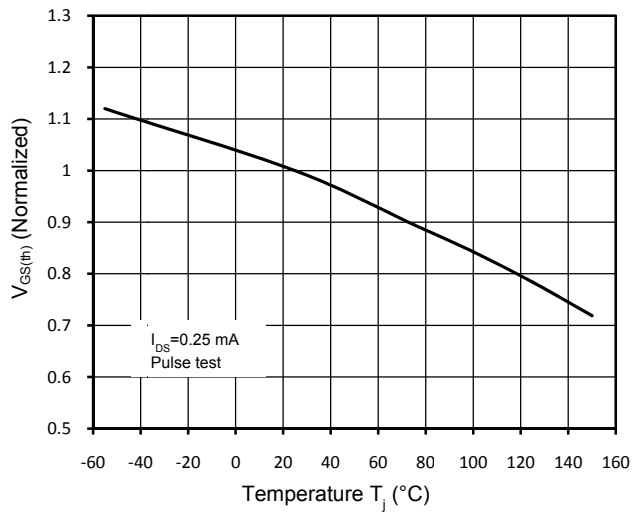


Figure 7. Threshold Voltage vs. Temperature

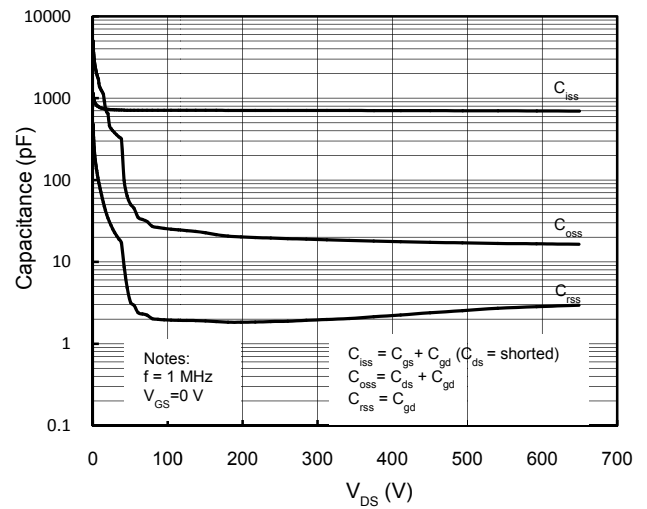


Figure 8. Capacitance Characteristics

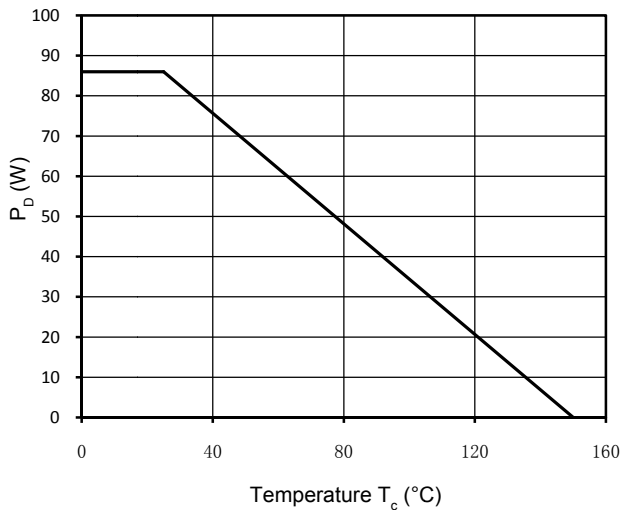


Figure 9. Power Dissipation

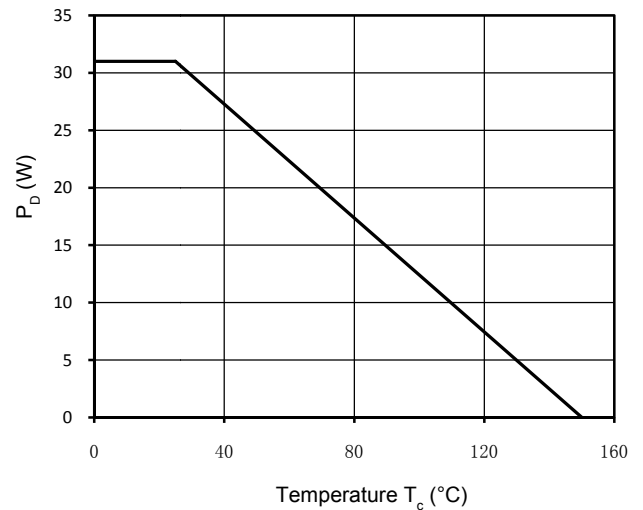


Figure 10. Power Dissipation (TO-220F)

