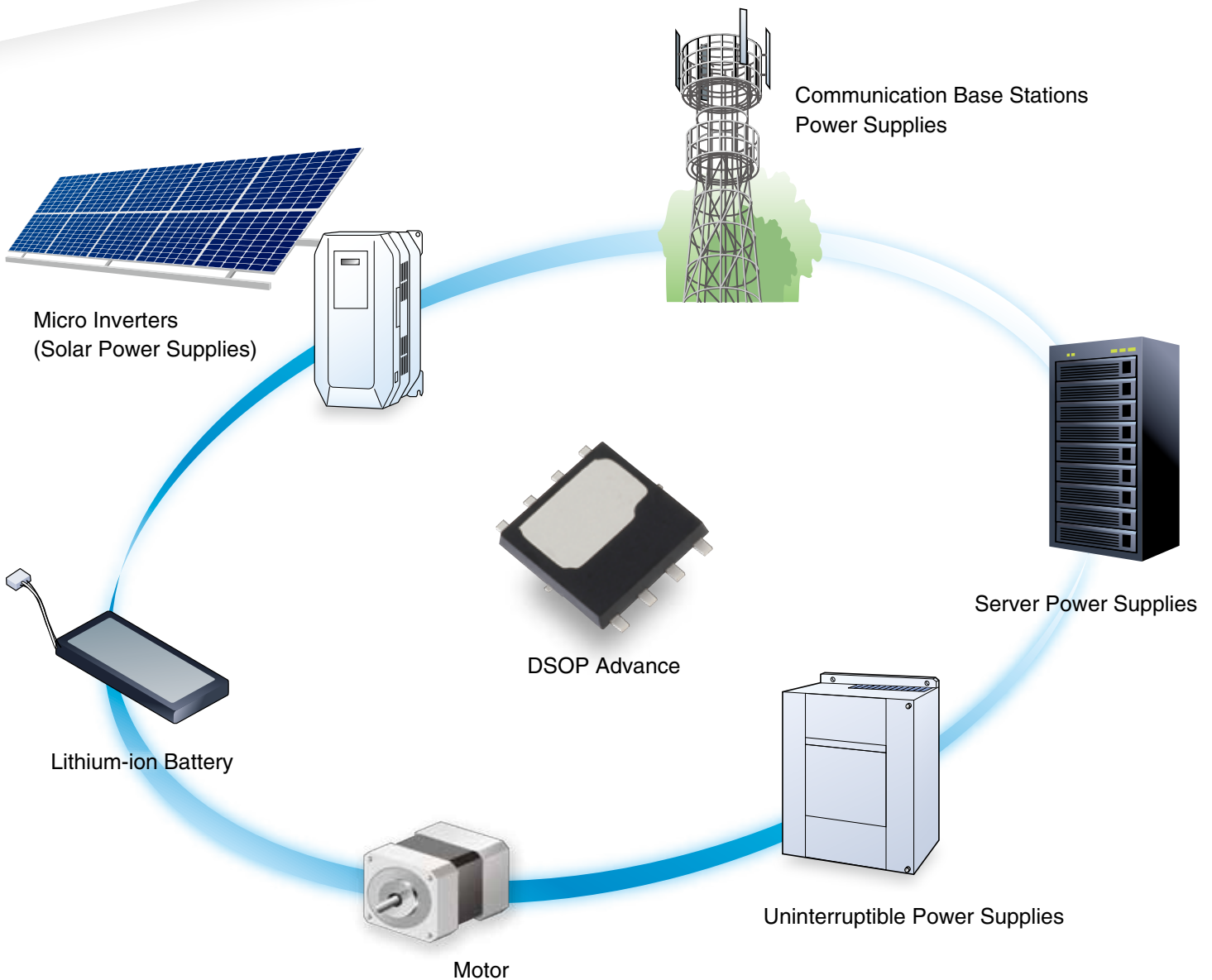


U-MOSIX/U-MOSVIII Series Low Voltage MOSFETs



Gen-9 and Gen-8 High-Performance U-MOS Series That Help Save Energy

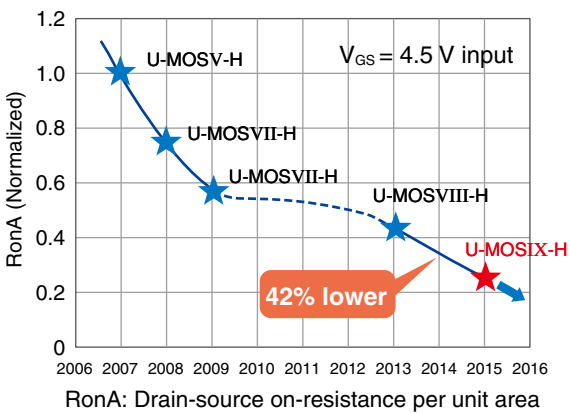
Low- V_{DS} MOSFETs

Toshiba has used each successive generation of fabrication processes and steadily optimized the device structure to reduce the power losses of its low-voltage power MOSFETs.

Features

- Low on-resistance due to the use of a small-geometry process
- Low power losses due to a greatly improved trade-off between on-resistance and charge characteristics
- MOSFETs with a wide range of V_{DS} and extensive packaging options suitable for various applications
- High avalanche ruggedness and ESD tolerance
- Device structure designed to reduce switching noise and thus simplify system design

[Continual Reduction in On-Resistance of 30-V MOSFETs]



U-MOSIX and U-MOSVIII Series

The high-performance U-MOSIX and U-MOSVIII-H series combine low on-resistance and high switching speed and are available with a wide range of V_{DS} from 30 V to 250 V.

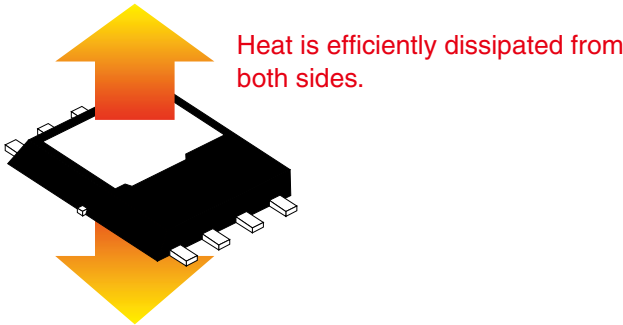
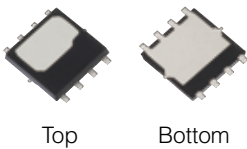
