Ordering number : ENA1796A

SANYO Semiconductors

DATA SHEET

An ON Semiconductor Company

N-Channel Silicon MOSFET

BFL4004 — General-Purpose Switching Device Applications

Features

- ON-resistance $R_{DS}(on)$=1.9Ω (typ.)
- Input capacitance Ciss=710pF (typ.)
- 10V drive

Specifications

Absolute Maximum Ratings at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit
Drain-to-Source Voltage	V_{DSS}		800	V
Gate-to-Source Voltage	V_{GSS}		±30	V
Drain Current (DC)	I_{Dc}*1	Limited only by maximum temperature Tch=150°C	6.5	A
	I_{Dpack}*2	Tc=25°C (SANYO's ideal heat dissipation condition)*3	4.3	A
Drain Current (Pulse)	I_{DP}	PW≤10μs, duty cycle≤1%	13	A
Allowable Power Dissipation	P_D		2.0	W
		Tc=25°C (SANYO's ideal heat dissipation condition)*3	36	W
Channel Temperature	Tch		150	°C
Storage Temperature	Tstg		−55 to +150	°C
Avalanche Energy (Single Pulse) *4	E_{AS}		225	mJ
Avalanche Current *5	I_{AV}		6.5	A

Note :*1 Shows chip capability

*2 Package limited

*3 SANYO's condition is radiation from backside.

The method is applying silicone grease to the backside of the device and attaching the device to water-cooled radiator made of aluminium.

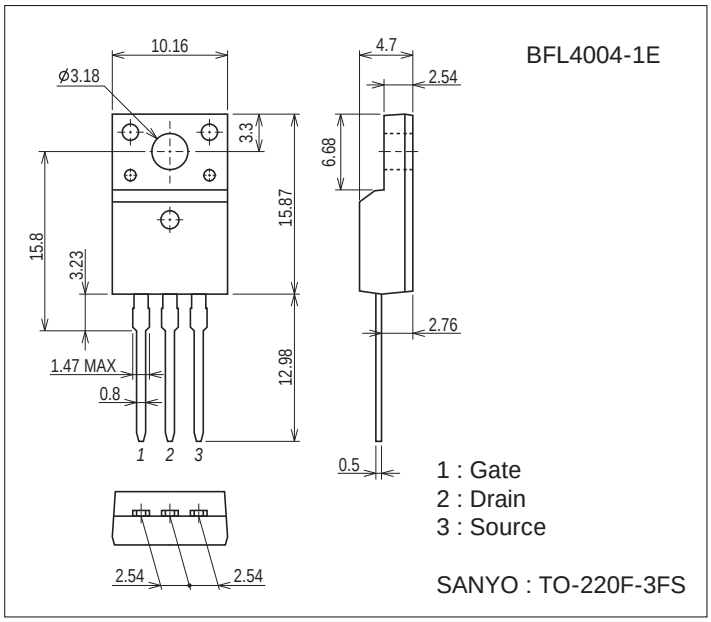
*4 V_{DD}=50V, L=10mH, I_{AV}=6.5A (Fig.1)

*5 L≤10mH, single pulse

Package Dimensions

unit : mm (typ)

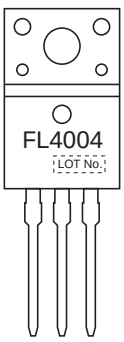
7528-001



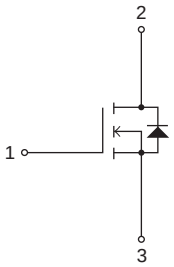
Product & Package Information

- Package : TO-220F-3FS
- JEITA, JEDEC : SC-67
- Minimum Packing Quantity : 50 pcs./tube

