MOSFETs Silicon P-Channel MOS (U-MOSⅥ)

SSM3J353F

1. Applications

- Power Management Switches

2. Features

(1) 4.0 V gate drive voltage.

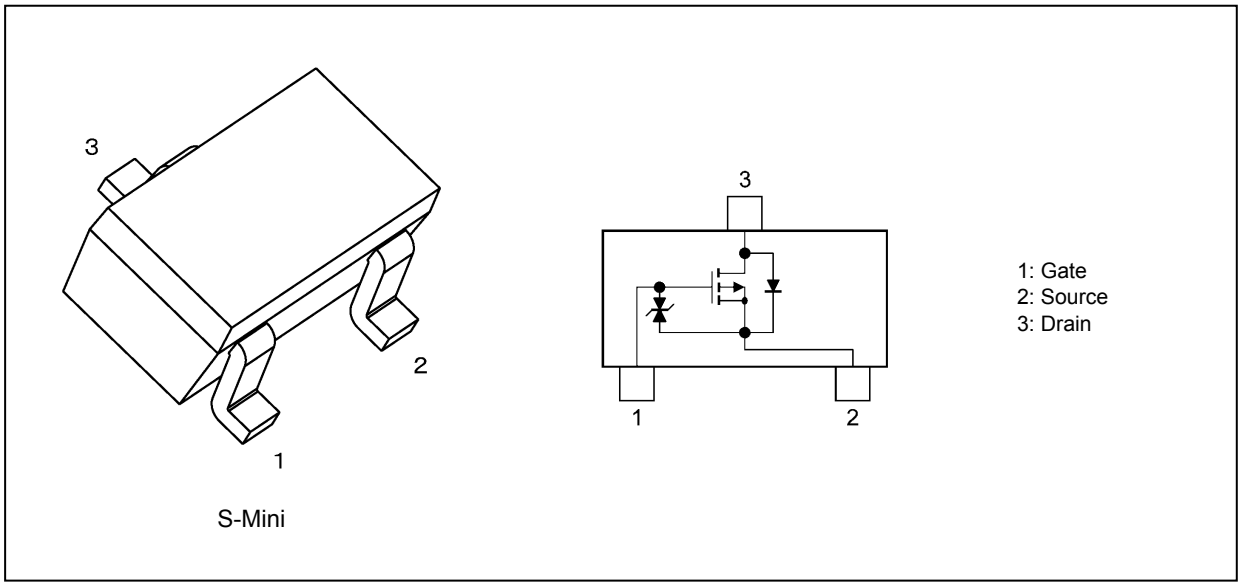
(2) Low drain-source on-resistance

: $R_{DS(ON)}$ = 274 mΩ (max) (@V_{GS} = -4.0 V, I_D = -0.5 A)

$R_{DS(ON)}$ = 232 mΩ (max) (@V_{GS} = -4.5 V, I_D = -0.5 A)

$R_{DS(ON)}$ = 150 mΩ (max) (@V_{GS} = -10 V, I_D = -2.0 A)

3. Packaging and Pin Assignment



Start of commercial production

2016-02

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4. Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25 °C)

Characteristics			Symbol	Rating	Unit
Drain-source voltage			V_{DSS}	-30	V
Gate-source voltage			V_{GSS}	-25 / +20	
Drain current (DC)		(Note 1)	I_D	-2.0	A
Drain current (pulsed)		(Note 1), (Note 2)	I_{DP}	-4.0	
Power dissipation		(Note 3)	P_D	600	mW
Power dissipation	t ≤ 1s	(Note 3)		1200	
Channel temperature			T_{ch}	150	°C
Storage temperature			T_{stg}	-55 to 150	

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.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

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

Note 2: Repetitive rating; pulse width limited by maximum channel temperature.

Note 3: Device mounted on a 25.4 mm × 25.4 mm × 1.6 mm FR4 glass epoxy board (Cu pad: 645 mm^2)

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

Note: The MOSFETs in this device are sensitive to electrostatic discharge. When handling this device, the worktables, operators, soldering irons and other objects should be protected against anti-static discharge.

