

Product Summary

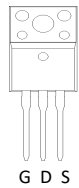
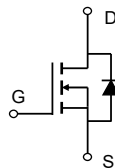
V_{DS}	$R_{DS(ON)_TYP}$	I_{D_MAX}
650 V	390 mΩ @ $V_{GS} = 18V$	6.0 A

TO220F-3L


Top View



Bottom View


 PIN Configuration
(Top View)


Schematic Diagram

Features

- High blocking voltage with low On-Resistance
- High speed switching with low capacitances
- Easy to parallel and simple to drive
- Avalanche ruggedness
- Halogen free, RoHS compliant


Benefits

- Higher system efficiency
- Reduced cooling requirements
- Increased power density
- Increased system switching frequency

Applications

- Solar inverters
- Switch mode power supplies
- High voltage DC/DC converters
- Battery chargers
- Motor drives
- Pulsed power applications

Ordering Information

Orderable Part Number	Package Type	Device Marking	Form	Quantity (pcs)
SCMP65R390BF	TO220F-3L	P65R390B	Tube	50

Maximum Ratings (@ $T_C = 25^\circ\text{C}$, unless otherwise specified.)

Parameter	Symbol	Value	Unit
Drain - Source Voltage	V_{DS}	650	V
Gate - Source Voltage (Absolute maximum values)	V_{GSmax}	-10/+22	V
Gate - Source Voltage (Recommended operating values)	V_{GSop}	-5/+18	V
Continuous Drain Current ($V_{GS} = 18V$) ⁽¹⁾	$T_C = 25^\circ\text{C}$	6.0	A
	$T_C = 100^\circ\text{C}$	4.3	A
Pulsed Drain Current ⁽²⁾	I_{DM}	20	A
Single Pulse Avalanche Energy ⁽³⁾	E_{AS}	64	mJ
Power Dissipation	$T_C = 25^\circ\text{C}$	42	W
	$T_C = 100^\circ\text{C}$	21	W
Junction & Storage Temperature Range	T_J, T_{STG}	-55 ~ +175	$^\circ\text{C}$