Marking



Electrical Connection



Electrical Characteristics at Ta=25°C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	I_D=10mA, V_{GS}=0V	800			V
Zero-Gate Voltage Drain Current	I_{DSS}	V_{DS}=640V, V_{GS}=0V			1.0	mA
Gate-to-Source Leakage Current	I_{GSS}	V_{GS}=±30V, V_{DS}=0V			±100	nA
Cutoff Voltage	V_{GS}(off)	V_{DS}=10V, I_D=1mA	2.0		4.0	V
Forward Transfer Admittance	| yfs |	V_{DS}=20V, I_D=3.25A	1.7	3.4		S
Static Drain-to-Source On-State Resistance	R_{DS}(on)	I_D=3.25A, V_{GS}=10V		1.9	2.5	Ω
Input Capacitance	Ciss	V_{DS}=30V, f=1MHz		710		pF
Output Capacitance	Coss			120		pF
Reverse Transfer Capacitance	Crss			42		pF
Turn-ON Delay Time	$t_{d(on)}$	See Fig.2		17		ns
Rise Time	t_r			44		ns
Turn-OFF Delay Time	$t_{d(off)}$			130		ns
Fall Time	t_f			44		ns
Total Gate Charge	Qg	V_{DS}=200V, V_{GS}=10V, I_D=6.5A		36		nC
Gate-to-Source Charge	Qgs			6.2		nC
Gate-to-Drain “Miller” Charge	Qgd			18		nC
Diode Forward Voltage	V_{SD}	I_S=6.5A, V_{GS}=0V		0.85	1.2	V
Reverse Recovery Time	t_{rr}	See Fig.3		970		ns
Reverse Recovery Charge	Q_{rr}	I_S=6.5A, V_{GS}=0V, di/dt=100A/μs		6700		nC

Fig.1 Unclamped Inductive Switching Test Circuit

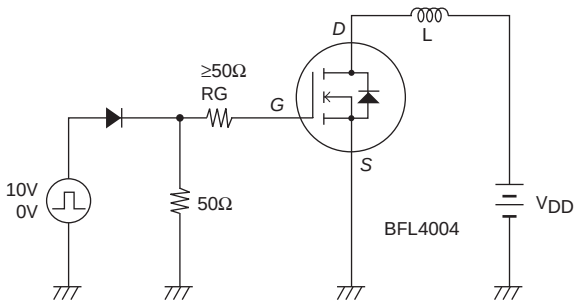


Fig.2 Switching Time Test Circuit

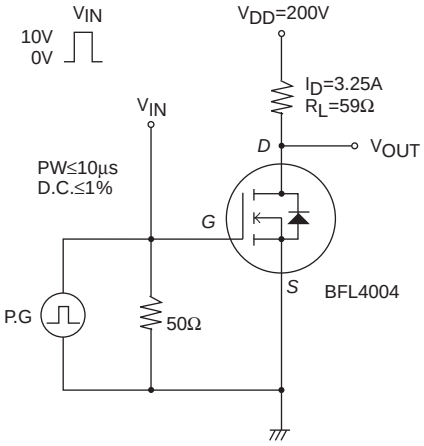
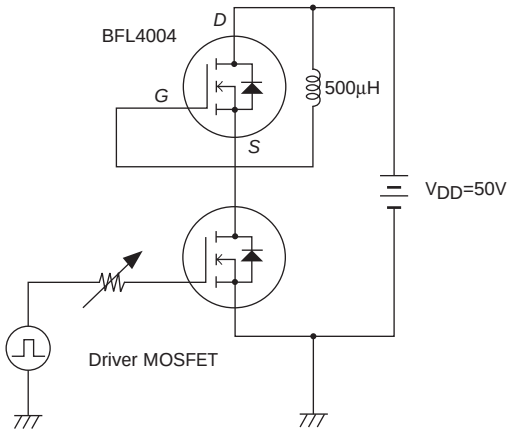
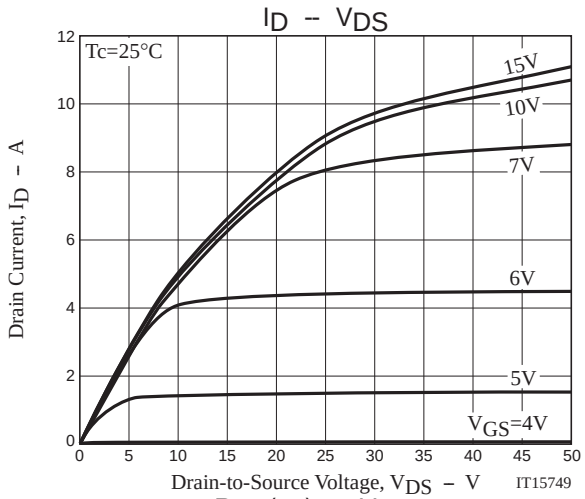