[Comparison of Coverage of the U-MOSVIII-H and U-MOSIX-H Series]

Drain-Source on-resistance $R_{DS(on)}$ (Max) @ $V_{GS} = 10\text{ V}$ (m Ω)	Drain-Source voltage V_{DS} (V)										
	30 V	40 V	45 V	60 V	75 V	80 V	100 V	120 V	150 V	200 V	250 V
100–200											
50–100											
20–50											
10–20											
5–10											
3–5											
1–3											
0.7–1											
0.7 less than											

Double-Sided-Cooling Package DSOP Advance

- 1. The DSOP Advance package efficiently dissipates heat from the metal plates on the top and bottom surfaces.**
The DSOP Advance package provides a higher current capacity than the conventional package with the same size and therefore helps save PCB space and reduce the system size.
- 2. The DSOP Advance package is footprint-compatible with the SOP Advance package.**
MOSFETs in the DSOP Advance package serve as easy replacements for those in the SOP Advance package without the need for modifying the PCB layout.
- 3. The DSOP Advance package has lower resistance.**

[DSOP Advance Package]



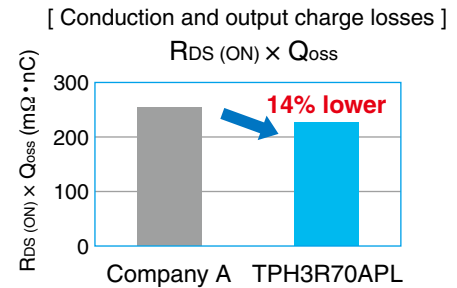
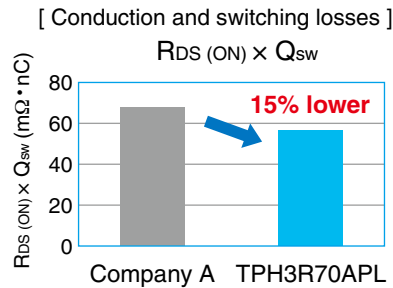
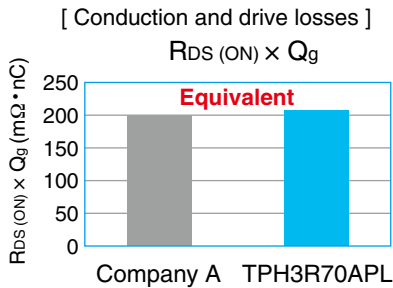
Features