Thermal Characteristics

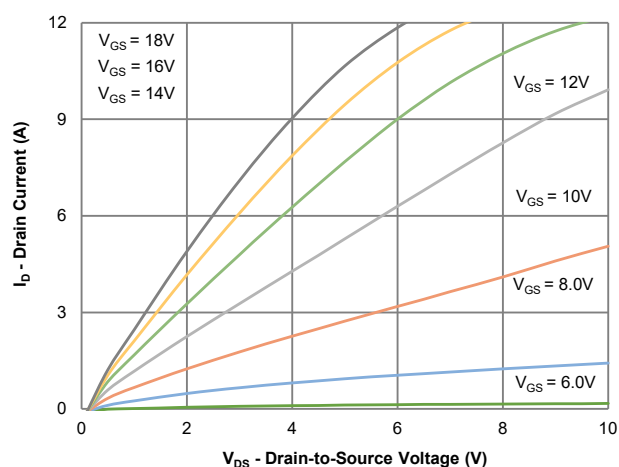
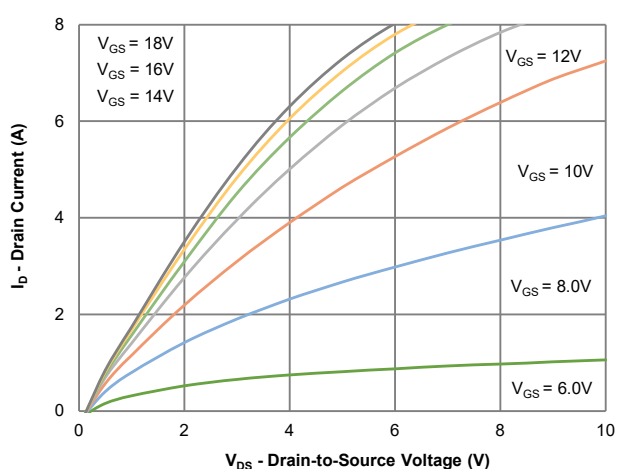
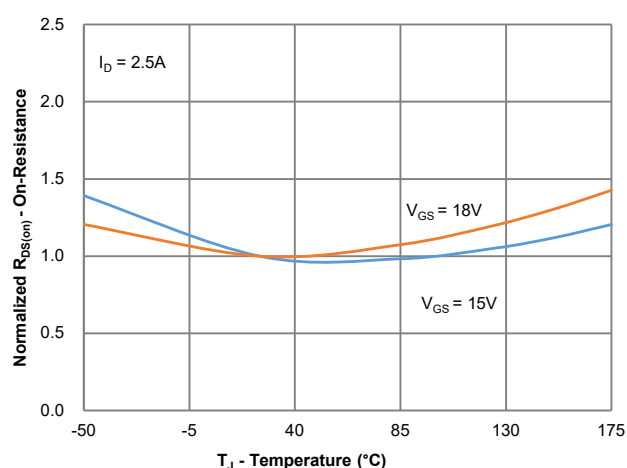
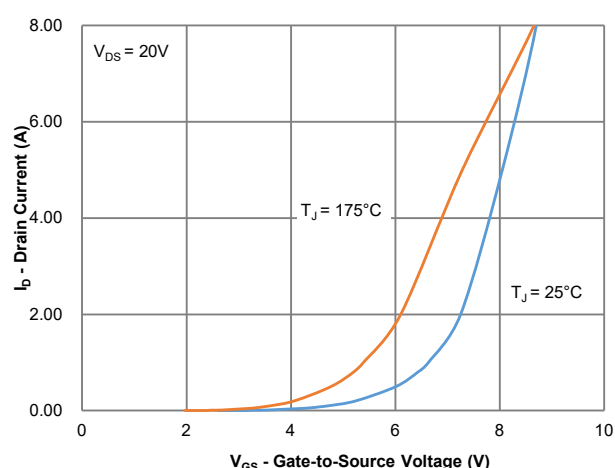
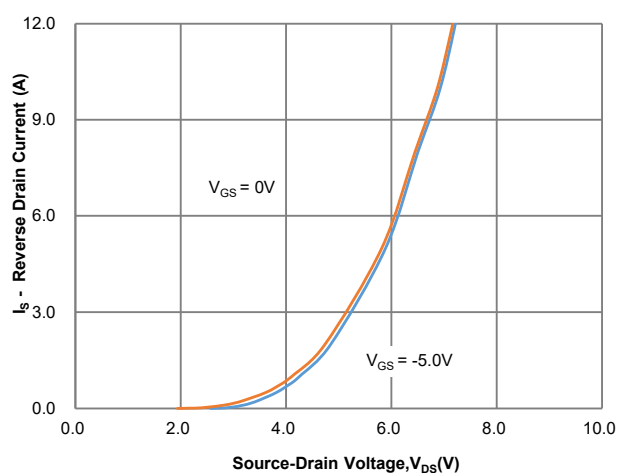
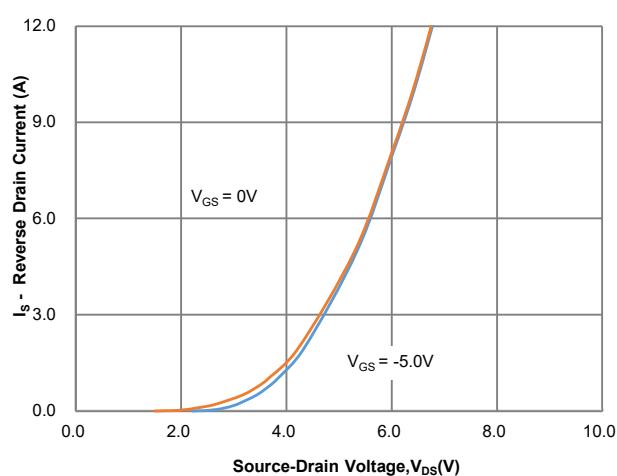
Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Ambient ⁽⁴⁾	$R_{\theta JA}$	40	50	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Case ⁽⁵⁾	$R_{\theta JC}$	3.0	3.6	$^\circ\text{C/W}$