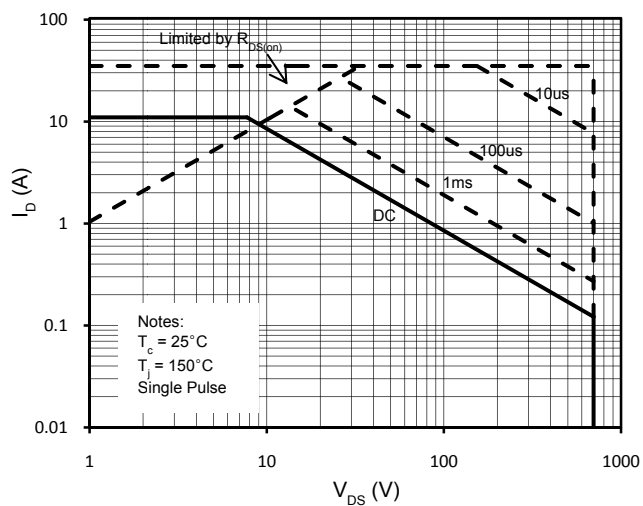


Figure 11. Maximum Safe Operating Area

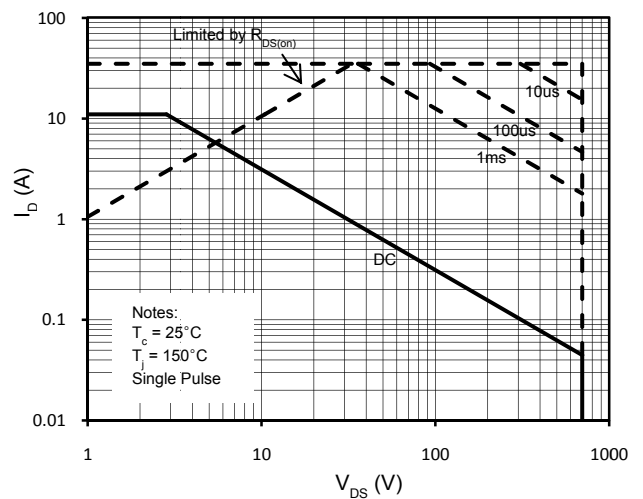


Figure 12. Maximum Safe Operating Area (TO-220F)

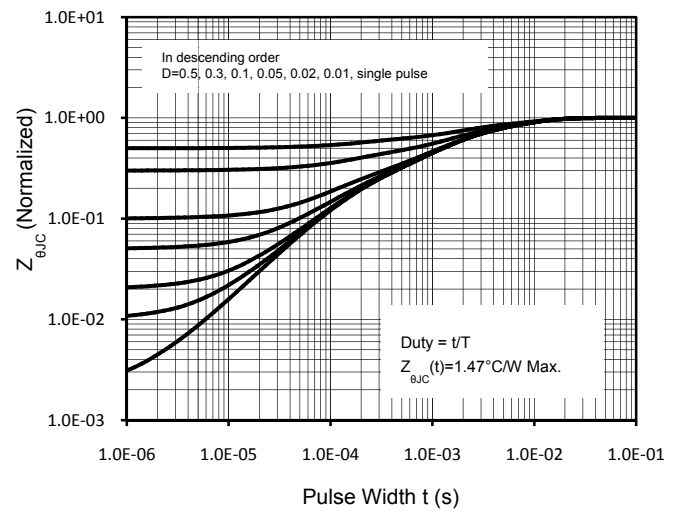
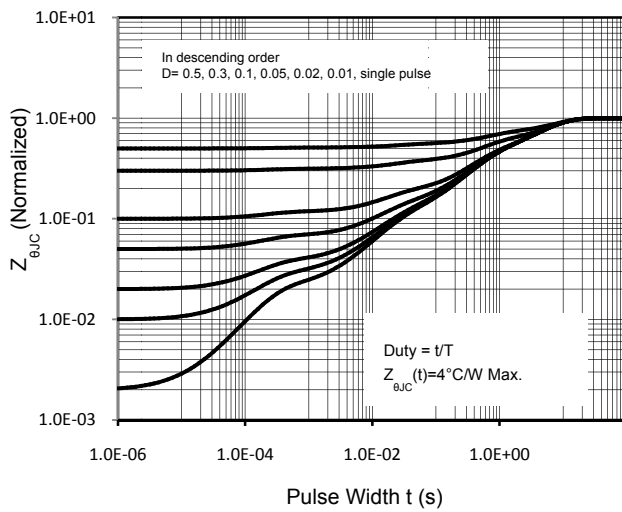