1. Greatly improved trade-off between on-resistance and charge characteristics

Fabricated with the latest process and the optimized cell structure, the U-MOSIX-H series provides a greatly improved trade-off between on-resistance and charge characteristics, which are important figures of merit for MOSFETs. Consequently, the U-MOSIX-H series provides significant reductions in major losses including conduction loss, drive loss, switching loss, and output charge loss, which help improve the efficiency of application systems and reduce the MOSFET device temperature.

Comparisons of $R_{DS(ON)} \times Q_{sw}$

($V_{DS} = 100\text{ V}$ Series)



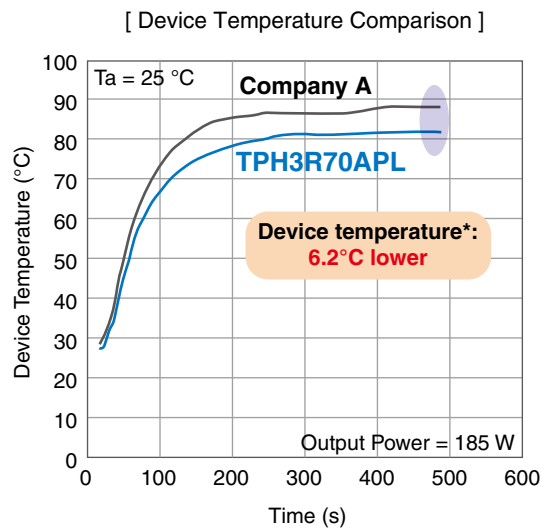
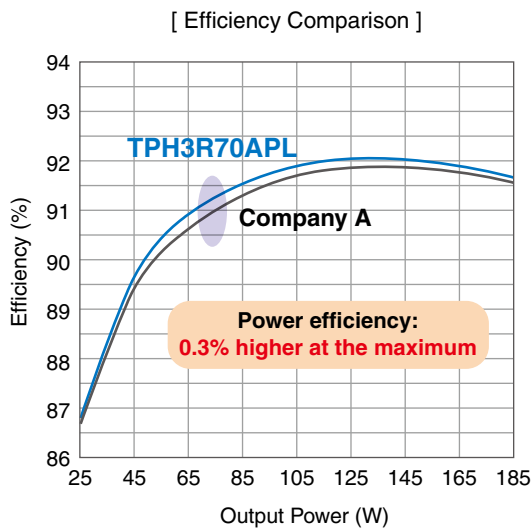
As of January 2018 (as surveyed by Toshiba)

$R_{DS(ON)}$: Drain-source on-resistance ($m\Omega$) (figure of merit for conduction loss)
 Q_g : Gate charge (nC) (figure of merit for drive loss)
 Q_{sw} : Gate switch charge (nC) (figure of merit for switching loss)
 Q_{oss} : Output charge (nC) (figure of merit for output charge loss)

TPH3R70APL:
 U-MOSIX-H, SOP Advance
 $V_{DS} = 100\text{ V}$,
 $R_{DS(ON)}(\text{Max}) = 3.7\text{ m}\Omega$ ($V_{GS} = 10\text{ V}$ input)

Comparisons of efficiency and device temperature

(Full-Bridge DC-DC Converter)



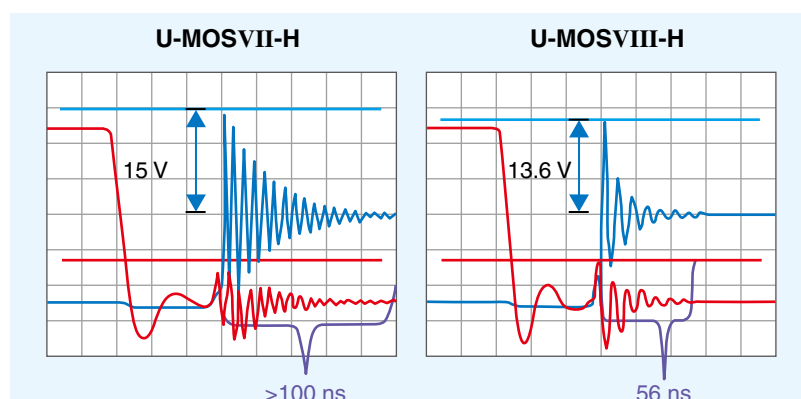
Operating conditions:
 Input voltage = 48 V
 Output voltage = 24 V
 Output power = 25 to 185 W
 Operating frequency: 150 kHz
 MOSFET gate drive voltage = 6 V