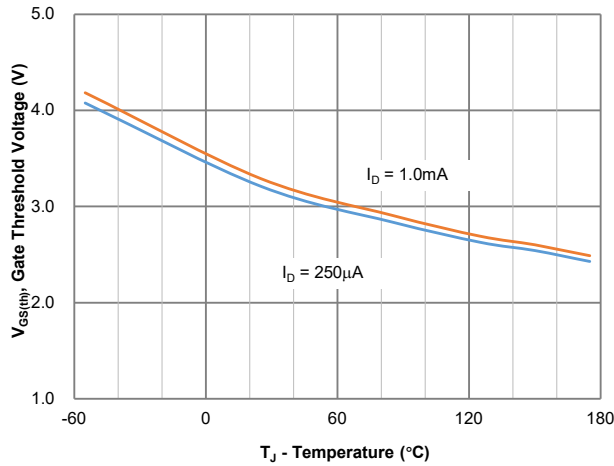
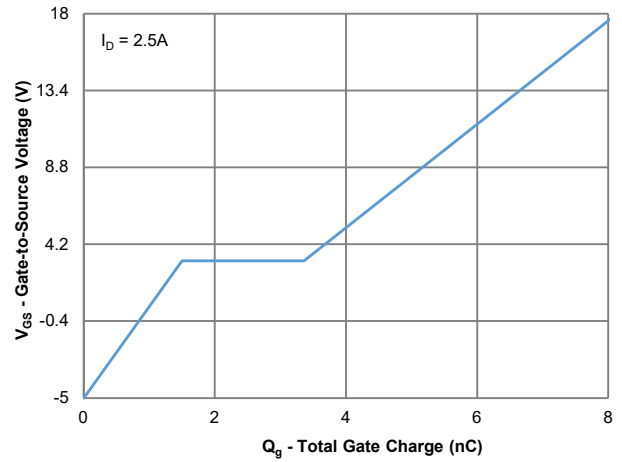
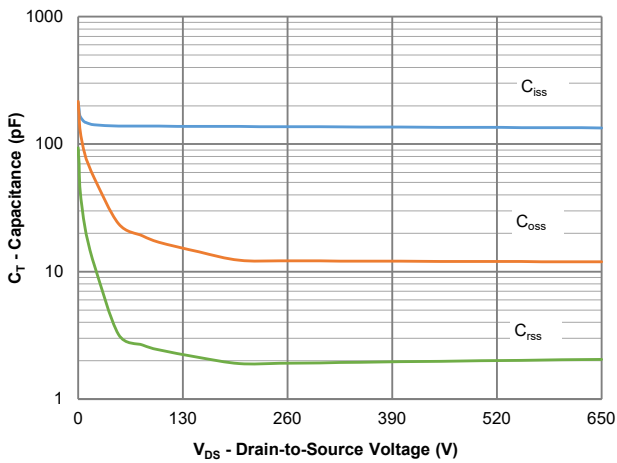
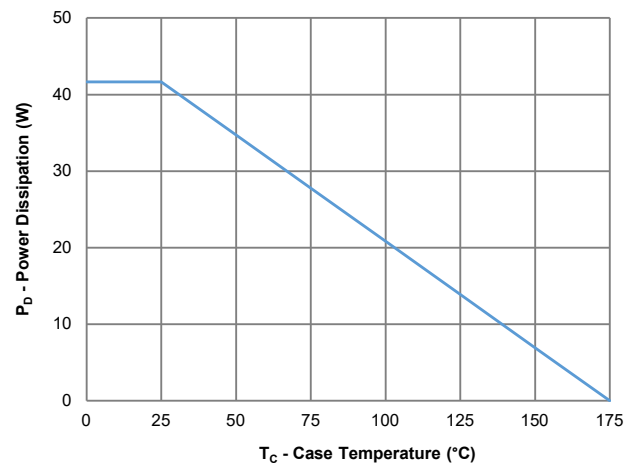
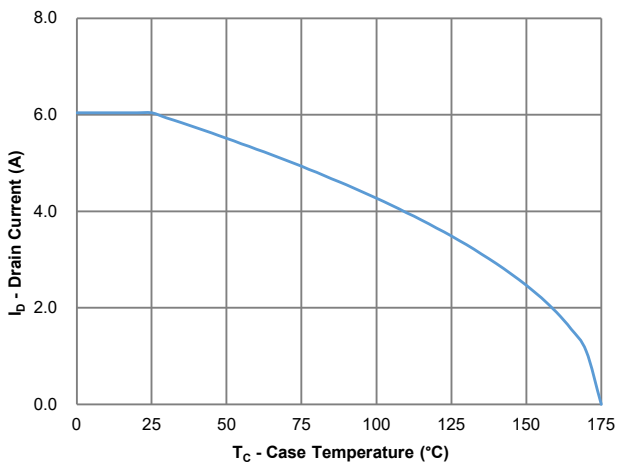
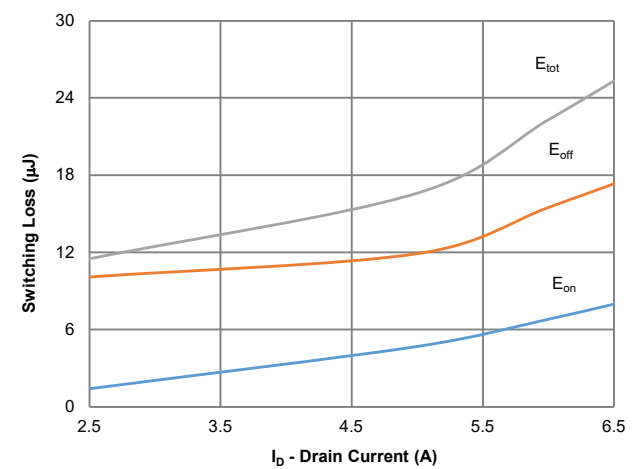
Electrical Characteristics (@ $T_J = 25^\circ\text{C}$, unless otherwise specified.)

