

**MOSFETs Silicon 650V N-Channel MOS**
**■ Applications**

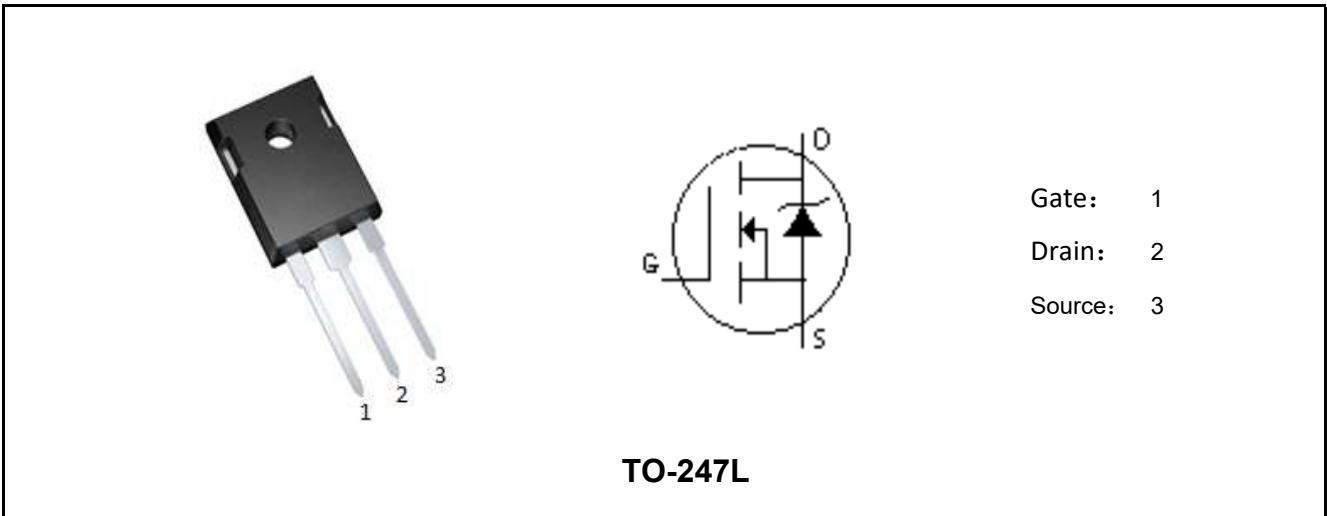
- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)
- HB or AHB or LLC half bridge andfull bridge topologies.

**■ Features**

- Multi-Epi process SJ-FET
- Low  $R_{DS(ON)}$
- Ultra Low Gate Charge
- RoHS and Halogen-Free Compliant
- 100% UIS and RG Tested
- Fast-Recovery body diode

**■ Product Summary**

$V_{DS} @ T_{j,max}$	700	V
$I_D$	60	A
$R_{DS(ON),Typ}@10V$	43	m $\Omega$
$Q_g$	110	nC



Marking	Package	Packaging	Min. package quantity
MSL048R65CFD3	TO-247L	Tube	450



**■ Absolute Maximum Ratings (Tc=25°C unless otherwise noted)**

Parameter	Symbol	Ratings	Unit
Drain-Source Voltage	$V_{DS}$	650	V
Gate-Source Voltage	$V_{GS}$	±30	V
Continuous Drain Current Tc=25°C (Note 1)	$I_D$	60	A
Continuous Drain Current Tc=100°C (Note 1)		35	
Drain Current-Pulsed (Note 1)	$I_{DM}$	240	A
Total Dissipation	$P_D$	350	W
Junction Temperature	$T_J$	150	°C
Storage Temperature	$T_{stg}$	-55-150	°C
Single Pulse Avalanche Energy (Note 2)	$E_{AS}$	120	mJ

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

**■ Thermal Characteristics**

Parameter	Symbol	Max	Unit
Maximum Junction-to-Case	$R_{\theta JC}$	0.36	°C/W
Maximum Junction-to-Ambient	$R_{\theta JA}$	40	°C/W

Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2:  $V_{DD}=100V$ ,  $T_{ch}=25^\circ C$ (initial),  $L=0.5mH$ ,  $R_g=25\Omega$ .