* At the center of the package mold surface

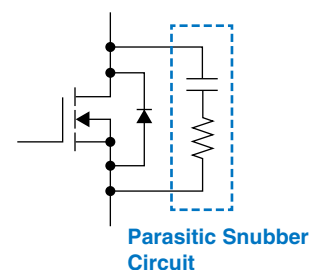
2. Reduction in switching noise

Due to the parasitic RC snubber between drain and source, the U-MOSVIII-H and U-MOSIX-H series help reduce noise and ringing during switching transitions.

[Comparison of Drain-Source Voltage Waveforms during Switch-Off Operation]



Test conditions:
 $V_{IN} = 12\text{ V}$
 $V_{OUT} = 5\text{ V}$
 $I_{OUT} = 12\text{ A}$



3. Guaranteed at a channel temperature of up to 175°C

The MOSFETs of the U-MOSIX-H series, including those with a V_{DS} of 30 V, are guaranteed at a channel temperature of up to 175°C and over a storage temperature range from -55°C to 175°C.

U-MOSIX/U-MOSVIII Series Lineup

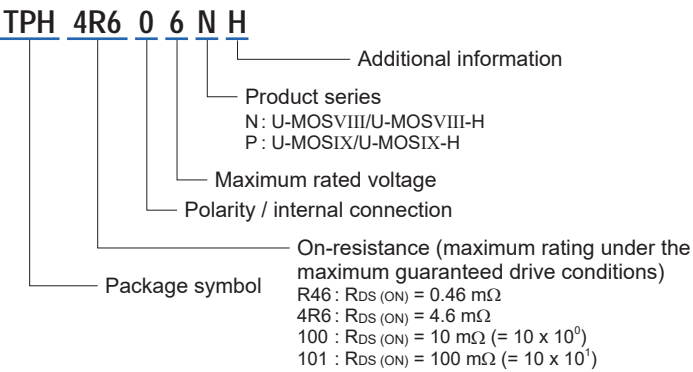
V _{DSS} (V)	R _{DS (ON)} max (mΩ)	TSON Advance	SOP Advance	SOP-8	DSOP Advance	TO-220	TO-220SIS	DPAK	D2PAK	DPAK+	D2PAK+	TO-220SM (W)
30	10 – 20	TPN11003NL	TPH11003NL									
	5 – 10	TPN8R903NL										
		TPN6R303NC	TPH8R903NL	TP89R103NL								
		TPN6R003NL	TPH6R003NL	TP86R303NL								
		TPN5R203PL										
	3 – 5	TPN4R303NL	TPH4R803PL			TK3R3E03GL						
40	1 – 3	TPN2R903PL	TPH3R003PL									
		TPN2R703NL	TPH2R903PL									
		TPN2R503NC	TPH2R003PL									
		TPN2R203NC	TPH1R403NL									
45	< 1		TPHR9203PL		TPWR8503NL							
			TPHR9003NL		TPWR6003PL							
			TPHR9003NC									
			TPHR6503PL									
	10 – 20									TK15S04N1L		
	5 – 10	TPN7R504PL	TPH7R204PL									
60	3 – 5	TPN3R704PL	TPH3R704PC			TK3R1E04PL	TK3R1A04PL	TK3R1P04PL		TK65S04N1L		
			TPH3R704PL									
		TPN2R304PL	TPH2R104PL							TK100S04N1L	TK1R5R04PB	TK1R4F04PB
			TPH1R204PB							TK1R4S04PB		
75	< 1		TPHR8504PL		TPWR8004PL							TK200F04N1L
												TKR74F04PB
	1 – 3	TPN2R805PL	TPH2R805PL									
	< 1		TPH1R405PL									
80	20 – 50	TPN22006NH										
		TPN14006NH	TPH14006NH			TK30E06N1	TK30A06N1			TK25S06N1L		
		TPN11006NL	TPH11006NL			TK40E06N1	TK40A06N1			TK40S06N1L		
		TPN11006PL										
	5 – 10	TPN7R506NH	TPH7R506NH			TK8R2E06PL	TK8R2A06PL					
	3 – 5	TPN7R006PL	TPH7R006PL			TK58E06N1	TK58A06N1	TK6R7P06PL				
90	3 – 5	TPN4R806PL	TPH4R606NH			TK4R3E06PL	TK4R3A06PL	TK4R4P06PL				
			TPH3R506PL			TK3R2E06PL	TK3R3A06PL			TK90S06N1L		
			TPH2R306NH									
			TPH2R506PL									
100	1 – 3		TPH1R306PL									
			TPH1R306P1									
120	1 – 3											
150	1 – 3											
200	1 – 3											
250	1 – 3											

