

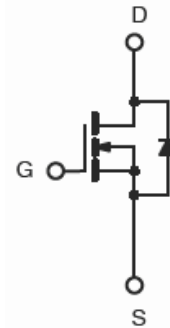
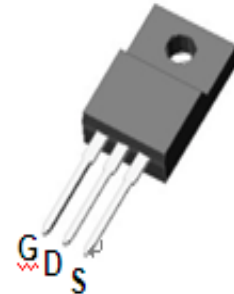
### 600V N-Channel Power MOSFET

#### Features

- High Voltage:  $BV_{DSS}=600V(\text{Min.})$
- Reliable and Rugged
- Avalanche Rated
- Lead Free and Green Devices Available
- 100% UIS + Rg Tested

#### Application

- AC/DC Power Conversion in Switched Mode Power Supplies(SMPS)
- Uninterruptible Power Supply (UPS)
- Adapter



#### Ordering Information

Type NO	Marking	Package Code
WSM1660F	M1660F	TO-220F

#### Absolute maximum ratings ( $T_C=25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	600	V
Gate-source voltage	$V_{GSS}$	$\pm 30$	V
Drain current (DC)	$I_D$	( $T_C=25^\circ\text{C}$ )	20 <sup>a</sup>
		( $T_C=100^\circ\text{C}$ )	12.7 <sup>a</sup>
Drain current (Pulsed) <sup>b</sup>	$I_{DM}$	80 <sup>a</sup>	A
Power dissipation	$P_D$	34.7	W
MOSFET dv/dt ruggedness	dv/dt	50 <sup>c</sup>	V/ns
Single pulsed avalanche energy	$E_{AS}$	360 <sup>d</sup>	mJ
Avalanche current	$I_{AR}$	3 <sup>e</sup>	A
Repetitive avalanche energy	$E_{AR}$	0.85 <sup>e</sup>	mJ
Junction temperature	$T_J$	150	°C
Storage temperature range	$T_{stg}$	-55~150	

Note a: Limited by maximum junction temperature.

Note b: Pulse width limited by safe operating area.

Note c:  $V_{DS}=480V$ ,  $I_D=20A$

Note d:  $I_D=3A$ ,  $V_{DB}=50V$ ,  $T_J=25^\circ\text{C}$

Note e: Repetitive Rating : Pulse width limited by maximum junction temperature.

Characteristic	Symbol	Rating	Unit
Thermal resistance	Junction-case	$R_{th(J-C)}$	3.6
	Junction-ambient	$R_{th(J-A)}$	62.5
			°C/W

## Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)

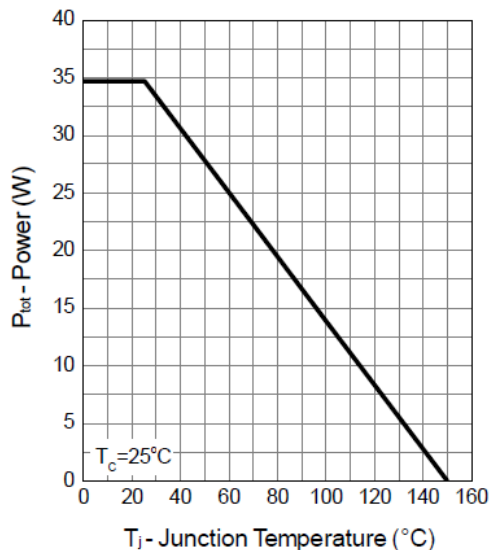
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV <sub>DSS</sub>	I <sub>D</sub> =250uA, V <sub>GS</sub> =0	600	-	-	V
Gate threshold voltage	V <sub>GS(th)</sub>	I <sub>D</sub> =250uA, V <sub>DS</sub> =V <sub>GS</sub>	2.5	3.5	4.5	V
Drain-source cut-off current	I <sub>DSS</sub>	V <sub>DS</sub> =480V, V <sub>GS</sub> =0V	-	-	1	uA
Gate leakage current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±30V	-	-	±100	nA
Drain-source on-resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>DS</sub> =10A	f	0.14	0.16	Ω
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz	-	1820	2350	pF
Output capacitance	C <sub>oss</sub>		-	1415	-	
Reverse transfer capacitance	C <sub>rss</sub>		g	42	-	
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> =400V, V <sub>GEN</sub> =10V, R <sub>L</sub> =20 Ω I <sub>DS</sub> =20A, R <sub>G</sub> =15Ω	-	16	-	ns
Rise time	t <sub>r</sub>		-	41	-	
Turn-off delay time	t <sub>d(off)</sub>		-	47	-	
Fall time	t <sub>f</sub>		-	27	-	
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> =400V, V <sub>GS</sub> =10V I <sub>DS</sub> =10A	-	49.5	64	nC
Gate-source charge	Q <sub>gs</sub>		-	9.5	-	
Gate-drain charge	Q <sub>gd</sub>		-	23	-	
Forward voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =20A	f	0.93	1.3	V
Reverse recovery time	t <sub>rr</sub>	I <sub>S</sub> =20A, V <sub>R</sub> =360V dI <sub>SD</sub> /dt=100A/us	-	345	-	ns
Reverse recovery charge	Q <sub>rr</sub>		-	5.2	-	uC
Peak Reverse Recovery Current	I <sub>rm</sub>		-	30	-	A

