

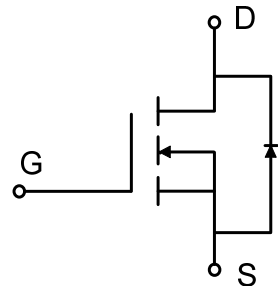
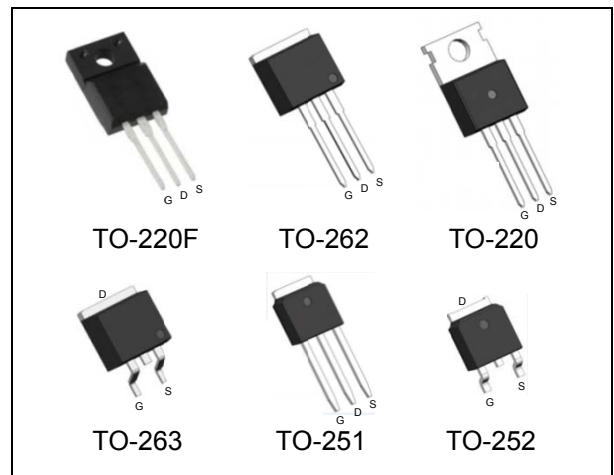
500V 0.256Ω Super Junction Power MOSFET

Description

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

Features

- $V_{DS} = 550V @ T_{j,max}$
- Typ. $R_{DS(on)} = 0.256\Omega$
- 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_{DSS}	500		V
Continuous drain current ¹⁾ ($T_C = 25^\circ C$)	I_D	22		A
		12		A
Pulsed drain current ²⁾	I_{DM}	55		A
Gate-source voltage	V_{GS}	± 30		V
Avalanche energy, single pulse ³⁾	E_{AS}	130		mJ
Avalanche energy, repetitive ²⁾	E_{AR}	0.2		mJ
Avalanche current, repetitive ²⁾	I_{AR}	2		A
Power dissipation ($T_C = 25^\circ C$) - Derate above $25^\circ C$	P_D	85	31	W
		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	22		A
Diode pulse current	$I_{S,pulse}$	55		A

Thermal Characteristics

Parameter	Symbol	WMK/WMM/WMO/WMP/WMN	WML	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	1.35	4	°C/W
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	62	80	°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}	$V_{GS}=0\text{ V}$, $I_D=0.25\text{ mA}$	500	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=0.25\text{ mA}$	2	3	4	V
Drain cut-off current	I_{DSS}	$V_{DS}=500\text{ V}$, $V_{GS}=0\text{ V}$, $T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	- -	- 50	1 -	μA
Gate leakage current, forward	I_{GSSF}	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$	-	-	100	nA
Gate leakage current, reverse	I_{GSSR}	$V_{GS}=-20\text{ V}$, $V_{DS}=0\text{ V}$	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}$, $I_D=3\text{ A}$	--	0.256	0.285	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $f=1\text{ MHz}$	-	648	-	pF
Output capacitance	C_{oss}		-	37	-	
Reverse transfer capacitance	C_{rss}		-	1.2	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=300\text{ V}$, $I_D=5\text{ A}$ $R_G=25\Omega$, $V_{GS}=10\text{ V}$	-	13	-	ns
Rise time	t_r		-	18	-	
Turn-off delay time	$t_{d(off)}$		-	66	-	
Fall time	t_f		-	28	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DD}=480\text{ V}$, $I_D=5\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$	-	5.2	-	nC
Gate to drain charge	Q_{gd}		-	5.1	-	
Gate charge total	Q_g		-	16.8	-	
Gate plateau voltage	$V_{plateau}$		-	4.7	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}$, $I_F=2\text{ A}$	-	-	1.2	V
Reverse recovery time	t_{rr}	$V_R=50\text{ V}$, $I_F=5\text{ A}$, $dI_F/dt=100\text{ A}/\mu\text{s}$	-	176	-	ns
Reverse recovery charge	Q_{rr}		-	1.2	-	μC
Peak reverse recovery current	I_{rrm}		-	13	-	A

Notes:

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

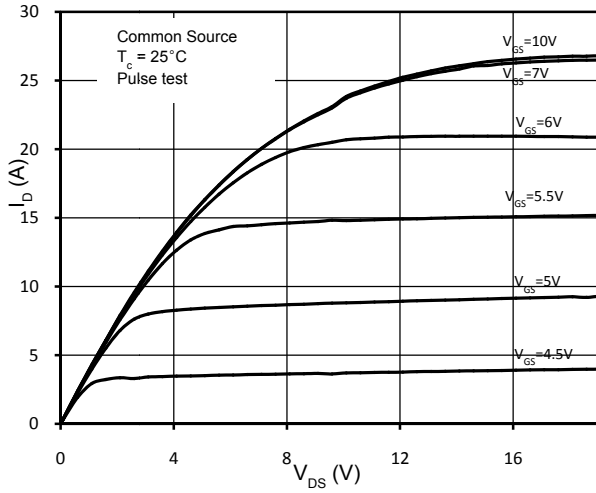


Figure 1. On-Region Characteristics

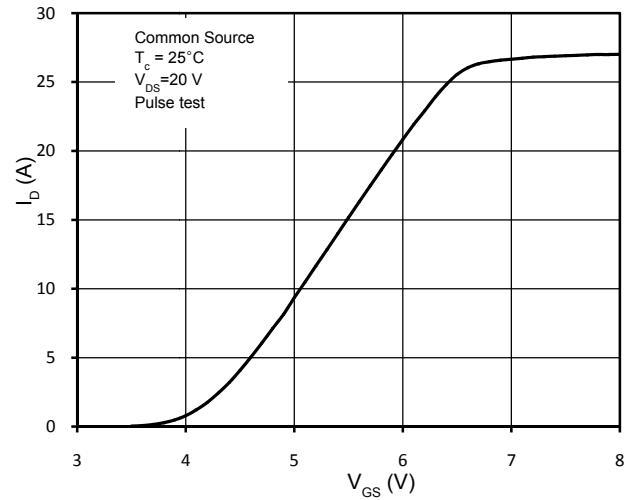


Figure 2. Transfer Characteristics

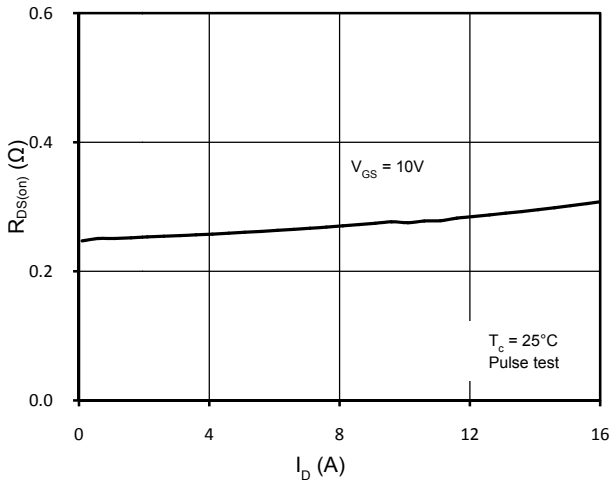


Figure 3. Static Drain-Source On Resistance

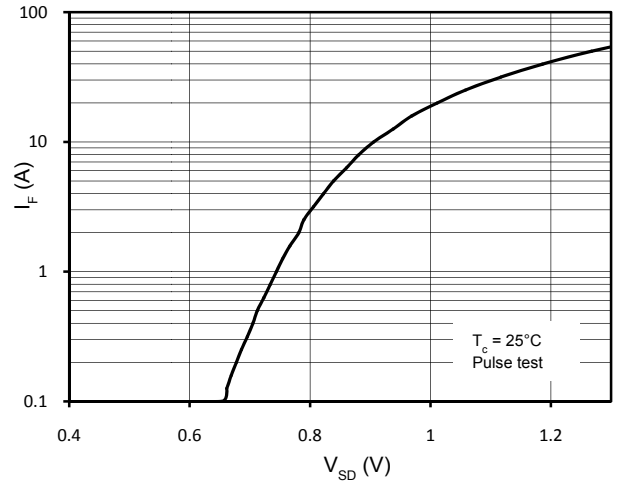