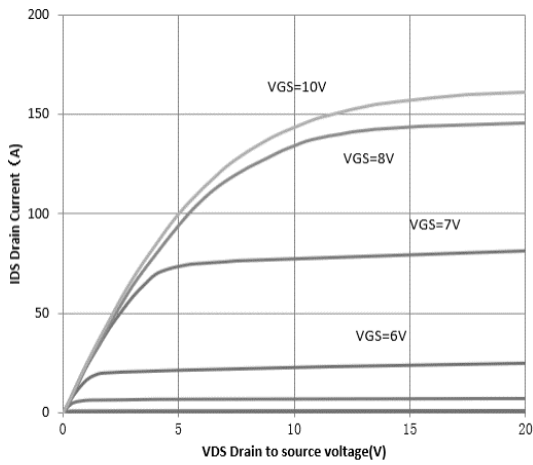
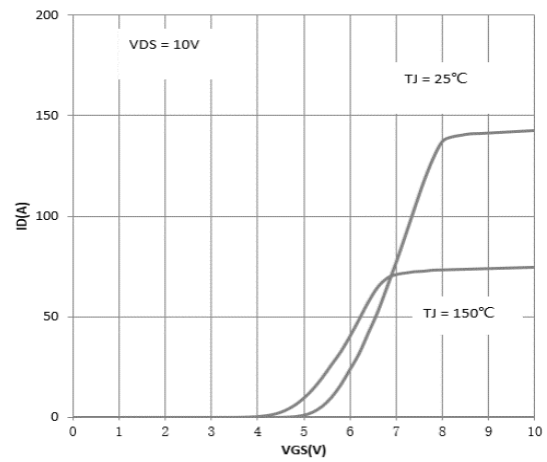
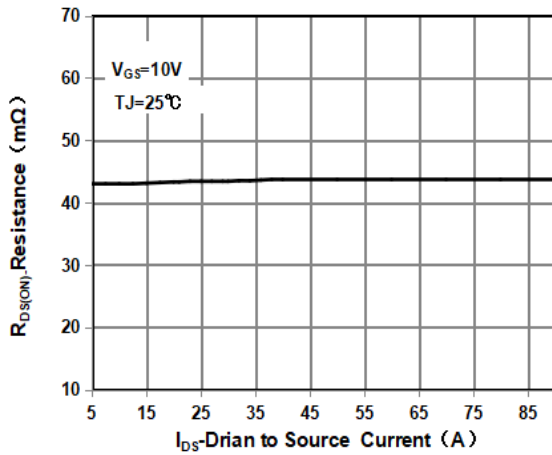
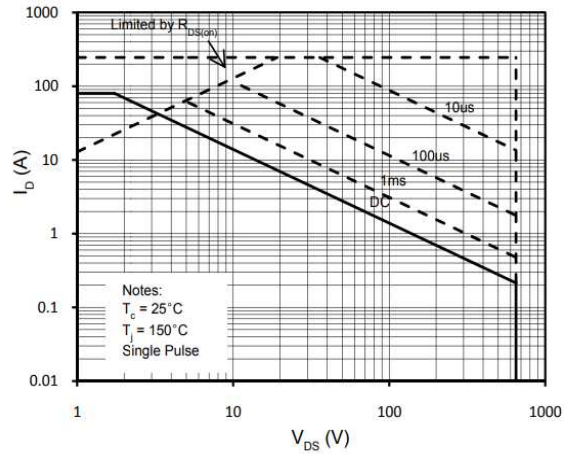
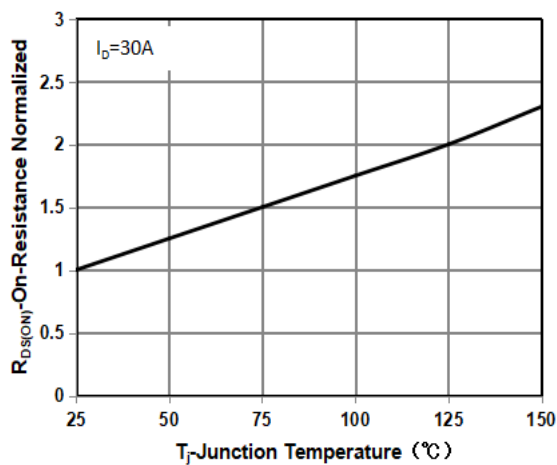
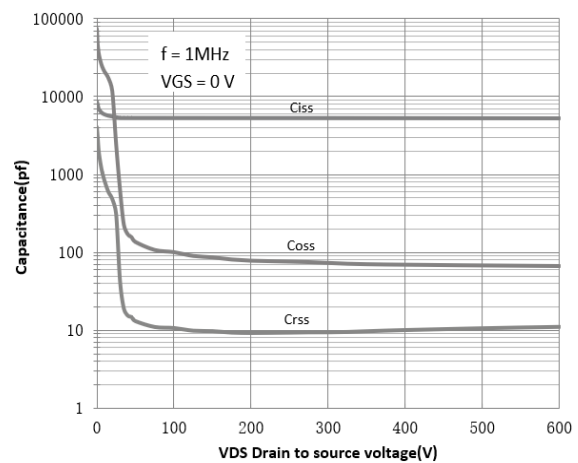
Note: This transistor is sensitive to electrostatic discharge and should be handled with care.

