OCENME

September, 2013

SJ-FET

OSP7N60S/ OSF7N60S
600V N-Channel MOSFET

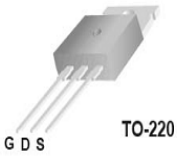
Description

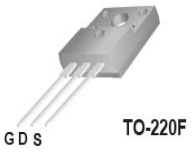
SJ-FET is new generation of high voltage MOSFET family that is utilizing an advanced charge balance mechanism for outstanding low on-resistance and lower gate charge performance.

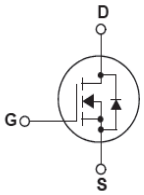
This advanced technology has been tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate and higher avalanche energy. SJ-FET is suitable for various AC/DC power conversion inswitching mode operation for higher efficiency.

Features

- 600V @TJ = 150 ℃
- Typ. RDS(on) = 0.58Ω
- Ultra Low Gate Charge (typ. Qg = 9nC)
- 100% avalanche tested
- Rohs Compliant







Absolute Maximum Ratings

Symbol	Parameter	OSP7N60S	OSF7N60S	Unit
V_{DSS}	Drain-Source Voltage	600		V
I_D	Drain Current -Continuous (TC = 25℃) -Continuous (TC = 100℃)	7 5	7* 5*	A
I_{DM}	Drain Current - Pulsed (Note 1)	11	11*	A
V_{GSS}	Gate-Source voltage	±30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	86		mJ
I_{AR}	Avalanche Current (Note 1)	1.7		A
E_{AR}	Repetitive Avalanche Energy (Note 1)	43		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5		V/ns
P_D	Power Dissipation (TC = 25℃) -Derate above 25℃	104 0.8	35 0.3	W W/℃
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		℃
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300		℃

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	OSP7N60S	OSF7N60S	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.5	3.6	℃/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	--	--	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	75	62	℃/W

OSP7N60S/ OSF7N60S

Electrical Characteristics TC = 25℃ unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BVDSS	Drain-Source Breakdown Voltage	VGS = 0V, ID = 250μA, TJ = 25℃	600	--	--	V
		VGS = 0V, ID = 250μA, TJ = 150℃	--	650	--	V
ΔBVDSS / ΔTJ	Breakdown Voltage Temperature Coefficient	ID = 250μA, Referenced to 25℃	--	0.6	--	V/℃
IDSS	Zero Gate Voltage Drain Current	VDS = 600V, VGS = 0V VDS =480V, TC = 125℃	--	--	1 10	μA μA
IGTSF	Gate-Body Leakage Current, Forward	VGS = 30V, VDS = 0V	--	--	100	nA
IGSSR	Gate-Body Leakage Current, Reverse	VGS = -30V, VDS = 0V	--	--	-100	nA
On Characteristics						
VGS(th)	Gate Threshold Voltage	VDS = VGS, ID = 250μA	2.5	3.5	4.5	V
RDS(on)	Static Drain-Source On-Resistance	VGS = 10V, ID =3. 5A	--	0.58	0.65	Ω
gFS	Forward Transconductance	VDS = 40V, ID =3. 5A (Note 4)	--	16	--	S
Rg	Gate Resistance	F=1MHz, open drain	--	4.5	--	Ω
Dynamic Characteristics						
Ciss	Input Capacitance	VDS = 25V, VGS = 0V, f = 1.0MHz	--	360	--	pF
Coss	Output Capacitance		--	25	--	pF
Crss	Reverse Transfer Capacitance		--	1.2	--	pF
Switching Characteristics						
td(on)	Turn-On Delay Time	VDD = 400V, ID = 3.5A RG = 20Ω (Note 4, 5)	--	25	--	ns
tr	Turn-On Rise Time		--	55	--	ns
td(off)	Turn-Off Delay Time		--	70	--	ns
tf	Turn-Off Fall Time		--	40	--	ns
Qg	Total Gate Charge	VDS = 480V, ID = 3.5A VGS = 10V (Note 4, 5)	--	8	--	nC
Qgs	Gate-Source Charge		--	2.0	--	nC
Qgd	Gate-Drain Charge		--	2.7	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
IS	Maximum Continuous Drain-Source Diode Forward Current		--	--	7	A
ISM	Maximum Pulsed Drain-Source Diode Forward Current		--	--	18	A
VSD	Drain-Source Diode Forward Voltage	VGS = 0V, IS = 7A	--	--	1.5	V
trr	Reverse Recovery Time	VGS = 0V, IS = 7A dIF/dt =100A/μs (Note 4)	--	190	--	ns
Qrr	Reverse Recovery Charge		--	2.3	--	μC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature

2. L=60mH, I_{AS}=1.7A, VDD=150V, Starting TJ=25 ℃

3. I_{SD}≤7A, di/dt ≤ 200A/us, V_{DD} ≤ BV_{DSS}, Starting TJ = 25 ℃

4. Pulse Test: Pulse width ≤ 300us, Duty Cycle ≤ 2%

5. Essentially Independent of Operating Temperature Typical Characteristics

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Typical Performance Characteristics

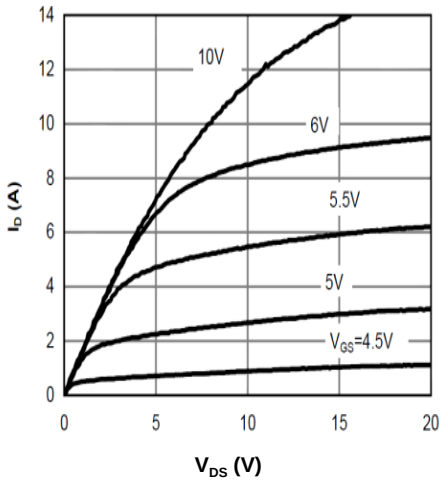


Figure 1: On-Region Characteristics@25° C

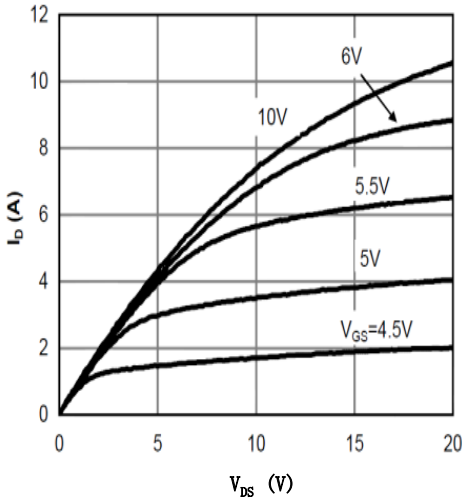


Figure 2: On-Region Characteristics@125° C

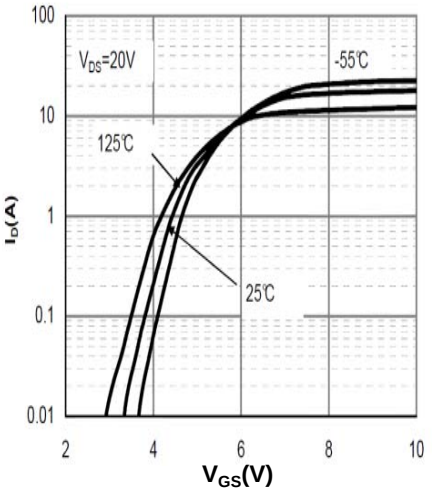


Figure 3: Transfer Characteristics

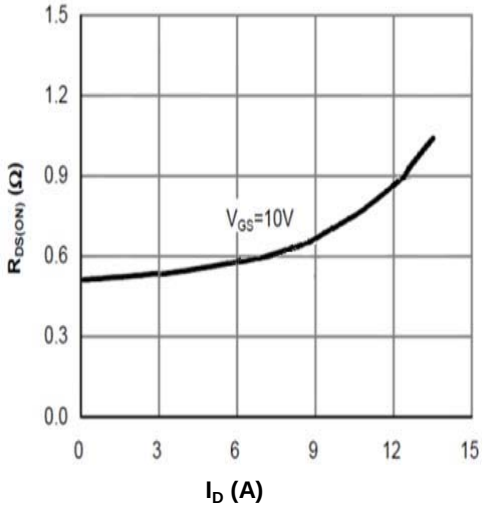