Figure 4. Body-Diode Forward Characteristics

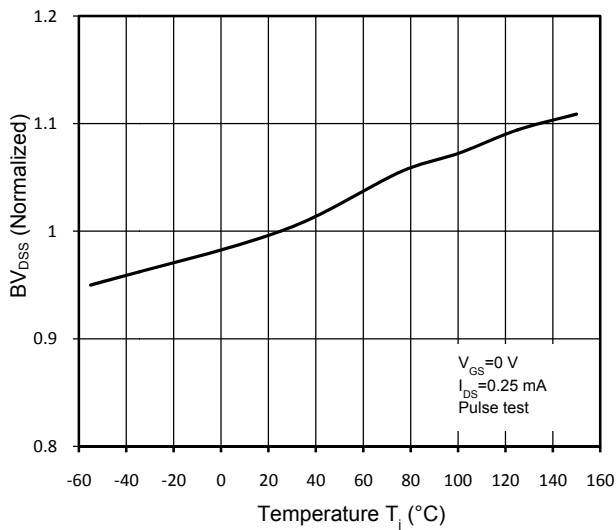


Figure 5. Normalized $BV_{DS(s)}$ vs. Temperature

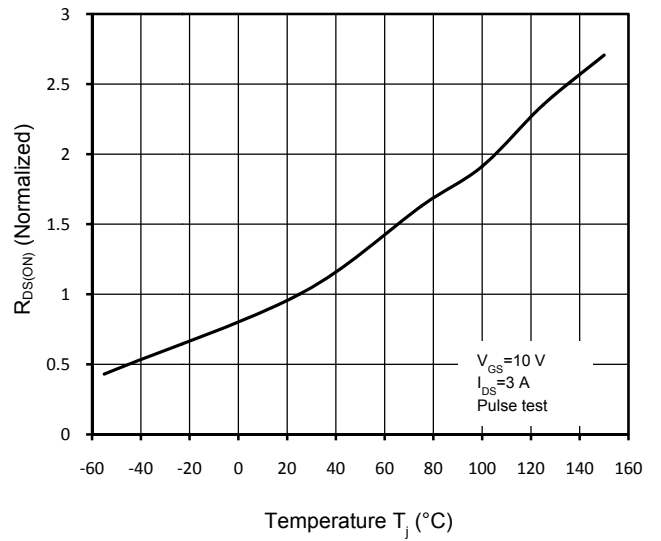


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

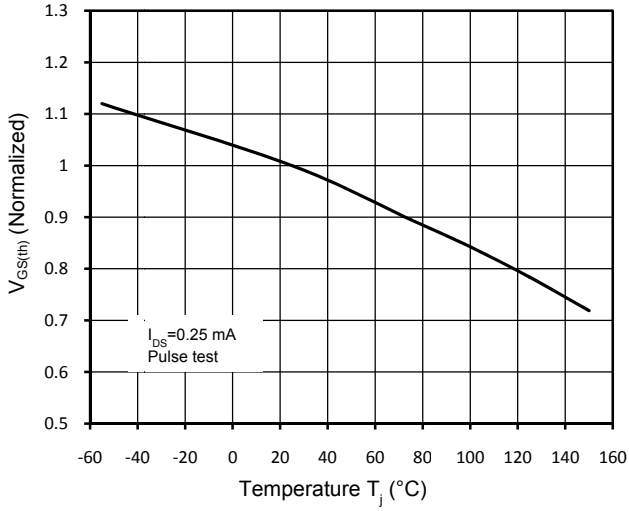


Figure 7. Threshold Voltage vs. Temperature

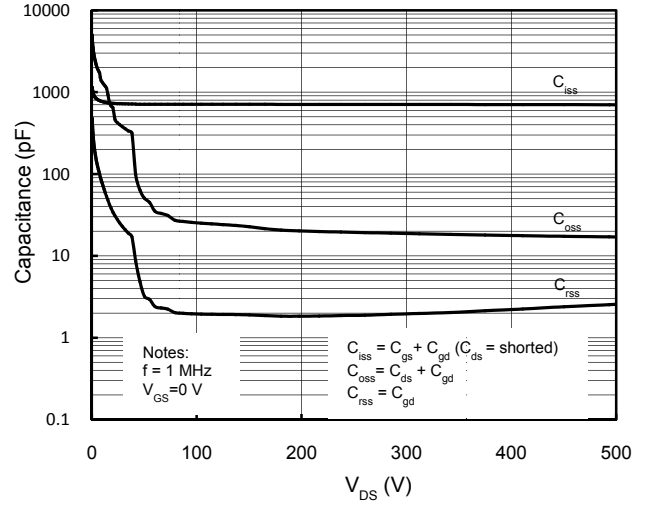