Note: The channel-to-ambient thermal resistance, $R_{th(ch-a)}$, and the drain power dissipation, P_D, vary according to the board material, board area, board thickness and pad area. When using this device, be sure to take heat dissipation fully into account.

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5. Electrical Characteristics

5.1. Static Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±16 V	—	—	±1	μA
Drain cut-off current		I_{DSS}	V_{DS} = -30 V, V_{GS} = 0 V	—	—	-1	
Drain-source breakdown voltage		$V_{(BR)DSS}$	I_D = -1 mA, V_{GS} = 0 V	-30	—	—	V
Drain-source breakdown voltage	(Note 1)	$V_{(BR)DSX}$	I_D = -1 mA, V_{GS} = 8 V	-22	—	—	
Gate threshold voltage		V_{th}	V_{DS} = V_{GS}, I_D = -0.25 mA	-1.0	—	-2.2	
Drain-source on-resistance	(Note 2)	$R_{DS(ON)}$	I_D = -0.5 A, V_{GS} = -4.0 V	—	198	274	mΩ
			I_D = -0.5 A, V_{GS} = -4.5 V	—	176	232	
			I_D = -2.0 A, V_{GS} = -10 V	—	125	150	
Forward transfer admittance	(Note 2)	$\|Y_{fs}\|$	V_{DS} = -10 V, I_D = -1.0 A	—	2.6	—	S

Note 1: If a reverse bias is applied between gate and source, this device enters $V_{(BR)DSX}$ mode. Note that the drain-source breakdown voltage is lowered in this mode.

Note 2: Pulse measurement.

5.2. Dynamic Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input capacitance	C_{iss}	V_{DS} = -15 V, V_{GS} = 0 V, f = 1 MHz	—	159	—	pF
Reverse transfer capacitance	C_{rss}		—	23	—	
Output capacitance	C_{oss}		—	30	—	
Switching time (turn-on time)	t_{on}	V_{DS} = -15 V, I_D = -1.0 A, V_{GS} = 0 to -4.5 V, R_G = 15 Ω	—	30	—	ns
Switching time (turn-off time)	t_{off}		—	34	—	

5.3. Switching Time Test Circuit

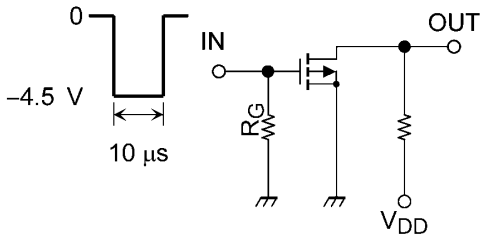


Fig. 5.3.1 Switching Time Test Circuit

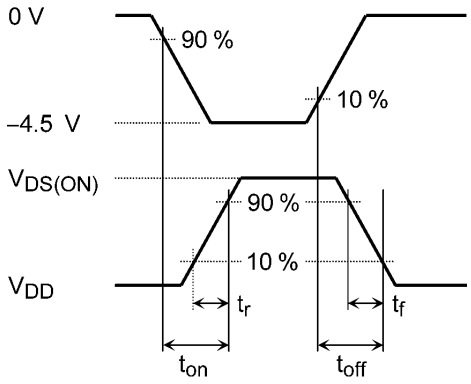


Fig. 5.3.2 Input Waveform/Output Waveform

5.4. Gate Charge Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Q_g	V_{DD} = -15 V, I_D = -2.0 A, V_{GS} = -4.5 V	—	3.4	—	nC
Gate-source charge 1	Q_{gs1}		—	1.5	—	
Gate-drain charge	Q_{gd}		—	1.4	—	

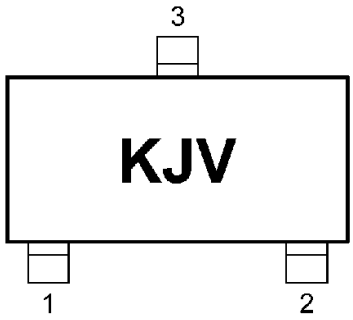
5.5. Source-Drain Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Diode forward voltage	(Note 1)	V_{DSF}	I_D = 2.0 A, V_{GS} = 0 V	—	0.9	1.2	V

Note 1: Pulse measurement.

