

**$V_{RM} = 400\text{ V}$ ,  $I_{F(AV)} = 20\text{ A}$ ,  $t_{rr} = 50\text{ ns}$**   
**Fast Recovery Diode**  
**FML-4204S**

**Description**

The FML-4204S is a fast recovery diode of 400 V / 20 A. The maximum  $t_{rr}$  of 50 ns is realized by optimizing a life-time control.

**Package**

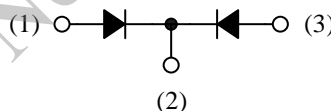
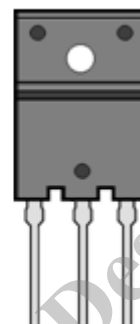
TO3PF-3L

**Features**

- $V_{RM}$ ----- 400 V
- $I_{F(AV)}$ ----- 20 A
- $V_F$ ----- 1.3 V
- $t_{rr1}$ ----- 50 ns
- Bare Leads: Pb-free (RoHS Compliant)
- Flammability: Equivalent to UL94V-0

**Applications**

- Secondary-side Rectifier Diode  
(Flyback Converter, LLC Converter, etc.)
- Freewheel Diode  
(Offline Buck Converter, Offline Buck-boost Converter, etc.)



- (1) Anode
- (2) Cathode
- (3) Anode

Not to scale

## FML-4204S

### Absolute Maximum Ratings

Unless otherwise specified,  $T_A = 25\text{ }^\circ\text{C}$ .

Parameter	Symbol	Conditions	Rating	Unit
Nonrepetitive Peak Reverse Voltage <sup>(1)</sup>	$V_{RSM}$		400	V
Repetitive Peak Reverse Voltage <sup>(1)</sup>	$V_{RM}$		400	V
Average Forward Current	$I_{F(AV)}$	See Figure 1 and Figure 2	20	A
Surge Forward Current <sup>(1)</sup>	$I_{FSM}$	Half cycle sine wave, positive side, 10 ms, 1 shot	100	A
$I^2t$ Limiting Value <sup>(1)</sup>	$I^2t$	$1\text{ ms} \leq t \leq 10\text{ ms}$	50	$\text{A}^2\text{s}$
Junction Temperature	$T_J$		-40 to 150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$		-40 to 150	$^\circ\text{C}$

### Electrical Characteristics

Unless otherwise specified,  $T_A = 25\text{ }^\circ\text{C}$ .

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage Drop <sup>(1)</sup>	$V_F$	$T_J = 25\text{ }^\circ\text{C}$ , $I_F = 10\text{ A}$	—	—	1.3	V
		$T_J = 100\text{ }^\circ\text{C}$ , $I_F = 10\text{ A}$	—	0.94	—	V
Reverse Leakage Current <sup>(1)</sup>	$I_R$	$V_R = V_{RM}$	—	—	50	$\mu\text{A}$
Reverse Leakage Current under High Temperature <sup>(1)</sup>	$H \cdot I_R$	$V_R = V_{RM}$ , $T_J = 150\text{ }^\circ\text{C}$	—	—	400	$\mu\text{A}$
Reverse Recovery Time <sup>(1)</sup>	$t_{rr1}$	$I_F = I_{RP} = 500\text{ mA}$ , 90% recovery point, $T_J = 25\text{ }^\circ\text{C}$	—	—	50	ns
	$t_{rr2}$	$I_F = 500\text{ mA}$ , $I_{RP} = 1000\text{ mA}$ , 75% recovery point, $T_J = 25\text{ }^\circ\text{C}$	—	—	35	ns
Thermal Resistance <sup>(2)</sup>	$R_{th(J-C)}$		—	—	2.0	$^\circ\text{C/W}$

### Mechanical Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Unit
Heatsink Mounting Screw Torque		0.686	—	0.882	N·m
Package Weight		—	6.5	—	g

<sup>(1)</sup> Specifies a value per chip; the FML-4204S consists of two chips.