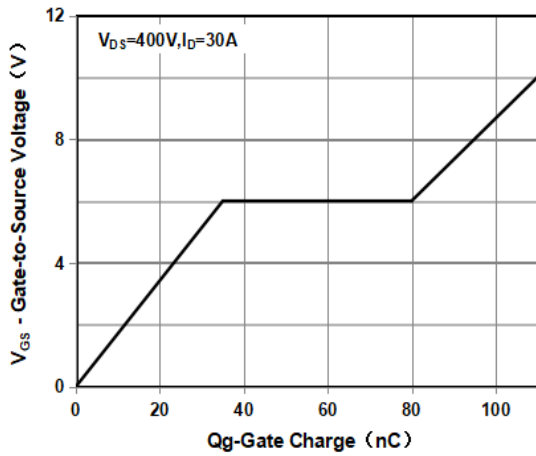
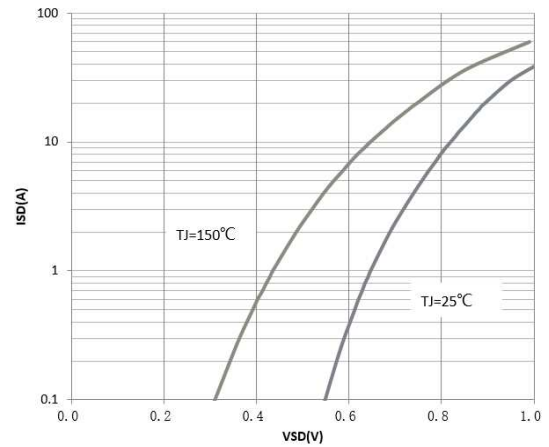
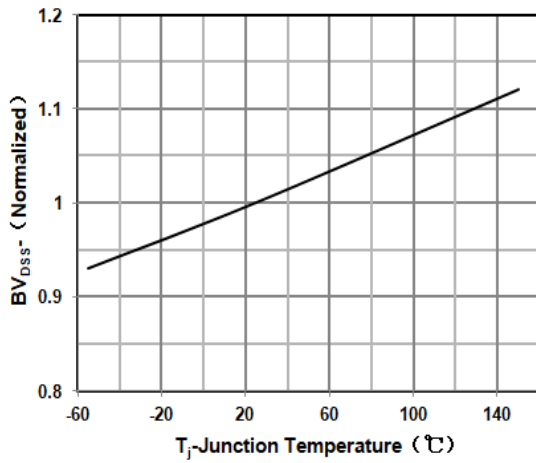


**■ Electrical Characteristics (Tc=25°C unless otherwise noted)**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static Parameters</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	650	-	-	V
		T <sub>j</sub> =150°C	700	-	-	
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V	-	-	1	uA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V	-	-	±100	nA
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	3	4	5	V
Drain-Source On Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =30A	-	43	48	mΩ
		T <sub>j</sub> =150°C	-	100	-	
<b>Dynamic Characteristics</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =35V, V <sub>GS</sub> =0V, f=1.0MHz	-	5300	-	pF
Output Capacitance	C <sub>oss</sub>		-	230	-	pF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	17	-	pF
Gate Resistance	R <sub>g</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1.0MHz	-	3.2	-	Ω
<b>Switching Paramters</b>						
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DS</sub> =400V, I <sub>D</sub> =30A, V <sub>GS</sub> =10V, R <sub>G</sub> =1.8Ω	-	15	-	ns
Turn-On Rise Time	t <sub>r</sub>		-	35	-	ns
Turn-Off Delay Time	t <sub>d(off)</sub>		-	87	-	ns
Turn-Off Rise Time	t <sub>f</sub>		-	6	-	ns
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =400V, I <sub>D</sub> =30A, V <sub>GS</sub> =10V	-	110	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	35	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	45	-	nC
<b>Source-Drain Characteristics</b>						
Max. Diode Forward Current	I <sub>S</sub>		-	-	60	A
Max. Pulsed Forward Current	I <sub>SM</sub>		-	-	240	A
Diode Forward Voltage	V <sub>sd</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =30A	-	0.95	1.5	V
Reverse Recovery Time	t <sub>rr</sub>	V <sub>R</sub> =400V, I <sub>F</sub> =30A, di/dt=100A/us	-	180	-	ns
Reverse Recovery Charge	Q <sub>rr</sub>		-	1.3	-	μC