Figure 8. Capacitance Characteristics

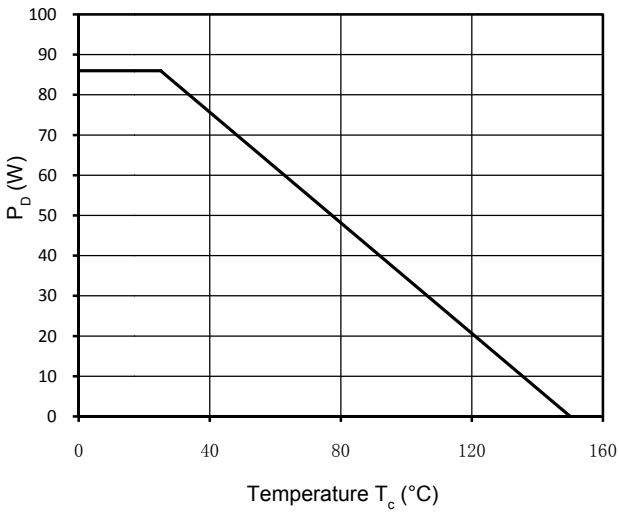


Figure 9. Power Dissipation

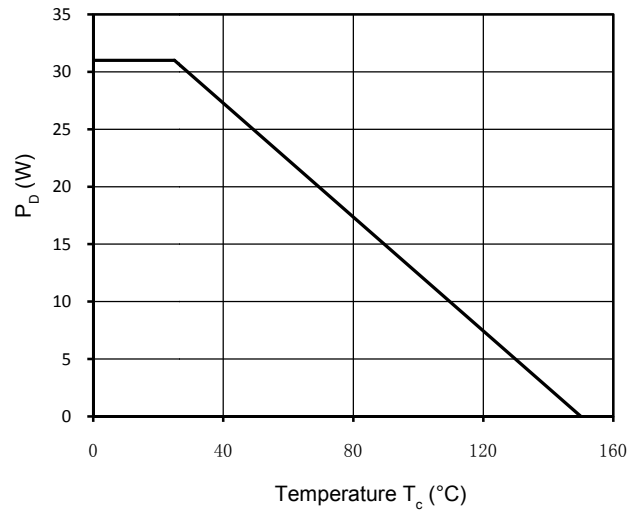


Figure 10. Power Dissipation (TO-220F)

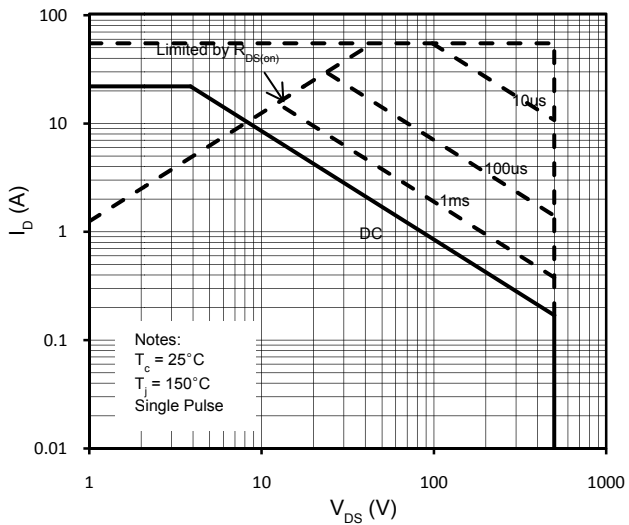


Figure 11. Maximum Safe Operating Area

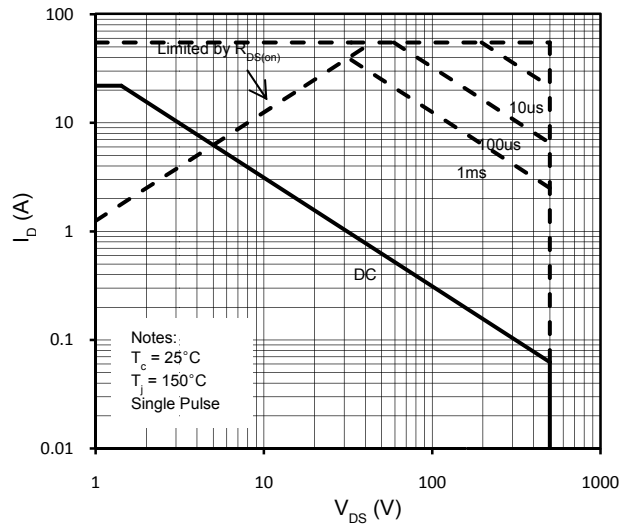


Figure 12. Maximum Safe Operating Area (TO-220F)