<sup>(2)</sup> Refers to thermal resistance between junction and the case. The case temperature is measured at the backside near the screw hole.

Derating Curves

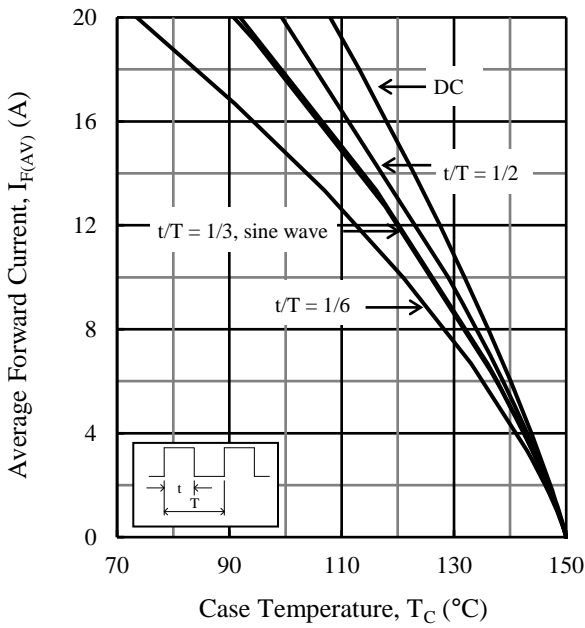


Figure 1.  $I_{F(AV)}$  vs.  $T_C$  ( $T_J = 150\text{ }^\circ\text{C}$ ,  $V_R = 0\text{ V}$ )

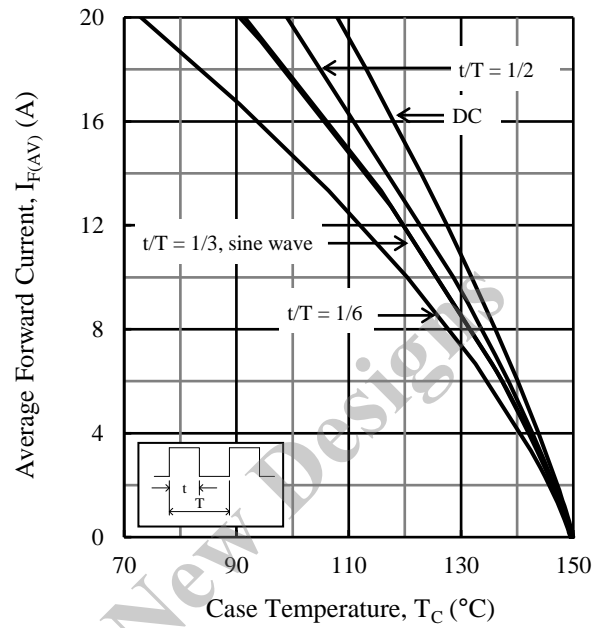


Figure 2.  $I_{F(AV)}$  vs.  $T_C$  ( $T_J = 150\text{ }^\circ\text{C}$ ,  $V_R = 400\text{ V}$ )