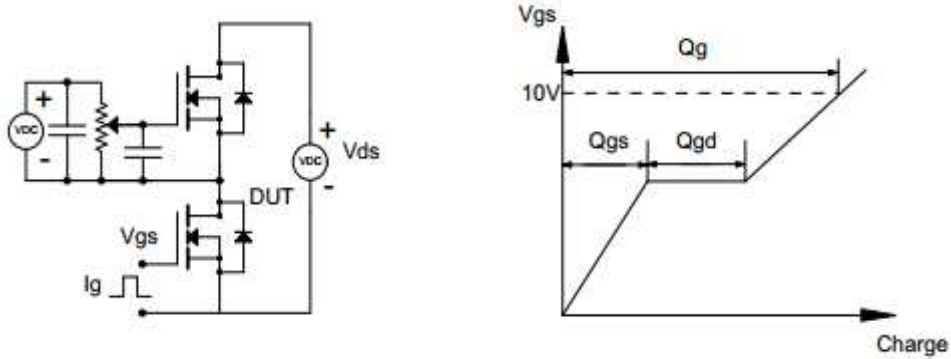
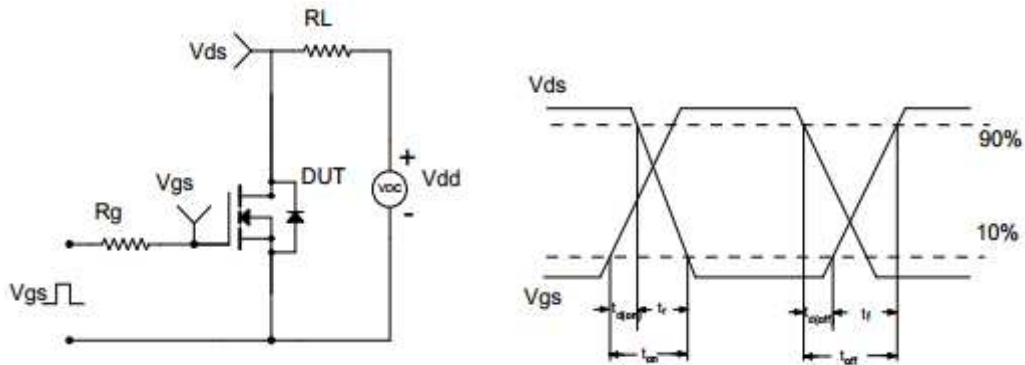
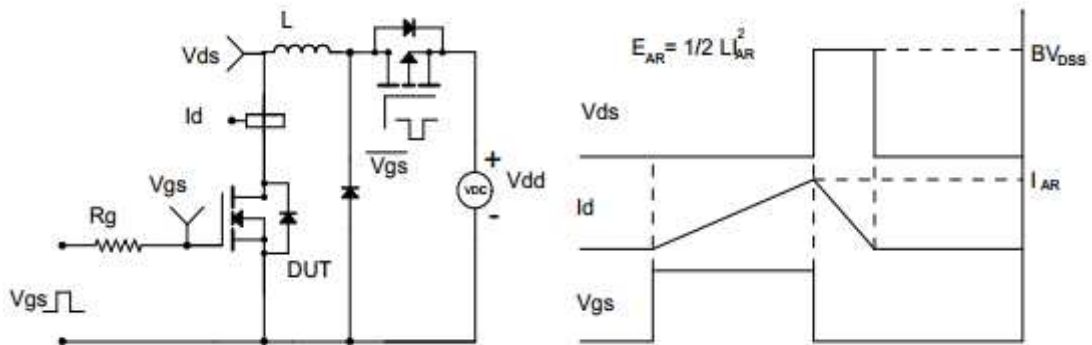


**■ Characteristics Curves**

**Output Characteristics**

**Transfer Characteristics**

**On Resistance Vs Drain Current**

**Maximum Safe Operating Area**

**Rdson-Junction Temperature**

**Capacitance**



**Gate Charge Waveform**

**Source-Drain Diode Forward Voltage**

**Breakdown Voltage Vs Junction Temperature**

Note : The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



**■ Test Circuit & Waveform**
**Gate Charge Test Circuit & Waveform**

**Resistive Switching Test Circuit & Waveform**

**Unclamped Inductive Switching (UIS) Test Circuit & Waveform**


**TO-247L Package Dimensions**

Unit: mm

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	4.80		5.20	E1	13.00		13.60
A1	2.20	2.40	2.60	E2	5.00		5.50
A2	1.85		2.15	E3	1.90		2.60
b	1.07		1.33	e		5.44	
b2	1.90		2.16	L	19.30		19.90
b4	2.90		3.20	L1	3.75	3.95	4.15
c	0.52		0.68	ΦP	3.40		3.80
D	20.70		21.30	ΦP1	7.00		7.40
D1	16.15		16.95	S	6.04	6.15	6.30
E	15.50		16.10				