Figure 4: On-Resistance vs. Drain Current and Gate Voltage

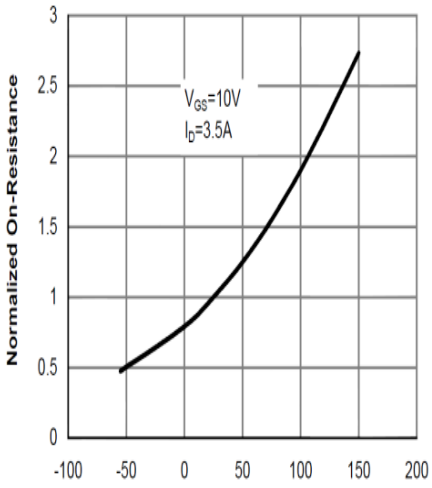


Figure 5: On-Resistance vs. Junction Temperature

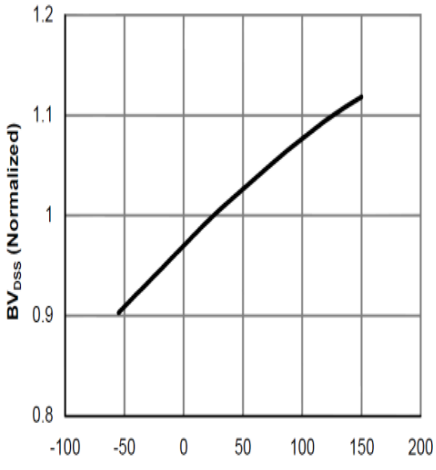
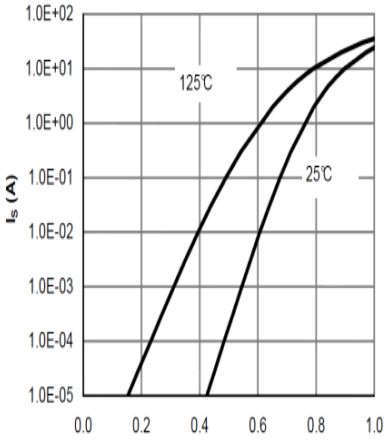


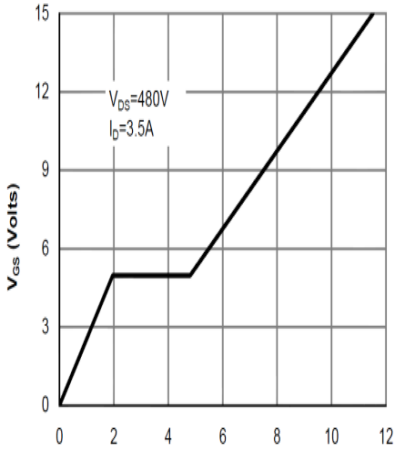
Figure 6: Break Down vs. Junction Temperature

Typical Performance Characteristics



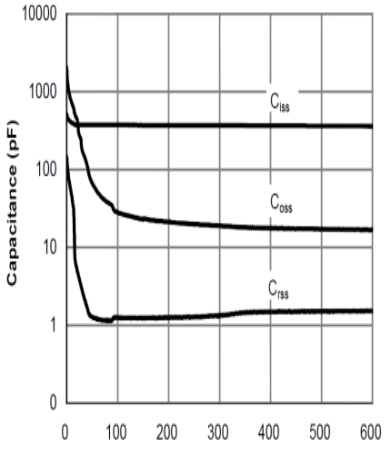
V_{SD} (V)

Figure 7: Body-Diode Characteristics



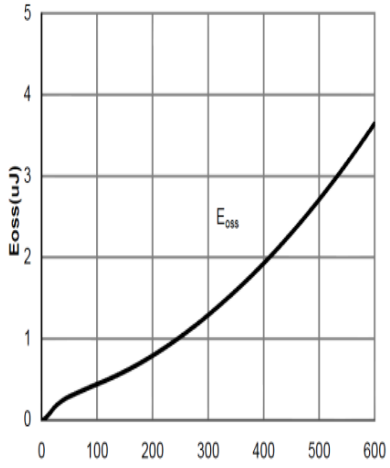
Qg (nC)

Figure 8: Gate-Charge Characteristics



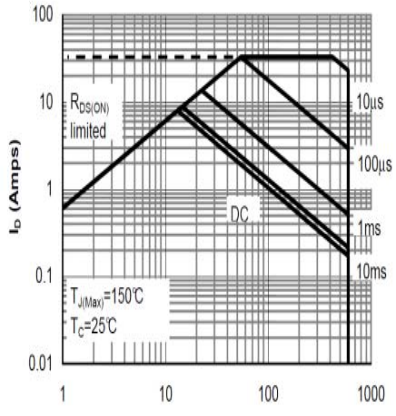
V_{DS} (V)