Figure 13. Transient Thermal Response Curve (TO-220F) Figure 14. Transient Thermal Response Curve

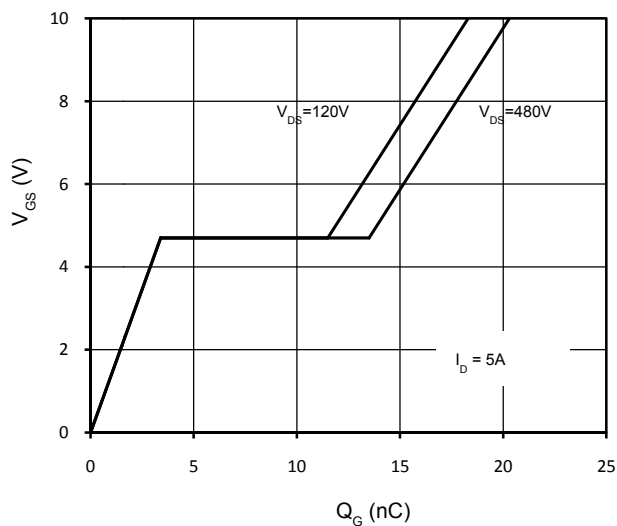
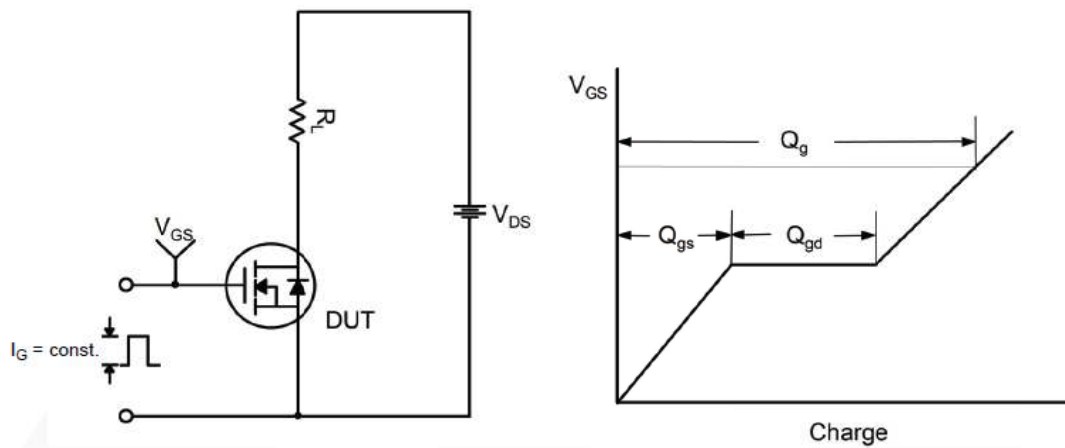
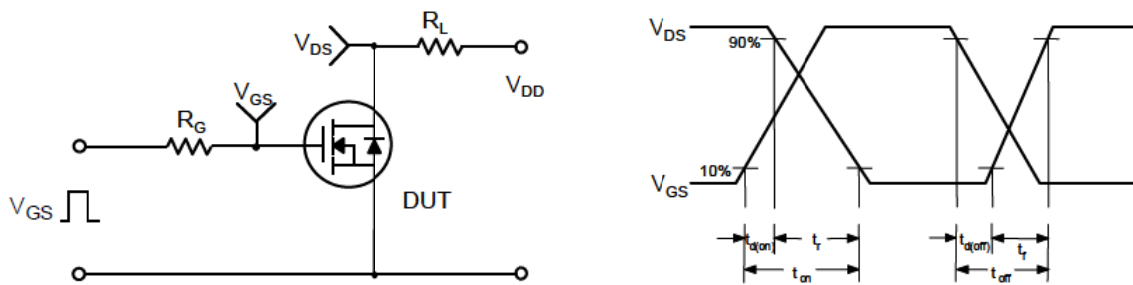