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6. Marking



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7. Characteristics Curves (Note)

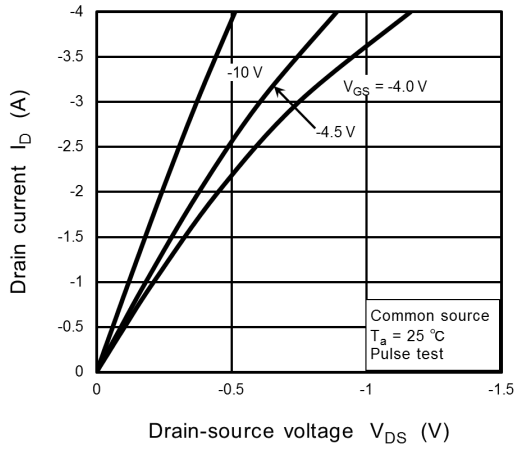


Fig. 7.1 I_D - V_{DS}

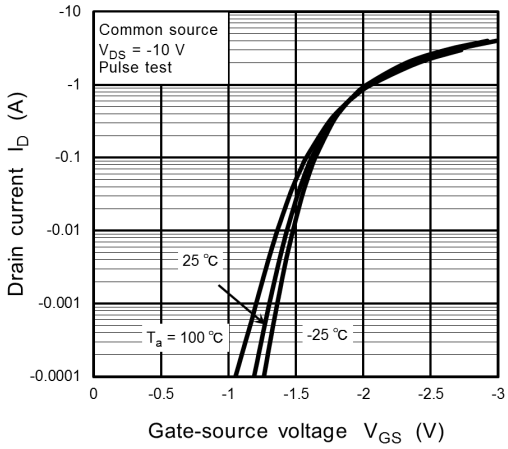


Fig. 7.2 I_D - V_{GS}

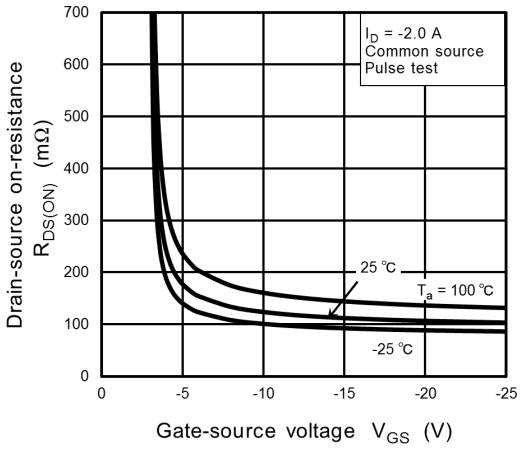