Characteristic Curves

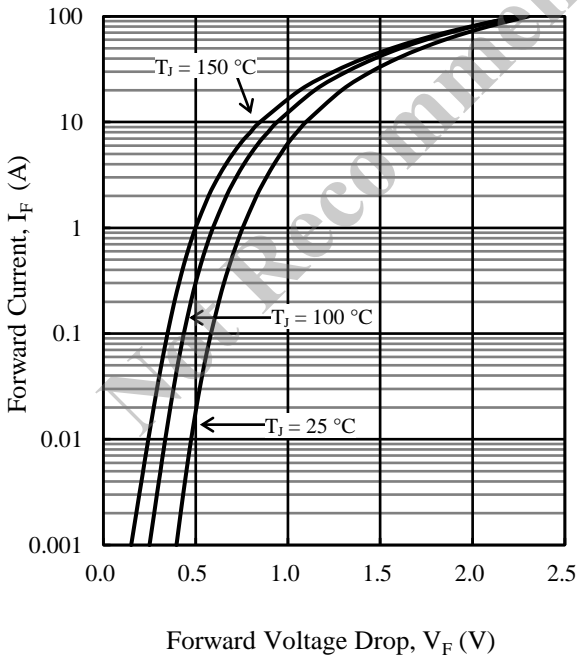


Figure 3. Typical Characteristics:  $I_F$  vs.  $V_F$

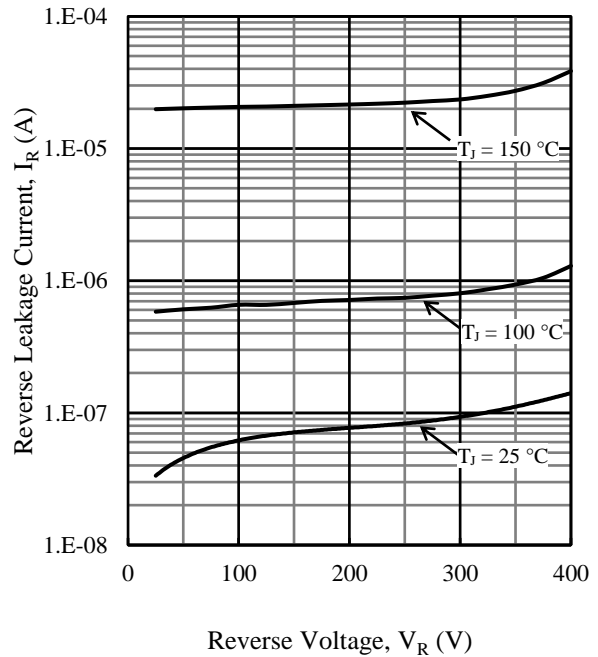
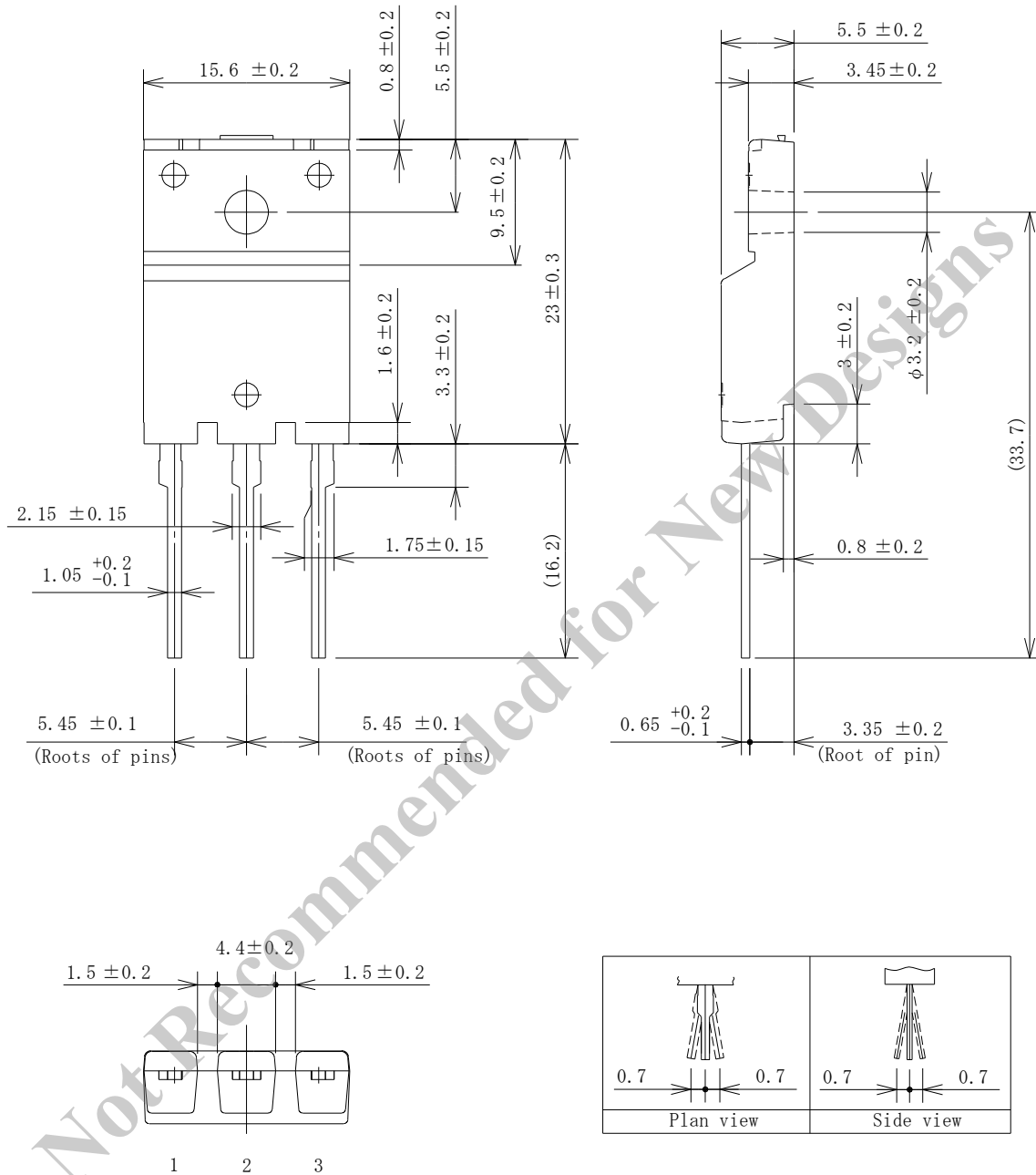