Figure 15. Gate Charge Characteristics

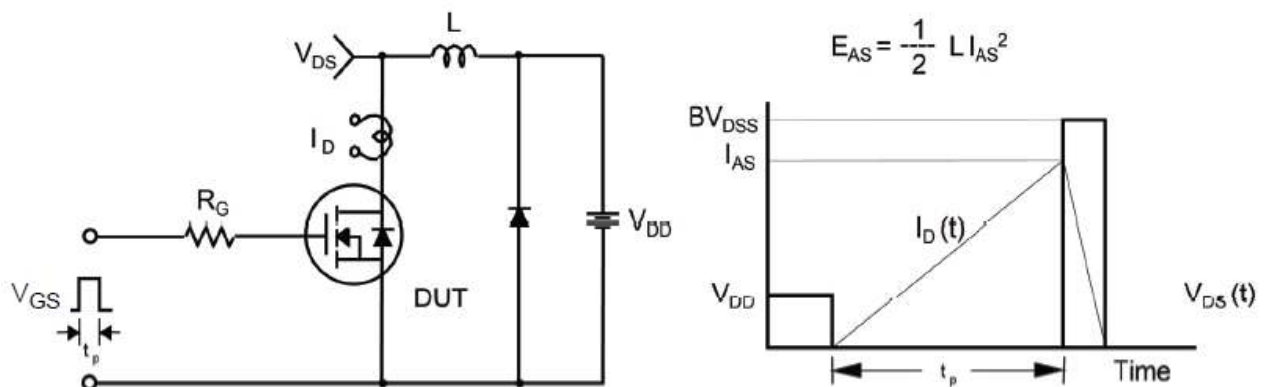
Gate Charge Test Circuit & Waveform



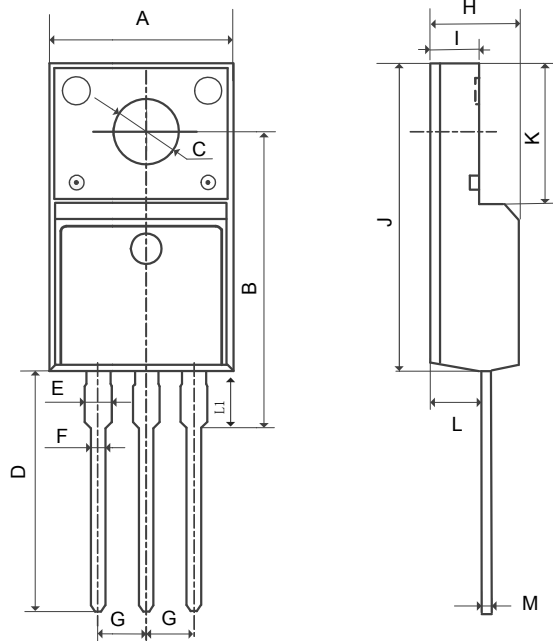
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