Fig. 7.3 $R_{DS(ON)}$ - V_{GS}

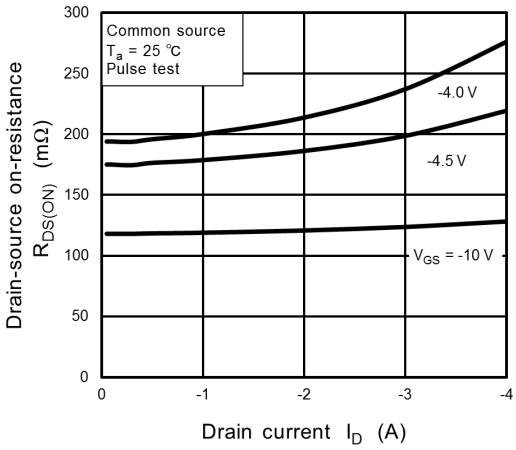


Fig. 7.4 $R_{DS(ON)}$ - I_D

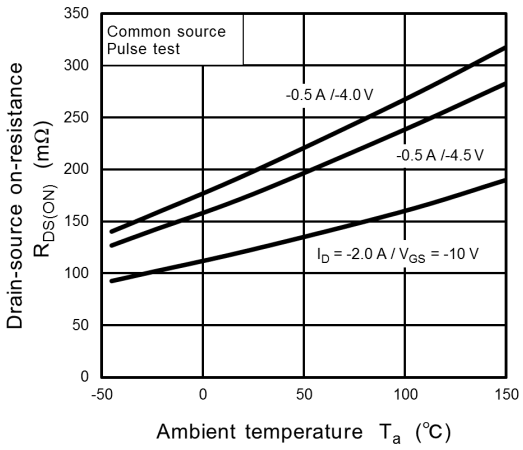


Fig. 7.5 $R_{DS(ON)}$ - T_a

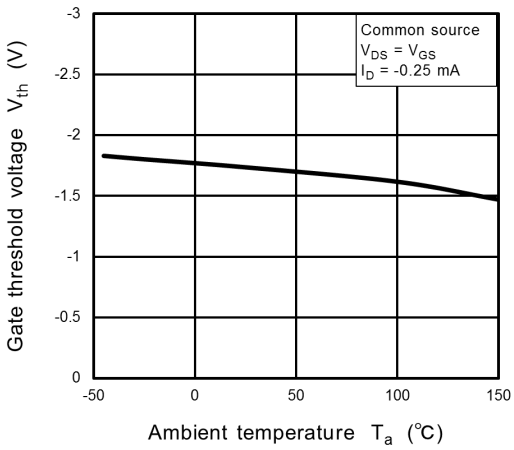


Fig. 7.6 V_{th} - T_a

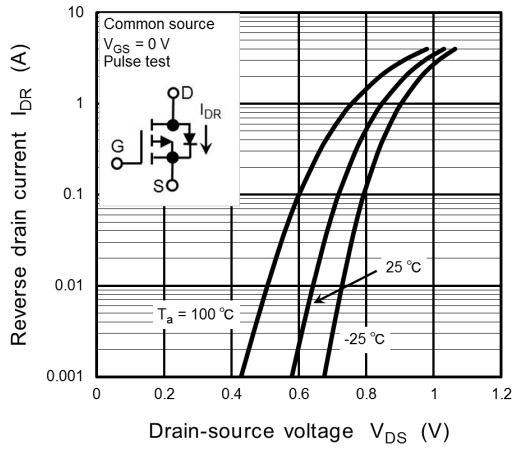


Fig. 7.7 I_{DR} - V_{DS}

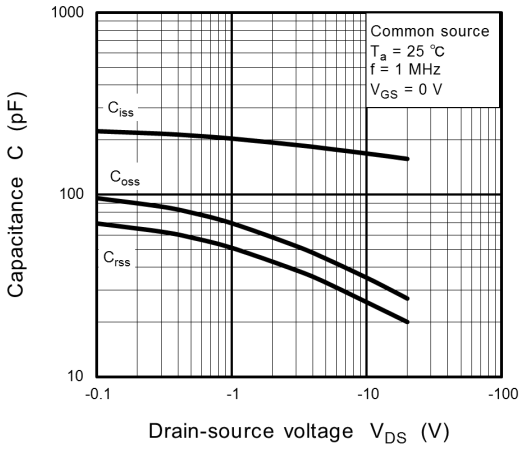