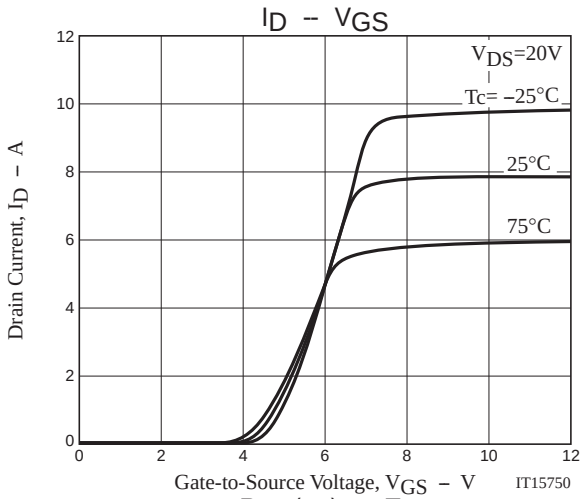
Fig.3 Reverse Recovery Time Test Circuit

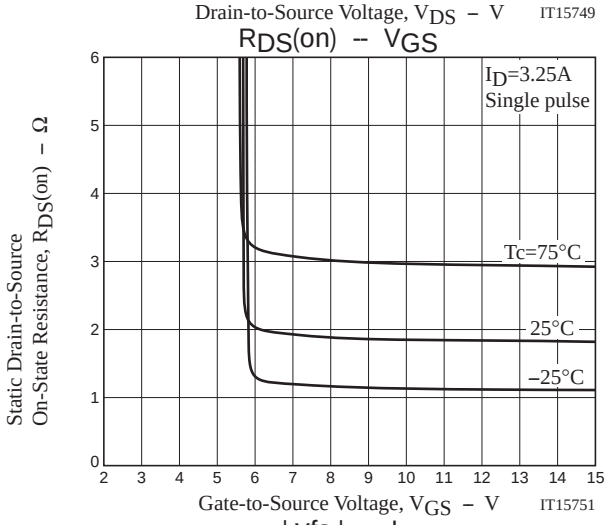


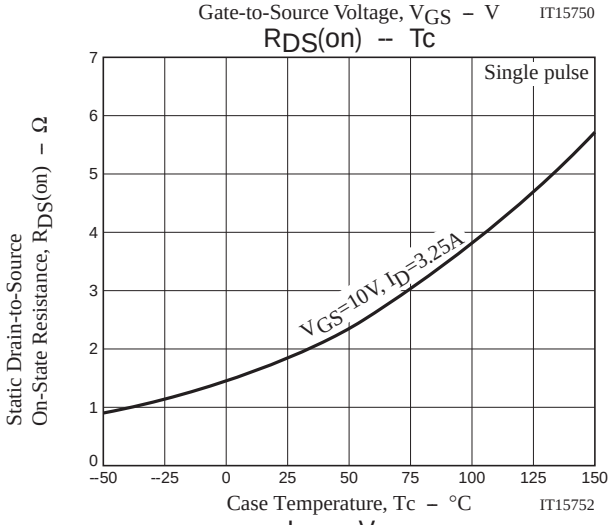
Ordering Information

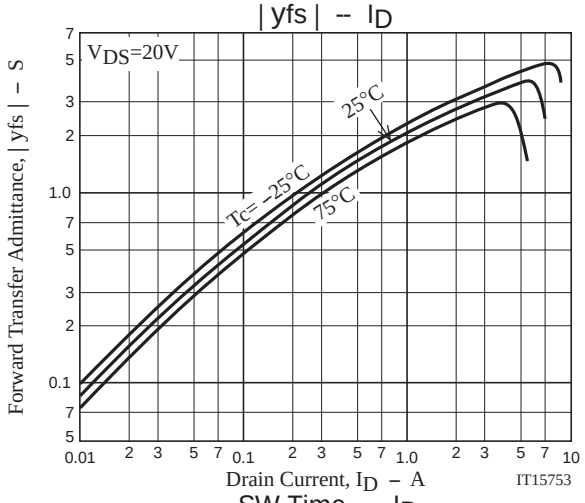
Device	Package	Shipping	memo
BFL4004-1E	TO-220F-3FS	50pcs./tube	Pb Free