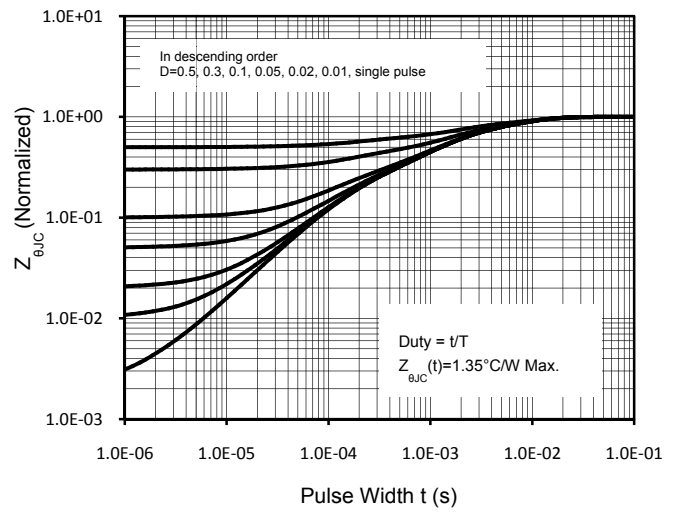
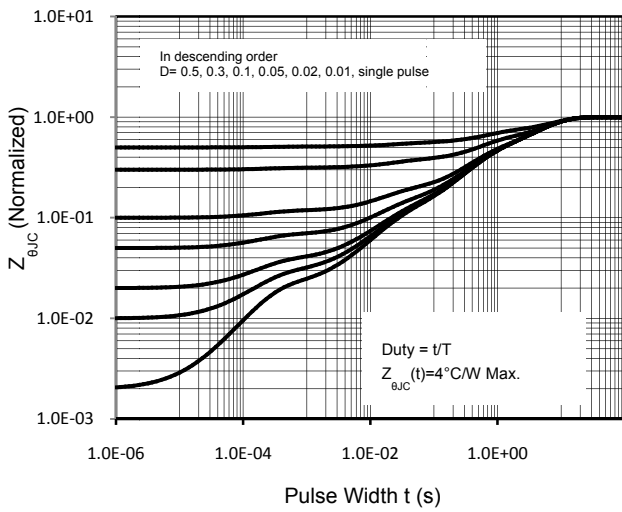


Figure 13. Transient Thermal Response Curve (TO-220F) Figure 14. Transient Thermal Response Curve

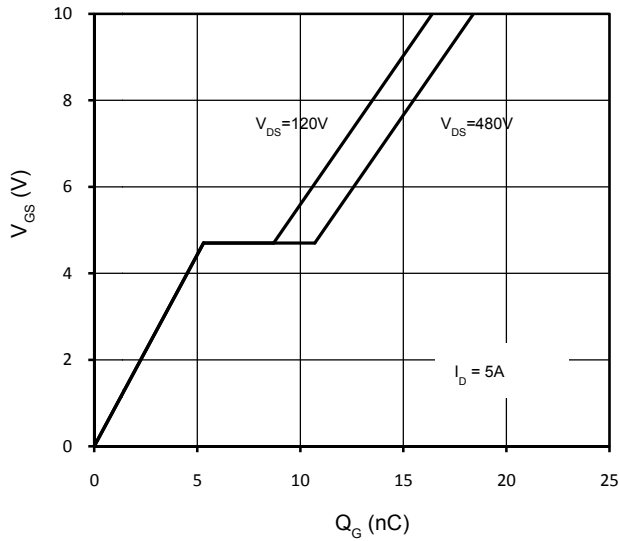
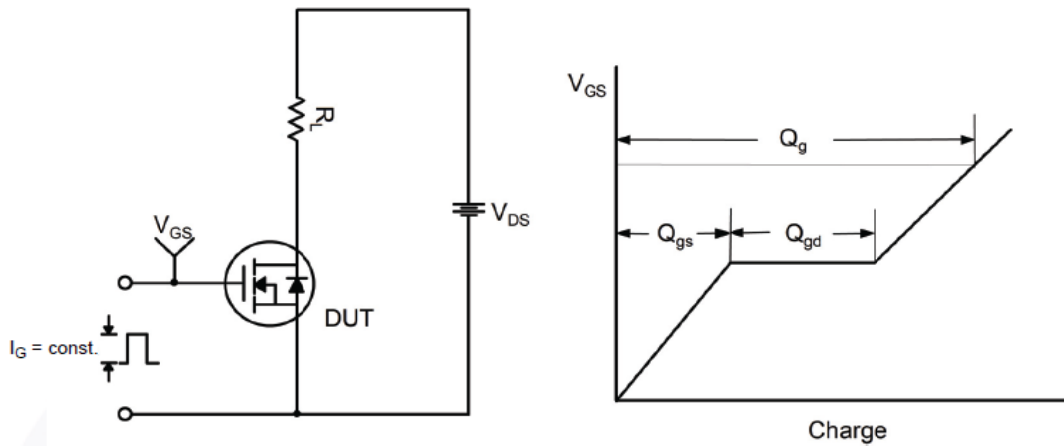
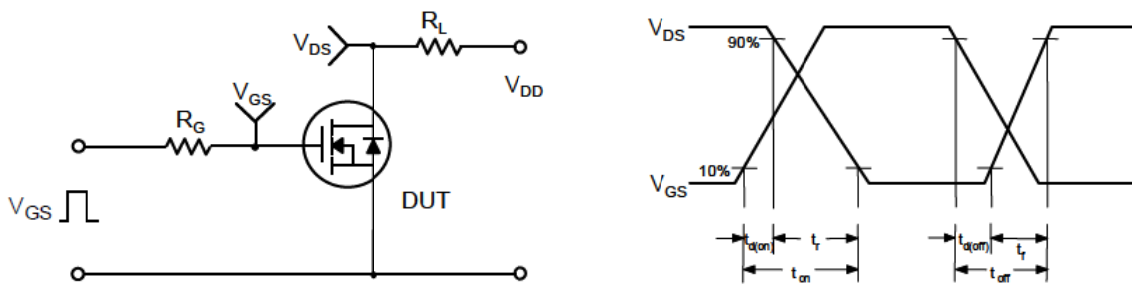