Figure 9: Capacitance Characteristics



V_{DS} (V)

Figure 10: C_{oss} stored Energy



V_{DS} (V)

Figure 11: Maximum Forward Biased Safe Operating Area

Typical Performance Characteristics

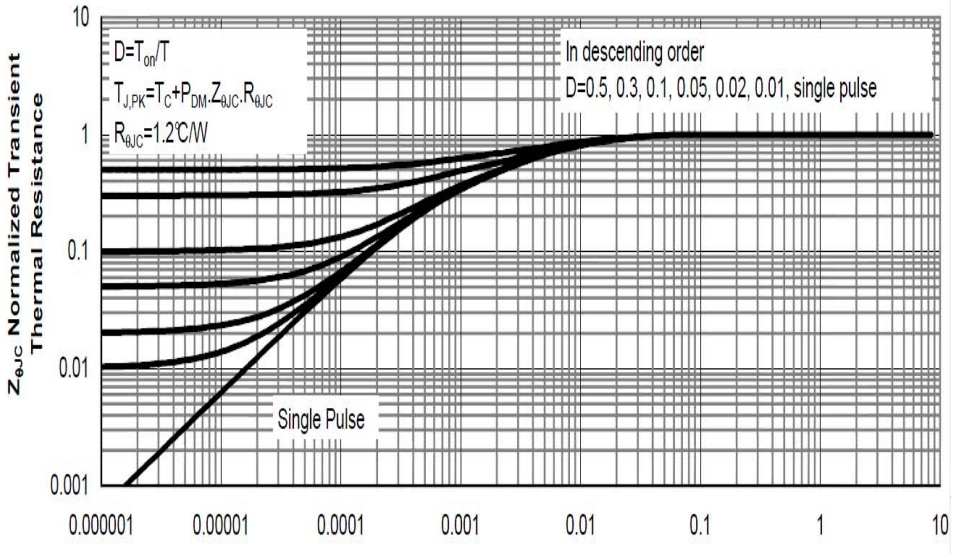


Figure 12: Normalized Maximum Transient Thermal Impedance