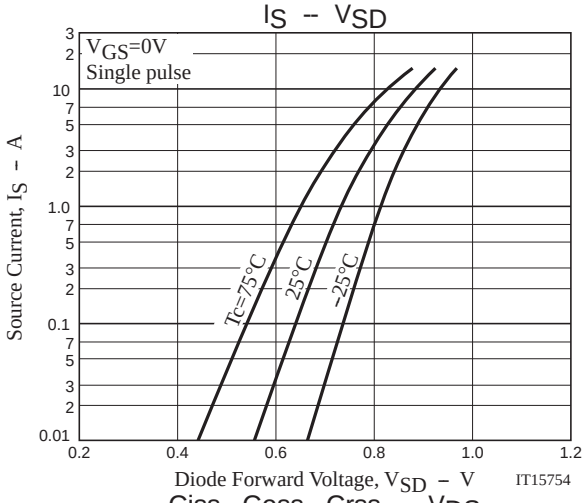

ID -- VDS
Tc=25°C
15V
10V
7V
6V
5V
VGS=4V
Drain Current, ID – A
Drain-to-Source Voltage, VDS – V
IT15749

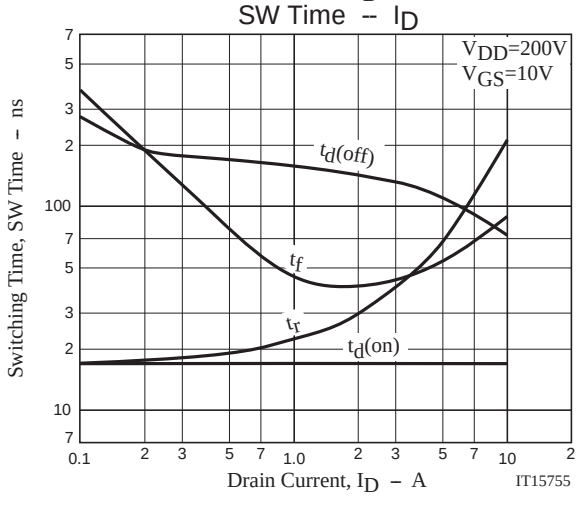

ID -- VGS
VDS=20V
Tc= –25°C
25°C
75°C
Drain Current, ID – A
Gate-to-Source Voltage, VGS – V
IT15750

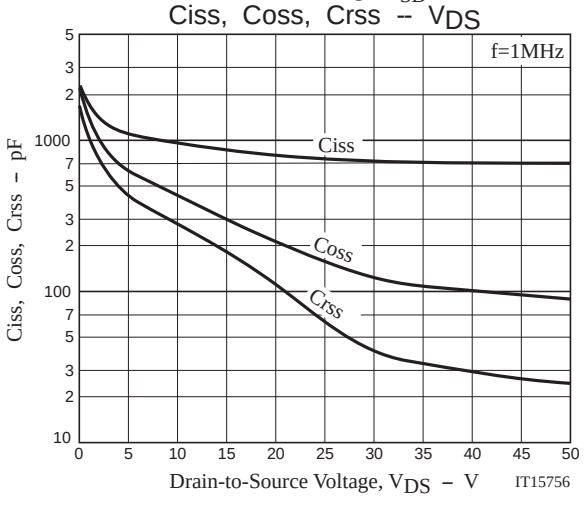

RDS(on) -- VGS
ID=3.25A
Single pulse
Tc=75°C
25°C
–25°C
Static Drain-to-Source On-State Resistance, RDS(on) – Ω
Gate-to-Source Voltage, VGS – V
IT15751