Note f: Pulse test ; pulse width ≤ 300us, duty cycle ≤ 2%.

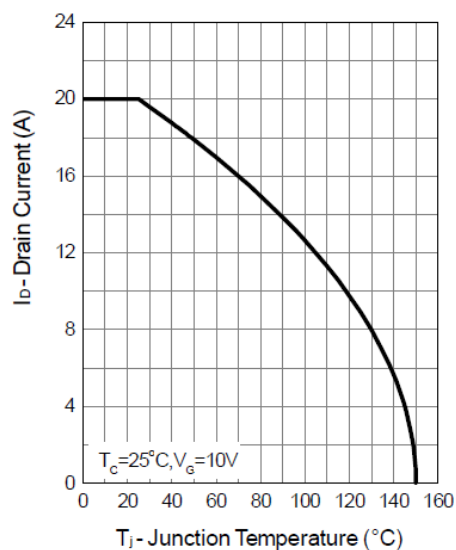
Note g: Guaranteed by design, not subject to production testing.

## Typical Operating Characteristics

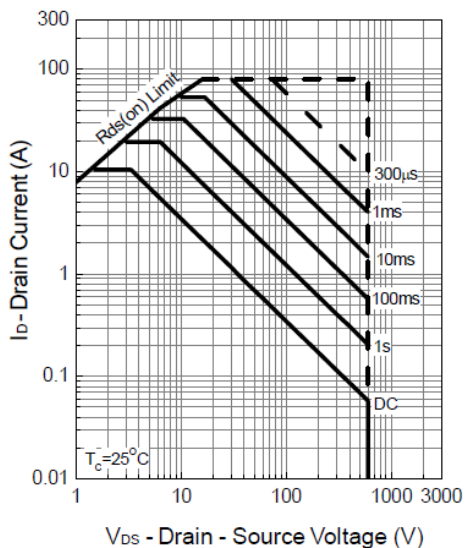
### Power Dissipation



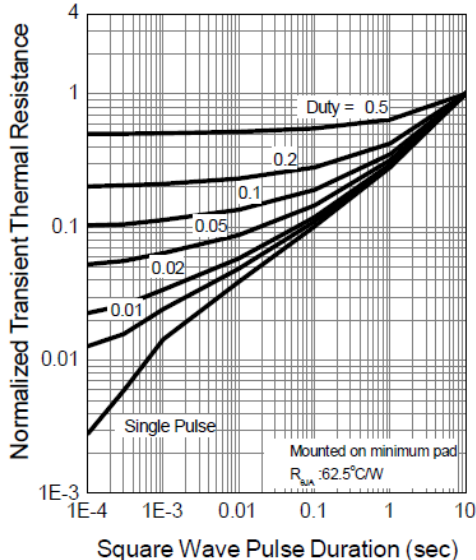
### Drain Current



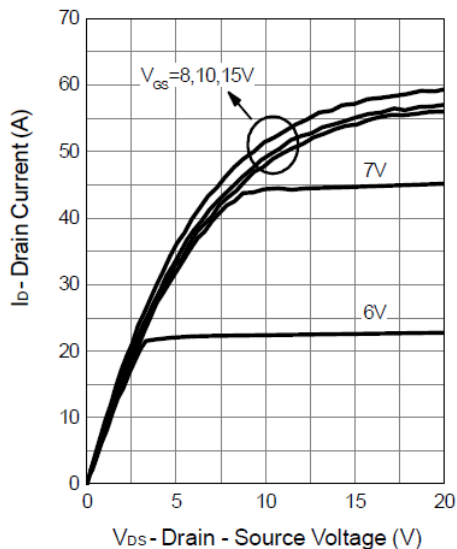
### Safe Operation Area



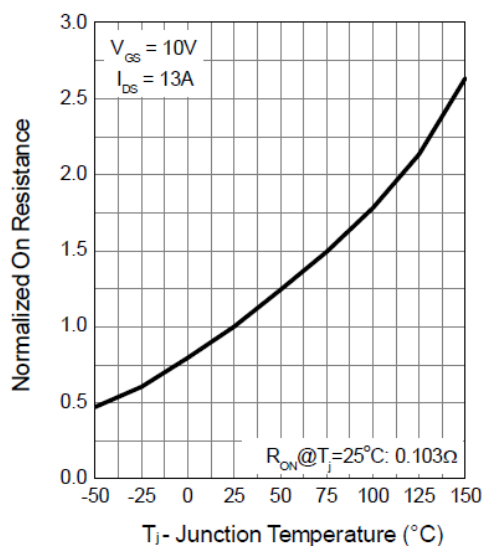
### Thermal Transient Impedance



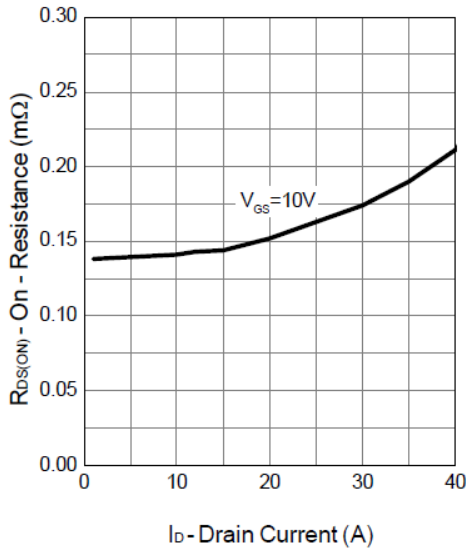