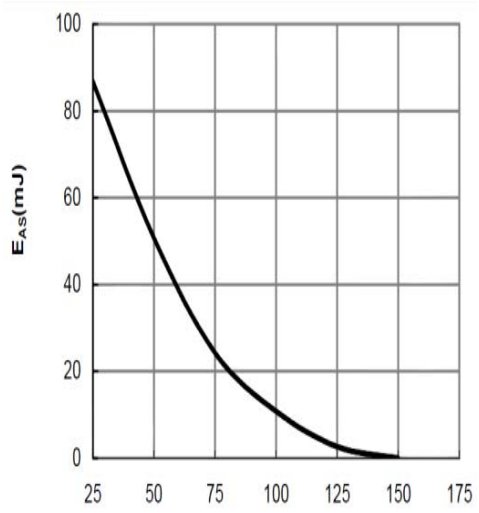


Figure 13: Avalanche energy

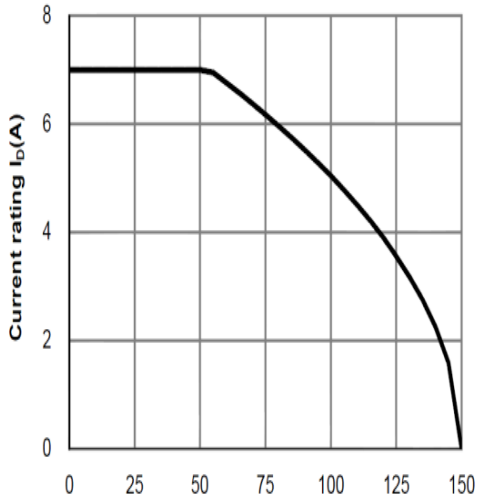


Figure 14: Current De-rating

Typical Performance Characteristics

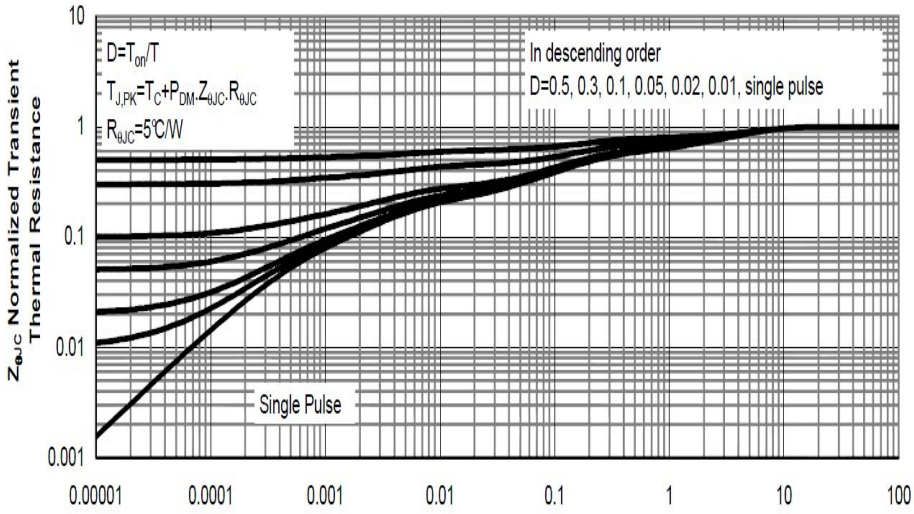
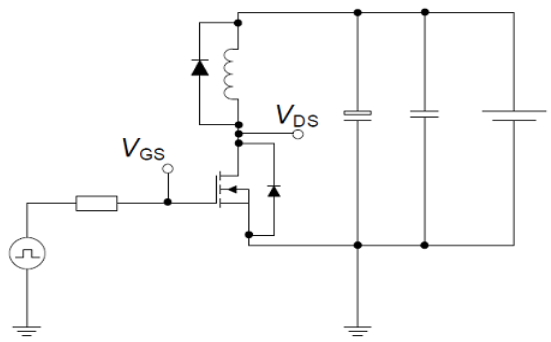