Figure 4. Typical Characteristics:  $I_R$  vs.  $V_R$

# FML-4204S

## Physical Dimensions

### • TO3PF-3L



### NOTES:

- Dimensions in millimeters
- Maximum gate burr height is 0.3 mm.
- Bare lead frame: Pb-free (RoHS compliant)
- When soldering the products, it is required to minimize the working time within the following limits:  
 Flow: 260 ± 5 °C / 10 ± 1 s, 2 times  
 Soldering Iron: 380 ± 10 °C / 3.5 ± 0.5 s, 1 time  
 Soldering should be at a distance of at least 1.5 mm from the body of the product.

Marking Diagram

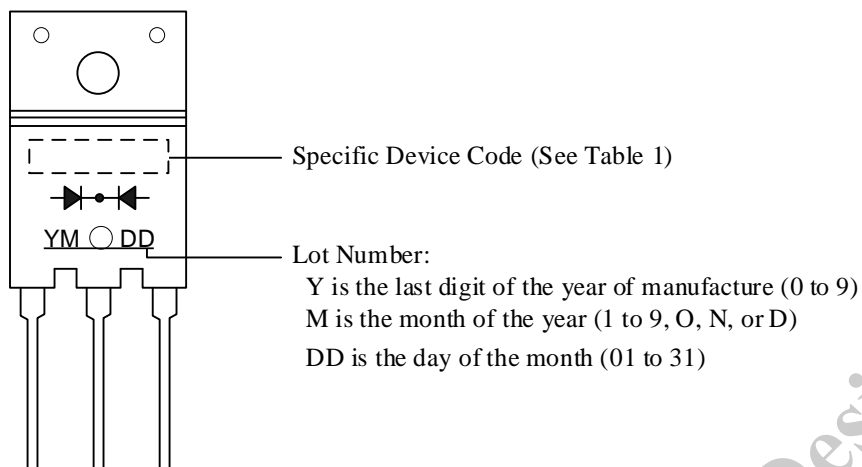


Table 1. Specific Device Code

Specific Device Code	Part Number
L4204S	FML-4204S

Not Recommended for New Designs

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