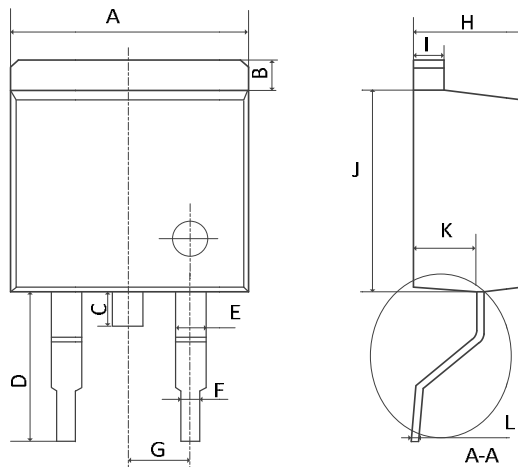
Mechanical Dimensions for TO-220F



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

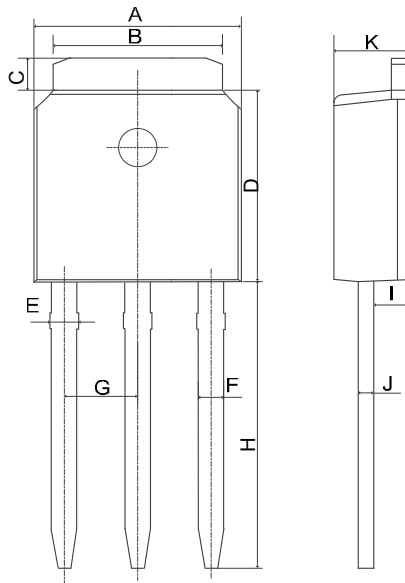
Mechanical Dimensions for TO-263



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	10.00	10.40
B	1.11	1.41
C	1.25	1.55
D	5.10	5.50
E	1.12	1.42
F	0.71	0.92
G	2.39	2.69
H	4.49	4.89
I	1.17	1.37
J	8.45	8.85
K	2.54	2.84
L	0.28	0.49

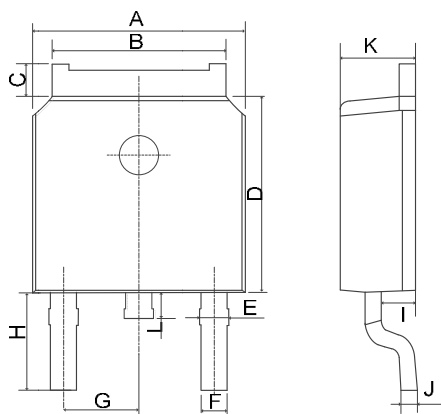
Mechanical Dimensions for TO-251



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	6.40	6.80
B	5.13	5.46
C	0.88	1.28
D	5.90	6.22
E	0.68	1.10
F	0.68	0.91
G	2.29REF	
H	9.00	9.65
I	0.90	1.17
J	0.40	0.61
K	2.10	2.50

Mechanical Dimensions for TO-252



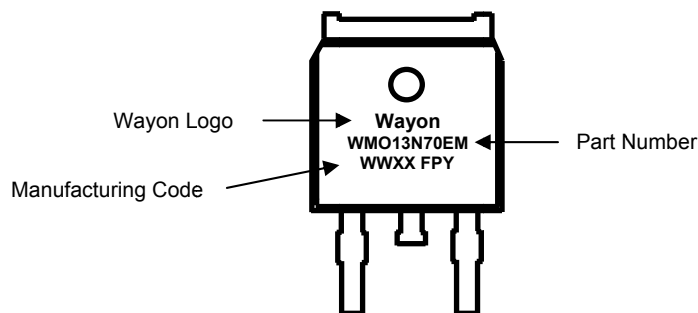
COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	6.40	6.80
B	5.13	5.50
C	0.88	1.28
D	5.90	6.22
E	0.68	1.10
F	0.68	0.91
G	2.29REF	
H	2.90REF	
I	0.85	1.17
J	0.51REF	
K	2.10	2.50
L	0.40	1.00

Ordering Information

Part	Package	Marking	Packing method
WML13N70EM	TO-220F	WML13N70EM	Tube
WMK13N70EM	TO-220	WMK13N70EM	Tube
WMN13N70EM	TO-262	WMN13N70EM	Tube
WMM13N70EM	TO-263	WMM13N70EM	Tape and Reel
WMO13N70EM	TO-252	WMO13N70EM	Tape and Reel
WMP13N70EM	TO-251	WMP13N70EM	Tube

Marking Information



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