V_{DSS} (V): Drain-Source voltage
R_{DS (ON)} (mΩ): Drain-Source on-resistance

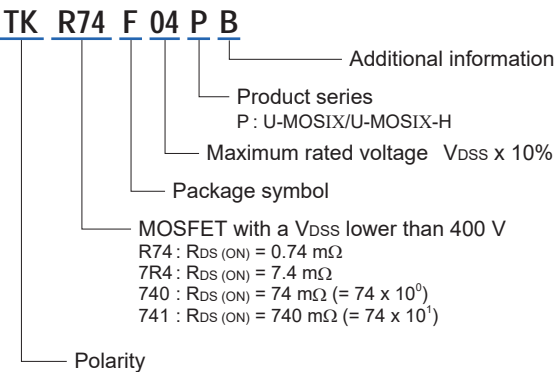
V _{DSS} (V)	R _{DS (ON)} max (mΩ)	TSON Advance	SOP Advance	SOP-8	DSOP Advance	TO-220	TO-220SIS	DPAK	D2PAK	DPAK+	D2PAK+	TO-220SM (W)
100	20 – 50	TPN3300ANH										TK11S10N1L
	10 – 20	TPN1600ANH	TPH1400ANH			TK22E10N1	TK22A10N1	TK110P10PL				TK7S10N1Z
		TPN1200APL				TK110E10PL	TK110A10PL					
			TPH8R80ANH			TK34E10N1	TK34A10N1			TK33S10N1L	TK60R10N1L	TK60F10N1L
			TPH6R30ANL			TK40E10N1	TK40A10N1	TK7R7P10PL		TK33S10N1Z	TK60R10N1L	TK60F10N1L
			TPH5R60APL			TK7R2E10PL	TK7R4A10PL			TK60S10N1L		
120	3 – 5		TPH4R50ANH		TPW4R50ANH	TK65E10N1	TK65A10N1		TK65G10N1			TK160F10N1L
			TPH4R10ANL		TPW3R70APL	TK3R9E10PL	TK4R1A10PL					TK160F10N1
			TPH3R70APL			TK100E10N1	TK100A10N1					
150	1 – 3					TK2R9E10PL						
200	1 – 3											
250	1 – 3											

Part Naming Conventions

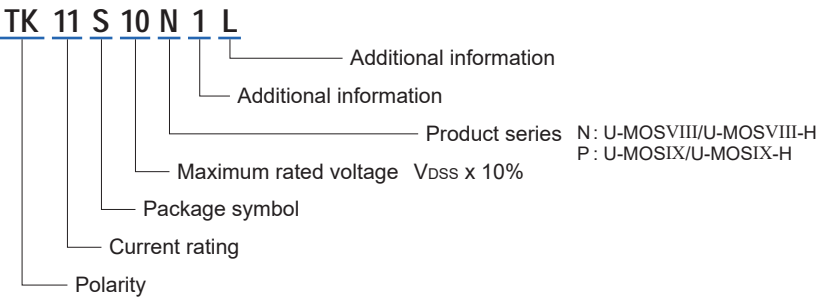
High-pin-count series



MOSFETs in a new 3-pin package



MOSFETs in a conventional 3-pin package



U-MOSIX/U-MOSVIII Series Low Voltage MOSFETs

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