Figure 15: Normalized Maximum Transient Thermal Impedance

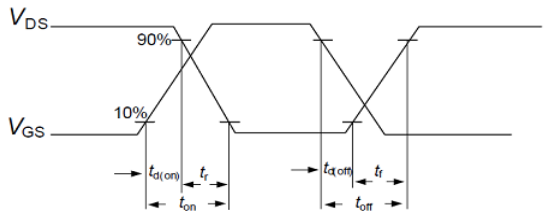
Test circuits

Switching times test circuit and waveform for inductive load

Switching times test circuit for inductive load

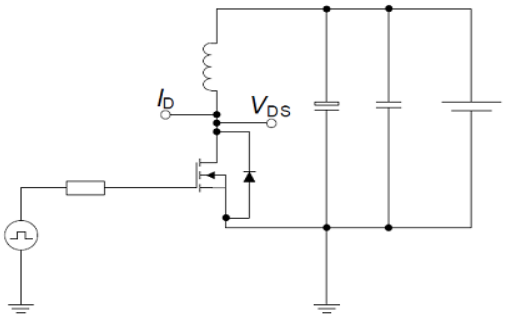


Switching time waveform

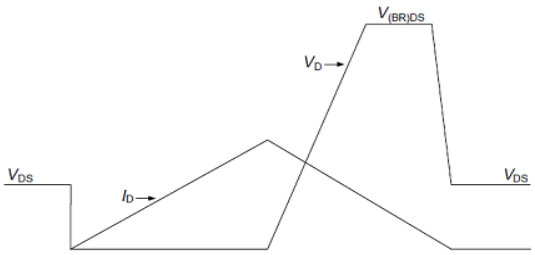


Unclamped inductive load test circuit and waveform

Unclamped inductive load test circuit

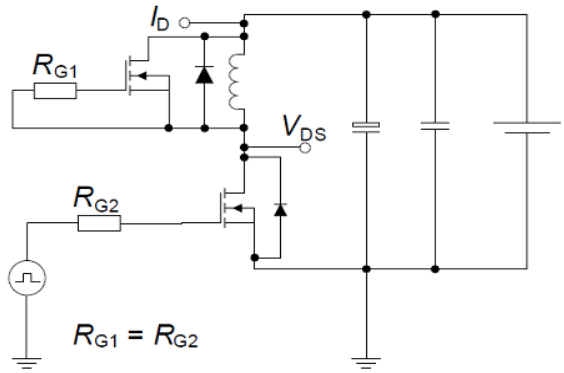


Unclamped inductive waveform

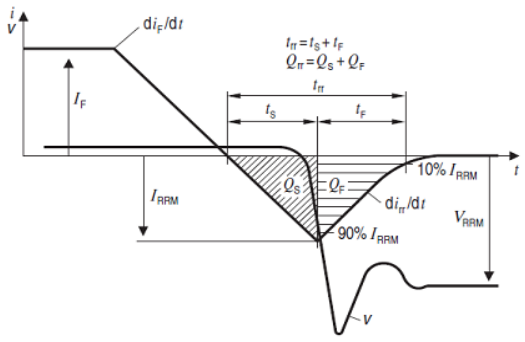


Test circuit and waveform for diode characteristics

Test circuit for diode characteristics



Diode recovery waveform



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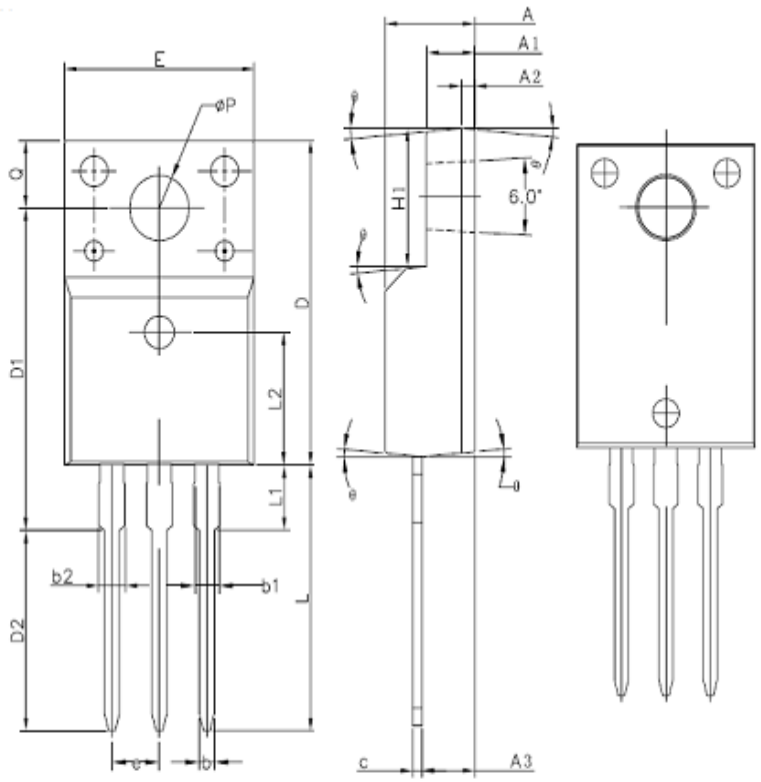
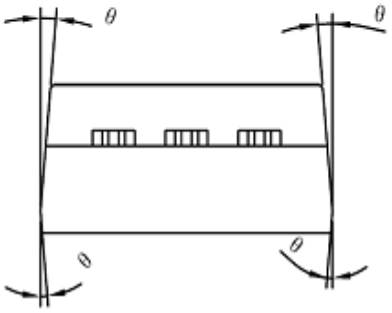
PKG TO-220F



