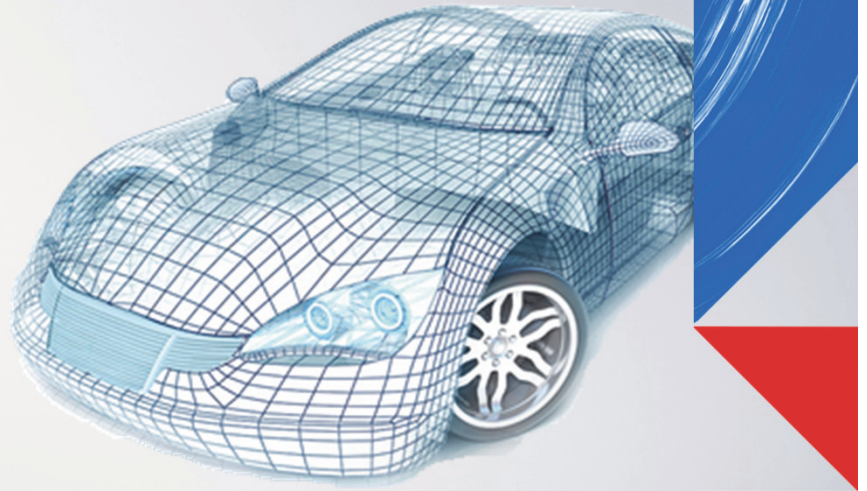


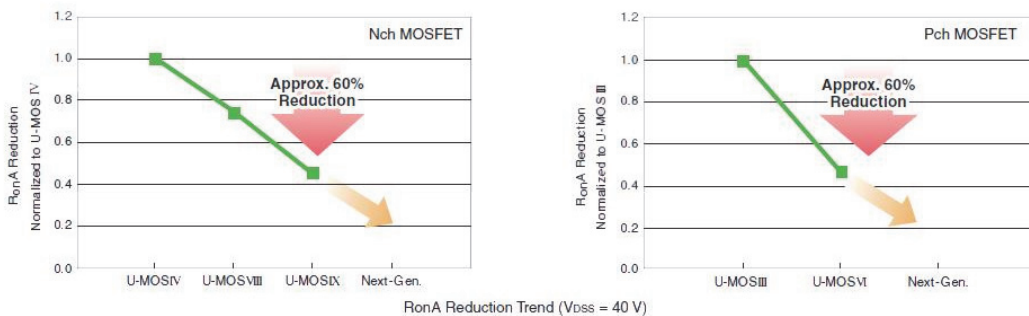
Power MOSFET



For Automotive

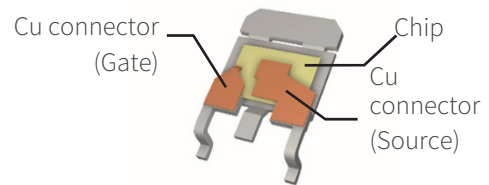
Toshiba offers an extensive lineup of power MOSFETs for various automotive applications including 48V battery systems. The combination of low ON-resistance and advanced package technology makes Toshiba's power MOSFETs an ideal solution for reducing system losses, thereby contributing to energy-saving in automotive applications. All MOSFETs on this leaflet are qualified to AEC-Q101 or are under AEC-Q101 qualification.

Reduced $R_{ON}A$ due to the small-geometry trench process



Copper (Cu) connector bonding

Copper (Cu) connectors are used instead of conventional Aluminium wire bonding in all the MOSFETs mentioned in this flyer. Copper connectors contribute to the reduction of the package resistance and inductance.



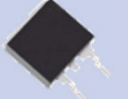
Package	Polarity	Process	V_{DSS} (V)	Part no.	$R_{DS(ON)}$ max (m Ω)		I_D (DC) (A)	P_D (W)	Qg typ (nC)	AEC-Q101
					$V_{GS}=10\text{V}$ (-10V Pch)	$V_{GS}=6\text{V}$ (-6V Pch)				

TO-220SM(W) Package (10mm x 13mm)


	Nch	UMOS10	100	(XK1R9F10QB)	(1.92)	(3.31)	(160)	(375)	(184)	*
		UMOS9	40	TKR74F04PB	0.74	0.98	250	375	227	✓
			40	TK1R4F04PB	1.35	1.90	160	205	103	✓
		UMOS8	40	TK200F04N1L	0.9	1.37	200	375	214	✓
			100	TK60F10N1L	6.11	9.25	60	205	60	✓
	Pch	UMOS6	40	TK160F10N1L	2.4	3.9	160	375	122	✓
			-40	TJ200F04M3L	1.8	2.6	-200	375	460	✓
			-40	TJ100F04M3L	3.6	5.4	-100	250	250	✓
			-60	TJ150F06M3L	5.6	6.1	-150	300	420	✓
			-60	TJ100F06M3L	7.1	10.7	-100	250	250	✓

Package	Polarity	Process	V _{DSS} (V)	Part no.	R _{DS(ON)} max (mΩ)		I _D (DC) (A)	P _D (W)	Qg typ (nC)	AEC-Q101
					V _{GS} =10V (-10V Pch)	V _{GS} =4.5V/6V (-4.5V/-6V Pch)				

D2PAK+ Package (10mm x 15mm)

	Nch	UMOS9	40	TK1R5R04PB	1.50	2.05@6V	160	205	103	✓
		UMOS8	100	TK60R10N1L	6.31	9.55@6V	60	205	60	✓


DPAK+ Package (6.5mm x 9.5mm)