### Output Characteristics



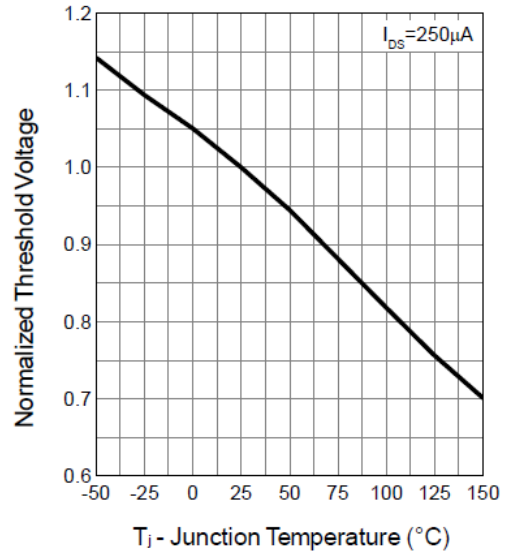
### Drain-Source On Resistance



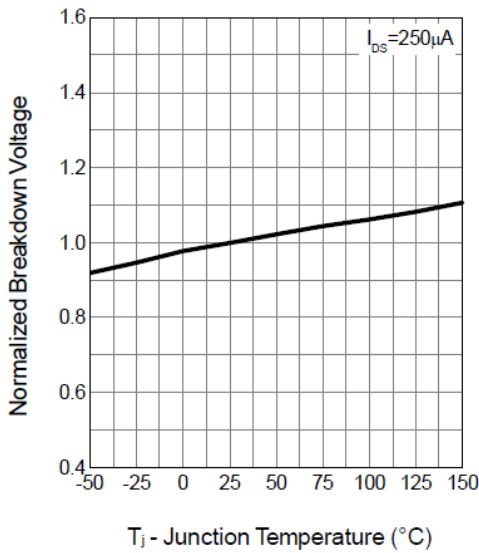
**Drain-Source On Resistance**



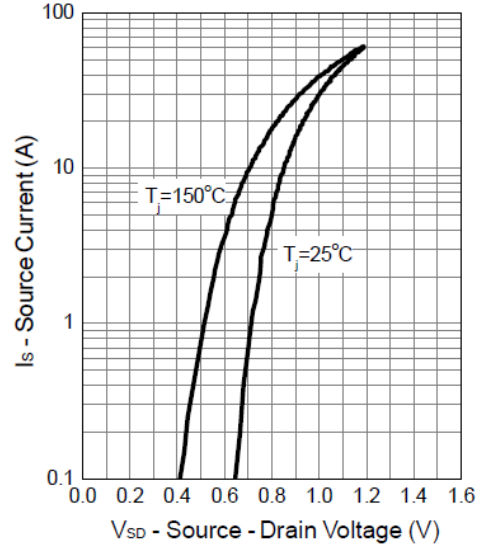
**Gate Threshold Voltage**



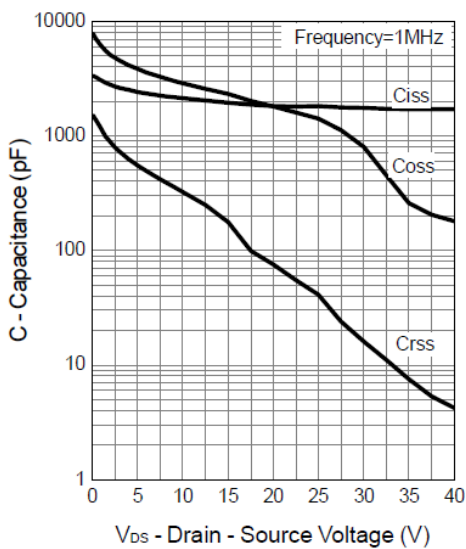
**BVDSS vs Junction Temperature**



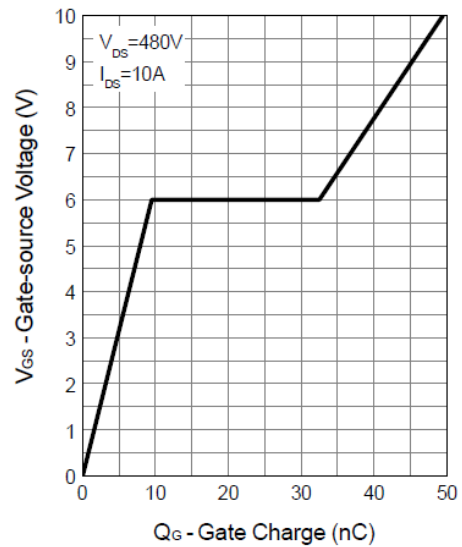
**Source-Drain Diode Forward**



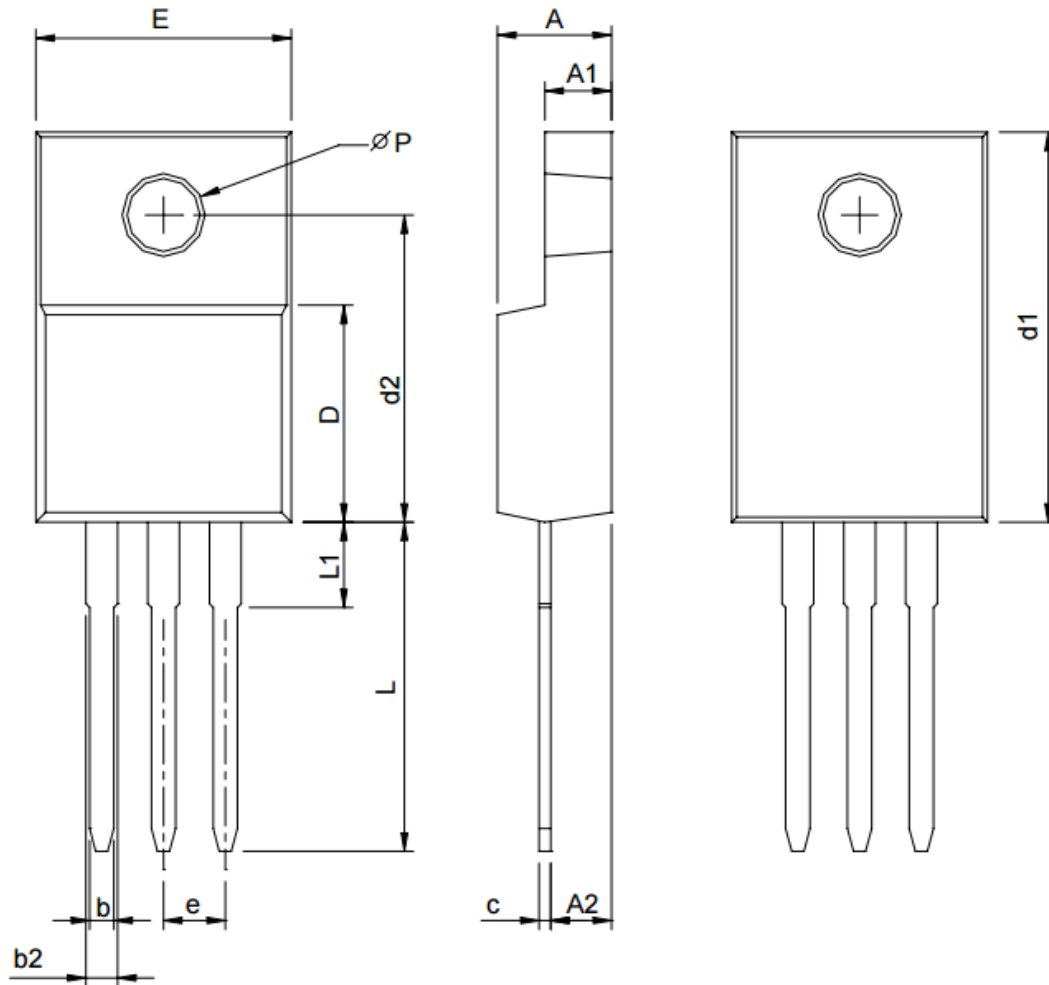