Figure 15. Gate Charge Characteristics

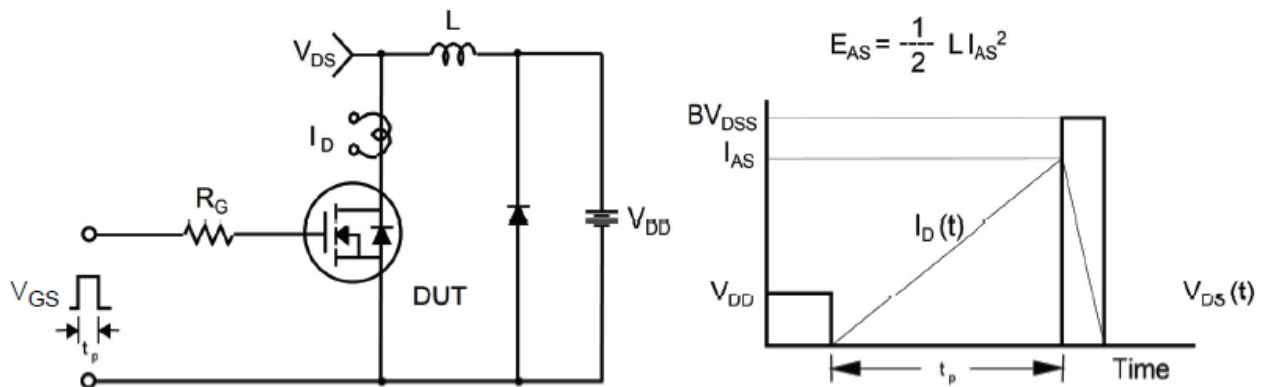
Gate Charge Test Circuit & Waveform



Switching Test Circuit & Waveforms

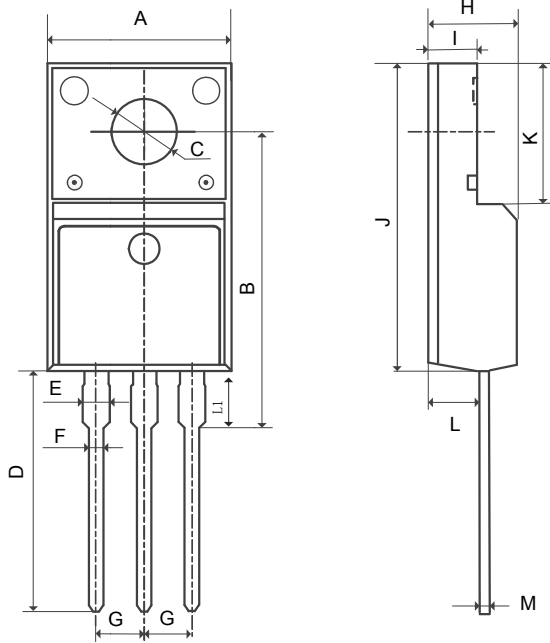


Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions for TO-220F

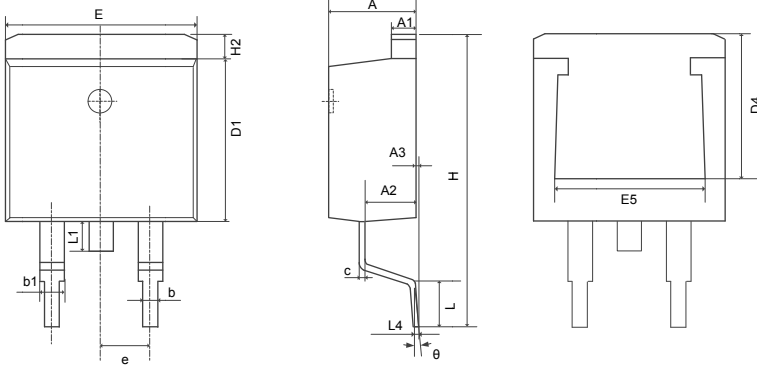
COMMON DIMENSIONS



SYMBOL	MM		
	MIN	NOM	MAX
A	9.96	10.16	10.36
B	15.10	15.60	16.10
C	3.03	3.20	3.38
D	12.64	12.96	13.28
E	1.18	1.38	1.58
F	0.70	0.81	0.95
G	2.54REF		
H	4.50	4.70	4.90
I	2.34	2.54	2.74
J	15.57	15.87	16.17
K	6.70REF		
L	2.56	2.76	2.96
M	0.40	0.52	0.65
L1	2.85	3.10	3.45

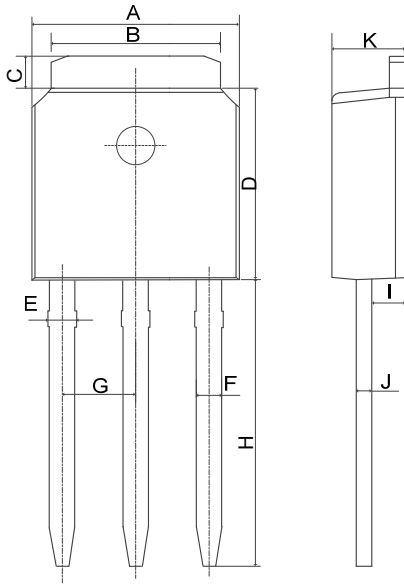