	Nch	UMOS9	40	TK1R4S04PB	1.35	1.90@6V	120	180	103	✓		
		40	TK100S04N1L		TK100S04N1L	2.3	4.5@4.5V	100	157	76	✓	
			TK65S04N1L		TK65S04N1L	4.3	7.8@4.5V	65	107	39	✓	
			TK15S04N1L		TK15S04N1L	17.8	37@4.5V	15	46	10	✓	
		60	TK90S06N1L		TK90S06N1L	3.3	5.2@4.5V	90	157	81	✓	
			TK40S06N1L		TK40S06N1L	10.5	18@4.5V	40	88	26	✓	
			TK25S06N1L		TK25S06N1L	18.5	36.8@4.5V	25	57	15	✓	
		100	TK60S10N1L		TK60S10N1L	6.11	9.25@6V	60	180	60	✓	
			TK55S10N1		TK55S10N1	6.5	-	55	157	49	✓	
			TK33S10N1Z		TK33S10N1Z	9.7	-	33	125	28	✓	
			TK33S10N1L		TK33S10N1L	9.7	16.2@4.5V	33	125	33	✓	
			TK11S10N1L		TK11S10N1L	28	50@4.5V	11	65	15	✓	
	Pch	UMOS8	TK7S10N1Z		TK7S10N1Z	48	-	7	50	7.1	✓	
			-40	TJ90S04M3L		TJ90S04M3L	4.3	6.0@-4.5V	-90	180	172	✓
				TJ80S04M3L		TJ80S04M3L	5.2	7.9@-6V	-80	100	158	✓
				TJ60S04M3L		TJ60S04M3L	6.3	9.4@-6V	-60	90	125	✓
				TJ40S04M3L		TJ40S04M3L	9.1	13@-6V	-40	68	83	✓
		TJ20S04M3L			TJ20S04M3L	22.2	32@-6V	-20	41	37	✓	
		-60	TJ10S04M3L		TJ10S04M3L	44	62@-6V	-10	27	19	✓	
			TJ60S06M3L		TJ60S06M3L	11.2	14.5@-6V	-60	100	156	✓	
TJ50S06M3L			TJ50S06M3L	13.8	17.4@-6V	-50	90	124	✓			
TJ30S06M3L		TJ30S06M3L	21.8	28@-6V	-30	68	80	✓				
TJ15S06M3L		TJ15S06M3L	50	63@-6V	-15	41	36	✓				
TJ8S06M3L		TJ8S06M3L	104	130@-6V	-8	27	19	✓				


* Under development

Package	Polarity	Process	VDSS (V)	Part no.	R _{DS(ON)} max (mΩ)		ID(DC) (A)	PD (W)	Qg typ (nC)	AEC-Q101
					VGS=10V (-10V Pch)	VGS=6V (-4.5V Pch)				


DSOP Advance (WF)L package (5mm x 6mm)

	Nch	UMOS9	40	TPWR7904PB	0.79	1.3	150	170	85	✓
		UMOS8	100	(XPW4R10ANB)	(4.1)	(6.2)	(70)	(170)	(75)	*


DSOP Advance (WF)M package (5mm x 6mm)

	Nch	UMOS9	40	TPW1R104PB	1.14	1.96	120	132	55	✓
		UMOS8	100	(XPW6R30ANB)	(6.3)	(9.5)	(45)	(132)	(52)	*

SOP Advantage (WF) package (5mm x 6mm)

	Nch	UMOS9	40	TPHR7904PB	0.79	1.3	150	170	85	✓
				TPH1R104PB	1.14	1.96	120	132	55	✓
		UMOS8	100	(XPH4R10ANB)	(4.1)	(6.2)	(70)	(170)	(75)	*
				(XPH6R30ANB)	(6.3)	(9.5)	(45)	(132)	(52)	*
	Pch	UMOS6	-40	XPH3R114MC	3.1	4.7	-100	170	230	✓
				XHP4R714MC	4.7	6.9	-60	132	160	✓

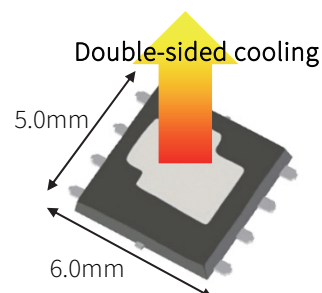
TSON Advance (WF) package (3.3mm x 3.6mm)

	Nch	UMOS8	40	(XPN3R804NC)	(3.8)	(7.8@4.5V)	(40)	(100)	(35)	*
				(XPN7R104NC)	(7.1)	(14.2@4.5V)	(20)	(65)	(21)	*
			60	(XPN6R706NC)	(6.7)	(13.3@4.5V)	(40)	(100)	(35)	*
				(XPN12006NC)	(12.0)	(23.7@4.5V)	(20)	(65)	(23)	*
	Pch	UMOS6	-40	XPN9R614MC	9.6	13.4@4.5V	-40	100	64	✓
				(XPN19014MC)	(18.7)	(27.3@4.5V)	(-20)	(65)	(46)	*

* Under development

Double-sided cooling

The DSOP advance(WF) double-sided cooling packages fit the same footprint as the SOP advance(WF). Due to the greatly reduced thermal resistance, the maximum load can be increased considerably. Alternatively the MOSFET temperature can be reduced to increase long term reliability.



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Power MOSFET package lineup

D2PAK+	TO-220SM(W)	DPAK+
<p>D2PAK foot print compatible</p> <p>Unit : mm</p>	<p>Unit : mm</p>	<p>Unit : mm</p>

DSOP Advance(WF) L with wettable flanks	DSOP Advance(WF) M with wettable flanks	SOP Advance(WF) with wettable flanks
<p>Unit : mm</p>	<p>Unit : mm</p>	<p>Unit : mm</p>

TSON Advance(WF) with wettable flanks

Tentative package drawing

Unit : mm