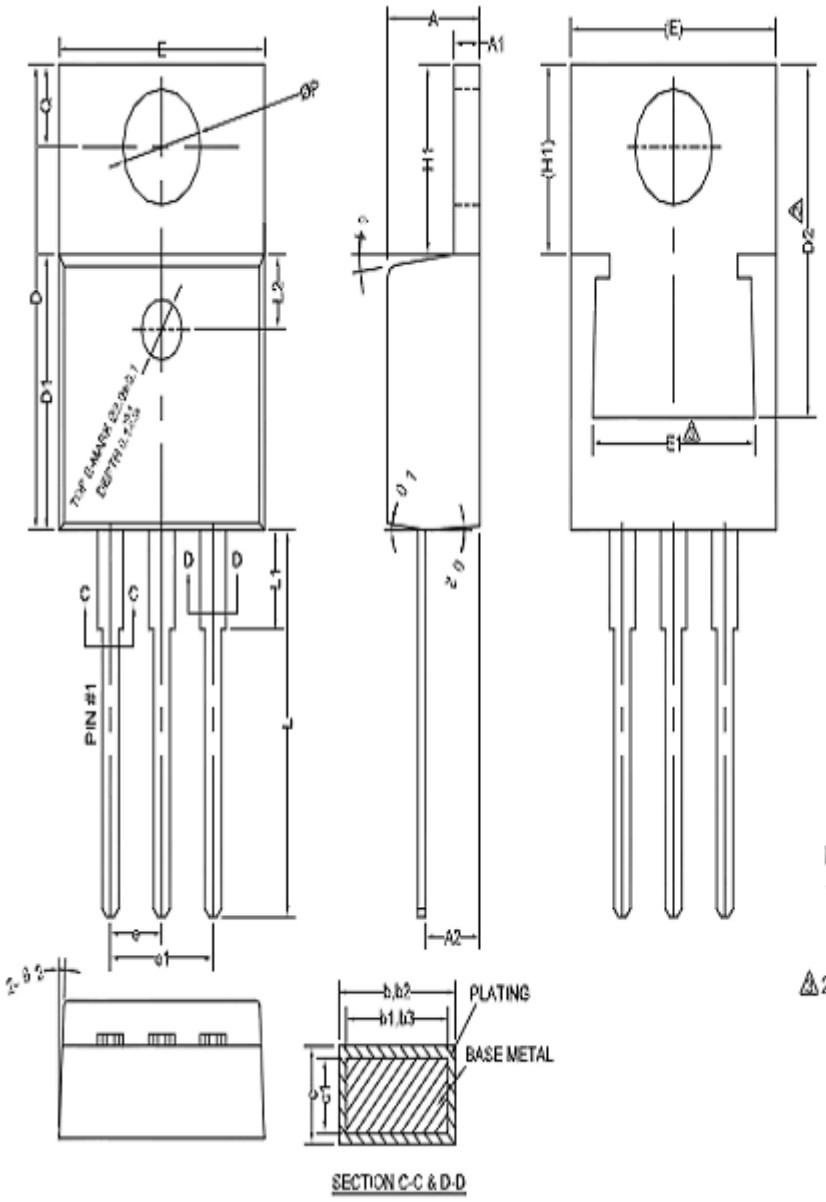


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2		0.70 REF	
A3	2.56	2.76	2.96
b	0.70	–	0.90
b1	1.18	–	1.38
b2	–	–	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	9.60	9.80	10.0
E	9.96	10.16	10.36
e		2.54BSC	
H1	6.48	6.68	6.88
L	12.68	12.98	
L1	–	–	3.50
L2		6.50REF	
ØP	3.08	3.18	3.28
Q	3.20	–	3.40
θ	3°	5°	7°

OSP7N60S/ OSF7N60S

PKG TO-220



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

	SYMBOL	MIN	NOM	MAX
	A	4.40	4.57	4.70
	A1	1.22	-	1.32
	A2	2.59	2.38	2.79
	b	0.77	-	0.90
	b1	0.78	0.81	0.83
	b2	1.23	-	1.35
	b3	1.22	1.27	1.32
	c	0.34	-	0.47
	c1	0.33	0.38	0.43
	D	15.15	15.45	15.75
	D1	9.05	9.15	9.25
⚠	D2	11.40	-	12.88
	E	9.96	10.13	10.33
⚠	E1	8.66	-	8.89
⚠	e	2.44	2.54	2.64
⚠	e1	4.96	5.06	5.1
	H1	8.10	8.30	8.50
⚠	L	12.70	-	13.12
	L1	-	-	3.90
	L2	2.50REF		
	ΦP	3.80	3.84	3.88
	Q	2.60	-	2.90
	θ1	5°	7°	9°
	θ2	1°	3°	5°

NOTES:

1. ALL DIMENSIONS REFER TO JEDEC STANDARD TO-220 AB DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

⚠ 2.'D2' AND 'E1' ARE VARIABLES DEPENDING ON DIE PAD SIZES.