Fig. 7.8 C - V_{DS}

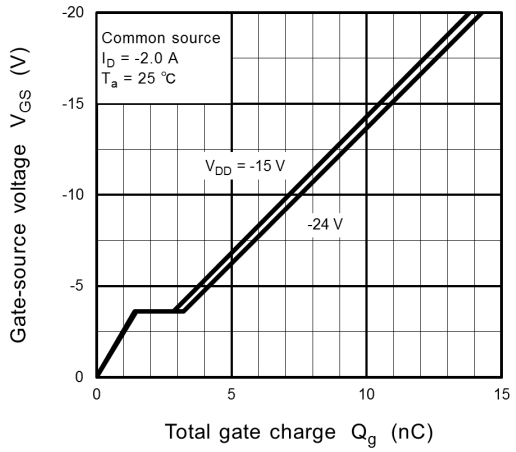


Fig. 7.9 Dynamic Input Characteristics

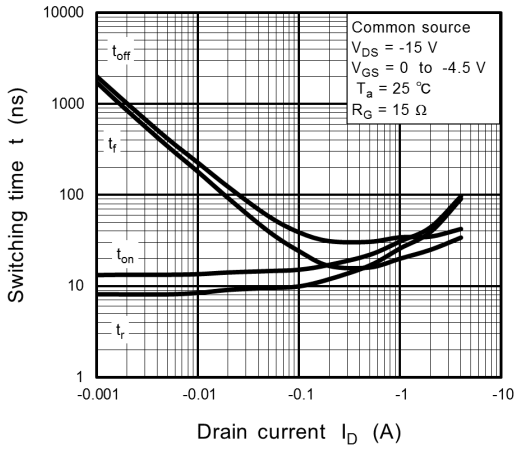


Fig. 7.10 t - I_D

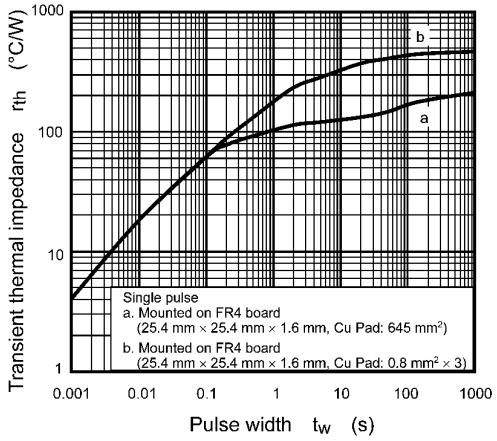


Fig. 7.11 r_{th} - t_w

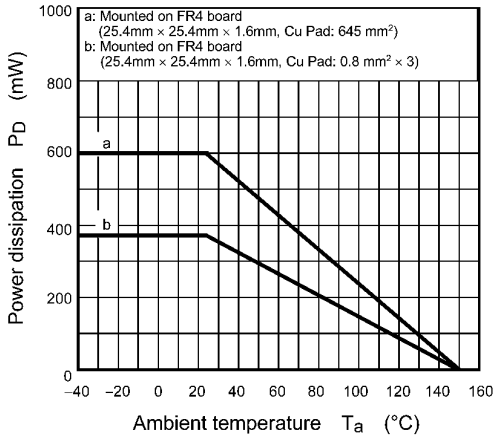


Fig. 7.12 P_D - T_a