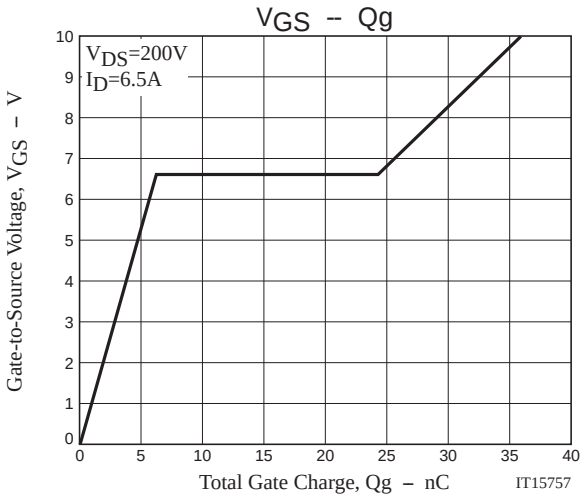

RDS(on) -- Tc
Single pulse
VGS=10V, ID=3.25A
Static Drain-to-Source On-State Resistance, RDS(on) – Ω
Case Temperature, Tc – °C
IT15752

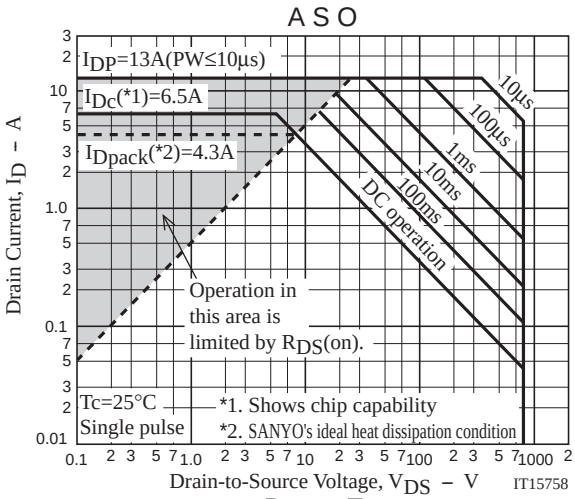

| yfs | -- ID
VDS=20V
25°C
Tc= –25°C
75°C
Forward Transfer Admittance, | yfs | – S
Drain Current, ID – A
IT15753

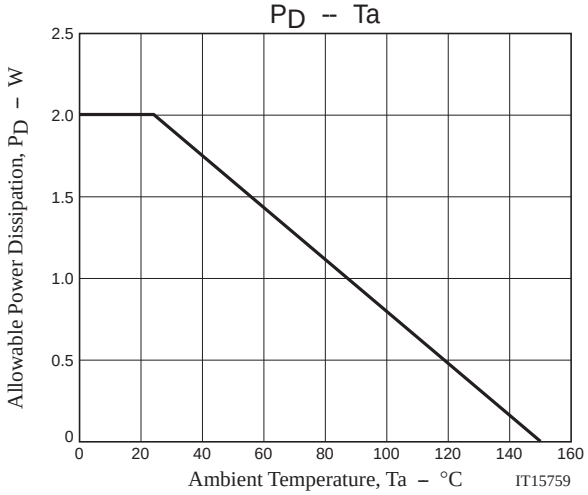

IS -- VSD
VGS=0V
Single pulse
Tc=75°C
25°C
–25°C
Source Current, IS – A
Diode Forward Voltage, VSD – V
IT15754

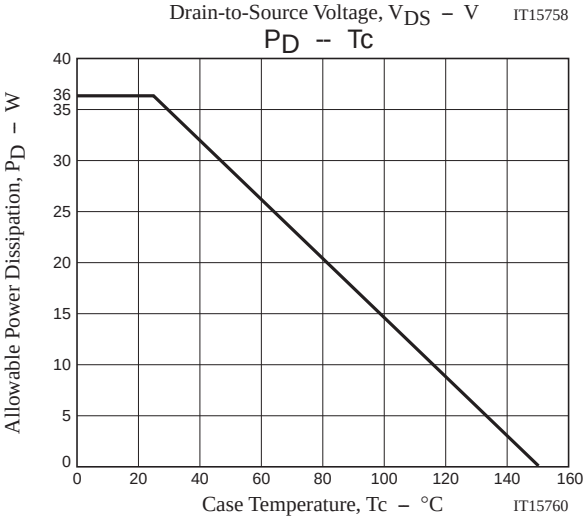

SW Time -- ID
VDD=200V
VGS=10V
td(off)
tf
tr
td(on)
Switching Time, SW Time – ns
Drain Current, ID – A
IT15755