Mechanical Dimensions for TO-263

COMMON DIMENSIONS



SYMBOL	MM		
	MIN	NOM	MAX
A	4.37	4.57	4.77
A1	1.22	1.27	1.42
A2	2.49	2.69	2.89
b	0.70	0.81	0.96
b1	1.17	1.27	1.47
c	0.30	0.38	0.53
D1	8.50	8.70	8.90
D4	6.60	—	—
E	9.86	10.16	10.36
E5	7.06	—	—
e	2.54BSC		
H	14.70	15.10	15.50
H2	1.07	1.27	1.47
L	2.00	2.3	2.60
L1	1.40	1.55	1.70
L4	0.25BSC		
θ	0°	5°	9°

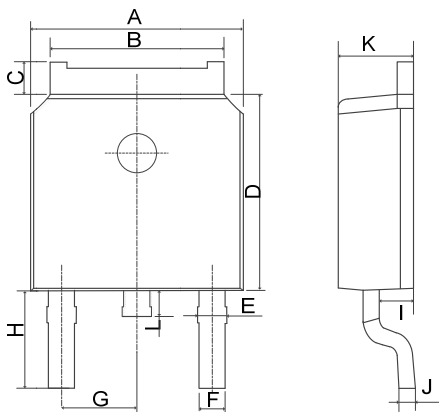
Mechanical Dimensions for TO-251



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	6.40	6.60	6.80
B	5.13	5.30	5.46
C	0.88	1.02	1.28
D	5.90	6.06	6.22
E	0.68	0.89	1.10
F	0.68	0.78	0.91
G	2.29REF		
H	9.00	9.40	9.65
I	0.90	1.04	1.17
J	0.40	0.51	0.61
K	2.10	2.30	2.50