**Capacitance**



**Gate Charge**

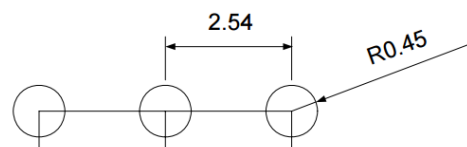


## Outline Dimension unit: mm



DIMENSIONS	TO-220FP			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.20	4.80	0.165	0.189
A1	2.34	3.20	0.092	0.126
A2	2.10	2.90	0.083	0.114
b	0.50	0.90	0.020	0.035
b2	0.91	1.90	0.035	0.075
c	0.30	0.80	0.012	0.031
D	8.10	9.40	0.319	0.370
d1	14.50	16.50	0.571	0.650
d2	12.10	12.90	0.476	0.508
E	9.70	10.70	0.382	0.421
e	2.54 BSC		0.100 BSC	
L	13.00	14.50	0.512	0.570
L1	1.60	4.00	0.063	0.157
P	3.00	3.60	0.118	0.142

### RECOMMENDED LAND PATTERN



UNIT: mm

# WSM1660F



First Line	WTC	Company Name	
Second Line	M1660F	Product Code	
Third Line	HEOMFI	1st ( Year Code )	A-2010 B-2011 C-2012 ...
		2nd( Month Code )	A-Jan B-Feb C-Mar D-Apr E-May F-Jun G-Jul H-Aug I-Sep J-Oct K-Nov L-Dec
		3rd ( Lot Code )	0-1 , A-9
		4th( Product Code )	M-MOS , T-Transistor
		5th ( Package Code )	B-TO-263 , X-TO-220 , F-TO220F
		6th ( Spec Code )	( Reserve )