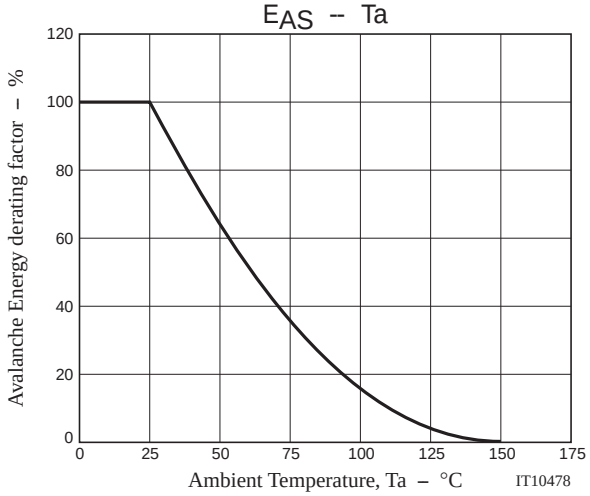

Ciss, Coss, Crss -- VDS
f=1MHz
Ciss
Coss
Crss
Ciss, Coss, Crss – pF
Drain-to-Source Voltage, VDS – V
IT15756


VGS – Qg
VDS=200V
ID=6.5A
Gate-to-Source Voltage, VGS – V
Total Gate Charge, Qg – nC
IT15757


A S O
IDP=13A(PW≤10μs)
IDc(*1)=6.5A
IDpack(*2)=4.3A
10μs
100μs
1ms
10ms
100ms
DC operation
Operation in this area is limited by RDS(on).
Tc=25°C
Single pulse
*1. Shows chip capability
*2. SANYO's ideal heat dissipation condition
Drain Current, ID – A
Drain-to-Source Voltage, VDS – V
IT15758


PD – Ta
Allowable Power Dissipation, PD – W
Ambient Temperature, Ta – °C
IT15759


PD – Tc
Allowable Power Dissipation, PD – W
Case Temperature, Tc – °C
IT15760


EAS – Ta
Avalanche Energy derating factor – %
Ambient Temperature, Ta – °C
IT10478

Magazine Specification

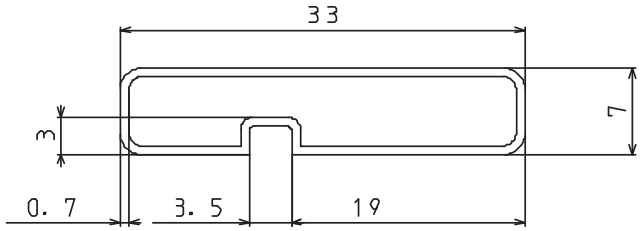
BFL4004-1E

1. Packing Format

Package Name	Magazine Name	Maximum Number of devices contained (pcs)			Packing format	
		Magazine	Inner box	Outer box	Inner BOX	Outer BOX
TO-220F-3FS	TO-220F	50	1,000	4,000	SPD-0V0001 20 magazines contained Dimensions:mm (external) 568×150×55	SPT-081029 4 inner boxes contained Dimensions:mm (external) 590×225×178

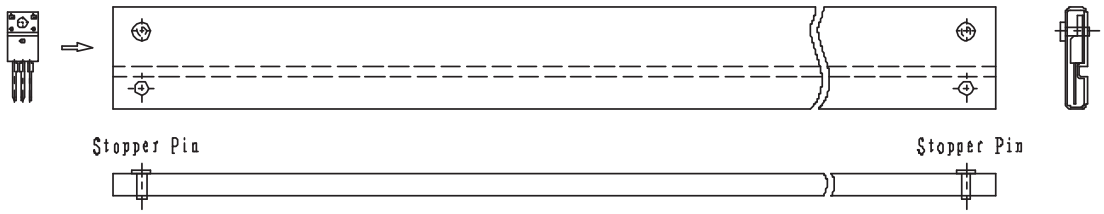
2. Magazine dimensions

(unit:mm)