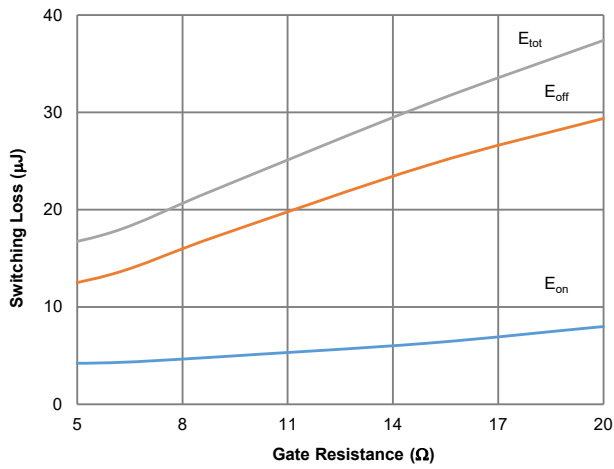
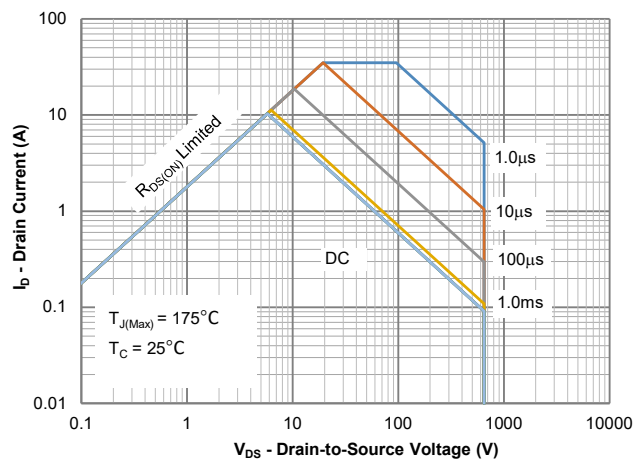
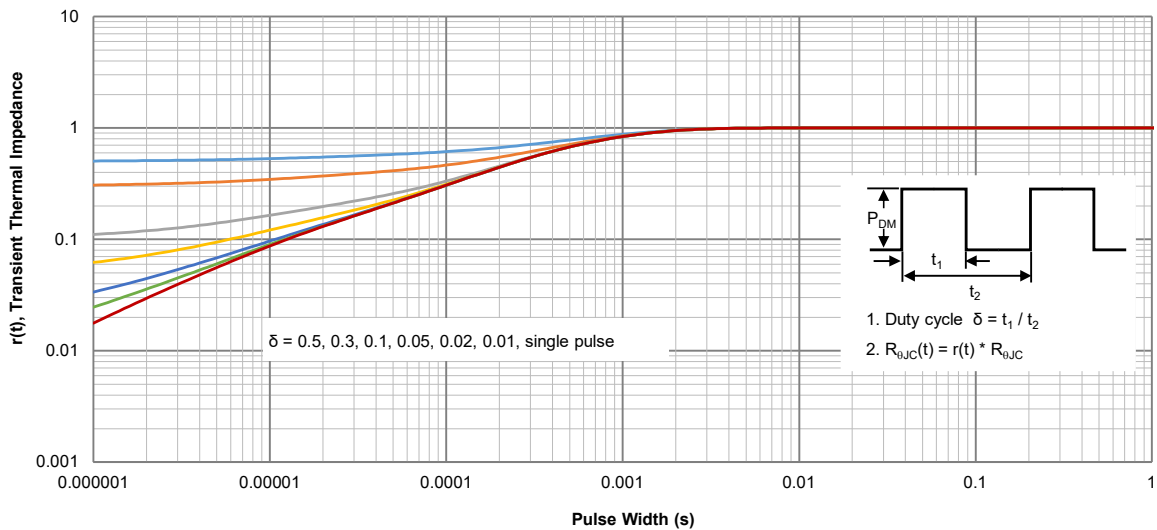
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Off Characteristics ⁽⁶⁾						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D = 1.0mA	650	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 650V, V _{GS} = 0V	-	2.0	100	μA
Gate-Source Leakage Current	I _{GSS}	V _{GS} = +22V, V _{DS} = 0V	-	-	200	nA
		V _{GS} = -10V, V _{DS} = 0V	-	-	-200	nA
On Characteristics ⁽⁶⁾						
Gate Threshold Voltage	V _{GS(th)}	V _{GS} = V _{DS} , I _D = 1.0mA, T _J = 25°C	2.1	3.2	4.2	V
		V _{GS} = V _{DS} , I _D = 1.0mA, T _J = 175°C	-	2.4	-	V
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} = 18V, I _D = 2.5A, T _J =25°C	-	390	470	mΩ
		V _{GS} = 18V, I _D = 2.5A, T _J =175°C	-	545	-	mΩ
		V _{GS} = 15V, I _D = 2.5A, T _J =25°C	-	510	-	mΩ
		V _{GS} = 15V, I _D = 2.5A, T _J =175°C	-	590	-	mΩ
Diodes Forward Voltage	V _{SD}	V _{GS} = -5.0V, I _{SD} = 2.5A, T _J =25°C	-	6.0	-	V
		V _{GS} = -5.0V, I _{SD} = 2.5A, T _J =175°C	-	5.4	-	V
Dynamic Characteristics ⁽⁷⁾						
Input Capacitance	C _{iss}	V _{DS} = 400V, V _{GS} = 0V, f = 1MHz	-	137	-	pF
Output Capacitance	C _{oss}		-	12	-	pF
Reverse Transfer Capacitance	C _{rss}		-	2.0	-	pF
Gate Resistance	R _g	V _{GS} = 0V, V _{DS} = 0V, f = 1MHz	-	62	-	Ω
Switching Characteristics ⁽⁷⁾						
Turn-On Switching Loss	E _{on}	V _{DS} =400V, I _D = 2.5A, R _G =10Ω, V _{GS} =-5/18V	-	11	-	μJ
Turn-Off Switching Loss	E _{off}		-	1.5	-	
Total Switching Loss	E _{tot}		-	12	-	
Turn-On DelayTime	t _{d(on)}	V _{DS} =400V, I _D = 2.5A, R _G =10Ω, V _{GS} =-5/18V	-	7.8	-	ns
Rise Time	t _r		-	14	-	ns
Turn-Off DelayTime	t _{d(off)}		-	12	-	ns
Fall Time	t _f		-	20	-	ns
Gate Charge Characteristics ⁽⁷⁾						
Total Gate Charge (V _{GS} = 18V)	Q _g	V _{DS} =400V, I _D = 2.5A, V _{GS} =-5/18V	-	8.1	-	nC
Gate-Source Charge	Q _{gs}		-	1.5	-	nC
Gate-Drain Charge	Q _{gd}		-	1.9	-	nC
Drain-Source Diode Characteristics ⁽⁷⁾						
Body Diode Reverse Recovery Time	t _{rr}	V _{DS} = 400V, V _{GS} =-5.0V, I _{SD} = 2.5A, di/dt=1000A/μs	-	5.7	-	ns
Body Diode Reverse Recovery Charge	Q _{rr}		-	15	-	nC
Peak Reverse Recovery Current	I _{rrm}		-	4.5		A
Diode Forward Current	I _s	T _C = 25°C	-	-	6.0	A