Mechanical Dimensions for TO-252

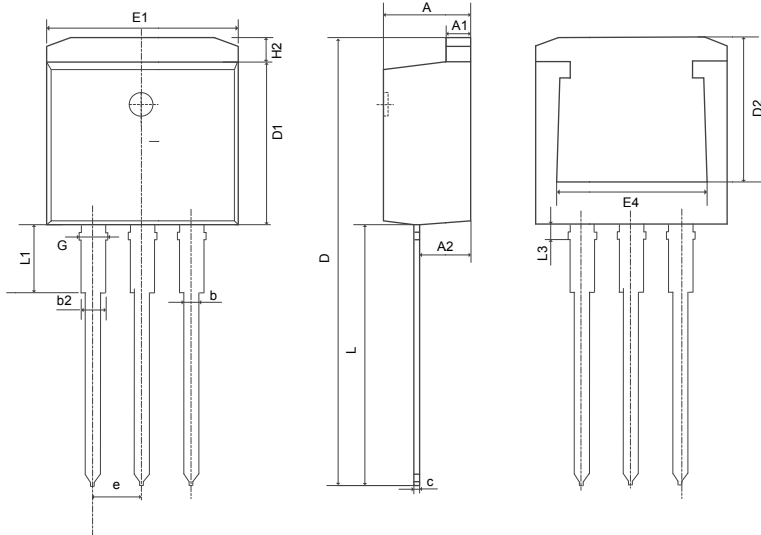


COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	6.40	6.60	6.80
B	5.13	5.33	5.50
C	0.88	—	1.28
D	5.90	6.10	6.22
E	0.68	0.89	1.10
F	0.68	0.78	0.91
G	2.29REF		
H	2.90REF		
I	0.85	1.07	1.17
J	0.51REF		
K	2.10	2.30	2.50
L	0.40	—	1.00

Mechanical Dimensions for TO-262

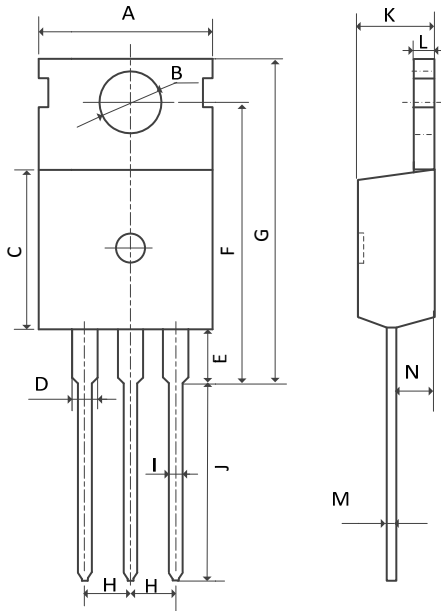
COMMON DIMENSIONS



SYMBOL	MM		
	MIN	NOM	MAX
A	4.37	4.57	4.77
A1	1.22	1.27	1.42
A2	2.49	2.69	2.89
b	0.71	0.81	0.96
b2	1.17	1.27	1.42
c	0.28	0.38	0.53
D	23.20	23.70	24.02
D1	8.50	8.7	8.90
D2	6.00	—	—
E1	9.86	10.16	10.36
E4	7.06	—	—
e	2.54BSC		
G	1.25	1.35	1.50
H2	—	—	1.50
L	13.33	13.73	14.13
L1	3.50	3.75	4.00
L3	1.28	1.43	1.58

Mechanical Dimensions for TO-220

COMMON DIMENSIONS

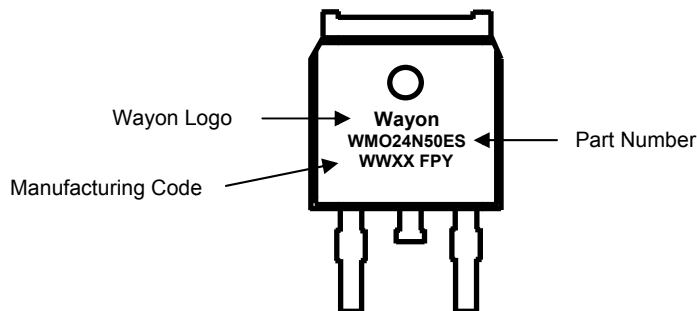


SYMBOL	MM		
	MIN	NOM	MAX
A	9.70	10.00	10.20
B	3.40	3.60	3.80
C	8.90	9.10	9.40
D	1.17	1.27	1.47
E	2.60	3.10	3.40
F	15.10	15.80	16.70
G	19.55MAX		
H	2.54REF		
I	0.70	0.80	0.95
J	9.35	10.30	11.00
K	4.30	4.57	4.77
L	1.20	1.30	1.45
M	0.40	0.50	0.65
N	2.20	2.40	2.60

Ordering Information

Part	Package	Marking	Packing method
WML24N50ES	TO-220F	WML24N50ES	Tube
WMK24N50ES	TO-220	WMK24N50ES	Tube
WMN24N50ES	TO-262	WMN24N50ES	Tube
WMM24N50ES	TO-263	WMM24N50ES	Tape and Reel
WMO24N50ES	TO-252	WMO24N50ES	Tape and Reel
WMP24N50ES	TO-251	WMP24N50ES	Tube

Marking Information




Contact Information

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