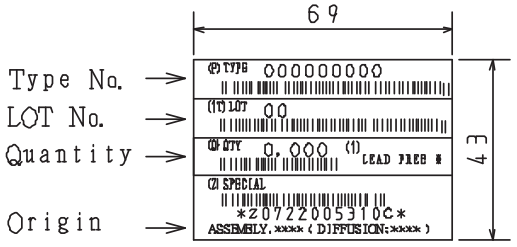


Tolerance=±0.3mm
Thickness=0.7±0.2mm
Length =532.5±2mm
Material =PVC (Antistatic treatment)

3. Storage method to magazine

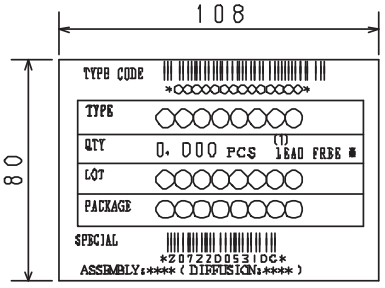


4. Inner box label (unit:mm)



5. Outer box label (unit:mm)

It is a label at the time of factory shipments.
The form of a label may change in physical distribution process.

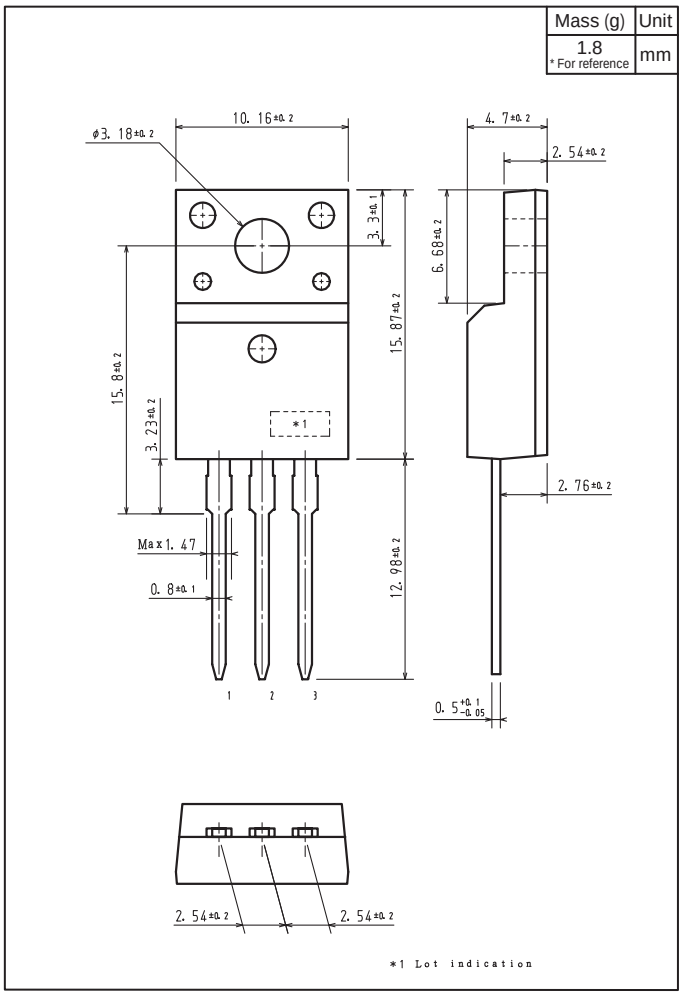


NOTE (1)
The LEAD FREE ※ description shows that the surface treatment of the terminal is lead free.

Label	JEITA Phase
LEAD FREE 3	JEITA Phase 3A

Outline Drawing

BFL4004-1E



Note on usage : Since the BFL4004 is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.

This catalog provides information as of December, 2012. Specifications and information herein are subject to change without notice.