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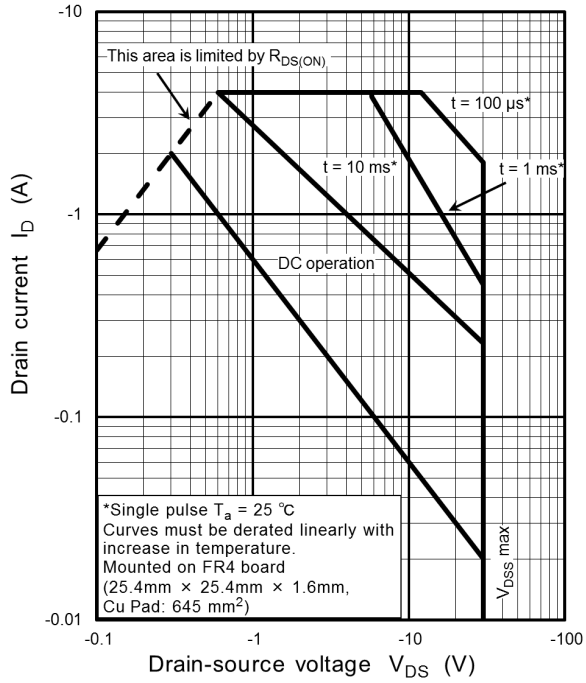
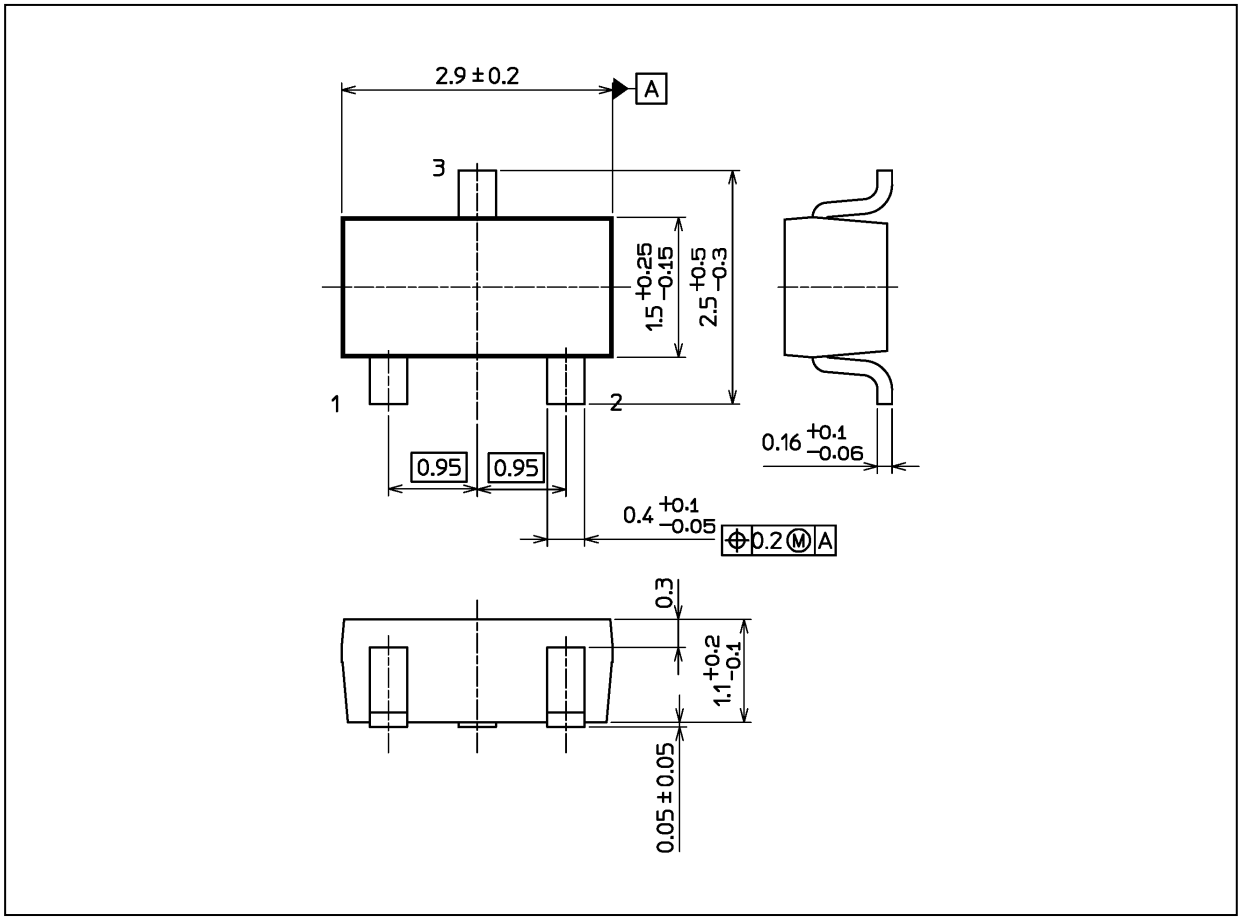


Fig. 7.13 Safe Operationg Area

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

Package Dimensions

Unit: mm



Weight: 12 mg (typ.)

Package Name(s)
Nickname: S-Mini

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