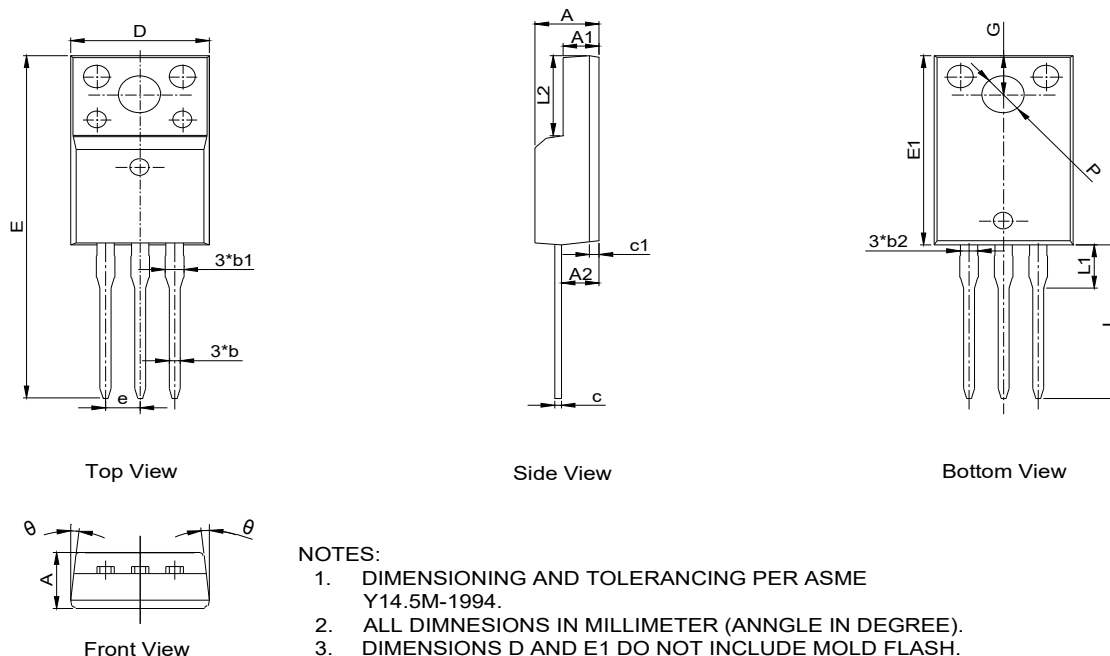
Notes:

1. This current is chip limited, which is calculated based on R_{thjc} .
2. This current is calculated on single pulse with 10 μs Single Pulse.
3. Defined by design, not subject to production test, E_{AS} condition: $T_J=25^\circ\text{C}$, $V_{DD}=325V$, $V_{GS}=10V$, $L=10mH$.
4. Device mounted on FR-4 substrate PC board with 2oz copper in 1inch square cooling area.
5. Thermal resistance from junction to the exposed pad.
6. Short duration pulse test used to minimize self-heating effect.
7. Defined by design, not subject to production.

Typical Electrical and Thermal Characteristics

Figure 1: Output Characteristics $T_J = 25^\circ\text{C}$

Figure 2: Output Characteristics $T_J = 175^\circ\text{C}$

Figure 3: On-Resistance vs. Junction Temperature

Figure 4: Transfer Characteristics

Figure 5: Body Diode Characteristic, $T_J = 25^\circ\text{C}$

Figure 6: Body Diode Characteristic, $T_J = 175^\circ\text{C}$

Typical Electrical and Thermal Characteristics

Figure 7: Gate Threshold Variation vs. Junction Temperature

Figure 8: Gate Charge Characteristics

Figure 9: Capacitance Characteristics

Figure 10: Power Derating

Figure 11: Current Derating

Figure 12: Switching Losses vs. Drain Current

Typical Electrical and Thermal Characteristics

Figure 13: Switching Losses vs. Gate Resistance

Figure 14: Safe Operating Area

Figure 15: Normalized Maximum Transient Thermal Impedance

TO220F-3L Package Outline
Package Outline

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
2. ALL DIMNESIONS IN MILLIMETER (ANNGLE IN DEGREE).
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH.

DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	2.50	2.76	2.96
b	0.60	0.80	1.00
b1	--	--	1.47
b2	1.10	--	1.38
c	0.40	0.50	0.63
c1	0.70 REF		
D	9.96	--	10.40
e	2.54 BSC		
E	28.30	28.85	29.35
E1	15.67	15.87	16.10
G	3.20	--	3.40
L	12.68	--	13.30
L1	--	--	3.50
L2	6.48	6.68	6.88
P	3.30 REF		
θ	0°	--	12°